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Wild wheats: a monograph of *Aegilops* L. and *Amblyopyrum* (Jaub. & Spach) Eig (Poaceae)

A revision of all taxa closely related to wheat, excluding wild *Triticum* species, with notes on other genera in the tribe Triticeae, especially *Triticum*

M. W. van Slageren

Genetic Resources Unit
International Center for Agricultural Research in the Dry Areas

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Aleppo, Syria

and

Herbarium Vadense
Department of Plant Taxonomy
Wageningen, Agricultural University, The Netherlands

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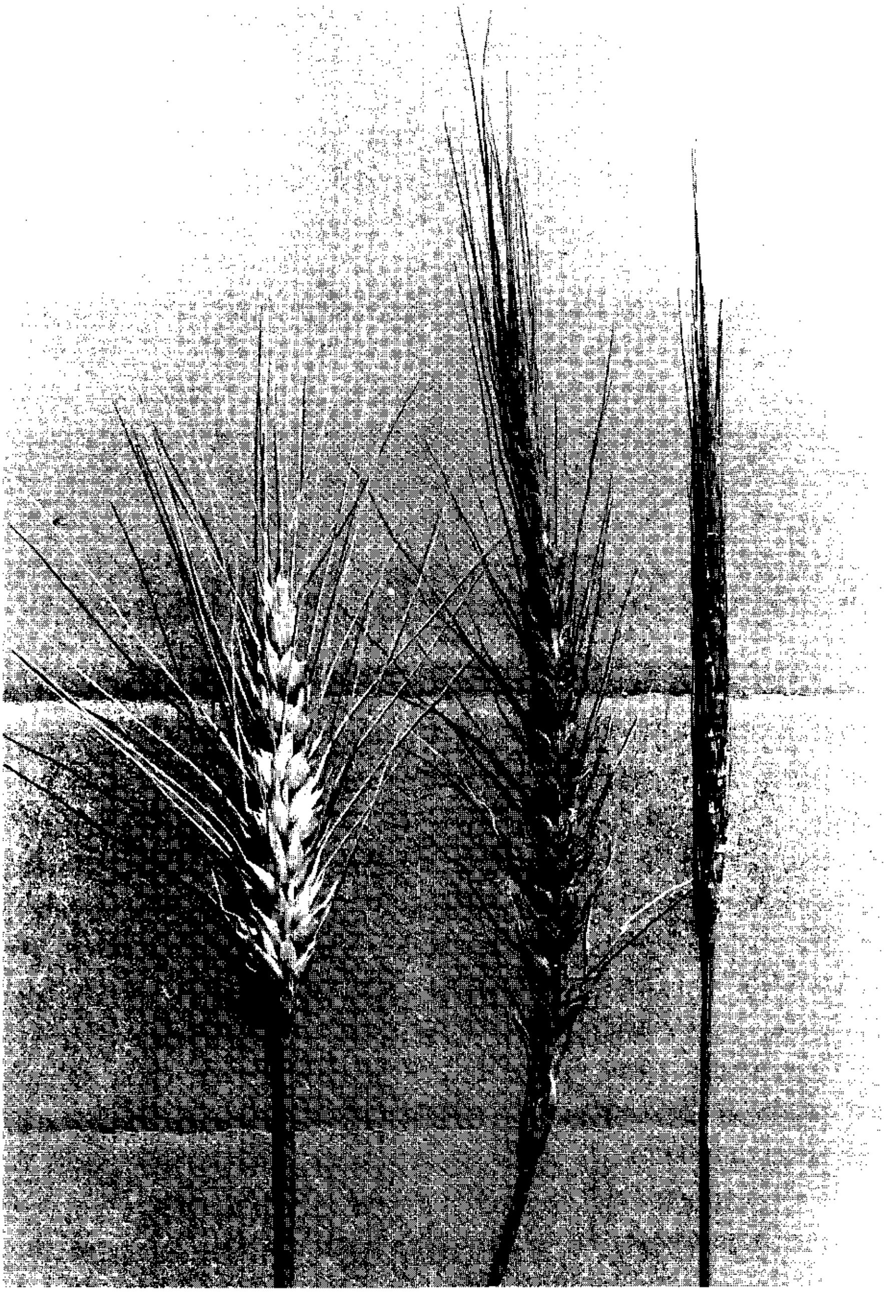


Fig. 1. Possibly a natural hybridization (sterile spike in the centre) of *Triticum aestivum* (left) and *Aegilops speltoides* var. *ligustica* (right) on the edge of a bread wheat field near Qamishly, NE Syria (left to right colls. *van Slageren & Sweid MSFS-91047H, 91047aH, 91050H* (all ICARDA); phot. M.W. van Slageren).

Contents

Foreword

The usefulness of germplasm collections to plant breeders, crop evolutionists, plant pathologists, taxonomists and other experimental biologists is evident. Data that can be derived from taxonomic studies and herbarium collections are invaluable to the efficient planning of collection missions in search for the germplasm required for plant improvement.

The International Center for Agricultural Research in the Dry Areas (ICARDA) has a joint mandate with the Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) for wheat improvement in the West Asia and North Africa (WANA) region. The utilization of genetic resources such as landraces and wild progenitors of cutivated wheat to improve and stabilize crop production in the face of the biotic and abiotic stresses of the region is a key component in the development of adapted germplasm. In this process plant breeders are increasingly searching for desirable genes in the exotic germplasm that is now compiled in genebanks, such as the one at the Genetic Resources Unit at ICARDA.

Plant taxonomy as a science that deals with delimiting, describing, naming and classifying botanical material is at the basis of all germplasm activities. In the case of cultivated crops it should ideally present a complete inventory of the gene pool in a wide sense, enabling researchers worldwide to relate their work to precisely described and named taxa. This objective has not been reached for many of the world's important crops. The wider gene pool of wheat has been the subject of intense debate as to the taxa involved and the genera in which to place them. Arguments presented here underline the distinction of the genera *Aegilops* and *Amblyopyrum* as separate from *Triticum sensu stricto*. All taxa allocated to these two genera are described, leaving only the wild species of the genus *Triticum*, which are the most direct relatives of cultivated wheat, to be published elsewhere.

I am confident that, especially with the advent of rapidly developing biotechnological tools, the wider gene pool of wheat will increasingly find its utilization in the improvement of germplasm for this important crop, leading, ultimately, to raising the standards of living for the farmers of the WANA region and elsewhere.

Nasrat R. Fadda
Director General, ICARDA

Summary

Aegilops L., a genus of annual grasses (family Poaceae Barnhart, subfamily Pooideae, tribe Triticeae Dumort., subtribe Triticinae Griseb.), has been revised. The genus forms the largest part of the so-called secondary gene pool of wheat (*Triticum* L.). Morphological evidence as well as phylogenetical considerations underlined the location of one species, *Ae. mutica* Boiss., in the monospecific genus *Amblyopyrum* (Jaub. & Spach) Eig. This transfer re-established an earlier decision by Eig, which had generally not been followed.

Aegilops now comprises 22 species and five non-typical varieties, arranged in five sections. These taxa and their names resulted from taxonomic decisions and from scrutiny of the almost 900 names involved. *Amblyopyrum* now consists of only one species with one non-typical variety, although 39 names are involved. In addition, the intergeneric hybrid genus x *Aegilotriticum* P.Fourn. remains in existence because of the continued separation of the parental genera *Aegilops* and *Triticum*. This hybrid genus now consists of seven accepted taxa: one artificially created hybrid and six highly sterile, natural hybrids. Its eight accepted names remain from no less than 77 names involved.

Aegilops is a Mediterranean-Western Asiatic element, occurring around the Mediterranean Sea and in Western and Central Asia. Its centre of origin is thought to be in Transcaucasia; its centre of diversity follows the Fertile Crescent arc in West Asia. The 10 diploid taxa are generally less widespread than the 10 tetraploids, with two hexaploid species of limited distribution. Only *Ae. sharonensis* Eig may be considered an endemic. *Amblyopyrum* is a Western Asiatic element of limited distribution, occurring only in Turkey and Armenia. A key is presented to the taxa of *Aegilops*, *Amblyopyrum* and the wild taxa of *Triticum*. The sectional arrangements in *Aegilops* are reviewed, as are the relations with other genera in the subtribe Triticinae. Lastly, an overview is presented of the taxa in the first and second gene pools of wheat with a summary of the accepted taxa in *Triticum sensu stricto*.

A detailed botanical description of the species in *Aegilops* and *Amblyopyrum* is accompanied by a line drawing, dot-distribution maps, lists of literature and synonyms, and notes on taxonomic and nomenclatural problems, distribution, ecology, uses, and – when available – vernacular names. The economic importance of species in both genera is, besides being an accessible source of genetic variation for wheat improvement, ephemeral.

Keywords: *Aegilops*, *Amblyopyrum*, taxonomy, distribution, phylogeny, wheat gene pool.

Résumé

Le genre *Aegilops* L., graminée annuelle (famille des Poaceae Barnhart, sous-famille des Pooideae, tribu des Triticeae Dumort., sous-tribu des Triticinae Griseb.), a été révisé. Il constitue la plus grande part de ce qu'on appelle communément le réservoir génétique secondaire du blé (*Triticum* L.). Des preuves morphologiques ainsi que des considérations phylogénétiques ont permis de souligner la position d'une espèce, *Ae. mutica* Boiss., dans le genre monospécifique *Amblyopyrum* (Jaub. & Spach) Eig. Ce changement confirme une proposition antérieure de Eig qui n'avait pas été suivie de façon générale.

Le genre *Aegilops* contient à présent 22 espèces et cinq variétés atypiques, réparties en cinq sections. Ces taxa et leurs noms étaient le résultat de décisions taxinomiques et de l'examen rigoureux du presque 900 noms impliqués. *Amblyopyrum* ne constitue plus maintenant qu'un seule espèce avec une variété atypique, bien que 39 noms soient impliqués. De plus, le genre hybride intergénérique x *Aegilotriticum* P.Fourn. y est maintenu du fait de la séparation persistante des genres parentaux *Aegilops* et *Triticum*. Ce genre hybride contient à présent sept espèces reconnues: un hybride créé artificiellement et six hybrides naturels hautement stériles. Ses huit noms reconnus sont maintenus après l'étude de pas moins de 77 noms impliqués.

Aegilops provient de la région Méditerranée / Asie de l'Ouest. Il est distribué autour de la mer Méditerranée et en Asie occidentale et centrale. On pense que son centre d'origine est en Transcaucasie. Son centre de diversité se situe dans les régions du Croissant Fertile en Asie de l'Ouest. Les dix taxa diploïdes sont en général moins répandus que les dix tétraploïdes. Les deux hexaploïdes ayant une distribution limitée. Seul, *Ae. sharonensis* Eig peut être considérée comme une espèce endémique. *Amblyopyrum* provient d'Asie de l'Ouest avec une distribution se limitant à la Turquie et à l'Arménie. Une clé est donnée pour les taxa d'*Aegilops*, d'*Amblyopyrum* et les taxa sauvages de *Triticum*. Le classement en sections dans le genre *Aegilops* est passé en revue, ainsi que les relations avec les autres genres dans la sous-tribu des Triticinae. Enfin, les taxa des réservoirs génétiques primaire et secondaire du blé sont passés en revue avec un résumé des taxa reconnus de *Triticum sensu stricto*.

La description détaillée des espèces d'*Aegilops* et d'*Amblyopyrum* est accompagnée de dessins au trait, de cartes de distribution, de listes de références bibliographiques et de synonymes, ainsi que des notes sur leurs problèmes de taxinomie et de nomenclature, leur distribution, leur écologie, leur utilisation et, lorsqu'ils existent, leurs noms vernaculaires. Mis à part le fait d'être accessibles pour la variation génétique dans le cadre de l'amélioration du blé, les espèces de ces deux genres sont d'une importance économique faible.

Mots clefs: *Aegilops*, *Amblyopyrum*, taxinomie, distribution, phylogénie, réservoir génétique du blé.

ملخص

أعيدت دراسة الدوسر .*Aegilops* L ، وهو جنس من الأعشاب الحولية (فصيلة Poaceae Barnhart وتحت فصلية Pooideae وعشيرة .Triticeae Dumort وتحت عشيرة .Triticinae Griseb ويشكل هذا الجنس القسم الأكبر مما يدعى بالمجموعة الوراثية الثانوية للقمح (.*Triticum* L). وقد أكدت الأدلة الشكلية (المورفولوجية) والدراسات المتعلقة بتاريخ تطوره، موقع أحد الأنواع .*Ae. mutica* Boiss في الجنس النوعي الأحادي *Amblyopyrum* (Jaub. & Spach) Eig وقد أدى هذا التحول عموماً إلى تأكيد قرار كان قد اتخذه Eig سابقاً.

يتكون الدوسر *Aegilops* حالياً من 22 نوعاً، وخمسة أصناف غير نموذجية مرتبة في خمسة أقسام. وقد نجمت هذه التصنيفات وتسمياتها عن القرارات التصنيفية، ومن دراسة زهاء 900 اسم. ويتكون *Amblyopyrum* حالياً من نوع واحد فقط ذي صنف واحد غير نموذجي، رغم شمول 39 اسماً. بالإضافة الى ذلك، فإن عملية تهجين الجنس الهجين .x *Aegilotriticum* P. Fourn لازالت قائمة بسبب الفصل المستمر لجنس الأب الدوسر *Aegilops* و *Triticum*. ويتكون هذا الجنس الهجين حالياً من سبعة تصنيفات مقبولة: هجين واحد اصطناعي، وستة هجن طبيعية عقيمة جداً. وتبقى اسماؤها الثمانية مقبولة من بين لايقل عن 77 اسماً مطروحاً.

إن الدوسر *Aegilops* عنصر ينتمي إلى حوض المتوسط وغربي آسيا، وينمو حول حوض البحر الأبيض المتوسط وفي غربي ووسطي آسيا. ويعتقد أن منشأه الأصلي في ماوراء القوقاز؛ أما منطقة تنوعه فتقع ضمن قوس الهلال الخصيب في غربي آسيا. وبصورة عامة، فإن تصنيفاته العشرة الثنائية التضاعف أقل انتشاراً من العشرة الرباعية التضاعف إلى جانب نوعين سداسيي التضاعف محدودي الانتشار. وقد يعتبر *Ae. sharonensis* Eig محلياً فقط. إن *Amblyopyrum* عنصر من غربي آسيا محدود التوزع ، ولايوجد إلا في تركيا وأرمينيا. ويقدم المدخل الرئيسي لتصنيف *Aegilops* و *Amblyopyrum* والصنف البري *Triticum*. ويتم حالياً مراجعة الترتيبات المقطعية في *Aegilops* بالإضافة إلى الأجناس الأخرى في تحت العشيرة Triticinae. وأخيراً، تقدم مراجعة التصنيف في المجموعات الوراثية الأولى والثانية للقمح مع ملخص للتصنيف المقبول في *Triticum sensu stricto*.

إن الوصف النباتي المفصّل للأنواع في *Aegilops* و *Amblyopyrum* مشفوع برسوم خطية وخرائط عن توزع تلك الأنواع، وقوائم بالمراجع والمرادفات والملاحظات المتعلقة بالتصنيف، ومشكلات التسمية والتوزع والبيئة والاستخدامات فضلاً عن التسميات الدارجة في حال توفرها. إن الأهمية الأقتصادية للأنواع في كلا الجنسين، على الرغم من توفيرها مصدراً سهل المنال للتنوع الوراثي لتحسين القمح، ليست كبيرة.

New names published in this work

1 Introduction

Orient and immortal wheat standing from everlasting to everlasting.
James Joyce, *Ulysses*

The genus *Aegilops* L. has been a most intensively studied group of grasses, especially since it was discovered that a close relation existed with the cultivated wheats. Within the framework of the Consultative Group on International Agricultural Research (CGIAR) the International Center for Agricultural Research in the Dry Areas (ICARDA), together with the Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT), has the regional responsibility for the improvement of (tetraploid) durum wheat and of (hexaploid) bread wheat. Regional refers here to ICARDA's target region, West Asia and North (i.e., north of the Sahara) Africa, commonly abbreviated to 'WANA'. Significant results were reviewed in two recent symposia, held at ICARDA (ICARDA, 1990, 1993b).

For present and future crop improvement programs a germplasm collection with as wide a diversity as possible is required. Such a collection for wheat improvement exists at ICARDA, containing breeders' lines and cultivars, landraces, and wild relatives (ICARDA, 1993a). Especially the latter two groups attract increasing attention as they may provide characteristics related to local adaptation acquired over a long period of time. With the advent of biotechnological tools new possibilities are arising to incorporate genetic material from the wider gene pool of cultivated wheat into newly developed cultivars. This, in turn, has led to the need for a comprehensive collection of species of *Aegilops sensu lato* accompanied by relevant passport data of provenance in order to relate each accession to the environment whence it was collected and to which it is adapted. This revision is a result of studies on wild wheat relatives between 1988 and 1994, and is warranted by the need for a correct nomenclature and delimitation of all taxa related to cultivated wheat (genus *Triticum* L.).

Assemblage of a world-wide collection of germplasm led to a re-evaluation of the relation between *Aegilops* and *Triticum*, a subject of intense debate in recent times, especially following Bowden's (1959) classic paper which proposed a merger of the two genera based on their genetic similarity. In Chapter 5 of this study the separate status of the two genera is advocated, with additional arguments to separate *Aegilops* from the monospecific genus *Amblyopyrum* (Jaub. & Spach) Eig, which is based on an *Aegilops* species. As a result the proposed classification contains taxa at the generic level, which can consistently be separated and properly circumscribed. Because of the separation of *Aegilops* from *Triticum* the intergeneric hybrid genus x *Aegilotriticum* P.Fourn. remains in existence, rather than becoming a group of interspecific hybrids within an emendated genus *Triticum*. All taxa recognized in *Aegilops*, *Amblyopyrum* and x *Aegilotriticum* are listed in Table 1, together with their basionyms and/or most common synonyms.

Table 1. Taxa recognized in the genera *Aegilops*, *Amblyopyrum*, and x *Aegilotriticum* and their basionyms or most widely known synonyms

Taxon	Basionym (B:) and/or most common synonym (S:)
Genus **Aegilops** L.	S: *Triticum* L. *pro parte*
Sections of **Aegilops**	
1. Sect. *Aegilops*	S: *Aegilops* L. sect. *Surculosa* Zhuk.
2. Sect. *Comopyrum* (Jaub. & Spach) Zhuk.	B: *Aegilops* L. subg. *Comopyrum* Jaub. & Spach.
3. Sect. *Cylindropyrum* (Jaub. & Spach) Zhuk.	B: *Aegilops* L. subg. *Cylindropyrum* Jaub. & Spach
4. Sect. *Sitopsis* (Jaub. & Spach) Zhuk.	B: *Aegilops* subg. *Sitopsis* Jaub. & Spach
5. Sect. *Vertebrata* Zhuk. emend. Kihara	(no basionym. Emendation of sect. *Vertebrata* Zhuk.)
Species of **Aegilops**	
1. *Aegilops bicornis* (Forssk.) Jaub. & Spach	B: *Triticum bicorne* Forssk.
var. *bicornis*	
var. *anathera* Eig	S: *Aegilops bicornis* (Forssk.) Jaub. & Spach var. *mutica* (Asch.) Eig
2. *Aegilops biuncialis* Vis.	S: *Aegilops lorentii* Hochst.
3. *Aegilops caudata* L.	S: *Aegilops markgrafii* (Greuter) Hammer S: *Aegilops dichasians* (Bowden) Humphries
4. *Aegilops columnaris* Zhuk.	–
5. *Aegilops comosa* Sm. in Sibth. & Sm.	–
var. *comosa*	
var. *subventricosa* Boiss.	S: ssp. *heldreichii* (Holzm. ex Boiss.) Eig
6. *Aegilops crassa* Boiss.	–
7. *Aegilops cylindrica* Host	–
8. *Aegilops geniculata* Roth	S: *Aegilops ovata* L. *pro parte*
9. *Aegilops juvenalis* (Thell.) Eig	B: *Triticum juvenale* Thell.
10. *Aegilops kotschyi* Boiss.	–
11. *Aegilops longissima* Schweinf. & Muschl.	–
12. *Aegilops neglecta* Req. ex Bertol.	S: *Aegilops ovata* L. emend. Roth S: *Aegilops triaristata* Willd. S: *Aegilops recta* (Zhuk.) Chennav.
13. *Aegilops peregrina* (Hack. in J.Fraser) Maire & Weiller	B: *Triticum peregrinum* Hack. in J.Fraser S: *Aegilops variabilis* Eig
var. *peregrina*	
var. *brachyathera* (Boiss.) Eig	B: *Aegilops triuncialis* L. var. *brachyathera* Boiss.
14. *Aegilops searsii* Feldman & Kislev ex Hammer	–
15. *Aegilops sharonensis* Eig	B: *Aegilops bicornis* (Forssk.) Jaub. & Spach var. *major* Eig
16. *Aegilops speltoides* Tausch	S: *Aegilops aucheri* Boiss.
var. *speltoides*	
var. *ligustica* (Savign.) Fiori	B: *Agropyrum ligusticum* Savign.
17. *Aegilops tauschii* Coss.	B: *Triticum aegilops* P.Beauv. ex Roem. & Schult. S: *Aegilops squarrosa* auct. non L. *pro parte*
18. *Aegilops triuncialis* L.	–
var. *triuncialis*	
var. *persica* (Boiss.) Eig	B: *Aegilops persica* Boiss.
19. *Aegilops umbellulata* Zhuk.	–
20. *Aegilops uniaristata* Vis.	–

Table 1. (continued)

Taxon	Basionym (B:) and/or most common synonym (S:)
Genus **Aegilops** L. (continued)	
21. *Aegilops vavilovii* (Zhuk.) Chennav.	B: *Aegilops crassa* Boiss. ssp. *vavilovii* Zhuk.
22. *Aegilops ventricosa* Tausch	S: *Aegilops squarrosa* auct. non L. *pro parte*
Genus **Amblyopyrum** (Jaub. & Spach) Eig	B: *Aegilops* subg. *Amblyopyrum* Jaub. & Spach
Species of **Amblyopyrum**	
1. *Amblyopyrum muticum* (Boiss.) Eig	B: *Aegilops mutica* Boiss. S: *Aegilops tripsacoides* Jaub. & Spach
var. *muticum*	
var. *loliaceum* (Jaub. & Spach) Eig	B: *Aegilops loliacea* Jaub. & Spach
Genus **x Aegilotriticum** P.Fourn.	S: x *Aegilotricum* R.Wagner ex Tscherm.-Seys. S: x *Aegilotrichum* (E.G.Camus ex?) A.Camus
Species of **x Aegilotriticum**	
1. x *Aegilotriticum erebunii* (Gandilyan) van Slageren	B: *Triticum erebunii* Gandilyan
2. x *Aegilotriticum grenieri* (K.Richt.) P.Fourn.	B: x *Triticum grenieri* K.Richt. S: *Triticum vulgari-triaristatum* Godr. & Gren. S: *Aegilops vulgari-triaristata* (Godr. & Gren.) H.Loret & Barrandon
3. x *Aegilotriticum langeanum* (Amo) van Slageren	B: *Aegilops caudata* L. var. α *langeana* Amo S: *Aegilops vulgari-triuncialis* Lange S: *Triticum vulgari-triunciale* (Lange) H.Loret S: x *Triticum loretii* K.Richt. S: *Aegilops loretii* (K.Richt.) Husn.
4. x *Aegilotriticum rodetii* (Trab.) van Slageren	B: x *Triticum rodetii* Trab.
5. x *Aegilotriticum sancti-andreae* (Degen) Soó	B: *Aegilops sancti-andreae* Degen S: x *Aegilotriticum cylindrare* Cif. & Giacom. S: x *Aegilotriticum cylindroaestivum* Gandilyan
6. x *Aegilotriticum speltaeforme* (Jord.) van Slageren	B: *Aegilops speltaeformis* Jord. S: *Triticum speltaeforme* (Jord.) Asch. & Graebn.
7. x *Aegilotriticum triticoides* (Req. ex Bertol.) van Slageren	B: *Aegilops triticoides* Req. ex Bertol. S: *Triticum vulgari-ovatum* Godr. & Gren. S: *Triticum requienii* Ces., Pass. & Gibelli S: *Aegilops vulgari-ovata* (Godr. & Gren.) H.Loret & Barrandon

As *Aegilops* has been considered frequently, both in floristic treatments and, especially, in (cyto-)genetic studies as a part of an emendated genus *Triticum*, the correct names under both genera are presented (Table 2).

The separate generic status of *Aegilops* is both practical and also in accordance with the 'Gene pool concept' of Harlan & de Wet (1971). In this concept *Aegilops* and *Amblyopyrum* consitute most of the secondary gene pool (or GP-2) of wheat.

[Harlan & de Wet also include *Haynaldia* Schur, a synonym of *Dasypyrum* (Coss. & Durieu) Durieu (cf., Clayton & Renvoize, 1986: 156) and three species of *Agropyron* Gaertn. in the GP-2. They are not treated here, and this publication is thus *not* a revision of the entire GP-2 of wheat. In addition, a tertiary gene pool (GP-3) of wheat, consisting of 'several species of *Agropyron* and several of *Elymus*' (Harlan & de Wet, 1971: 511) is recognized, while a later review by Harlan (1975: 114) also included *Hordeum vulgare*.] The four wild taxa of *Triticum*, viz. *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell., *T. timopheevii* (Zhuk.) Zhuk. ssp. *armeniacum* (Jakubz.) van Slageren, *T. turgidum* L. ssp. *dicoccoides* (Körn. ex Asch. & Graebn.) Thell., and *T. urartu* Tumanian ex Gandilyan, constitute, together with their cultivated counterparts, the primary gene pool (GP-1) of wheat. [Notes on the names of the GP-1 taxa are presented in Chapter 5.4.3, Table 9.] Wild *Triticum* taxa are more readily crossable with the cultivars than taxa from the GP-2, and hybrid swarms among the GP-1 taxa are frequently observed in nature. [In contrast the natural hybrids among GP-2 taxa and of GP-2 taxa and wheat cultivars are highly sterile. See at 4.2.1.] Hence the position and delimitation of the GP-1 taxa is of even greater importance for wheat breeders. Their revision will be published elsewhere, but an enumeration is presented in Chapter 5.4.3, Table 9.

The total amount of names in circulation at or below generic level, and published or not is 1015 (Table 4). After revision there remain 27 taxa in *Aegilops*, two in *Amblyopyrum*, and four in (wild) *Triticum* at species level or below. Thus, with, in addition, three ploidy levels involved, the gene pool of cultivated wheat is extensive and its polyploid cultivar groups are a highly buffered complex (Harlan, 1975: 114). The large GP-2 may, with some difficulty, provide an exploitable source of desirable traits for further crop improvement.

This revision does not evaluate arguments regarding genome donors to cultivated wheat, nor speculates in detail about the phylogeny of a tribe, characterized by reticulate evolution and displaying almost every possible mechanism involved in this evolution process. I agree with Hammer's (1980a: 46) quotations that the contribution of taxonomy to the understanding of crop gene pools is, or should be, pragmatic, and that too much time is, or has been, spent on infra-specific names and taxa, hardly taken into account by any user. Thus the decisions of this revision can be disputed, but my hope is that the taxa presented here are at least clear-cut and well defined, and bear the correct names. The compiled distribution data summarize current knowledge, paving the way for others to draw conclusions about, e.g., the domestication of the wheats.

Table 2. Genomic formula and synonyms (when available) when *Aegilops*, *Amblyopyrum* and x *Aegilotriticum* are placed within *Triticum* emend.

Species of **Aegilops**	Genome*	Species of *Triticum*
1. *Aegilops bicornis* (Forssk.) Jaub. & Spach	S^b	*Triticum bicorne* Forssk.
2. *Aegilops biuncialis* Vis.	$U\underline{M}$	*Triticum macrochaetum* (Shuttlew. & A.Huet ex Duval-Jouve) K.Richt. (note 1)
3. *Aegilops caudata* L.	C	*Triticum dichasians* Bowden
4. *Aegilops columnaris* Zhuk.	$U\underline{M}$	(note 2)
5. *Aegilops comosa* Sm. in Sibth. & Sm.	M	*Triticum comosum* (Sm. in Sibth. & Sm.) K.Richt.
6. *Aegilops crassa* Boiss.	$D\underline{M}$ $DD\underline{M}$	*Triticum crassum* (Boiss.) Aitch. & Hemsl.
7. *Aegilops cylindrica* Host	DC	*Triticum cylindricum* (Host) Ces., Pass. & Gibelli
8. *Aegilops geniculata* Roth	$\underline{M}U$	(note 3)
9. *Aegilops juvenalis* (Thell.) Eig	DMU	*Triticum juvenale* Thell.
10. *Aegilops kotschyi* Boiss.	SU	*Triticum kotschyi* (Boiss.) Bowden
11. *Aegilops longissima* Schweinf. & Muschl.	S^l	*Triticum longissimum* (Schweinf. & Muschl.) Bowden
12. *Aegilops neglecta* Req. ex Bertol.	$U\underline{M}$ $U\underline{M}N$	*Triticum neglectum* (Req. ex Bertol.) Greuter *Triticum recta* (Zhuk.) Chennav.
13. *Aegilops peregrina* (Hack. in J.Fraser) Maire & Weiller	SU	*Triticum peregrinum* Hack. in J.Fraser
14. *Aegilops searsii* Feldman & Kislev ex Hammer	S^s	(note 2)
15. *Aegilops sharonensis* Eig	S^l	*Triticum longissimum* (Schweinf. & Muschl.) Bowden ssp. *sharonense* (Eig) Chennav. (note 4)
16. *Aegilops speltoides* Tausch	S	*Triticum speltoides* (Tausch) Gren. ex K.Richt.
17. *Aegilops tauschii* Coss.	D	*Triticum aegilops* P.Beauv. ex Roem. & Schult.
18. *Aegilops triuncialis* L.	UC CU	*Triticum triunciale* (L.) Rasp. (var. *triunciale*) (*T. triunciale* ssp. *persicum*; see note 2)
19. *Aegilops umbellulata* Zhuk.	U	*Triticum umbellulatum* (Zhuk.) Bowden
20. *Aegilops uniaristata* Vis.	N	*Triticum uniaristatum* (Vis.) K.Richt.
21. *Aegilops vavilovii* (Zhuk.) Chennav.	DMS	*Triticum syriacum* Bowden
22. *Aegilops ventricosa* Tausch	DN	*Triticum ventricosum* (Tausch) Ces., Pass. & Gibelli

Species of **Amblyopyrum**		
1. *Amblyopyrum muticum* (Boiss.) Eig	T	*Triticum tripsacoides* (Jaub. & Spach) Bowden (note 1)

Species of **x Aegilotriticum**		
1. x *Aegilotriticum erebunii* (Gandilyan) van Slageren	DA	*Triticum erebunii* Gandilyan
2. x *Aegilotriticum grenieri* (K.Richt.) P.Fourn.	–	(note 5)
3. x *Aegilotriticum langeanum* (Amo) van Slageren	–	(note 5)
4. x *Aegilotriticum rodetii* (Trab.) van Slageren	–	x *Triticum rodetii* Trab.
5. x *Aegilotriticum sancti-andreae* (Degen) Soó	–	(note 5)
6. x *Aegilotriticum speltaeforme* (Jord.) van Slageren	–	*Triticum speltaeforme* (Jord.) Asch. & Graebn.
7. x *Aegilotriticum triticoides* (Req. ex Bertol.) van Slageren	–	(note 5)

*: Genomic formula according to Waines & Barnhart (1992) with tetraploids and hexaploids cited as 'female parent x male parent'. Underlining indicates modification from the same genome types, present in the diploid species. See note 6.

Notes: 1. *Triticum biunciale* (Vis.) K.Richt. is superfluous after *T. biunciale* Vill. from 1787, an earlier name for what is now a *Vulpia* species. For the correct name of *Ae. biuncialis* in *Triticum* the next available name is now *T. macrochaetum* (Shuttlew. & A.Huet ex Duval-Jouve) K.Richt., like *T. biunciale* (Vis.) K.Richt. also from 1890.

Likewise, *Triticum muticum* (Boiss.) Hack. from 1907 is a later homonym of the same name by Schübler (1818), used for a *Triticum* cultivar. Hence the next available name for the taxon in *Triticum* has to be used. This is *T. tripsacoides* (Jaub. & Spach) Bowden from 1959.

2. *Aegilops columnaris* Zhuk., *Ae. searsii* Feldman & Kislev ex Hammer and *Ae. triuncialis* L. var. *persica* (Boiss.) Eig have not correctly been transferred to *Triticum* and new combinations would be required to do so (*T. triunciale* ssp. *persicum* is invalidly proposed; thus far the combination at variety level under *Triticum* has not been made). See Chapter 10 at 10.4, *Ae. columnaris*, 10.14, *Ae. searsii*, and 10.18b, *Ae. triuncialis* var. *persica*.

3. The well-known but ambiguous name *Aegilops ovata* L. has to be replaced by *Ae. geniculata* Roth, among others because complete restauration of the former would lead to a conflict on the choice of the generic type species (see Chapter 7, note 5). The interpretation and specific name from Roth (1787) are followed. [More on this issue in note 2 at 10.12, *Ae. neglecta*.] As the name *Triticum geniculatum* was already published twice, Greuter (in Greuter & Rechinger, 1967) proposed *T. vagans* (Jord. & Fourr.) Greuter as the correct name in *Triticum*. However, any original material relating to this name has not been found, and the true nature of the Jordan & Fourreau species is in doubt (see Chapter 10 at 10.8, notes 1 and 2, and Chapter 13). A new combination would therefore be necessary. This is not done here following the concept that *Aegilops* and *Triticum* are separate genera.

4. This species has been retained as a variety under *Ae. longissima*, and subsequently transferred to *Triticum*, by Chennaveeraiah (1960: 163). Various combinations with *Triticum* (Waines & Johnson (1969: 231); Feldman & Sears (1981: 102); Kimber & Feldman (1987: 30)) are invalid. See the nomenclature at 10.15, *Ae. sharonensis*.

5. The available name in *Triticum* is invalid or has not been published (x *Aegilotriticum sancti-andreae* only). A genome type can only be given for x *Aegilotriticum erebunii* as this is an artificially created, stable and seed-setting amphidiploid. See Chapter 4.2.2.

6. Genome analysis in *Aegilops – Amblyopyrum* has been carried out since the beginning of the 20th century (Kihara, 1954: 336; see also Chapter 5.2.1), with the school of Kihara and his collaborators as one of its major proponents. Earlier overviews of the genera resulting from karyotype analysis (Senjaninova-Korczagina, 1930, 1932) were commented upon and altered by Kihara (1940, 1954), using genome analysis, and proposing symbols for the different genome types involved. These symbols have become universally accepted and somewhat modified over the years, and are now quinquennially reviewed by the International Wheat Genetics Symposia. Comparison of the schemes of Kihara (1940: Table 12, 1954: Table 3), Sears (1948: Table 2), Kihara & Tanaka (1970: Table 1), and Kimber & Tsunewaki

(1988: Tables 1-2) illustrates the simplification (and thus user-friendliness) achieved.

Important amendments to the results of this research, however, were proposed by Waines & Barnhart (1992), whose critique centers around the following: (1) Kihara's genome analysis in no way reflected the total available variation in morphology and geography, being based on 1-3 accessions only for each analyzer; (2) the same holds for Kihara's concept of 'modified genome types', and (3) his method was essentially typological. Moreover, it would be more consequent to indicate a genome type in the polyploids as 'female parent x male parent' as this is a standard notation with an important group of users, the plant breeders. And, in addition, a genome type should result from a biosystematic species concept and its accociated research rather than being typologically defined. The listing of Waines & Barnhart's (1992) Tables 1-2 therefore deviates considerably from the most recent one by Kimber & Tsunewaki (1988: Tables 1-2). Compare, for instance, the designation for *Aegilops triuncialis* (sub *Triticum* at Kimber & Tsunewaki): 'U$\underline{C}$' with Kimber & Tsunewaki, but 'UC' for ssp. *triuncialis* and 'CU' for ssp. *persica* with Waines & Barnhart, the latter authors thus indicating *Ae. umbellulata* as the female parent for the typical subspecies and *Ae. caudata* as the female parent for the non-typical subspecies.

The most important features of Waines & Barnhart's list compared to Kimber & Tsunewaki's are: (1) the separation of *Aegilops* from *Triticum*; (2) a consequent notation as 'female x male parent'; (3) there are far less 'modified' genome types than hitherto assumed (in fact only the 'M' genome and then not in all polyploid combinations), and (4) an interpretation and subsequent notation of the genome types as resulting from a biosystematical rather than a typological standpoint. I think Waines & Barnhart's points are valid ones and consequently their list of formulas is adopted here.

2 Materials and methods (with some comments)

This revision is based on a morphological study of fresh and conserved material belonging to the genera *Aegilops*, *Amblyopyrum*, and some other members of the subtribe Triticinae (most notably wild taxa of *Triticum*). The material was compared with published descriptions. The information present on herbarium labels and collected during field trips, carried out by the author and various colleagues, served to compile data on distribution and phenological variation. Typification of all hitherto described taxa was verified when possible. Relevant taxonomic and floristic literature accompanies the treatment of each entity.

2.1 Herbarium studies

The examination of herbarium material was carried out mainly at the Herbarium Vadense in the Department of Plant Taxonomy (WAG) of the Agricultural University at Wageningen, the Netherlands, where many loans were placed. A number of herbaria, being located near the author's place of research, the International Center for Agricultural Research in the Dry Areas (ICARDA), near Aleppo, Syria, were visited in conjunction with collecting missions in the region. These trips, conducted in the years 1988 – 1993, yielded field observations, germplasm, and herbarium specimens of (nearly) all the taxa of *Aegilops*, *Amblyopyrum* and wild *Triticum* described or discussed in this study, while additional germplasm material was obtained by correspondence.

In all, around 20,000 herbarium specimens have been examined, representing, in my opinion, an estimated 75-85% of all material available. A number of large (cf., *Index Herbariorum* ed. 8, Table 2) and relevant herbaria such as BP, H, M, MANCH, RO, S, TBI and UPS have *not* been seen. The large number of specimens seen does, of course, not represent an equal amount of locations; the number of herbaria where specimens of a certain collection are placed varied from one to a few (in most cases) to up to more than 20 (such as exsiccatae series, and a few widely distributed collections by Amdursky, Eig, Feinbrun, and Zohary). With several species all specimens seen have been cited, but in many cases a geographical selection is made owing to the large amount of materials. This is predominantly with collections originating in Europe, while African and Asian ones are more completely presented. A special case is the Commonwealth of Independent States (CIS), the former USSR, as the large collections of ASH, LE, TASH, and WIR are almost exclusively with Cyrillic-written labels. With generous help in these institutes most of them could be translated and their data are now available to a wider audience. Hence a more fully citation, except duplicates from a location, seems justified.

Labelling of the herbarium specimens has been done in accordance with the decisions taken in this revision, except for those materials which had to be returned early to the owners. Not all specimens carry the latest names because the study had to be carried out over a long period of time. When herbaria were visited during collection missions the labelling was according to the best names available at that time. The complicated nomenclature of some species was a further cause of changes during the course of this study.

Material was studied from the following, officially recognized, herbaria (cf., *Index Herbariorum* (ed. 8), Holmgren et al., 1990):

A	– Herbarium, Arnold Arboretum, Harvard University, Cambridge, Massachusetts, U.S.A.
AHUC	– Herbarium, Beecher Crampton Collection, Agronomy and Range Science Department, University of California, Davis, California, U.S.A.
ANK	– Herbaryumu, Ankara Üniversitesi Fen Facültesi, Tandoğan, Ankara, Turkey
ASH	– Herbarium, Botanical Institute of the Turkmeniyan Academy of Sciences, Ashkhabad, Turkmenistan
B	– Herbarium, Botanischer Garten und Botanisches Museum Berlin-Dahlem, Germany (includes B-W, herbarium of C.L. von Willdenow; separately indicated)
BAG	– National Herbarium, Ministry of Agriculture and Irrigation, Abu Ghraib, Baghdad, Iraq
BC	– Herbario, Laboratori de Botànica, Universitat de Barcelona, Barcelona, Spain
BEI	– Herbarium, Biology Department, American University of Beirut, Beirut, Lebanon
BM	– Herbarium, The Natural History Museum, London, England, U.K.
BOLO	– Erbario, Istituto ed Orto Botanico, Università di Bologna, Bologna, Italy
BR	– Herbarium, Nationale Plantentuin van België, Jardin Botanique National de Belgique, Meise, Belgium
C	– Herbarium, Botanical Museum, University of Copenhagen, Copenhagen, Denmark
CAI	– Herbarium, Botany Department, Faculty of Science, Cairo University, Giza, Egypt
CAIM	– Herbarium, Flora and Phytotaxonomy Research, Ministry of Agriculture, Cairo, Egypt
COI	– Herbarium, Botanical Institute, University of Coimbra, Coimbra, Portugal
CYP	– Cyprus Herbarium, Department of Agriculture, Ministry of Agriculture & Natural Resources, Nicosia, Cyprus
DAV	– John M. Tucker Herbarium, Botany Department, University of California, Davis, California, U.S.A.
E	– Herbarium, Royal Botanic Garden, Edinburgh, Scotland, U.K.
ERE	– Herbarium, Institute of Botany of the Academy of Sciences of Armenia, Erevan, Armenia
F	– Herbarium, Botany Department, Field Museum of Natural History, Chicago, Illinois, U.S.A.
FI	– Herbarium Universitatis Florentinae, Museo Botanico, Firenze, Italy
G	– Conservatoire et Jardin Botaniques de la Ville de Genève, Chambésy/Genève, Switzerland (includes G-BOIS, herbarium of P.E. Boissier; separately indicated)
GAT	– Herbarium, Zentralinstitut für Genetik und Kulturpflanzenforschung, Gatersleben, Germany
GE	– Erbario, Istituto Botanico Hanbury ed Orto Botanico, Università di Genoa, Genoa, Italy
HUB	– Herbarium, Botany Department, Hacetepe University, Beytepe Ankara, Turkey
IZ	– Herbarium, Plant Genetic Resources Research Institute, Menemen, Izmir, Turkey (germplasm accessions are under PGRRI)
JE	– Herbarium Haussknecht, Friedrich Schiller Universität, Jena, Germany
K	– The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, England, U.K.
L	– Rijksherbarium / Hortus Botanicus, Leiden, Netherlands
LD	– Herbarium, Botanical Museum, Lund, Sweden
LE	– Herbarium, V.L. Komarov Botanical Institute of the Academy of Sciences of the USSR, St Petersburg, Russia
LINN	– Herbarium, Linnaean Society of London, Burlington House, London, England, U.K.
LY	– Herbier, Département de Biologie Végétale, Université de Lyon, Vileurbanne Cedex, France

MO	– Herbarium, Missouri Botanical Garden, Saint Louis, Missouri, U.S.A.
MPU	– Herbier, Institut de Botanique, Montpellier, France
NY	– Herbarium, New York Botanical Garden, New York, U.S.A.
OXF	– Fielding-Druce Herbarium, Plant Sciences Department, University of Oxford, England, U.K.
P	– Herbier, laboratoire de Phanérogamie, Muséum National d'Histoire Naturelle, Paris, France (includes P-TRF, herbarium of J.P. de Tournefort; P-CO, herbarium of E.S.-C. Cosson; both separately indicated)
PAD	– Erbario Patavinum, Centro Musei Scientifici, Padova, Italy
PH	– Herbarium, Botany Department, Academy of Natural Sciences, Philadelphia, Pennsylvania, U.S.A.
PI	– Erbario Horti Pisani, Dipartimento di Scienze Botaniche, Università di Pisa, Pisa, Italy (includes PI-CAR, herbarium of T. Caruel; PI-GUAD herbarium of M. Guadagno; PI-PASS herbarium of G. Passerini; PI-PELL herbarium of P. Pellegrini; all separately indicated)
PR	– Herbarium, Botany Department, National Museum in Prague, Průhonice near Praha, Czech Republic
PRC	– Herbarium, Botany Department, Faculty of Natural Sciences, Charles University, Praha, Czech Republic
RAB	– Herbarium, Institut Scientifique, Département de Botanique et d'Ecologie Végétale, Rabat, Morocco
RNG	– Herbarium, Plant Science Laboratories, University of Reading, Reading, England, U.K.
SAV	– Herbarium, Oddelenie taxonómie vyšších rastlín, Botanicky ústav, Slovenskey akadémie vied, Bratislava, Slovakia
SO	– Herbarium, Botany Department, University of Sofia, Bulgaria
SOA	– Herbarium, Higher Agricultural Institute 'V. Kolarov', Plovdiv, Bulgaria
SOM	– Herbarium, Institute of Botany, Bulgarian Academy of Sciences, Sofia, Bulgaria
TASH	– Central Herbarium, Institute of Botany, Uzbek Academy of Sciences, Tashkent, Uzbekistan
TO	– Erbario, Dipartemente di Biologia Vegetale, Università degli Studi di Torino, Torino, Italy
TUB	– Herbarium, Institut für Biologie I, Lehrstuhl Spezielle Botanik, Eberhard-Karls-Universität, Tübingen, Germany
U	– Herbarium, Institute of Systematic Botany, State University of Utrecht, Utrecht, Netherlands
UCR	– Herbarium, Botany and Plant Sciences Department, University of California, Riverside, California, U.S.A.
ULT	– National Herbarium, Botany Department, Al-Faateh University, Tripoli, Libya
US	– United States National Herbarium, Botany Department, Smithsonian Institution, Washington, D.C., U.S.A.
W	– Herbarium, Department of Botany, Naturhistorisches Museum, Wien, Austria
WAG	– Herbarium Vadense, Department of Plant Taxonomy, Agricultural University, Wageningen, Netherlands
WIR	– Herbarium, N.I. Vavilov Institute of Plant Industry, St Petersburg, Russia (germplasm accessions are under VIR)
YAI	– Herbarium, Botany Department, Armenian Agricultural Institute, Erevan, Armenia
Z	– Herbarium, Institut für Systematische Botanik, Universität Zürich, Zürich, Switzerland

Personal herbaria that are indicated by the *Index* under their codes (e.g., G-BOIS, PI-CAR, etc.) are included in the list above. In addition, various non-coded personal herbaria are indicated separately: 'BM-Walter', herbarium of T. Walter's *Flora caroliniana*; 'BOLO-Bertoloni' for A. Bertoloni's *Flora italica*; 'LD-Retzius', herbarium of A.J. Retzius; 'LY-Jordan', herbarium of A. Jordan, present in the Université libre de Lyon (Stafleu & Cowan, 1979: 460) and thus not in the Université Claude Bernard in the same city; 'LY-Gandoger' for the large herbarium of M. Gandoger, kept separately in LY; 'MPU-Coste' for the herbarium of H.J. (Abbé) Coste and mainly relating to his *Flore descriptive et illustrée de la France*; 'MPU-Duval-Jouve' for the herbarium of J. Duval-Jouve, and 'MPU-Maire', herbarium of R.Ch.J.E. Maire (the separate indication of Gandoger, Coste, Duval-Jouve and Maire relates mainly to type collections). Some material from the private herbarium of A. Eig (HUJ) was studied at WAG.

A number of herbaria not recognized by the *Index* were also visited. The abbreviations used for them in the lists of examined herbarium specimens do not imply any formal status and are used for convenience:

ACSAD	– Arab Center for Studies of the Arid Zones and Dry Lands, Douma, Syria
ARI	– Agricultural Research Institute, Ministry of Agriculture & Natural Resources, Nicosia, Cyprus
ICARDA	– International Center for Agricultural Research in the Dry Areas, Aleppo, Syria
IIPGR	– Institute of Introduction and Plant Genetic Resources 'K. Malkov', Plovdiv, Bulgaria
Min.Agr.Syr.	– Ministry of Agriculture and Agrarian Reform, Damascus, Syria (herbarium present at the Soil Department, Douma, Syria)

2.2 Nomenclature **Tables 3-4**

2.2.1 Discussion

Nomenclature is exhaustive for all relevant literature that could be traced. Citation of floristic literature is selective (see below). Species are listed alphabetically, but with infraspecific taxa the autonyms are treated first. Homotypic synonyms of the species name are listed at the species level and not at the infraspecific autonym.

References made to the *International Code of Botanical Nomenclature* (abbreviated as ICBN or as the '*Code*' hereafter) apply to the *Code*, adopted by the 14th International Botanical Congress of Berlin, 1987 (Greuter et al., 1988; the 'Berlin' *Code*).

Many problems existed in relation to the typification of the names involved. In particular Art. 8.3 of the *Code* prompted critical evaluation of type designation of the accepted names of this study. 'Type' is used here in the broad sense as defined by Barrie et al. (1992: 509), with holotype, lectotype, isotype, syntype and neotype in the sense of the ICBN Art. 7. selected and/or added when available.

Frequently names proved to be so-called *isonyms*, a term introduced by Nicholson (1975) and (surprisingly) not (yet) included in the *Code*. Isonyms exist when two authors give the same name to the same type, that is, all elements of two combinations have the same type.

Many names proved to be based on syntypes. A lectotype has been chosen among them in relevant cases, i.e., for accepted names, but also for some of their heterotypic synonyms, such as the Jordan & Fourreau species in *Ae. ovata* (in the sense of *Ae. geniculata*), one of which (*vagans*) was chosen for a combination with *Triticum* (see note 2 at 10.8). When no lectotype is chosen, only the inspected specimens of the syntypes are listed, except when none was seen (and the status of the name thus relies on literature references).

Neotypes were selected when holotypes were not present in the author's herbarium during personal visits, nor were located elsewhere after correspondence. Table 3 summarizes the typification for the accepted taxa in *Aegilops*, *Amblyopyrum*, and the hybrid genus x *Aegilotriticum*.

Table 3. Typification of accepted taxa in the genera *Aegilops*, *Amblyopyrum*, and x *Aegilotriticum* (lecto- and neotypes in **bold**)

Taxon	Typification
Genus **Aegilops** L.	Type species: *Ae. triuncialis* L. Designated by Hammer (1980b: 228), sustained by Jarvis (1992: 555) on behalf on the Special Committee on Lectotypification (see Chapter 7, note 5) to supersede *Ae. ovata* L.
Sections of **Aegilops**	
1. Sect. *Aegilops*	Type species: *Ae. triuncialis* L.
2. Sect. *Comopyrum* (Jaub. & Spach) Zhuk.	Type species: *Ae. comosa* Sm. in Sibth. & Sm.
3. Sect. *Cylindropyrum* (Jaub. & Spach) Zhuk.	Type species: *Ae. cylindrica* Host.
4. Sect. *Sitopsis* (Jaub. & Spach) Zhuk.	Lectotype species: *Ae. speltoides* Tausch. Designated by Hammer (1980b: 230).
5. Sect. *Vertebrata* Zhuk. emend. Kihara	Type species: *Ae. tauschii* Coss.
Species of **Aegilops**	
1. *Aegilops bicornis* (Forssk.) Jaub. & Spach	[Egypt] *Forsskål s.n.* (holotype: C).
var. *bicornis*	
var. *anathera* Eig	[Libya] *Ruhmer s.n. (401?)* (**lectotype:** PR; isolectotypes: BR, FI, JE, MPU-Maire, P). See p. 145.
2. *Aegilops biuncialis* Vis.	Type: the illustration with dissection presented in R. de Visiani, *Flora dalmatica* 1, Tab. 1, fig. 2 (1842). Designated by Gandilyan (1980: 190).
3. *Aegilops caudata* L.	[Greece] *de Tournefort 4940* (**neotype:** P-TRF; isoneotype: LE). Designated by Scholz & van Slageren (1994). See p. 160.
4. *Aegilops columnaris* Zhuk.	[Turkey] *Zhukovsky s.n.* (**lectotype:** WIR 635). See p. 169 .
5. *Aegilops comosa* Sm. in Sibth. & Sm.	[Greece] *Sibthorp s.n.* (holotype: OXF).
var. *comosa*	
var. *subventricosa* Boiss.	[Greece] *von Heldreich 606* (**lectotype:** G-BOIS; isolectotypes: A, C, G, FI, JE, K, L, LE, LY, LY-Gandoger, LY-Jordan, MPU, P, PI, W). See p. 181.
6. *Aegilops crassa* Boiss.	[Iran] *Kotschy 248* (holotype: G-BOIS; isotypes: BM, C, FI, G, K, L, LE, MO, OXF, P, PI, PRC, TUB).
7. *Aegilops cylindrica* Host	[Hungary] *Kitaibel 226* (**lectotype:** BP; isolectotype: B-W 18878-1). See p. 200.
8. *Aegilops geniculata* Roth	[Germany] *Roth s.n.* (holotype: B-W; isotypes: BM, LE, TUB).
9. *Aegilops juvenalis* (Thell.) Eig	[France] *Touchy s.n.* (holotype: MPU).
10. *Aegilops kotschyi* Boiss.	[Iran] *Kotschy 366a* (**lectotype:** G-BOIS; isolectotypes: BM, C, E, FI, G, K, LE, OXF, P, PI, PRC, TUB). See p. 252.

Table 3 (continued)

Taxon	Typification
11. *Aegilops longissima* Schweinf. & Muschl.	[Egypt] *Schweinfurth s.n.* (**lectotype:** B; isolectotypes: CAIM, MPU, US). See p. 261.
12. *Aegilops neglecta* Req. ex Bertol.	[France] *Requien s.n.* (holotype: BOLO-Bertoloni; isotype: MPU-Duval-Jouve).
13. *Aegilops peregrina* (Hack. in J.Fraser) Maire & Weiller	[U.K., Scotland] *Fraser s.n.* (**lectotype:** E; isolectotypes: K, RNG). See p. 284.
var. *peregrina*	
var. *brachyathera* (Boiss.) Eig	[Lebanon] *Blanche 805* (**lectotype:** G-BOIS). See p. 294.
14. *Aegilops searsii* Feldman & Kislev ex Hammer	[Palestine] *Feldman, Kislev & Kushnir s.n.* (holotype: HUJ; isotype: K).
15. *Aegilops sharonensis* Eig	[Palestine] *Eig s.n.* (holotype: HUJ; isotype: MPU).
16. *Aegilops speltoides* Tausch	[Turkey] *Bornmüller 1735* (**neotype:** B; isoneotypes: BM, FI, G, JE, K, L, LD, LE, LY-Jordan, LY-Gandoger, NY, OXF, P, SO, W, Z). See p. 309.
var. *speltoides*	
var. *ligustica* (Savign.) Fiori	[Italy] *Savignone s.n.* (**neotype:** FI; isoneotype: LY-Gandoger). See p. 320.
17. *Aegilops tauschii* Coss.	**Lectotype:** the illustration in J.Ch. Buxbaum, *Plantarum minus cognitarum Centuria* 1: Tab. 50, fig. 1 (1728). See p. 328.
18. *Aegilops triuncialis* L.	[Spain] *Loefling 701 β*, (holotype: LINN 1218.8). Designated by Bowden (1959: 675).
var. *triuncialis*	
var. *persica* (Boiss.) Eig	[Iran] *Kotschy 365* (holotype: G-BOIS; isotypes: BM, C, E, FI, G, JE, K, LE, LY, MO, MPU, OXF, P, PI, PRC, TUB).
19. *Aegilops umbellulata* Zhuk.	[Turkey] *Zhukovsky s.n.* (**lectotype:** WIR 1439). Unpublished designation by Zhukovsky in WIR. See p. 374.
20. *Aegilops uniaristata* Vis.	[Croatia, Dalmatia] *de Visiani s.n.* (holotype: PAD; isotype: W).
21. *Aegilops vavilovii* (Zhuk.) Chennav.	[Syria] *Vavilov 29028* (**lectotype:** WIR 747). See p. 385.
22. *Aegilops ventricosa* Tausch	[Spain] *Boissier s.n.* (**neotype:** G; isoneotypes: A, BR, C, E, F, G, JE, K, LE, MPU, NY, P, PI, TUB, W). See p. 392 .
Genus **Amblyopyrum** (Jaub. & Spach) Eig	Type (and only) species: *Amblyopyrum muticum* (Boiss.) Eig
Species of **Amblyopyrum**	
1. *Amblyopyrum muticum* (Boiss.) Eig	[Turkey] *Aucher-Eloy 2977* (holotype: G; isotypes: [the hispid specimens of] BM, FI, G-BOIS, K, MPU, OXF, P).
var. *muticum*	
var. *loliaceum* (Jaub. & Spach) Eig	[Turkey] *Aucher-Eloy 2977* (holotype: P; isotypes: BM, G, G-BOIS, MPU, OXF). Glabrous specimens only.

Table 3 (continued)

Taxon	Typification
Genus x **Aegilotriticum** P.Fourn.	**Lectotype species:** x *Aegilotriticum requienii* (Ces., Pass. & Gibelli) P.Fourn. (= x *Aegilotriticum triticoides* (Req. ex Bertol.) van Slageren. See p. 43.
Species of x **Aegilotriticum**	
1. x *Aegilotriticum erebunii* (Gandilyan) van Slageren	[Armenia] *Gandilyan, Schakarjan et Petrosian* creavit (holotype: WIR 0104546; isotype: YAI).
2. x *Aegilotriticum grenieri* (K.Richt.) P.Fourn.	[France] *Godron s.n./Grenier s.n.(?)* (syntypes: hb. Godron (NCY) and/or hb. Grenier (P), respectively). To be lectotypified. See p. 49.
3. x *Aegilotriticum langeanum* (Amo) van Slageren	[Spain] *Lange s.n.* (**lectotype:** C; isolectotypes: K, P). See p. 50.
4. x *Aegilotriticum rodetii* (Trab.) van Slageren	[Algeria] *Trabut s.n.* (holotype: AL; isotypes: F, MPU).
5. x *Aegilotriticum sancti-andreae* (Degen) Soó	[Hungary] *von Degen s.n.* (**lectotype:** BP; isolectotype: W). See p. 54.
6. x *Aegilotriticum speltaeforme* (Jord.) van Slageren	[France] *Jordan s.n.* (Fl. Gall. et Germ. Exsiccata de C. Billot no. 2187) (**neotype:** LY-Jordan; isoneotypes: BM, F, G, JE, LE, LY, M, MPU, MPU-Duval-Jouve, OXF, P, PI, WAG). See p. 56.
7. x *Aegilotriticum triticoides* (Req. ex Bertol.) van Slageren	[France] *Requien s.n.* (holotype: BOLO-Bertoloni (Fl. ital.); isotypes: G, K, MPU, NY, P, PI, TO).

2.2.2 Comment on nomenclature

Hawksworth's (1992: 547-548 and Fig. 1) survey among a limited number of taxonomists makes interesting reading on the amount of time spent on nomenclature while revising a group. In my study the percentage of time spent on this subject was certainly greater than the reported average of 19.5% of his target group. Reasons for this may be: (1) the Mediterranean flora is comparatively well studied; (2) the intensive study of the wild relatives in view of the evolution and improvement of wheat, and (3) the sometimes capricious use of names of *Aegilops* and wild species of *Triticum* by applied researchers. An example illustrates the third item: in a cytogenetic study of Dvořák et al. (1993) on the donor species of the A-genome of wheat, wild diploid wheat is presented as 'wild ssp. *T. monococcum aegilopoides* (Link) Thell.' (l.c., 1993: 21). This must be *T. monococcum* L. ssp. *aegilopoides* (Link) Thell. to conform with Art. 24.1 of the *Code* ('...infraspecific epithet *connected* by a term denoting its rank...'; my italics). For more notes on the name *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell., of which the epithet replaces the more widely known one of *baeoticum* at subspecies level, see Table 9 at Chapter 5.4.3.

The study of the nomenclature of *Aegilops* and *Amblyopyrum* revealed a deplorable state of affairs at even the most basic level, such as correct citation of names and the designation of types, connected with them. Table 3 shows that of the accepted taxa in *Aegilops* a lectotype had to be chosen in no less than 11 out of the

27 cases, while four neotypes, among others of well-known species such as *Ae. speltoides* and *Ae. ventricosa*, had to be designated (in view of Arts. 7.9 and 7.10 of the *Code*) because their type collections or any other original material – if it ever existed – have not been found. The situation in the hybrid genus x *Aegilotriticum* was even worse: no type species was designated, only two names were correctly published under this generic name (*grenieri* and *sancti-andreae*), two lectotypes and one neotype had to be chosen, and 24 names had to be rejected for non-compliance with the ICBN rules. [Names published in the two invalidly formed names for the same intergeneric hybrid, x *Aegilotricum* and x *Aegilotrichum*, are not considered here but have to be excluded by default unless recombined to the correct hybrid generic name.]

Although *Aegilops* is a larger genus within the grasses, and at the end of the logarithmic curve of Clayton & Renvoize (1986: 22), a genus of 22 species with five additional varieties is by no means big in the plant kingdom. However, in this relatively small genus the complexity of the nomenclature may be demonstrated in the summary of Table 4.

2.3 Literature citation

Next to citation of relevant literature of taxonomic treatments and revisions an enormous amount of floristic literature can be listed, especially for those species (partly) occurring in Europe. Citation of floras has therefore been selective with nationwide floras prevailing over regional or local ones. The latter are cited when: (1) taxonomic changes or important remarks such as lengthy discussions on variation, ecology etc. are made; (2) no nationwide flora exists or has been completed; (3) the nationwide flora is clearly outdated, and (4) when dealing with introduced taxa.

Whenever possible, abbreviated citation of literature is in accordance with the second edition of Stafleu & Cowan's *Taxonomic Literature* (Stafleu & Cowan, 1976-88), while abbreviation of authors follows Brummitt & Powell's (1992) *Authors of plant names*.

2.4 Maps

The distribution maps are from the Goode Base Map Series, published by the Committee on Geographical Studies, University of Chicago, Ill., U.S.A. They are the latest, revised edition of these maps, and were published between 1939 and 1963. As a result, some country boundaries have been changed since. It is therefore emphasized that, in accordance with ICARDA policy, the distribution maps have been used solely to support research data, and do not indicate any opinion, as some borders are sources of conflict in the depicted regions.

Distribution of the taxa is compiled from both herbarium and germplasm data, using the same symbol. Introductions as well as unchecked data from the literature are indicated with different symbols.

Table 4. Names and epithets in *Aegilops*, *Triticum pro parte*, *Aegilops* x *Triticum* hybrids, and in other genera pertaining to the *Aegilops* – *Triticum* group

Before revision:	
Generic names for (parts of) the genus *Aegilops*	16
Names at subgenus or sectional level equivalent with the genus *Aegilops*	4
Sub-generic and sectional names	29
Species names	169
Sub-specific names	426
Nomina nuda	54
Names of excluded taxa	31
Herbarium names (not published) – generic level	1
Herbarium names (not published) – species level or below	21
Rejected names because of Art. 33.4 (Gandoger's *Flora Europae*)	148
(subtotal	899)
Generic names for the genus *Amblyopyrum*	1
Names at subgenus or sectional level equivalent with the genus *Amblyopyrum*	3
Species names	7
Sub-specific names	28
(subtotal	39)
Generic names for *Aegilops* x *Triticum* hybrids	3
Epithets and condensed formulae published in any of the three hybrid genera, in *Aegilops* or in *Triticum* pertaining to hybrids	74
(subtotal	77)
Total	**1015**
After revision:	
Generic level: *Aegilops* L.	1
Sectional names	5
Species names	22
Non-typical variety names	5
Generic level: *Amblyopyrum* (Jaub. & Spach) Eig	1
Species names	1
Non-typical variety names	1
Generic level: nothogenus x *Aegilotriticum* P.Fourn.	1
species names*	7
Total	**44**

* : Accepted up to now. May increase in the future through valid publication of artificially created hybrids of *Aegilops* x *Triticum*.

2.5 Cultivation of plant material

As far as possible the species and varieties collected were cultivated at ICARDA's main station at Tel Hadya, 30 km SW of Aleppo, Syria. The plants were grown in the open; greenhouse cultivation (temperature 17°C, photoperiod 12 hrs, relative humidity 80%) was used only for multiplication. Crosses of *Aegilops* and *Amblyopyrum* species with durum or bread wheat lines were part of the cereal breeding research at the Germplasm Program / Cereal Program of ICARDA. A number of artificial amphidiploids was obtained and cultivated similar to the wild material. Some natural hybrids of *Aegilops* x *Triticum* were collected during expeditions and planted in a greenhouse, but all this material proved to be sterile.

2.6 Germplasm

Owing to the increased importance of *Aegilops* for its use in wide crossing for wheat improvement (following the introduction of new techniques to overcome sterility barriers), a considerable amount of material has been and is currently being collected during mature seed stage. Powell (1990) listed 14,872 unique accessions in his database, deducted from around 20,000 after elimination of duplicates (Hodgkin et al., 1992). The total number in the world's genebanks, however, is estimated as being over 27,000 with around 22,000 of them being unique samples (Hodgkin et al., 1992). Thus, with serious germplasm collection starting as recent as the 1970s, more material (at least in numbers) has already been assembled than in more than 200 years of plant collecting! As a result the germplasm accessions for some species (e.g., *Ae. vavilovii* and *searsii*, probably also *Ae. longissima*) now outnumber the available herbarium material.

As germplasm material is associated with ecological and distributional data a list of selected accessions is included with most of the taxa, on the following criteria: (1) inspected by the author; (2) presenting additional distribution data, and (3) documented with at least a full location and collector(s). Listed material was studied from the genebank at ICARDA, but deposition at other genebanks of ICARDA's material is also indicated. The entire collection of ICARDA is preserved as a so-called 'active collection', to be used by breeders and other researchers, and, in addition, as a 'base-collection'. This last collection, preserved at -20°C, is for safe-keeping only, and, also for this purpose, is duplicated at the Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico.

Although promoted by the International Plant Genetic Resources Institute (IPGRI) there is still no worldwide consensus of standard abbreviations of collections similar to the *Index Herbariorum*. However, acronyms for many institutes are provided by Bettencourt & Konopka (1990) and used here. These codes are used for convenience and do not imply any formal status.

AAI	– Armenian Agricultural Institute, Erevan, Armenia
ARC	– Agricultural Research Centre, Tripoli, Libya
ARCG	– Agricultural Research Centre, Giza, Egypt
ARI	– Agricultural Research Institute, Nicosia, Cyprus (also under herbaria)
IPGRI	– International Plant Genetic Resources Institute, Rome, Italy
ICARDA	– International Center for Agricultural Research in the Dry Areas, Aleppo, Syria (also under herbaria)
ITGC	– Institut Technique des Grandes Cultures, El Harrach, Algeria

IHAR	–	Plant Breeding and Acclimatization Institute, National Department of Plant Genetic Resources, Radzików near Warsaw, Poland
IIPGR	–	Institute of Introduction and Plant Genetic Resources 'K. Malkov', Sadovo, Plovdiv, Bulgaria (also under herbaria)
INIA	–	Instituto Nacional de Investigação Agrária, Oeiras, Portugal
INRA-M	–	Institut National de la Recherche Agronomique – Maroc, Rabat, Morocco
JUST	–	Jordan University of Science and Technology, Irbid, Jordan
KYOTO	–	Plant Germplasm Institute, Faculty of Agriculture, Kyoto University, Mukoshi, Kyoto, Japan
NARC-J	–	National Agricultural Research Center, Ministry of Agriculture, Forestry and Fisheries, Kannondai, Tsukuba, Japan
NCARTT	–	National Centre for Agricultural Research and Technology Transfer, Amman, Jordan
PARC	–	Pakistan Agricultural Research Council, Islamabad, Pakistan
PGRRI	–	Plant Genetic Resources Research Institute, Aegean Agricultural Research Institute, Menemen, Izmir, Turkey (herbarium specimens are under IZ)
SARD	–	Scientific Agricultural Research Directorate, Douma, Damascus, Syria
SPII	–	Seed and Plant Improvement Institute, Karaj, Iran
UCR	–	Department of Botany and Plant Sciences, University of California, Riverside, California, U.S.A. (also under herbaria)
USDA	–	National Small Grain Collection, United States Department of Agriculture, Agricultural Research Service, Aberdeen, Idaho, U.S.A.
VIR	–	N.I. Vavilov Institute of Plant Industry, St. Petersburg, Russia (coded WIR under herbaria)

3 History of the genera *Aegilops* and *Amblyopyrum*

3.1 Pre-Linnaean history of *Aegilops* L. — Table 5

The great majority of pre-Linnaean literature refers to only one species, *Aegilops ovata* L. (in the sense of *Ae. geniculata* Roth, thus *pro parte*). Only a few descriptions referring to other species (*Ae. caudata*, *triuncialis* and *tauschii*) were found. The history of the generic name is confusing as the name *Aegilops* has been connected with species of the grass genera *Avena*, *Briza*, *Bromus*, *Festuca*, *Lolium*, *Phalaris*, and *Triticum*, and, in addition, with *Hyacinthus* and *Quercus*. The milestone in accurately describing *Aegilops geniculata* is Dodoens' (or Dodonaeus) *Cruydt-boeck* from 1608, the Dutch translation of his *Stirpium historiae pemptades sex* from 1583. (I have not seen the 1608 edition; the enlarged editions from 1618 and 1644 have been my major source.) In the *Cruydt-boeck* the different nature of the other grass genera is explained, a 'bulbous' *Aegilops* mentioned at *Hyacinthus*, and a distinction between *Aegilops herba* and *Aegilops arbor* is made: the former is our grass genus *Aegilops*, the latter is the oak species *Quercus aegilops* L. (see below).

The genus name *Aegilops* is mentioned for the first time with the ancient Greeks, especially Dioscorides, Theophrastus and Galenus. The name is related to its supposed healing properties for an eye disease from which goats suffer (see the etymology of the genus name, Chapter 7). For any indication by Pedanios Dioscorides, however, I had to rely on a secondary source, which is the Latin translation from his *Materia Medica* by Mattioli, called *Commentarii in libros sex Pedani Dioscorides anazarbei, de medica materia* from 1554 (and many later editions). Mattioli enumerates some of the basic information on *Aegilops*, provided by Dioscorides, such as its segetal growth habitat, especially among *Hordeum* and 'zeam', and its leaves being similar to wheat leaves (l.c., 1554: 520). [The 'zeam' is not maize (*Zea mays* L.), but spelt wheat, *Triticum aesivum* L. ssp. *spelta* (L.) Thell., as a later reference from Dodoens, 'Van Zea oft Spelte' ('About zea or spelt', l.c., 1644: 797) indicates.]

In addition, Mattioli states that Dioscorides called the intended plant *Avena*, but he indicates that *Aegilops* was actually meant by the Greek (l.c., 1554: 520). Similarly, Bauhin (1623: 10) enumerates the Αἰγίλωψ of Dioscorides, Theophrastus, Galenus, and Oribasus under a new description, *Festuca utriculis lanugine flavescentibus*, which is *Avena fatua* L. (see below under excluded species).

For Theophrastus' *De Historia Plantarum* I relied on the English translation by Hort (1916). *Aegilops* is mentioned as a plant that appears in the spring (Liber 8, Cap. 7) as a 'degeneration' of cereals, and that it is growing among barley and lentils (Cap. 8). In Cap. 9 it is mixed-up with wild oats: 'Of the plants that resemble wheat or barley ... oats (*aigilops-zeia*) is the strongest and most exhausts the ground; for it has many roots which run deep and many stems; but its fruit is the lightest and is welcome to all animals...'. But '...*aegilops* and oats are as it were wild and uncultivated things....' is also mentioned in this Chapter.

Next to Dioscorides' *Avena*, further confusion was added by references to the Roman writer Gaius Plinius Major, who may have intended *Aegilops* with his *Festuca Hordeum*. Mattioli (1554: 520) starts his treatment of '*Aegilops*' with the name *Aegilops sive Festuca* [*Aegilops* or *Festuca*], but with a drawing of the *Bromus* species that became his *Aegilops* I in a later edition (before 1563; see below). De Lobel (1576: 20), however, is not sure whether the *Festuca Hordeum* of Plinius is the same as his newly described *Festuca sive [or] Aegilops narbonensis*. In the sense of Mattioli it is not, as de Lobel's plant is a 'true' *Aegilops* and Mattioli's a *Bromus*.

The various editions and translations of Mattioli's Dioscorides book illustrate the development and growing confusion of the concept of the genus and species of *Aegilops*.

The first of many editions, called *Il Dioscoride dell' eccellente Dottor Medico M.P.And. Matthioli da Siena*, was written in Italian and appeared in 1544 (Raphael, sine dato). Later Italian editions are from 1548, 1550, 1552 and 1568. The oldest edition I studied was from 1552 and cites on p. 667 Dioscorides' fourth book, Cap. 141 as 'Dell' Egilopa'. The 1568 edition cites the same Chapter number, but presents the two icons with *Egilopa* I (= the *Bromus* species) and *Egilopa* II (= *Aegilops geniculata*) (l.c., 1568: 1264-1265). The plate of 'I' appeared for the first time in the first Latin edition of 1554, accompanying '*Aegilops, sive Festuca*' and Cap. 134 (thus not 141) of Dioscorides (l.c., 1554: 520), and was reprinted in the editions of 1558, 1559 and 1560. The description and plate of 'II' must have appeared for the first time in a Latin (or Italian) edition from between 1560 and 1563, since both plates are present in the German translation by Handsch (1563: 119B). Later they jointly appeared in Mattioli's Latin editions of 1565, 1570 and 1583, in later German (Camerarius, 1586, 1590) and French (des Moulins, 1572) translations, as well as in other herbals (e.g., de Lobel, 1576; Gerard, 1597). The second Latin edition of 1558 is also remarkable as this is the oldest reference to Arabic vernaculars I have found ('Dausir, Dalisit, Dosana, Dauser, sive Dußer', l.c., 1558: 584). These names are also published in later editions and translations.

An extended genus *Aegilops* is presented by de Lobel's (1576) *Plantarum seu stirpium historia*. Here the 'I' and 'II' icons from Mattioli are reproduced, with the names *Bromus* and *Aegylops Narbonensis*, respectively (l.c., 20, Figs. 1 and 4). In addition there is *Bromus sterilis altera*, Fig. 2, and *Aegylops Bromoides Belgarum*, Fig. 3, which are a *Bromus* L. species, and *Avena fatua* L., respectively. He furthermore connected Mattioli's *Aegylops altera* (II), not his *prima* (I), with the icon and description of the 'I' (l.c., 1576: 21), a mistake perpetuated in the Dutch translation of 1581, and taken over by Dodoens (1644: 863-864). The same switch was made earlier by Calzolari in his *Compendium* (1571: 842-843), when presenting '*Aegilops sive Festuca*' together with Mattioli's icon of *Ae. geniculata* (the 'II'),

Table 5. Summary of *Aegilops* 'species' in the *Kreuterbuch* of Tabernæmontanum

Vernacular name	Latin name	Identification*
I. Gerstentwalch	Ægylops I	*Bromus secalinus* L. or *B. commutatus* Schrad. ('Ægilops I. & Avena fatua, Tab.', listed by Bauhin (1623: 10), under the phrase-name of the *Bromus* species). This is Mattioli's *Aegilops* I.
II. Twalch	Festuca seu Ægylops II	Most likely *Bromus hordeaceus* L. (common synonym: *B. mollis* L.)
III. Gerstentwalch	Ægylops III	*Hordeum murinum* L.
IV. Gerstentwalch	Ægylops IV Bromoïdes I	*Stipa capillata* L. (but see the excluded species at end of this Chapter)
V. Frembd Twalch	Ægylops peregrina V	*Aegilops geniculata* Roth. This is Mattioli's *Aegilops* II.
VI. Havertwalch	Ægylops VI Bromoïdes II	*Avena fatua* L. (cf., Bauhin, Pinax: 10)

* : From the woodblock illustrations and upon joint inspection provided by Dr T.A. Cope (K)

but '*Aegilops altera*' (the 'II') with Mattioli's *Bromus* (the '*Aegilops* I').

No less than six species are described in a herbal from Jacobus Theodorus Müller who came from a German town called Bergzabern. His 'family' name, Tabernæmontanum, is in fact the Latinization of the name of his native town. Although presenting the *Aegilops* I and II icons from Mattioli, the title page of Tabernæmontanum's book does not indicate that it is another German translation of Mattioli's. His *Kreuterbuch* went through several editions (1613, 1625, 1664, 1687) after its appearance in 1588. The treatment of *Aegilops* is summarized in Table 5. See the excluded species at the end of this Chapter for more details.

Also Dodoens' (1618/1644: 861) *Cruydt-Boeck* is not an emendated version of Mattioli's as the title page relates most descriptions to various works of Carolus Clusius, but many data as well as illustrations are clearly taken from the Italian. Dodoens gives a remarkably correct account of the phenology, ecology, and geography of *Aegilops geniculata*. However, when he cites Galenus and Dioscorides in reference to medicinal properties we are in fact in the dark about which plant this relates to: *Aegilops*, *Avena fatua* or *Bromus commutatus / secalinus*. A translation of the Dutch text with some notes is presented here in the original lay-out:

About Ægilops or Festuca.

Appearance

The *Ægilops* has leaves as the Wheat or Barley; but produces thin, short culms / not becoming taller than a 'spanne'[1] / bearing small spikes on her top: on which only two / sometimes three grains[2] grow / somewhat smaller than Barley-spikes / folded in lined sheaths[3]: and from the tip or extremity protrude thin, long and sharp awns[4]. The root is like the one of Wheat.

Locality. In the [cultivated] fields of the Provence and Languedoc / and also in Italy is this herb often found between the Cereals[5]. It grows often / as Galenus writes / between the Barley. In the 'Dutch'[6] countries it is less well known: although [over-]there many other infestations of the Cereals are to be found / that make life difficult for the grain.

Name. In Greek this herb is called *Aegilops* Αἰγίλωψ / in Latin / as Plinius writes / *Festuca*.

Nature, Properties and *Effect*. *Aegilops* has a property to digest / says Galenus: which is shown by the taste: because it is somewhat sharp on the tongue: it also shows from / to know / because it heals all hardened swellings / and the pimples that may come in the eyes.

The same assures Dioscorides also / saying: The herb called *Aegilops* / mixed with Flour and administered from outside / eliminates the hardiness[es] / and cures a disease called *Ægilops* / which are the hollow pains that come on the sides of the eyes. The juice mixed with Flour / is dried / and kept for re-use.

[1] Old Dutch measure: distance of thumb to little finger of an open, stretched hand, thus (around) 20 cm.
[2] In the meaning of spikelets, rather than kernels.
[3] Lined sheaths referring to the glumes with protruding semi-parallel venation.
[4] Orig. 'vlimmekens'. Vlim = awn.
[5] Orig. 'Koren'. Usually referring to wheat, but, as barley is also mentioned, 'Cereals' may be more appropriate.
[6] Orig. 'Duytsche' ['German']. May refer to [low parts of] Germany, but usually to the Netherlands and Belgium (the 'Low Countries'). (Dodoens was from Mechelen, Belgium.)

In the 'Appendix' that follows this description, Dodoens mentions the frequent occurrence of *Aegilops* among wheat and barley in warm countries and on 'savel' (= a clay soil with 60-80 % sand) soils, a desiccating medicinal property (see below), and its name as *Aegilops herba*, as contrasting with *Aegilops arbor*, which '...is an acorn-bearing tree / otherwise called *Cerris*...' (l.c., 861). At the description of the oak trees ('About *Aegilops* or *Cerris*', l.c., 1301) reference is made to the Greek (Αἰγίλωψ) and Latin (*Cerris*) names, and that this plant is to be distinguished from '...another *Aegilops* Αἰγίλωψ, which is not a tree / but an infestation in the cereal [fields]; otherwise called *Festuca*...'. The name *Quercus aegilops* was later given by Linnaeus (1753: 996) to the oak species; *Cerris* was proposed by Spach (1842: 166) for a section of *Quercus*, including *Q. aegilops* L. (see Chapter 7, note 4).

Dodoens (l.c., 1644: 861) also mentions the occurrence of an *Aegylops* 'with the bulbs' (i.e., the group of bulb-producing plants), but he states that the plant is unknown to him unless the 'Druyfkens-Jacinthe' ['Grape-Hyacinth'] is meant. This refers to his earlier listing (p. 340) of *Ægylops* in connection with two *Hyacinthus* species, *H. racemosus* and *H. botryoïdes*; both are now under *Muscari* Mill. as *M. racemosum* (L.) Mill. and *M. botryoïdes* (L.) Mill.

Dodoens furthermore states that the 'Dravick' (= Dravik (Du.) = genus *Bromus* L.) and the 'Dolick' (= Dolik (Du.) = *Lolium temulentum* L.) are also called *Aegilops* (l.c., 861), and that the 'Kleyn Beemd-Phalaris' is called '*Aegilops* Plinij' by Tragus (l.c., 823). His description and illustration (p. 822-823) clearly show *Phalaris canariensis* L.

As most of the herbals were not just enumerations of known plants but also used by doctors, many medicinal properties, whether real or imagined and passed on through folk-lore, are presented. Thus various properties are attributed to *Aegilops geniculata*, although I have been unable in recent literature to find any 'serious' medicinal effects. Some of the supposed effects are listed here (mainly in translation):

- 'The juice of *Festuca* [*F. italica* = *Aegilops geniculata*], mixed with dried barley flour, and moistened from time to time with rose water, [and then] plastered, heals the disease called *Aegilops* or Fistula in the corner of the eye(s); it mollifies and disperses hard lumps, and assuages the swellings in the joints.' (Gerard, 1597: 68).
- '[This] Herb [together] with flour heals *Aegilops* and hard [swellings]...mixed with flour [it has a] desiccating effect, according [to] Dioscorides, Plinius...' (Bauhin, 1651: 435-436). (May apply to *Avena* as discussed above.) See also the quotation from Dodoens (1644).
- 'The roots, soaked in wine, and kept for several days, eliminate all worms from the body' (Zwinger, 1744: 352).

See Chapter 7 and Chapter 10 at 10.8, respectively, for the many vernacular names mentioned in the pre-Linnaean literature that could be related to the genus *Aegilops* or to *Ae. geniculata*.

A useful summary of pre-Linnaean literature is presented by Honckeny (1792: 484-485). This list has served as a starting point for the chronological enumeration below, which covers, besides the ancient Greeks, literature between 1554 and 1753. Although extensive, this listing is by no means exhaustive and further consultation of herbals may show additional interpretations of *Aegilops* or any of its species. The excluded species are listed separately, while phrase descriptions and Latin names are *italicized*:

Genus *Aegilops*:

Aegilops Theophr., De Historia Plantarum (Liber) 8, Caps. 7-9, De Causis Libri (Liber) 4, Cap. 16 *pro parte*. – Note: reference to De Causis Libri fide Scaliger (1566: 233).

Aegilops sive Festuca Dioscorides, De Materia Medica, Lib. 4, Cap. 134 (but see note 1) *pro parte*. – Note: the generic name is cited as such by Mattioli, Comm. Diosc. Anaz. Med. Mat. 520 (1554) and other editions. See also note 1.

Festuca Hordeum (Gaius) Plinius (Major). Cited as such by de Lobel (1576: 20) and Dodoens (1583: 530: 'Latinis, Plinio teste, *Festuca*'). In fact unclear (see above).

Gramen Tourn., Inst. rei herb. (ed. 2) 1: 516 (1700); Monti, Ind. bot. mat. med. 31 (1753, but before 1 May, cf., Stafleu & Cowan, 1981: 564) *pro parte*.

Aegilops P.Mich., Nov. pl. gen. 35 (1729, nomen). See note 2.

Aegilopoides P.Mich., Nov. pl. gen. 36 (1729, nomen). See note 2.

Aegilops L., Corollarium 20 (1737), Hort. upsal. 301 (1748).

Notes: 1. It seems that with Dioscorides the name *Aegilops* was mentioned in the fourth book of *De Materia Medica*, but the Chapter numbers vary: Cap. 141 in the 1552 and 1568 Italian editions, 134 in the 1554, 1565, 1570 and later Latin editions. Zwinger (1696, 1744) cites 'Lib. 4, Cap. 139' as the place where Dioscorides mentioned *Aegilops*. Most authors, however, mention 'Cap. 134'.

2. In his *Nova plantarum genera*, Micheli (1729) enumerates genera under various 'Distributions', a term linked to a rather general type of plant description rather than geographical patterns. Genera are only named and not described. Under 'Distributio III' *Aegilops*, *Sorghum*, and *Schoenanthus* are listed, and only *Aegilopoides* at 'Distributio IV' (l.c., p. 35-36). I have been unable to see any plant material (most likely at FI, cf., Stafleu & Cowan, 1981), related to his *Aegilopoides*. Nevertheless, given the similarity in name, I suppose that some species of the current genus *Aegilops* have been involved.

Species of *Aegilops*:

3.1.1 **Aegilops caudata** L., Sp. pl. (ed. 1) 2: 1051 (1753).

Pre-Linnaean description:

Gramen creticum, spica gracili, in duas aristas longissimas & asperas abeunte Tourn., Corollarium (Inst. rei herb.) 39 (1703).

3.1.2 **Aegilops ovata** L., Sp. pl. (ed. 1) 2: 1050 (1753).

Pre-Linnaean descriptions (referring to Linnaeus' *Aegilops ovata pro parte*, namely in the sense of *Ae. geniculata* Roth):

Aegilops II Mattioli, Comm. Diosc. Anaz. Med. Mat. [in an edition from between 1560 and 1563; see text] 1206 (1565), 746 (1570), Vol. 2: 547 (1583), Discorsi Ped. Dioscoride 1265 (1568, icon); Handsch, Neuw Krütsbuch 119B (1563); Calzolari, Compendium 842 (1571, as *Aegilops sive Festuca* and with Mattioli icon); des Moulins, Commentaires Mattioli 643 (1572); Dodoens, Stirp. hist. pempt. 529-530, fig. 1 (1583, as *Ægilops*); Camerarius, De Pl. Epitome 928 (1586, '*Ægilops altera*'; see note 1) / Kreuterbuch 107a (1586, 1590; German version of the *Epitome*?); Daléchamps, Hist. general. pl. 406 (1587); Pancov, Herbarium portabile no. 243 (1654; as '*Ægylops*, 2 M', 'M' = Mattioli); Zornn, Herbarium no. 263 ('*Ægilops* 2') / p. 12 ('*Ægilops secunda*') (1673, 1679); Zwinger, Theatr. bot. 301 (1696), 352 (1744); Royen, Fl. leyd. prodr. 72 (1740).

Festuca sive Aegylops Narbonensis Lobel (de Lobel, Lobelius), Pl. stirp. hist. 20, fig. 4 (icon), 21 (descr.) (1576, on p. 21 as '*Festuca sive αιγλωψ Narbonensis & calidarum regionum*') / Kruydtb. 43 (1581, Dutch transl.), Pl. icon. 34 (1581); Parkinson, Theatr. bot. 1148, f. 3 (1640); Ray, Hist. pl. 2: 1290, n. 14 (1688); Séguier, Pl. veron. 1: 358 (1745). – Notes: 1. See note 2 for the name *narbonensis*. Used as the binomial *Aegylops narbonensis* by Honckeny (1792: 485) and Juel (1936: 15) in synonymy of *Ae. ovata* (see the nomenclature at 10.8). 2. The de Lobel phrase-name is cited in synonymy of *Ae. triaristata* (= *Ae. neglecta*) by Gussone (1826: 371, see note 3).

Triticum sylvestre Cesalpino (Caesalpinus), Pl. libri XVI, Liber 4, Cap. 47, p. 178 (1583); Bubani, Fl. pyren. 4: 395 (1901-02, sic!). – Note: used by Bubani to name *Ae. geniculata*, publishing this binomial after 1753. See the nomenclature at 10.8, *Aegilops geniculata* Roth.

Aegilops lobelii Daléchamps, Hist. general. pl. 406 (1587); Bauhin, Pinax, Liber 1, Sect. 1: 10 (1623, 1671, '*Lobelij*' in both eds. and in syn. of *Festuca altera capitulis duris*).

Aegilops peregrina Tabern., Neuw Kreuterb. 1: 670, 671 (1588, '*Ægylops peregina* V'), Neuw vollk. Kreuterb. 564, 565 (1613), (ibid.) 527 (1625), New vollk. Kräuterb. 545 (1664, 1687). – Note: used as a binomial by Honckeny in synonymy of *Aegilops ovata* L. (See the nomenclature at 10.8). Cited as '*Ae. peregrina sexta* Tabern. Kraeut. p. 545' by Marschall von Bieberstein (1808: 433), referring to the 1664/1687 edition of Tabernæmontanum's herbal.

Festuca Italica J.Gerard, Herball (ed. 1) 67 and fig. 2 (1597). – Note: used as a binomial by Honckeny in synonymy of *Aegilops ovata* L. (See the nomenclature at 10.8).

Aegilops herba Dodoens, Cruydt-Boeck 861 (1618, 1644). – Note: probably for the first time in the 1608 edition (not seen).

Festuca altera capitulis duris C.Bauhin, Pinax, Liber 1, Sect. 1: 10 (1623, ed. 1; 1671, ed. 2), Theatri bot. 151 (1658); Morison, Pl. hist. univ. 3 (Sect. 8., Tab. 17, no. 10): 211 (1699, 1715); Séguier, Pl. veron. 1: 358 (1745); de la Croix de Sauvages, Meth. fol. 40 (1751, sub '*Aegylops*, Linn.').

Frumentum sylvestre Castori. Not found. Cited by Bauhin, Pinax, 10 (1623, 1671), Theatri bot. 152 (1658).

Aegilops veteribus et in genere J.Bauhin, Hist. pl. 2: 434 (1651). – Note: cited as the binomial '*Aegilops veterum*' by Honckeny (1792: 485) in synonymy of *Aegilops ovata* L. (see the nomenclature at 10.8).

Gramen spicatum durioribus et crassioribus locustis, spica brevi Tourn., Inst. rei herb. (ed. 2) 1: 519 (1700); Scheuchzer, Agrostographia 11 (1719; see note 4); Vaillant, Bot. paris. 82 (1727, quoting de Tournefort's page as 529); Séguier, Pl. veron. 1: 358 (1745).

Aegilops spica ovata aristis breviore L., Hort. upsal. 301 (1748); Dalibart, Fl. paris. prod. 304 (1749).

Gramen secalinum, spica ex duobus rantum vel tribus locustis duris & crassis congesta Mont. (Monti?), Prod. 61, t.3 f. 89 (year?); Séguier, Pl. veron. 1: 358 (1745). – Note: book and author not found, but author could be G.L. Monti (1712-1797). The year should be between 1700 (de Tournefort) and 1748 (Linnaeus) as both de Tournefort and 'Mont.' are cited by Séguier (1745). This *Prodromus* is cited with 'Monti' by Honckeny (1792: 485), as 'Monti. Prodr. 61 f. 89' and under the Tournefort phrase-name by Desfontaines (1799: 383), and as 'Mont. Bon. Pr. Gram. tab. loc. spiculr. f. n. 89' by Bubani (1901-02: 395).

Notes: 1. The *Epitome* of Camerarius (1586) was apparently well known by botanists as many cite '*Ægilops altera* Cam.' rather than *Aegilops* II from Mattioli (e.g., Roth, 1787: 45; Desfontaines, 1799: 383; Smith in Sibthorp & Smith, 1808: 74; Bertoloni, 1834: 786; Richter, 1835-39: 998). Camerarius' book is, however, probably a somewhat modified edition of Mattioli's as the latter is mentioned in the title of both the Latin (1586) and German (1586, 1590) versions.

2. The name *narbonensis* in the phrase-name of de Lobel refers to Narbonne in southern France, where *Aegilops geniculata* can be found. This is, however, not mentioned by de Lobel. Gerard (1597: 68) writes about his *Festuca Italica*: '...Festuca of Narbon in France is called αιγιλωψ, in Latine *Aegilops Narbonensis*,...', and Morison's (1699: 211) description and ecology of *Ae. ovata* auct. is even more detailed: '...In Galliae Narbonensis, Italiae, & Siciliae agris, inter segetes triticeas & hordeaceas, aestivis & glareosis marginibus frequenter occurrit...'.

3. Gussone (1826: 371) cites the Scheuchzer and de Lobel phrase-names under *Ae. triaristata*, stating, in addition, that a variety of this species with glumes with four awns can easily be confused with *Ae. ovata*. Scheuchzer's phrase-name is derived from de Tournefort and thus *Ae. 'ovata'*, but his illustration refers to *Ae. neglecta* (see note 4). The description in de Lobel's *Plantarum seu stirpium historia* (1576: 21), is accompanied by an icon (fig. 4 on p. 20), which, although ambiguous, is usually interpreted as *Aegilops ovata sensu stricto*. See text above.

4. The illustration of Tab. 1, fig. 2A, B, C, referred to by Scheuchzer (1719: 11) was chosen as the lectotype of the name *Aegilops ovata* L. by Greuter (in Greuter & Rechinger, 1967: 171). It is, however, *Ae. neglecta*. With Scheuchzer, as later with Linnaeus (1753) the two species, *Ae. geniculata* and *neglecta*, are thus mixed up and unified under the epithet *ovata*. See also note 2 at 10.12, *Ae. neglecta*.

3.1.3 **Aegilops tauschii** Coss., Notes pl. crit. 1(2b): 69 (1850).

Pre-Linnaean description:

Gramen loliaceum spurium, spica crassiore, aristata J.C.Buxb., Centuria 1: 31, Tab. 50, fig. 1 (1728). – Note: see note 2 at *Ae. ventricosa* (10.22) for a comment on the interpretation of the Buxbaum plate. Buxbaum cites the phrase name from Scheuchzer's *Agrostographia* (1719: 42), *Gramina spicata, spica simplici, loliacea, spuria*, but the latter's accompanying illustration clearly refers to *Parapholis incurva*. Von Trinius (1822: 229) identified Buxbaum's description and plate as *Ae. cylindrica*.

3.1.4 **Aegilops triuncialis** L., Sp. pl. (ed. 1) 2: 1051 (1753).

Pre-Linnaean descriptions:

Festuca altera capitulis duris, spica triunciali C.Bauhin, Pinax, Lib. 1, Sect. 1: 10 (1623, ed. 1; 1671, ed. 2).

Festuca altera capitulis duris, spicâ longiore Magnol, Bot. Monsp. (in the appendix altera of ed. 2) 311 (1686). – Note: quoted by Scheuchzer (1719: 12).

Gramen spicatum, durioribus & crassioribus locustis, spica longissima Tourn., Inst. rei herb. (ed. 2) 1: 519 (1700); Scheuchzer, Agrostographia 12 (1719); Vaillant, Bot. paris. 82, Tab. 17, fig. 1 (1727, quoting de Tournefort's page as 529).

Excluded genera:

Aegilops Brunfels, Herb. vivae eicon. 30 (5 eds. between 1530-1539); Bauhin, Hist. pl. 1: 405 (1650). = *Avena fatua* L. – Note: both references fide von Trinius

(1822: 99) who cites Brunfels' book as 'Hb. p. 30'. I have assumed that this refers to his *Herbarium vivae eicones* of which five editions appeared between 1530-1539 (cf., Stafleu & Cowan, 1976: 383).

Aegilops ('*Ægylops*') as illustrated by Pancov, Herbarium portabile no. 242 (1654), and Zornn, Herbarium no. 262 (1673, 1679). = *Briza* L. *pro parte*. – Note: presented by both Pancov and Zornn as '*Ægylops*, Hasenbrot [= bread of the hare], T.' The 'T.' may stand for Tragus rather than Theophrastus.

Aegilops Dill., Cat. pl. circa Gissam, Appendix (Nov. pl. gen.) 90 and Tab. 3, fig. B (next to p. 100) (1719). = *Bromus* L. *pro parte*.

Excluded species:

Aegilops I Mattioli, Comm. Diosc. Anaz. Med. Mat. 520 (1554, as '*Aegilops sive Festuca*' and with icon), 584 (1558, 1559, 1560, all as 1554 ed.), 1205 (1565, as '*Aegilops* I'), 746 (1570), Vol. 2: 546 (1583), Discorsi Ped. Dioscoride 1264 (1568, icon of 1554 ed. sub '*Egilopa* I'); Handsch, Neuw Krütsbuch 119A (1563); Calzolari, Compendium 843 (1571, '*Aegilops altera*'); des Moulins, Commentaires Mattioli 643 (1572); Camerarius, De Pl. Epitome 927 (1586, '*Ægilops, sive Festuca*'), Kreuterbuch 107a (1586, 1590, 'Gerstentwalch I *Ægilops*'); Tabernæmontanum, Neuw Kreuterb. 1: 669 (1588, '*Ægylops* I'), Neuw vollk. Kreuterb. 563, 565 (1613), (ibid.) 526 (1625), New vollk. Kräuterb. 544 (1664, 1687); Zornn, Herbarium no. 262 / p. 12 ('*Ægilops prima*') (1673, 1679); Zwinger, Theatr. bot. 300 (1696), 351 (1744). – Synonyms: *Festucago* Gaza [author is Th. Gaza, but book and year not found]. *Bromus sterilis* Lobel, Pl. stirp. hist. 20 (1576), Kruydtb. 41 (1581). *Festuca avenacea sterilis elatior* C.Bauhin, Pinax 9 (1623, 1671); Morison, Pl. hist. univ. 3 (Sect. 8., Tab. 17, no. 11): 211 (1699, 1715, as '*Sterilis elatior*'). *Aegilops Mattiolo forte* J.Bauhin, Hist. pl. 2: 439 (1651); Séguier, Pl. veron. 1: 335 (1745). *Gramen avenaceum, panicula sparsa, locustis majoribus & aristatis* Tourn., Inst. rei herb. (ed. 2) 1: 526 (1700); Scheuchzer, Agrostographia 258 (1719). = *Bromus commutatus* Schrad. or *B. secalinus* L.

Note: identifications of this and following *Ægylops* species as illustrated by Tabernæmontanum are from the woodblocks in the various editions of his *Kreuterbuch* (herbal), although the icon of this species appeared for the first time in Mattioli's herbal in 1554 (see above). *Bromus sterilis* L. is suggested many times, but the much longer lemma awns of this species (15-30 mm) would have been visible on the icon. The woodblock does not allow more precise identification than the two *Bromus* species suggested here, both well-known infestations of cultivated fields.

Aegilops II Tabern., Neuw Kreuterb. 1: 669 (1588, '*Festuca seu Ægylops II*'), Neuw vollk. Kreuterb. 563, 565 (1613), (ibid.) 526 (1625), New vollk. Kräuterb. 544 (1664, 1687). = (most likely) *Bromus hordeaceus* L. (common synonym: *B. mollis* L.)

Aegilops III Tabern., Neuw Kreuterb. 1: 670 (1588, '*Ægylops* III'), Neuw vollk. Kreuterb. 564, 565 (1613), (ibid.) 527 (1625), New vollk. Kräuterb. 544 (1664, 1687). = *Hordeum murinum* L.

Aegilops IV bromoïdes I Tabern., Neuw Kreuterb. 1: 670 (1588, '*Ægylops* IIII *Bromoïdes* I'), Neuw vollk. Kreuterb. 564, 565 (1613; this and following eds. as '*Ægylops* IV *Bromoïdes* I'), (ibid.) 527 (1625), New vollk. Kräuterb. 545 (1664, 1687); Scopoli, Fl. carniol. (ed. 2) 85, 86 (1771/1772; sub *Stipa pennata* on p. 85, sub *S. juncea* on p. 86; in both cases as '*Aegilops* IV Tabernem. p. 545'). – Synonyms: *Ægilops Bromoides*. Cited (as a binomial!) in Gerard, Herball (ed. 1) 70, fig. 1 (1597, see note 2). *Festuca longissimis aristis glumis vacuis spadicei coloris* C.Bauhin, Pinax 10 (1623, 1671); Ray, Hist. pl. 2: 1290, n. 13 (1688). *Ægilops bromoides, juba purpurascente* J.Bauhin, Hist. pl. 2: 436 (1651); Scheuchzer, Agrostographia 267, Tab. 6, fig. 1 (1719); Séguier, Pl. veron. 1: 355 (1745); – *post* Linnaeus (1753): Scopoli, Fl. carniol. (ed. 1) 207 (1760, sub *Avena*); De Notaris, Repert. fl. ligust. 437 (1844, sub '*Chrysopogon gryllus* Trin.'). *Gramen sparteum, festuceum, seu Ægilops spartea, villosa* Barrelier, Icones 18 (1714; written by J. Barrelier (1606-1673), and posthumously published by A. de Jussieu in 1714). – Synonym *post* Linnaeus (1753): *Aegilops bromoides* Tabern. ex P.Beauv., Ess. Agrostogr. 146 (1812, as '*Aegylops Bromoïdes* Scheuchzer Vid. [= videte] *Apluda gryllus*'); Juel, Burser hort. sicc. 15 (1936, as '*Aegylops bromoides* Tab.' at no. I.127(bis) sub *Stipa capillata* L.); Savage, Linn. det. hort. sicc. Burs. 10 (1937; sub *Stipa juncea* L.), *nom. inval.* (Art. 34.1*(c)*: only cited in synonymy by Palisot de Beauvois, Juel, and Savage). = *Stipa capillata* L.

Notes: 1. Three *Stipa* species are involved here, viz. *capillata* L., *juncea* L. and *pennata* L. The latter two have plumose awns, while *capillata* has long and scabrid awns. This agrees best with the icon of Tabernæmontanum's woodblock. **2.** Gerard's figure 1 (1597: 70) is accompanied by the binomial *Aegilops Bromoides* and presents a *Stipa* species. His description, however, begins with '*Aegilops Bromoides Belgarum*, is a plant...'. This plant is *Avena fatua* L. (see above).

Aegilops arbor Dodoens, Cruydt-Boeck 861, 1301 (1618, 1644). – Note: probably for the first time in the 1608 edition (not seen). = *Quercus aegilops* L.

Aegylops Bromoides Belgarum Lobel (de Lobel, Lobelius), Pl. stirp. hist. 20, fig. 3 (1576) / Kruydtb. 43 (1581, Dutch transl.), Pl. icon. 33 (1581); Parkinson, Theatr. bot. 1148 (1640); Ray, Hist. pl. 2: 1254, n. 4 (1688). – Synonyms: *Aegilops* VI *bromoïdes* II Tabern., Neuw Kreuterb. 1: 670 (1588, nomen '*Ægylops* VI *Bromoïdes* II'), Neuw vollk. Kreuterb. 564, 565 (1613), (ibid.) 527 (1625), New vollk. Kräuterb. 545 (1664, 1687). *Festuca utriculis lanugine flavescentibus* C.Bauhin, Pinax 10 (1623, 1671). = *Avena fatua* L.

Ægilops Madraspatana, glumis pilosis aristatis J.Scheuchzer, Agrostographia 92 (1719); Richter, Codex bot. linn. 993 (1835-39, '*maderaspatana*'); Petermann, Cod. linn. index. 4 (1840, '*Aegilops maderaspatana etc.*'). [= *Andropogon contortus* L. (fide Richter, 1835-39)] = *Heteropogon contortus* (L.) Roem. & Schult. – Note: the phrase-name of Scheuchzer was cited in synonymy at *Andropogon contortus* by Richter, and cited nearly as a binomial by Petermann. The species involved is now *Heteropogon contortus*.

Aegilops major, caule & foliis arundinaeus, locustis hirsutis Dill., Cat. pl. circa

Gissam 111 (1719). = *Bromus commutatus* Schrad. or *B. secalinus* L. – Note: Dillenius' description is followed by the citation of de Tournefort's phrase-name of *Aegilops* I of Mattioli, which applies to any to the two *Bromus* species (see above).

Aegilops major, caule & foliis arundinaceis, locustis glabrioribus & angustioribus, e fusco xerampelinis Dill., Cat. pl. circa Gissam 130, Appendix 60 (1719); Richter, Codex bot. linn. 88 (1835-39, in syn.); Petermann, Cod. linn. index 4 (1840, '*Aegilops major etc.*'). = *Bromus arvensis* L. (fide Richter, 1835-39).

Aegilops minor, panicula angusta, locustis parvis, foliis junceis Dill., Cat. pl. circa Gissam 82, 126 (1719). **Aegilops minor, panicula rariore, locustis majoribus** Dill., Cat. pl. circa Gissam 163, Appendix 63 (1719); Richter, Codex bot. linn. 88 (1835-39, in syn.); Petermann, Cod. linn. index 4 (1840, '*Aegilops minor etc.*'). = *Bromus hordeaceus* L. (fide Richter (1835-39), relating to the second phrase-name with its description on p. 163 and on p. 63 of the *Appendix*).

Aegilops mauritanica, aristis longioribus binis Petiver, Gaz. t. 38, f. 7 (year?). Cited in Richter, Codex bot. linn. 92 (1835-39); Petermann, Cod. linn. index 4 (1840, '*Aegilops mauretanica etc.*'). = *Avena sterilis* L. (fide Richter, 1835-39).

Aegilops quibusdam, aristis recurvis, s. Avena pilosa J.Bauhin, Hist. pl. 2: 433 (1651); Ray, Hist. pl. 2: 1254 (1688). = *Avena fatua* L. – Note: both J. Bauhin and Ray references fide von Trinius (1822: 101).

3.2 Linnaean history of *Aegilops* L. — Fig. 2; Table 6

The genus *Aegilops* was published by Linnaeus in the second volume of the *Species plantarum* in 1753. He classified it in the *Polygamia Monoecia*. By comparison, the allied genus *Triticum* was published earlier that year (but not for matters of nomenclature, see Art. 13.5 of the *Code*) in the first volume under the *Triandria Digynia*.

Linnaeus used the generic name '*Aegilops*' earlier in his *Hortus upsaliensis* (1748: 301), as a synonym under his phrase-name of *Aegilops ovata*, and cited van Royen's *Flora leydensis prodromus*, page 72 from 1740 (as '*Roy. lugdb.* 72') and Dodoens' *Stirpium historiae pemptades sex*, page 72 from 1583 (as '*Dod. pempt.* 72'). [The page mentioned from Dodoens, '72' (but as '73' later in the *Species plantarum*), is unclear to me, as *Aegilops ovata* is treated by Dodoens on pages 529-530.]. In addition, '*Aegilops altera*' from Camerarius' well-known *De Plantis Epitome*, page 928 from 1586 (as '*Cam. epit. 928*'; see also at Chapter 3.1) is cited as a synonym, as are the phrase-names from Bauhin's *Pinax* (1623) and from de Tournefort's *Institutiones* (1700; but Scheuchzer's quotation in his *Agrostographia* (1719) is cited here instead).

In the *Species plantarum* the earlier phrase-name for *Ae. ovata*, '*Aegilops spica ovata aristis breviore*', was reiterated by Linnaeus, with van Royen and Dodoens (but also Camerarius) as references under the synonym '*Ægilops*' (l.c., 1753: 1051), and, in addition, the Bauhin and Scheuchzer citations. This book compiled the species of the genus as Linnaeus saw them at the time. He enumerated five species of which four still belong to *Aegilops*, with *Ae. caudata* L. and *Ae. triuncialis* L. under their original names. Because of its complicated interpretation and Greuter's (in Greuter & Rechinger, 1967: 170) lectotypification of *Aegilops ovata*, this species must be referred to in the sense of its emendation by Roth (1787: 45) and called *Ae. geniculata* Roth (see at 10.8); *Ae. squarrosa* must now be referred to as *Ae. tauschii* Coss. because of Bowden's (1966) lectotypification of the name *squarrosa* (see at 10.17). The fifth species, *Aegilops incurva* L., does not belong to *Aegilops* (see below). As the Linnaean herbarium (LINN) is of such importance in relation to (the typification of) names, published in the *Species plantarum*, an overview of their status and identification is presented in Table 6. The numbering of the species in LINN (column: Name in LINN: **'1 ovata'**, **'caudata 2'**, etc.) corresponds with their numbers in the *Species plantarum*.

For the further 'Linnaean' history of *Aegilops* the genus is, similar to its starting point, considered here separate from *Triticum*, while *Amblyopyrum* is, for the moment, included (see also at 3.3). Further discussion on these matters is presented in Chapter 5. After Linnaeus' *Species plantarum* four major works are considered here.

The first one, Jaubert & Spach's *Illustrationes plantarum orientalium* (the *Aegilops* overview appeared in the fourth volume on pages 10-23, published during 1850-51; see Stafleu & Cowan, 1979), appeared nearly 100 years later. Since then each major revision appeared in a period of 30-50 years after its predecessor (with Zhukovsky (1928) and Eig (1929a) considered 'simultaneous').

Linnaeus' presentation of his five species did not include any hierarchy (Fig. 2 at '1753'), but with Jaubert & Spach the number not only more than doubled to 11, but the genus was also subdivided into six subgenera (Fig. 2 at '1851'). Some of these subgeneric names still serve as basionyms for sections of the genus (see also at 8.1). It must be noted that Jaubert & Spach did not include all species known at the time, as *Ae. ovata*, *caudata* and *triuncialis* from the *Species plantarum*, and, e.g., *Ae. biuncialis* from de Visiani's *Flora dalmatica* (1842), were absent. Earlier, the fifth species in the *Species plantarum*, *Ae. incurva* L., was reclassified as *Lepturus incurvatus* (L.) Trin. by von Trinius (1820: 123). [It is presently under *Parapholis*; see Table 6 and Chapter 12.]

Thirty years later, in 1884, Boissier's fifth volume (second part) of his monumental *Flora orientalis* appeared. *Aegilops* is treated in a typical floristic way, with a key and listing of species only, and without subgenera or sections. The number of species remained 11 (but included the three Linnaean species, absent from Jaubert & Spach), but 10 infraspecific taxa were added under, in total, six species, thus distinguishing 16 taxa at infraspecific level (Fig. 2 at '1884'). After being described as early as 1844 by Boissier himself (1844b: 73) – and thus before Jaubert & Spach's two species (from 1847 and 1851a) included in their section *Amblyopyrum* – *Aegilops mutica* was also included in the *Flora orientalis*. This flora has been a milestone in the botany of the Near East, being the only 'modern' flora to cover the whole of it, and it is only recently being replaced by countrywide floras, such as the

Flora of Turkey (Davis, 1965 et seq.), and the *Flora Iranica* (Rechinger, 1963 et seq.), etc.

Fifty years after Boissier, two complete monographs appeared, by Zhukovsky (1928) and Eig (1929a), respectively. Both reflect the tendency that prevailed in the early 20th century to split off any distinguishable morphological variant of a taxon (usually the species) and give it recognition. In retrospect these categories seem based on either a local environmental effect, or are caused by a single gene or small group of closely linked genes only (Hawkes, 1978: 125). In addition to this tendency, both authors were exponents of the Eastern European / Russian school that was characterized by a tendency to split and a strictly morphological and hierarchical approach (see, e.g., the *Triticum* classification by Dorofeev & Korovina (1979) into 27 species and 1031 varieties; more at 5.4.2). Thus Zhukovsky distinguished nine sections, 19 species and 50 infraspecific taxa, while Eig classified the genus into two subgenera (*Eu-Aegilops* and *Amblyopyrum*), six sections, seven subsections, 22 species and 79 infraspecific taxa (Fig. 2 at '1929'). Quite an increase from the 11 species, recognised by Boissier only 44 years earlier.

Eig, who was born in Russia, met Vavilov in 1926 when the latter visited Palestine. Vavilov encouraged him to prepare a monograph of *Aegilops*, and during 1928 Eig sent parts of his manuscript to Vavilov in Leningrad. However, during the months that passed before he received the manuscript back, Zhukovsky's monograph appeared (Eig, 1929a: Vorwort [Preface], p. 7; and Nachtrag [Appendix], p. 213). Eig raises the suggestion between the lines that Leningrad withheld the manuscript to enable a collaborator of Vavilov (Zhukovsky was working under Flaksberger in the wheat department of Vavilov's Institute for Applied Botany and Genetics) to be the first to publish a monograph (Eig, 1929a: note 2 of the Preface on p. 7). Eig, who completed most of his monograph during a stay at the botanical institute in Berlin-Dahlem (l.c., 1929a: 8), later sent his manuscript to Fedde in Berlin, who published it as Beiheft no. 55 of his Repertorium.

The rivalry between Zhukovsky and Eig is apparent in the latter's work, who criticised the former's monograph robustly (Eig, 1929c). Some examples may illustrate this: (1) In his Appendix, Eig comments on the two newly described species (*Ae. columnaris* and *umbellulata*) of Zhukovsky, mainly through immediate distinction of a typical and a new, atypical variety (var. *glabriuscula* and var. *pilosa*, respectively). (2) Zhukovsky distinguished four subspecies and four varieties in *Ae. ovata*; Eig two subspecies and seven varieties. *None* of the Zhukovsky names are found with Eig. (3) None of Zhukovsky's section names are found either with Eig, although the content of the sections is sometimes strikingly similar (e.g., the section *Sitopsis*, where Eig only added his earlier described *Ae. sharonensis*). (4) Zhukovsky located *Ae. mutica* in a separate section *Amblyopyrum*, changing the rank of Jaubert & Spach's subgenus of the same name. Eig maintained the subgenus *Amblyopyrum* from Jaubert & Spach, but added a new sectional name, *Anathera*, as well. That new sectional name definitely included the type of an earlier name, *Amblyopyrum*, at the same rank that ought to have been adopted, and is thus superfluous. In his Appendix Eig indicated that he had seen Zhukovsky's work, changed his text here and there, added some photographs and adjusted some

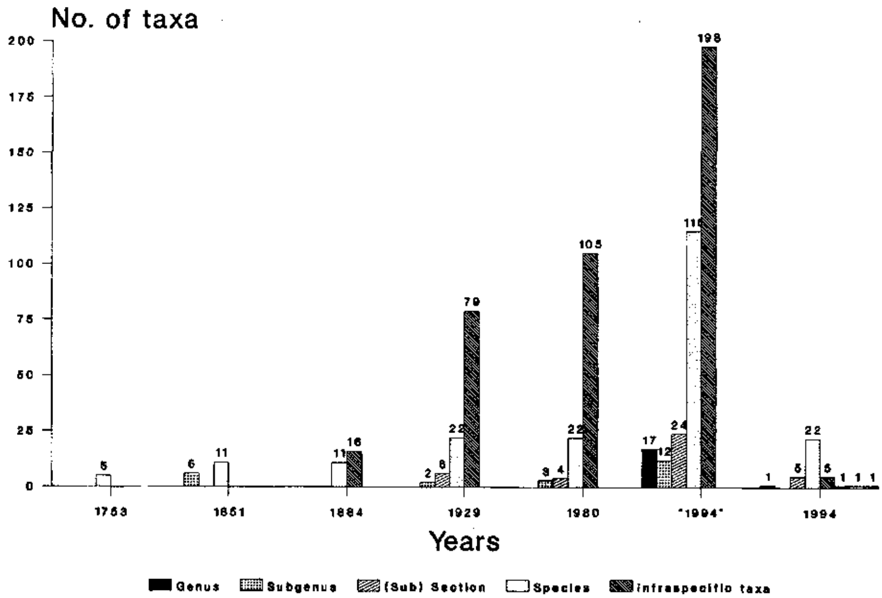


Fig. 2. Taxa recognized in *Aegilops* by Linnaeus (1753), Jaubert & Spach (1851), Boissier (1884), Eig (1929), in a compilation of all taxa described ('1994'), and in the current work (1994).

maps (l.c., 1929a: 213). On the whole, however, he seemed unable ('...geändert, was sich ohne Schwierigkeit ändern ließ...' [changed, what could be changed without difficulties], l.c., 213) to draw or incorporate more far-reaching conclusions, resulting from Zhukovsky's publication. Or was he unwilling? The absence of any sectional nomenclature, in this respect, is suspicious (see also at 8.1).

At any rate, being published in German (in a translation from the original Hebrew text, cf., the cover of Beiheft 55) and definitely more thorough, Eig's monograph gained the upper hand over Zhukovsky's more inaccessible Cyrillic-Russian work, despite its lengthy summary in English. Eig's nomenclature is still widely used, e.g., by gene banks such as the one at Kyoto University, Japan (Kihara's institute). For matters of nomenclature, however, many of Eig's names are superfluous renamings and need to be abandoned, e.g., his section names and the well-known case of *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller having priority over *Ae. variabilis* Eig.

Fifty years after Zhukovsky and Eig, Hammer's (1980a, 1980b) revision represents the last complete taxonomic overview of *Aegilops*. The tendency to split found its culmination here in three subgenera (*Aegilops*, *Sitopsis* and *Amblyopyrum*), four sections, 22 species and no less than 105 infraspecific taxa (Fig. 2 at '1980'). *Aegilops mutica* is the single species of the subgenus *Amblyopyrum* but eight infraspecific taxa (varieties and formae) are recognized as well. The large number of infraspecific taxa resulted from the incorporation of many ecotypes, for example the ones distinguished by Gandilyan (1975) in *Ae. mutica*, and by Popova (1923) in *Ae. crassa, cylindrica, tauschii*, and *triuncialis*, although Hammer, like me, failed to see any of their type collections (Hammer, pers. comm.). Hammer's revision is thus for a major part a summary of the infraspecific taxa distinguished in the past, but, contrary to the current work, they are all maintained. The distinctive position of *Ae. mutica* and the *Sitopsis* species is expressed in their accommodation under separate subgenera. He also lectotypified the genus again with *Ae. triuncialis*, a choice followed here (see note 5 at Chapter 7).

It must be noted that although both Eig and Hammer distinguish 22 species in *Aegilops*, these are not the same ones as the 22 species of this revision. Eig (1929a) obviously did not include *Ae. searsii*, which was not described until 1977 (Feldman & Kislev, 1977), but separated the two varieties of *Ae. speltoides* at species level, as *Ae. ligustica* (Savign.) Coss. (Eig erroneously writes only 'Coss.') and *Ae. speltoides* Tausch. Hammer treats *Ae. sharonensis* as a subspecies of *Ae. longissima*, and maintains *Ae. turcomanica* next to *Ae. juvenalis* (l.c., 1980b: 235), although in the last case the former species is absent from his overview (l.c., Table 2 on p. 227). The case for unification of the two '*speltoides* species', as well as for the separation of the '*longissima* subspecies' is made in Chapter 10 at 10.16a and in Chapter 5.1, respectively, while *Ae. turcomanica* is a heterotypic synonym of *Ae. juvenalis* (see at 10.9).

In all the treatments considered here, as in most of the floras inspected in Chapter 5.2.1 for the relation between *Aegilops* and *Triticum*, *Amblyopyrum* was treated as a part of *Aegilops* at either subgeneric or sectional level. Major exceptions are Chennaveeraiah's (1960) karyomorphological study, and the *Flora of Turkey* (Davis, 1985). See also at 3.3.

In addition to the five major treatments of *Aegilops*, Fig. 2 shows two bar diagrams at the year 1994. The diagram at '1994' compiles the total of taxa, described at generic and infrageneric level in *Aegilops* and *Amblyopyrum*, while 1994 presents the results of this revision: one genus *Aegilops* with five sections, 22 species and five non-typical varieties with, in addition, a monospecific genus *Amblyopyrum* with one species and one non-typical variety.

3.3 History of *Amblyopyrum* (Jaub. & Spach) Eig

The genus *Amblyopyrum* was created by Eig in May, 1929, shortly after he published his monograph of *Aegilops*, which appeared on 15 February of that year. He came to this separation from *Aegilops* after studying *Agropyron* material in various herbaria, of which he found the spikes more similar, or at least as similar as *Aegilops mutica* (Eig, 1929b: 200, 203).

When *Ae. mutica* was created, Boissier (1844b: 73-74) considered it as intermediate between *Aegilops* and *Agropyron*. Until its relocation under a separate genus in 1929 the position of *Ae. mutica* remained under *Aegilops*. Although Boissier's description only refers to the hispid forms (l.c., 74: '...glumis...velutino-lanatis [velvety-woolly]...'), the type specimen connected with the name, *Aucher-Éloy 2977* represents a mixed gathering of hispid and glabrous forms. Jaubert & Spach (1847, 1851a) subsequently described the hispid and glabrous forms as two sepa-

Table 6. Status of specimens on sheets 1218.1-15 under *Aegilops* in the Linnaean herbarium (LINN)

Number	Name in LINN*	Identification	Notes
1218.1	Aegilops **1 ovata.** // Hispania. 701.α Loefl. [*cf. Span. list 1753. 701.α det. Loefl.*]	*Ae. geniculata* Roth	See note 2 at 10.12, *Ae. neglecta*, for its possible role in the typification of *Ae. ovata* L.
1218.2	Aegilops **ovata**	*Ae. biuncialis* Vis.	–
1218.3	[*sine inscript*]	*Ae. peregrina* (Hack. in J. Fraser) Maire & Weiller var. *peregrina*	–
1218.4	M.	*Ae. geniculata* Roth	left- and right-hand specimens are both *Ae. geniculata.*
1218.5	Aegilops/**2 caudata.**	*Ae. ventricosa* Tausch	left- and right-hand plants are the same species; left-hand specimen indirectly proposed by Bowden (1959: 667, 668) as type of *Ae. caudata* L.; both as type by Greuter (in Greuter & Rechinger 1967: 173). See note 1 at 10.3.
1218.6	**caudata 2** [m.Lf.] [L:] o [*? refers to section of stem. S.S.*] [script. ignot:] *128.*	*Ae. ventricosa* Tausch	(mis-)identified by Bowden (1959: 668) as *Ae. squarrosa* auct. non L. (= *Ae. tauschii* Coss.).
1218.7	Aegilops **caudata.** [Sm:] *ovata?*	*Ae. geniculata* Roth	–
1218.8	**triuncialis 4.** //Hispania. 701 β Loefl. [*cf. Span. list 1753. n.701.β. det. Loefl.*]	*Ae. triuncialis* L.	Designated type of *Ae. triuncialis* L. by Bowden (1959: 675).
1218.9	**squarrosa 3.**	*Ae. triuncialis* L.	Designated type of *Ae. squarrosa* L. by Bowden (1966: 133), thereby reducing the name to a heterotypic synonym under *Ae. triuncialis.*
1218.10	Aegilops **5 incurva.**	*Parapholis incurva* (L.) C.E.Hubb.	Hubbard (1946: 14) does not indicate which of the four sheets 1218.10-13 is serving as the holotype for *P. incurva.*
1218.11	**incurvata 4** HU.	*Parapholis incurva* (L.) C.E.Hubb.	See Hubbard (1946: 14); *incurvata* is an orthographic variant of *incurva.*

Table 6 (continued)

Number	Name in LINN*	Identification	Notes
1218.12	**incurvata** [m.Lf.]	*Parapholis incurva* (L.) C.E.Hubb.	See Hubbard (1946: 14).
1218.13	**incurva** [m.Lf.]	*Parapholis incurva* (L.) C.E.Hubb.	See Hubbard (1946: 14).
1218.14	*Aegilops* **compressa** [m.Lf.] Nyt genus	*Hemarthria* R.Br. sp.	Identified by J.F. Veldkamp (L). See Chapter 12.
1218.15	Aegilops **exaltata** [m.Lf.] Koenig 10	*Ophiuros exaltatus* (L.) Kuntze	Basionym and type of *O. exaltatus*. See Chapter 12.

* : Layout of the text in this column follows Savage (1945: 182). L. = Linnaeus; Lf. = Linnaeus filius; S.S. = Sibthorp & Smith; Sm. = Smith; HU = Hortus Upsaliensis. The indication that Hasselquist inspected the sheet (only at 1218.2) is not presented. [A photograph of sheets 1218.1-15 is in F.]

rate species, *Ae. tripsacoides* and *Ae. loliacea*, respectively, but located both in 1851 under a separate subgenus *Amblyopyrum* (l.c., 1851a: 23). The type specimen cited by Jaubert & Spach in connection with the name *Ae. loliacea* was again *Aucher-Éloy 2977*, but only the glabrous specimens now serve as the type. [More notes on the typification in Chapter 11.] It is remarkable that the glumes of both species are nevertheless described by Jaubert & Spach as: '...dense hispidulæ...' (*Ae. tripsacoides*), and '...conspicue hispidæ...' (*Ae. loliacea*), respectively. Both these species were later mentioned as synonyms of *Ae. mutica* by Boissier (1884: 678), which, correctly seen by him, is the oldest name for the taxon at species level when both forms are united. Earlier than Boissier's *Flora orientalis*, von Steudel (1854: 355-356) described all three species separately, while Tchichatscheff (1860) and Cosson (1864) cite Boissier's *Ae. mutica*, with both the Jaubert & Spach species as synonyms.

Zhukovsky (1928) accommodated a separate section for *Ae. mutica* and classified both Jaubert & Spach's species as subspecies, thereby interpreting the *loliacea* form as the glabrous ones ('...Spiculis et rachidis articulis glabris...', l.c., 1928: 546) and the *tripsacoides* form as hairy ('...Spiculis hamatis...', l.c., 1928: 546), although 'hispidis' would be a more appropriate term to describe the hairiness than 'hamatis'.

Before separating it, Eig (1929a: 57) located *Ae. mutica* as far apart from the rest of *Aegilops* as possible by reinstating Jaubert & Spach's original subgenus *Amblyopyrum* for it, and uniting all other species in the subgenus *Eu-Aegilops*. Later that year he enumerated the differences between *Ae. mutica* and all other *Aegilops* species, as follows (characters listed for *Ae. mutica* only): (1) total absence of awns; (2) glumes widest at apex; (3) glume venation divergent; (4) glume apex truncate but irregularly gnawed; (5) plants '...either completely glabrous or beset with long, spreading, stiff hairs appearing like bristles...' [This is imprecise: only glumes and upper parts of lemmas are hispid; rachis segments, as well as stems and leaves are glabrous], and (6) apex of lower paleas rounded. In addition, Eig mentions the very long spikes, up to 24 cm, the relatively short glumes in comparison with the 'flowers' (Eig probably means spikelets), and the scanty, short and spreading leaves (l.c., 1929b: 202). These last three characters can also be found in species like *Ae. longissima*, and this may have been the reason that Eig considered this particular species as the nearest relative of *Ae. mutica*. However, karyotype analysis showed *Ae. speltoides* rather than *longissima* to be the closest relative in *Aegilops* (Chennaveeraiah, 1960: 158). The features of awnlessness, hairiness and lower palea are reminiscent of (some) *Agropyron* species, and Eig reiterated Boissier's earlier remark that *Amblyopyrum* can be seen as intermediate between *Aegilops* and the latter genus. However, neither numerical nor phylogenetical analyses of the tribe Triticeae locate *Agropyron* close to the wheat group (see Chapter 5.3).

Lastly, Hammer's (1980b) revision follows Eig's separate subgeneric status for *Amblyopyrum* (see at 3.2).

After the creation of the separate genus *Amblyopyrum* its recognition has not been universal. As to general overviews of the grasses, *Ae. mutica* has been maintained under *Aegilops* by, e.g., the karyomorphologic study of Advulov (1931: 306), and the taxonomic-evolutionary overview by Clayton & Renvoize (1986: 158), while taxonomic summaries by, e.g., Pilger (1954: 314), Watson et al. (1985: 452), Tzvelev (1989: 161), Watson (in Chapman, 1990: 258), and Watson & Dallwitz (1992: 85) all recognize the genus *Amblyopyrum*. [Watson & Dallwitz (1992: 65 and 85), however, are confusing since they present *Aegilops* on p. 65 as 'excluding *Amblyopyrum*', but on p. 85 *Amblyopyrum* as '= *Aegilops*', and with the author as 'Eig' (sic); it must be '(Jaubert & Spach) Eig').]

As to the floras covering its distribution, Turkey and Armenia (either as an independent part of the CIS or as part of the old USSR), a separate genus *Amblyopyrum* is present in, e.g., the *Flora of Turkey* (Davis, 1985: 232), and the *Zlaki SSSR* [*Grasses of the Soviet Union*] from Tzvelev (1976: 154 /1984: 219), but the genus is absent in Tzvelev's earlier contribution to the *Flora partis europaeae URSS* from 1974, although this flora covers the Caucasus region also. It is also absent in the earlier flora of the entire USSR for which Nevski treated the grasses in the second volume (Nevski, 1934 / 1963). On the other hand Nevski's contemporary Roshevitz listed *Amblyopyrum* as a genus in a book on fodder and cereal grasses (Roshevitz, 1937: 344 / 1980: 340). *Amblyopyrum* is also absent in Grossheim's *Flora Kavkaza* (1939) as well as in his *Opredelitel rastenich Kavkaza* [*Key to Caucasus plants*] from 1949. The genus is present, however, in Bor's treatments of the grasses for both the *Flora of Iraq* (1968: 224) and the *Flora Iranica* (1970: 203), although in both cases he had to write that *Amblyopyrum* was not (yet) found in these countries (they still are not; see Chapter 6.2).

In studies on the genetics of the wheat group (Senjaninova-Korczagina (1930, 1932), Kihara (1940, 1954), MacKey (1968: 45), Kihara & Tanaka (1970)), as well as on leaf anatomy (Gendels, 1980: 864) a separate section for *Ae. mutica* was accommodated within *Aegilops*, while Chennaveeraiah (1960: 162) for karyomorphological reasons, Baum (1977, 1978a, 1978b) on numerical grounds, and Löve (1982, 1984) according genome types, all recognized a separate generic status for *Amblyopyrum*.

The merits of an independent generic status for *Amblyopyrum* are discussed in Chapter 5.3.

4 Relationships of *Aegilops* and *Amblyopyrum* in the subtribe Triticinae

4.1 Morphology, habit and growth

Aegilops and *Amblyopyrum* are annual grasses, usually growing in tufts. Variation in harshness of the environment may cause great variation in characteristics such as plant height and number of tillers. However, controlled circumstances, e.g., experimental fields and greenhouses, enable luxurious growth that will not occur in natural circumstances.

For example, the culms of *Aegilops bicornis* attain a height in nature of only (10-) 20-40 cm, but in cultivation in the greenhouse at ICARDA they reached up to 80 cm! [This is my objection to the treatment of *Ae. variabilis* (= *Ae. peregrina*) by Eig, who based his treatment of the species on two years of field evaluation to study the heredity of its characters (Eig, 1929a: 121-127, and footnote 1 on p. 123). This has produced forms (l.c., Tab. 10-11), described under several varieties, that I could reproduce in ICARDA's greenhouse, but that I never encountered in the wild. The plasticity shown and classified therefore seems artificially created.]

Aegilops and *Amblyopyrum* are taxa with a preference for somewhat disturbed habitats, and some *Aegilops* species are known as colonizers, able to rapidly invade new territories (see 6.1.4 and 6.2). Most frequently they can be found along roadsides, edges of cultivation, and frequently as weeds among crops. Colonizing species as *Ae. biuncialis*, *Ae. geniculata*, and *Ae. triuncialis*, in particular, have the capacity to develop large stands – up to many hectares – while the same phenomenon was observed to a lesser extent with the weedy *Ae. cylindrica* and *tauschii*. In contrast, *Sitopsis* and *Vertebrata* species have fewer tillers, and are not found in dense stands or extensive populations (*Ae. sharonensis* may be an exception, cf., Kimber & Feldman (1987), as is *Ae. speltoides* (personal observation)).

The fragile rachis in *Aegilops* has been used in identification keys to separate the genus from *Triticum* (e.g., Davis, 1985: 163), but on the generic level this does not hold. Not only is the rachis in the wild taxa of *Triticum* brittle, providing a useful difference with almost all cultivated groups (diploid *monococcum* and tetraploid *dicoccon* to a lesser extent as their rachis is brittle upon pressure), but in *Aegilops* the rachis is, in fact, tough in all species with spikes that are falling entire and where the breakpoint is located at the base of the rachilla of the lowest fertile spikelet (sections *Aegilops*, *Comopyrum* and *Cylindropyrum*; but see below).

After shattering, the rudimentary spikelets at the base of the spike remain attached to the culm as the abcission layer is located above them. In case these are absent the lowermost spikelet remains attached (e.g., *Ae. crassa*, *Ae. tauschii*, *Ae. ventricosa*).

Three ways of disarticulation of the spike exist in *Aegilops*: (1) at the base of the rachilla: 'wedge-type' (e.g., in *Ae. speltoides* var. *ligustica*: Fig. 65-4a and b); (2)

at the top of the rachilla: 'barrel-type' (e.g., in *Ae. crassa*: Fig. 33), and (3) at the base of the lowest fertile spikelet: 'whole-spike type' (the whole spike, including the rachis segment that supports the lowest fertile spikelet, then falls as one unit: e.g., in *Ae. longissima*: Fig. 51-2). These disarticulation types almost completely coincide with the sections of *Aegilops* as defined here (see Chapter 8.3). Of the 22 species 13 are disarticulating whole-spike (three complete sections, listed above, plus *Ae. longissima*, *Ae. searsii*, and *Ae. speltoides* var. *speltoides* of sect. *Sitopsis*), five barrel-type (only section *Vertebrata*), and only three wedge-type (part of sect. *Sitopsis*). It appears that only D-genome species disarticulate barrel-type, but the S-genome species both wedge- and whole-spike. It may be through its D-genome that in *Ae. cylindrica* (genome DC) the spike quickly disintegrates barrel-type after initially falling entire. A special case is *Ae. speltoides*. The typical variety of this species shows whole-spike disarticulation, the var. *ligustica* wedge-type, but this floral-biological and otherwise morphological dimorphism is controlled by a closely linked block of genes representing extremes of a continuum (Zohary & Imber, 1963). In the other four species with a non-typical variety this dimorphism is not found. Chapter 8 gives data on each species.

In *Amblyopyrum* the spike rachis is somewhat tough, but upon maturity breaks wedge-type into parts, consisting of a limited number of spikelets. Eventually each spikelet is separated wedge-type. This wedge-type disarticulation is similar to its nearest evolutionary relative, *Ae. speltoides* (see the phylogeny at Chapter 4.3).

It appears that all three disarticulation types were present in the initial *Aegilops* – *Amblyopyrum* stock. Of the diploid species, seen as the most primitive representatives (see at 4.3), *Aegilops speltoides* var. *ligustica*, *Amblyopyrum muticum*, and, after reaching the western part of the Fertile Crescent, the locally evolved *Ae. bicornis* and *sharonensis* are disarticulating wedge-type. Whole-spike type are, e.g., *Ae. caudata*, *comosa*, *uniaristata* and *umbellulata*, while *Ae. tauschii* is of the barrel-type. For rapid colonization the whole-spike type disarticulation is apparently the most successful dispersal method as all widespread, tetraploid members of the genus show this feature. The successful spread of the diploid *Ae. tauschii*, which disarticulates barrel-type, is the only exception here.

Many more data of morphology are presented with the generic and specific descriptions. Other useful generic descriptions, including data on cytology and DNA content, are presented by Watson & Dallwitz in *The grass genera of the world* (1992).

4.2 Intergeneric and interspecific hybridization — Figs. 1, 3-7, 38; Table 7

4.2.1 Discussion

Intergeneric hybridization between *Aegilops* and *Triticum* can be both natural – a phenomenon underlining the close genetic links of the two genera – and artificial by crossing. All natural hybrids, both between *Aegilops* species and *Aegilops* x *Triticum* species, are highly sterile, although seeds may occasionally be found (see below). Artificially created hybrids, on the other hand, usually involve chromosome doubling to create stability in the offspring, and therefore produce seeds. Of the many hybrids (in fact amphidiploids) produced in this manner by, e.g., Gandilyan (AAI), only one – after recombination – is validly described so far (x *Aegilotriticum erebunii*) and admitted to the hybrid genus x *Aegilotriticum*, which accommodates the *Aegilops* x *Triticum* hybrids. Gandilyan's other amphidiploids, mainly among *Triticum* species, have names published for them although not enough stability in the seed setting of the offspring has been achieved thus far, a reason not to describe them as yet (Gandilyan, pers. comm.). According to the ICBN rules these names are to be regarded as *nomina nuda* (see, e.g., Gandilyan et al., 1986). None of the natural or artificial interspecific *Aegilops* hybrids has been validly described so far.

The oldest *Aegilops* x *Triticum* hybrids are among the exsiccatae of x *Aegilotriticum triticoides* (the '*geniculata* x bread wheat' hybrid) sent by Esprit Requien to various botanists (see note 3 at 4.2.2.7), as early as 1825-27 (material in G). Eventually Bertoloni published the species in 1834 as *Aegilops triticoides*, using notes and specimens from Requien.

Of two other widespread *Aegilops* species, *Ae. neglecta* and *triuncialis*, natural hybrids with wheat were described somewhat later: in 1856 from southern France by Grenier & Godron as *Triticum vulgari-triaristatum*, and in 1860 from Spain by Lange as *Aegilops vulgari-triuncialis*, respectively. Both were found in similar habitats as the *geniculata* hybrid: between roads and adjacent wheat fields, or next to fields where wheat had been cultivated the previous year. The '*cylindrica* x wheat' hybrid was not described until 1917 (from Hungary, and by von Degen as *Aegilops sancti-andreae*), while the '*ventricosa* x wheat' hybrid was described in 1919 (from Algeria, and by Trabut as x *Triticum rodetii*). The late description of the *cylindrica* hybrid is surprising as it is widely distributed, with an ecological preference for weedy and segetal growth (see at 10.7). During my collecting it has been, by far, the most frequently encountered natural hybrid.

In the mid-19th century the '*geniculata* x (bread) wheat' hybrid became the focus of attention through what can be considered nowadays as a wide-crossing wheat breeding program. Esprit Fabre, a farmer in Agde, in the Hérault in southern France, found a specimen of x *Aegilotriticum triticoides* growing out of a spike of *Aegilops geniculata* with tillers of *Aegilops geniculata* growing out of that same spike. After some unsuccessful years he found in 1838 spikes of the hybrid containing a few seeds. Their subsequent cultivation yielded plants that looked much more like wheat than the earlier *triticoides* and, more important, were setting seed. After a few years of cultivation he obtained seed-producing, fertile plants that increasingly looked like wheat and that he called '*Aegilops-blé*' [*Aegilops-wheat*]. Many specimens found their way to botanic gardens, among others the one in Lyon-Villeurbanne, where Jordan subsequently described these plants as *Aegilops speltaeformis* in 1855 (Jordan, 1855: 313). Jordan, who was known for his extremely narrow species concept (later called 'jordanons', cf., Stafleu & Cowan (1979: 460)), thought (foolishly) that, as the plants were setting seed, this represented a new species probably originating in the Orient (as more Oriental species were found in southern France), and accidently turning up in the garden of Fabre. Fabre, however, thought to have proven that '*Aegilops* could spontaneously turn into wheat' (Focke, 1881: 412), an opinion that fitted well with the so-called transformation theory, still adhered to by some scientists. [It must be noted that this discussion took place before Darwin's (1859) *On the origin of species*, which changed ideas about evolution of taxa dramatically.] Similarly to Fabre, von Regel (1857), although experimentally creating the *Ae. geniculata* x *T. aestivum* hybrid, calling it a 'Bastard' and observing its lack of pollen (l.c., 167), stated that this hybrid completely took over the characters of the male parent, and that (nevertheless) '...From the seed of *Aegilops ovata* therefore due to the fertilization by the wheat a real *Triticum* has arisen...' (l.c., 164, transl.). Earlier, von Regel (1856: 243) called: '...the bastard (*Aegilops triticoides*) really no *Aegilops*, but a *Triticum*, because its glumes and lemmas are not convex as with *Aegilops* but keeled...'.

Before von Regel's two publications, Godron, after obtaining F_1s from the '*geniculata* x bread wheat' cross, which looked strikingly similar to the 'wild' *Aegilops triticoides*, had called the latter '...nothing else than a hybrid, resulting from the accidental fertilization of the *Aegilops ovata* by the *Triticum vulgare...*' (Godron, 1854: 219). He reached three important conclusions from several years of crossing experiments: (1) hybridization can spontaneously occur in the Gramineae and *Aegilops triticoides* is the first known example of this; (2) the genera *Aegilops* and *Triticum* should be united (sic!) and the generic characters of the caryopsis in the Gramineae are more important than the floral ones, and (3) the observations of Fabre do *in no way* prove that the cultivated wheat originated from *Aegilops ovata*, nor that a species can transform itself into another species. The second conclusion was effectuated soon afterwards in the publication of the third volume of the *Flore de France* (Grenier & Godron, 1856: 601), where *Aegilops* became a section of *Triticum* (see also Chapter 5.2.1). [Most of this and preceding paragraph is adapted from the summaries of Focke (1881: 411-412) and Ascherson & Graebner (1902: 714), and from Godron (1854: 219).]

The spike of x *Aegilotriticum speltaeforme* (Fig. 6: right spikes) is more elongated and similar to the wheat spike as a result of the backcross with the (male) wheat parent than the spike of x *Aegilotriticum triticoides* (Fig. 6: left spikes). Rouy (1913: 330) describes this as 'reminiscent of *T. spelta* but with long awns'. Focke (1881: 412-413) captures precisely the crossing background of both species and presents them as concise formulas: '*Ae. ovata* L. ♀ x *T. vulgare* Vill. ♂' for *Ae. triticoides*, and '(*Ae. ovata* L. ♀ x *T. vulgare* Vill. ♂) ♀ x *T. vulgare* Vill. ♂' for *Ae. speltaeformis*, indicating which species is which parent. [*Aegilops ovata* L. used in this notation in the sense of *Ae. geniculata* Roth, see note 2 at 10.12.; *T. vulgare* Vill. is a later synonym of *T. aestivum* L. (in the sense of bread wheat, ssp. *aestivum*, only)]

The sterility of the hybrids is mainly caused by the lack of (viable) parental pollen, and only willful pollination with the *Triticum* parent may restore fertility, leading – in the case of *Ae. geniculata* – first to the seed-producing '*Aegilops*' *speltaeformis* while further backcrossing yields generations that increasingly look like wheats. This effect was observed in progenies, both starting with *Ae. genicula-*

ta and *ventricosa* as mother plants in the parental generation, by Groenland (1862). My own observation in Turkey in 1989 of '*Ae. cylindrica* x *T. aestivum* ssp. *aestivum*' hybrids showed the initial F_1 hybrid to have the dark-brown colour of the (ripe) *cylindrica* parent, but the spontaneous backcross to have the yellowish straw colour of the ripe wheat and an even more elongated spike.

In view of the history of the *Aegilops* x *Triticum* hybrids it is hardly surprising that the known distribution of several of them shows a predominance for sites in southern France (Fig. 3). Even though originally described from Spain, by far the greatest number of sites for *Ae. triuncialis* x *T. aestivum* ssp. *aestivum* originate from the *Département* of Aveyron in southern France and are the result of the collection work of only one man, Abbé Coste, although the hybrid is surprisingly absent from his *Flore descriptive et illustreé de la France* (Coste, 1906; see also specimens examined). Compilation of data, however, has also yielded sites in other parts of the distribution areas of the *Aegilops* parents involved, such as Greece, Italy, Lebanon, Spain, Syria, and Turkey. Not presented in Fig. 3 are sites for the frequently encountered '*Ae. cylindrica* x bread wheat' hybrid, which are more in the northern and northeastern parts of the *Aegilops* distribution (see at 4.2.2.5).

Aegilops x *Aegilops* hybrids of many species are present in herbaria, as well as found by me during collection missions. [See the examined specimens at the end of this Chapter for data.] Fig. 3 only shows the location on Cyprus of the *Ae. geniculata* x *Ae. peregrina* hybrid as this one is mentioned in Meikle's *Flora of Cyprus* (Meikle, 1985: 1822).

Primary *Aegilops* x *Triticum* hybrids (Figs. 5-6) are usually strongly developed plants, easily attaining 50-90 cm in height (Percival, 1921; over 1 meter tall is reported by Ascherson & Graebner, 1902: 713, for x *Aegilotriticum triticoides*, but I consider this as exaggerated), and thus with the wheat parent clearly expressed. Also from the wheat parent comes the tough rachis, as well as the keeled glumes, expressed in all hybrids of *Aegilops* species with wheats, be it *durum* or bread wheat. Because of the tough rachis the spike disarticulation is of the whole-spike type. The glumes have usually one or two awns, one of them at the keel, and sometimes an additional tooth between them. The glumes of x *Aegilotriticum triticoides* have the length of the awns reflecting those of the wheat parent: short when the parent was a beardless wheat, long with a bearded wheat (Percival, 1921: 382). Expression of the *Aegilops* characters will be according to the species involved, e.g., a short spike with *Ae. geniculata*, long apical glume awns with *Ae. triuncialis*, or disctincly hairy glumes when *Ae. neglecta* is involved.

Derived, secondary hybrids such as x *Aegilotriticum speltaeforme* will resemble the wheat parent more.

Aegilops x *Aegilops* hybrids (Figs. 4, 7) are usually the size of the parental species and display a mixture of their characters (Figs. 4-5). Characteristic, however, is the stong development of glume and lemma awns, which I observed in all species combinations encountered.

It must be noted that when *Aegilops* and *Triticum* are united in one genus, *Triticum* emend., as proposed by e.g., Bowden (1959), and Morris & Sears (1967), and as applied by the cytogenetic schools of Kimber in Columbia, Missouri, U.S.A., and Dvořák in Davis, California, U.S.A., a hybrid genus x *Aegilotriticum* cannot exist. Then the taxa of this nothogenus become interspecific hybrids.

A preliminary list of natural hybrids among *Aegilops* species and of *Aegilops* x *Triticum* species is presented in Table 7, compiling hybrids found by me and literature references on the same subject. This list is surely incomplete. As follows from the phylogenetical considerations (see Chapter 4.3) the great majority of *Aegilops* species involved are tetraploids, although some diploids may occasionally produce highly sterile hybrids as well. Two out of the three groups of the 57 combinations listed in Table 7 have their parental species identified. In addition, all 57 are *natural* hybrids. This number is, however, meagre compared with the no less than 356 crosses listed by Knoblauch (1968). This long list is ordered (presumably) by using an *Aegilops* species as the female parent and then listing all known crosses with it. His list is also marred by the lack of information on whether the crosses involved are artificial or natural (most of them are probably artificial).

The nothogenus x *Aegilotriticum* is defined here to include natural hybrids of *Aegilops* and *Triticum* as well as amphidiploids, created with *only wild* taxa in the parental generation. This is a debatable concept that may be readjusted when the cultivated taxa of *Triticum* are revised (see at 5.4.2 under '3').

4.2.2 Summary of taxa

x Aegilotriticum P.Fourn.

x **Aegilotriticum** P.Fourn., Quatre fl. France 89 (1935); Ciferri & Giacomini, Nomencl. fl. ital. 1: 51 (1950, author err. as 'Cerniak', referring to Tschermak); Baum, Can. J. Bot. 55: 1716 (1977); Farr et al., Index Nominum Genericorum (Plantarum) 1: 33 (1979); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 374 (1986). See note 1.

Lectotype species (*nov.*): x *Aegilotriticum requienii* (Ces., Pass. & Gibelli) P.Fourn. (= x *Aegilotriticum triticoides* (Req. ex Bertol.) van Slageren). See note 2.

Homotypic synonyms:

x *Aegilotricum* R.Wagner ex Tscherm.-Seys. in von Tschermak-Seysenegg & Bleier, Ber. Deut. Bot. Gesell. 44: 113 (1926); Eig, Feddes Repert., Beih. 55: 226 (1929a, as '*Aegilotricum* Tschermak'); Maire & Weiller, Fl. Afrique nord 3: 370 (1955); Baum, Can. J. Bot. 55: 1716 (1977); Pignatti, Fl. italia 3: 542 (1982, '*Aegilotriticum* Wagner'); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 374 (1986, author as 'Tschermak'); Watson & Dallwitz, The grass genera of the world 66 (1992, 'x *Aegilotriticum* Wagner ex Tschermak'), *nom. inval.* (Arts. H.6.2, incorrect formation of generic name, and 32.1*(b)*). See notes 1 and 3.

x *Aegilotrichum* (E.G.Camus ex?) A.Camus, Bull. Mus. Hist. Nat. Paris 33: 538 (1927); Baum, Can. J. Bot. 55: 1716 (1977, as 'x *Aegilotrichum* Wagner ex Tschermak et Bleier orth. mut. E.G. Camus ex A. Camus'); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 374 (1986, author as 'A. Camus'), *nom. inval.* (Arts. H.6.2, incorrect formation of generic name, and 32.1*(b)*). See note 1.

= *Aegilops* L. x *Triticum* L. The notation here and elsewhere in this Chapter is in

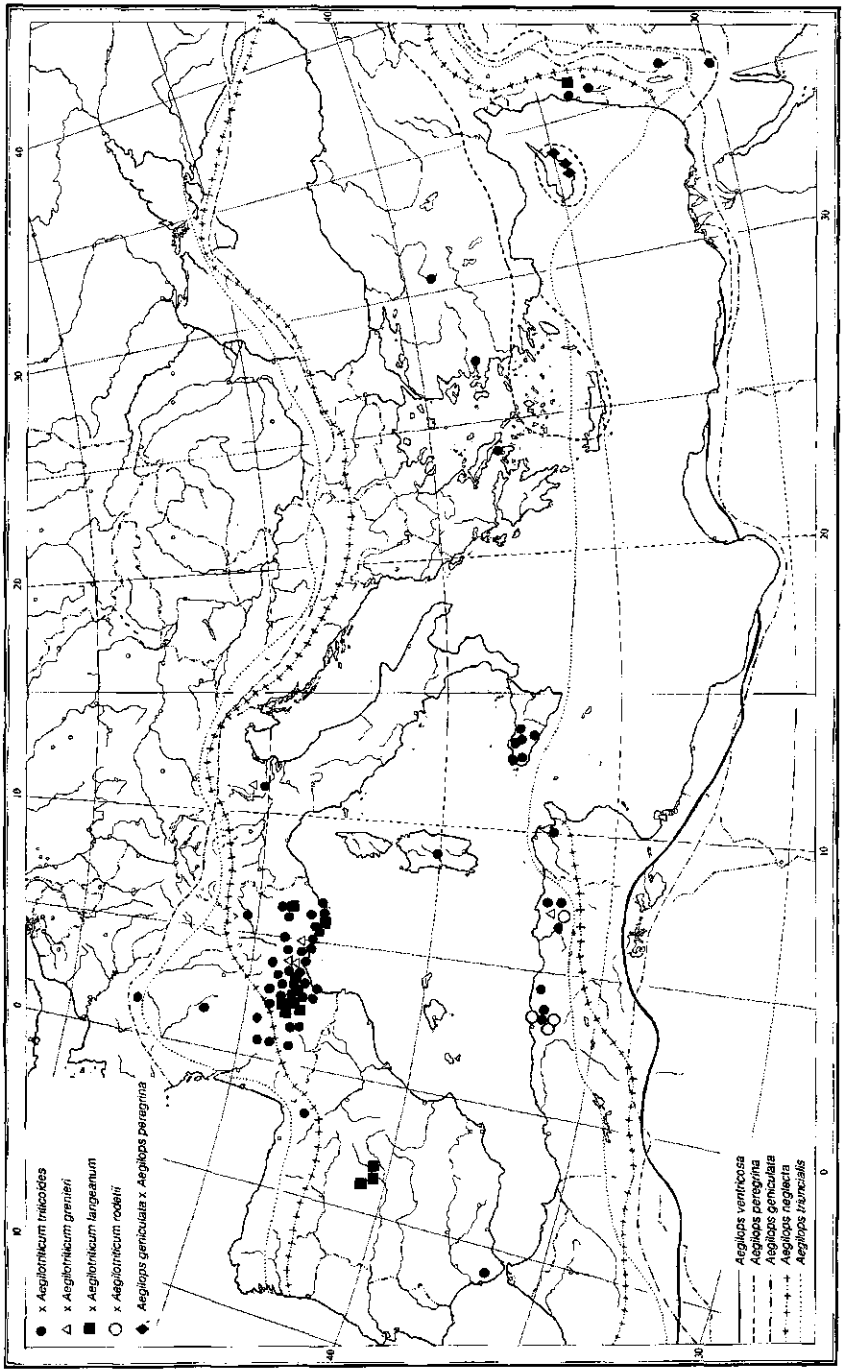


Fig. 3. Distribution of some *Aegilops* x *Triticum* and *Aegilops* x *Aegilops* hybrids in the Mediterranean.

Table 7. Compilation of observed and reported *natural* hybrids between *Aegilops* species and of *Aegilops* x *Triticum* species

Combination			Figure
***Aegilops* x *Aegilops* hybrids** (female parent x male parent):			
biuncialis (4n)	x	*peregrina* var. *peregrina* (4n)	
biuncialis (4n)	x	*triuncialis* (4n)	
columnaris (4n)	x	*triuncialis* (4n)	
crassa (4n/6n)	x	*cylindrica* (4n)	
crassa (4n)	x	*tauschii* (2n) – 1	
cylindrica (4n)	x	*columnaris* (4n)	
cylindrica (4n)	x	*triuncialis* (4n)	Fig. 4
geniculata (4n)	x	*peregrina* var. *peregrina* (4n)	
geniculata (4n)	x	*triuncialis* (4n)	
neglecta (4n/6n)	x	*biuncialis* (4n)	
neglecta (4n/6n)	x	*cylindrica* (4n)	
neglecta (4n/6n)	x	*triuncialis* (4n)	
triuncialis (4n)	x	*biuncialis* (4n)	
triuncialis (4n)	x	*columnaris* (4n)	
triuncialis (4n)	x	*cylindrica* (4n)	
triuncialis (4n)	x	*peregrina* var. *peregrina* (4n)	
***Aegilops* x *Triticum* hybrids** (female parent x male parent):			
Ae. biuncialis	x	*T. turgidum* ssp. *dicoccoides* (4n)	
Ae. biuncialis	x	*T. aestivum* ssp. *aestivum* (6n)	
Ae. columnaris (4n)	x	*T. turgidum* ssp. *durum* (4n)	
Ae. columnaris (4n)	x	*T.* sp. (4n/6n)	
Ae. crassa (4n/6n)	x	*T. aestivum* ssp. *aestivum* (6n)	
Ae. cylindrica (4n)	x	*T. aestivum* ssp. *aestivum* (6n)	Fig. 5
Ae. cylindrica (4n)	x	*T.* sp. (4n)	
Ae. geniculata (4n)	x	*T. aestivum* ssp. *aestivum* (6n)	Fig. 6
Ae. geniculata (4n)	x	*T. turgidum* ssp. *durum* (4n)	
Ae. juvenalis (6n)	x	*T. aestivum* ssp. *aestivum* (6n)	
Ae. neglecta (4n/6n)	x	*T. aestivum* ssp. *aestivum* (6n)	
Ae. neglecta (4n/6n)	x	*T. turgidum* ssp. *durum* (4n)	
Ae. neglecta (4n/6n)	x	*T. aestivum* ssp. *spelta* (6n)	
Ae. speltoides var. *ligustica* (2n)	x	*T. aestivum* ssp. *aestivum* (6n)	Fig. 1
Ae. speltoides (2n)	x	*T.* sp. (4n/6n)	
Ae. tauschii (2n)	x	*T. aestivum* ssp. *aestivum* (6n)	
Ae. triuncialis (4n)	x	*T. aestivum* ssp. *aestivum* (6n)	
Ae. triuncialis (4n)	x	*T. aestivum* ssp. *spelta* (6n)	
Ae. umbellulata (2n)	x	*T. aestivum* ssp. *aestivum* (6n)	
Ae. ventricosa (4n)	x	*T. turgidum* ssp. *durum* (4n)	
Ae. ventricosa (4n)	x	*T. aestivum* ssp. *aestivum* (6n)	
***Aegilops* x *Aegilops* hybrids of unclear parentage:**			
biuncialis (4n)	x	*cylindrica* (4n)	
biuncialis (4n)	x	*geniculata* (4n)	
biuncialis (4n)	x	*neglecta* (4n/6n)	
comosa var. *subventricosa* (2n)	x	*caudata* (2n) – 2	

Table 7 (continued)

Combination			Figure
***Aegilops* x *Aegilops* hybrids of unclear parentage (continued):**			
cylindrica (4n)	x	*columnaris* (4n)	
cylindrica (4n)	x	*triuncialis* (4n)	
geniculata (4n)	x	*biuncialis* (4n) – 3	
geniculata (4n)	x	*neglecta* (4n) – 3	
neglecta (4n)	x	*biuncialis* (4n) – 3	
neglecta (4n)	x	*columnaris* (4n) – 3	
neglecta (4n)	x	*columnaris* (4n) – 3	
neglecta (4n/6n)	x	*triuncialis* (4n)	
peregrina (4n)	x	*biuncialis* (4n) – 3	
peregrina (4n)	x	*kotschyi* (4n) – 3	
peregrina (4n)	x	*geniculata* (4n) – 3	
peregrina (4n)	x	*triuncialis* (4n) – 3	
sharonensis (2n)	x	*longissima* (2n) – 4	
triuncialis (4n)	x	*biuncialis* (4n)	Fig. 7
triuncialis (4n)	x	*columnaris* (4n) – 3	
triuncialis (4n)	x	*cylindrica* (4n) – 3	
triuncialis (4n)	x	*neglecta* (4n) – 3	

– 1 : reported by Kihara et al. (1965: 52). See also at 10.6.
– 2 : reported by Sakamoto & Kobayashi (1982: 52) as the hybrid of *Ae. heldreichii* and *Ae. caudata*.
– 3 : reported by Zohary (1966: 213) as occurring in both directions.
– 4 : reported by Ankory & Zohary (1962); probably in both directions.

the customary form of 'female parent x male parent', unless the sex of each contributing parent could not be ascertained.

Notes: 1. I agree with Clayton & Renvoize (1986: 374) and Stace (1987: 447) that the correct name for the hybrid *Aegilops* x *Triticum* is x *Aegilotriticum* P.Fourn., Quatre fl. France 89 (1935), since the earlier names x *Aegilotricum* R.Wagner ex Tscherm.-Seys. and x *Aegilotrichum* A.Camus are incorrectly formed (see Art. H.6.2) and therefore invalid according to Art. 32.1*(b)* of the *Code*. Baum (1977: 1716) considers x *Aegilotrichum* an orthographic variant of the Tschermak name and cites both this name and x *Aegilotricum* with 'Wagner ex Tschermak et Bleier' as the authors. However, in Camus' (1927) publication x *Aegilotrichum* is not presented separately from a number of species combinations, and there is no reference to Tschermak's publication and generic name, from which it could be derived as an orthographic variant. It is also unclear whether the author citation of x *Aegilotrichum* should be 'E.Camus ex A.Camus' or simply 'A.Camus', or, for that matter, 'Wagner ex Tschermak'. The Camus paper lists new combinations in this hybrid genus by 'G.' Camus (who is her father Edmond Gustave Camus, see Stafleu & Cowan, 1976: 432) as well as by the author 'A.' Camus (who is Aimée Antoinette Camus, see Stafleu & Cowan, 1976: 430), and all of them for existing hybrids, described elsewhere.

2. Three hybrid species are listed by Fournier (1935: 89), viz. x *Ae. requienii*, *grenieri* and *loretii*, but he presents the epithet *requienii* and its parental species clearly in connection with his new name for the hybrid genus (x) *Aegilotriticum*. Hence I designate x *Aegilotriticum requienii* as the type species. The species names are spelled by Fournier as '*Requieni*', '*Grenieri*' and '*Loreti*', respectively. Although they are directly derived from persons (E. Requien, J.Ch.M. Grenier, and H.Loret) and therefore may be written with a capital following Recommendation 73F of the *Code*, their spelling is changed in view of the rules and recommendations of Art. 73 to *requienii*, *grenieri*, and *loretii*, respectively.

3. In Brummitt & Powell (1992) standard abbreviations of authors are proposed that sometimes deviate from earlier proposals such as in *Taxonomic Literature* (ed. 2). Thus the commonly known abbreviation for Erich von Tschermak-Seysenegg, 'Tschermak', became Tscherm.-Seys. The Wagner involved was R. Wagner, one of the many with this family name, listed by Brummitt & Powell.

Enumeration of species:

4.2.2.1 x **Aegilotriticum erebunii** (Gandilyan) van Slageren, **comb. nov.**

Basionym: *Triticum erebunii* Gandilyan, Bull. WIR 142: 77 (1984, '*erebuni*'); Gandilyan, Nazarova & Schakarjan, Cytol. & Genet. 19(2): 100 (1985). See note 1.

Type: Armenia ('URSS, RSS Armeniae'), in Instituti agriculturae RSS Armeniae anno 1982, 24.VI (area experimentalis) *P.A. Gandilyan, Zh.O Schakarjan et E.A. Petrosian* creavit (holo: WIR 0104546, not seen; iso: YAI).

Homotypic synonym:

Triticum x *tauschourarticum* Gandilyan in Gandilyan, Schakarjan & Petrosian, Biol. J. Armenia 39(1): 9 (1986), *nom. inval.* (Arts. H.10.1, 36.1 and 40.1: no Latin diagnosis or reference; also illegitimate because of Art. 63.1: superfluous after *T. erebunii*).

= *Aegilops tauschii* Coss. ♀ x *Triticum urartu* Tumanian ex Gandilyan ♂.

Genome: DA (female parent 'D' x male parent 'A') with 2x = 2n = 28 ('DDA^uA^u' at Gandilyan (1984); '$D^{st}D^{st}A^uA^u$' at Gandilyan et al., 1986).

Etymology: the final epithet refers to the old name for Erevan. It refers also to the Erebuni Nature Reserve, near Erevan, Armenia, locus classicus of *Triticum urartu* and a protected area for wild wheat relatives. Most likely place of origin of the wild wheat parent of this cross.

Notes: 1. Gandilyan (1984: 77) cites 'x *Aegilotricum erebuni* Gandil.' in different typscript next to his *T. erebunii*. Citing two names at the same time may invoke ruling of Art. 34.3 on simultaneous publication. However, this second name is invalid for its generic name, and can be disregarded. By the ruling of various Articles, the later name *Triticum* x *tauschourarticum* can also be ignored.

2. This hybrid species is artificially created by using chromosome doubling to create stability. As both parental species have 2n = 14 (D-genome in *Ae. tauschii* and A-genome in *T. urartu*, respectively), the hybrid now has DDAA and 2n = 28. As herbarium material the hybrid is only known from the type specimens, but seed samples of progenies may exist elsewhere.

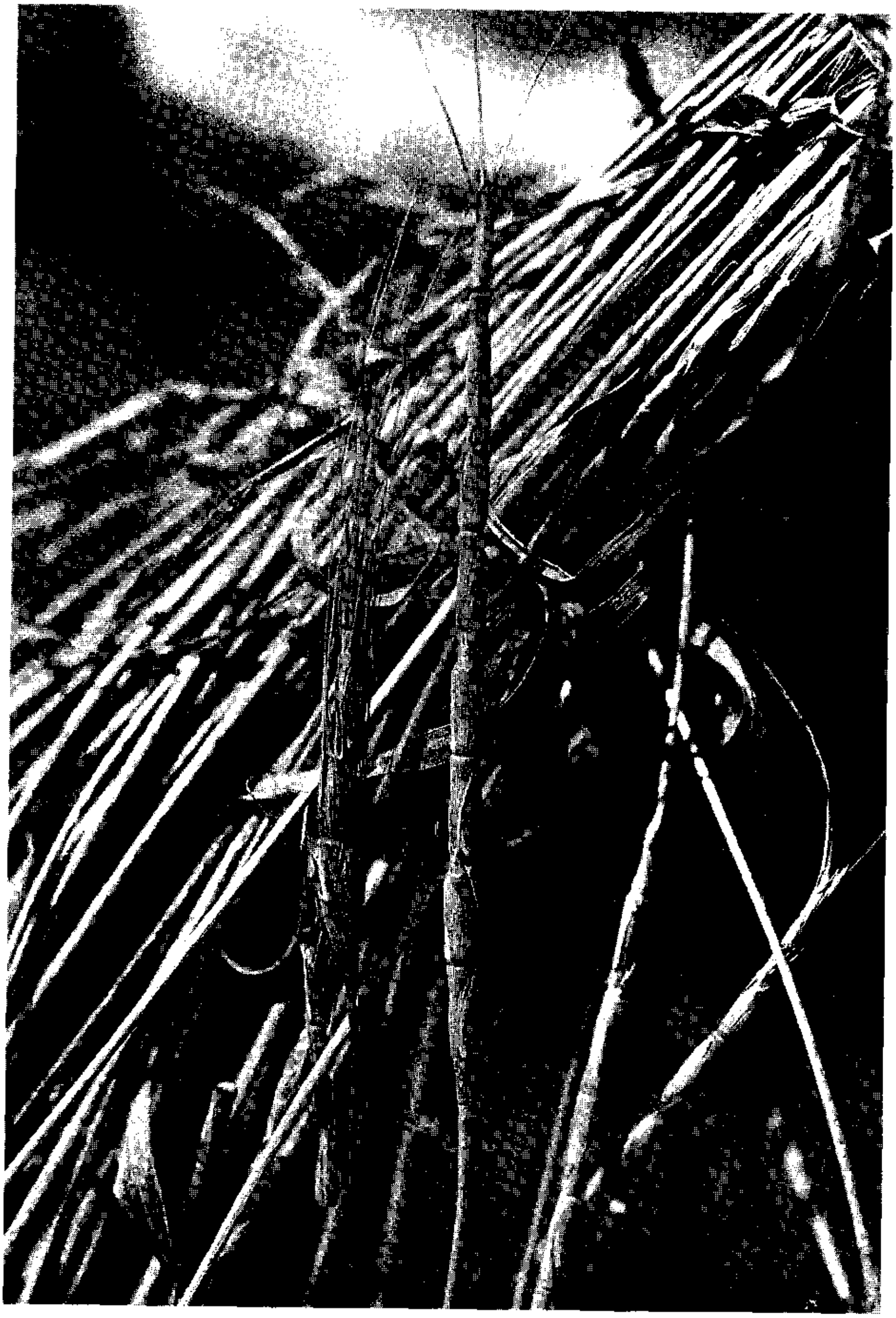


Fig. 4. Natural hybrid (left) of *Aegilops cylindrica* (right, female parent; *Navrozbekov 571*, VIR) x *Ae. triuncialis* (male parent, not shown) at the experimental station of the N.I. Vavilov Institute near Derbent, Daghestan, Russia. The female parent as a tight-up bundle on the field plot in the background.

4.2.2.2 x **Aegilotriticum grenieri** (K.Richt.) P.Fourn. **Fig. 3**

x *Aegilotriticum grenieri* (K.Richt.) P.Fourn., Quatre fl. France 89 (1935, '*Grenieri*'); Ciferri & Giacomini, Nomencl. fl. ital. 1: 51 (1950, '*Grenieri*').

Basionym: x *Triticum grenieri* K.Richt., Pl. eur. 1: 129 (1890, '*Grenieri*'); Rouy, Fl. France 14: 330 (1913, 'x *T. Grenieri* K.Richt.').

Syntypes: (France) Bord des champs de blé à Agde, à Montpellier, à Avignon, 1 Juin, *Godron s.n.* / *Grenier s.n.(?)* (Hb. Godron (NCY) and/or hb. Grenier (P), respectively; not seen). – Note: the citation clearly refers to several locations and indicates syntypes. Unfortunately no material has been seen and a lectotype still has to be chosen among them.

Homotypic synonyms:

Triticum vulgari-triaristatum Godr. & Gren. in Grenier & Godron, Fl. France 3(2): 601 (1856); Fiori, Nuov. Fl. Italia 1: 161 (1923, '*Tr. vulgare* x *Ae. triaristata*'), *nom. inval.* (Arts. 23.6*(d)* and H.10.3, and thus also because of Art. 32.1*(b)*). See note 1.

Aegilops vulgari-triaristata (Godr. & Gren.) H.Loret & Barrandon, Fl. Montpellier (ed. 1) 2: 771 (1876), (ed. 2) 578 (1886); Loret in Coste, Bull. Soc. bot. France 38: LXX (70) (1891, as '*Æ. vulgari* x *triaristata* Loret'); Nyman, Consp. fl. eur. 4: 839 (1882, as 'x *Ae. vulgari-triaristata* Loret. Barrand.'); Eig, Feddes Repert., Beih. 55: 226 (1929a, authors as 'Lor. et Bar.' only); Hammer, Feddes Repert. 91: 255 (1980b, cites Eig), *nom. inval.* (Arts. 23.6*(d)*, thus also because of Art. 32.1*(b)*, and H.10.3). See note 1.

Aegilops grenieri (K.Richt.) Husn., Graminées 4: 79 (1899); Eig, Feddes Repert., Beih. 55: 226 (1929a, '*Grenieri* Husnot'); Hammer, Feddes Repert. 91: 247 (1980b).

Triticum sativum x *ovatum* ssp. ('B') *grenieri* (K.Richt.) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 713 (1902, 'B. *Grenieri*'). – Note: a mix of a name and a formula.

Triticum aestivum L. x *ovatum* (L.) Rasp. B *grenieri* (K.Richt.) Thell., Fl. adv. Montpellier 144 (1912, 'B. *Grenieri*'). – Note: a mix of a name and a formula.

x *Aegilotrichum grenieri* (K.Richt.) E.G.Camus ex A.Camus, Bull. Mus. Hist. Nat. Paris 33: 538 (1927, '*Grenieri*'), *nom. incorr.*

x *Aegilotricum grenieri* (K.Richt.) Maire & Weiller, Fl. Afrique nord 3: 371 (1955, '*Grenieri*'); Quézel & Santa, Nouv. fl. Algérie rég. dés. merid. 1: 159 (1962, '*Grenieri*'), *nom. incorr.*

= *Aegilops neglecta* Req. ex Bertol. ♀ x *Triticum aestivum* L. ssp. *aestivum* ♂.

Distribution (Fig. 3): throughout the range of the parental species, thus limited by *Ae. neglecta*. Thus far known from various parts of France (Hérault, Gard, Bouches du Rhône, Vaucluse, Languedoc), Italy (Verona, cf., Fiori, 1923; Apulia, Calabria, Sicily, cf., Larghetti et al., 1992: 75, their Fig. 2 suggesting, however, that it is the hybrid of *Ae. geniculata* and bread wheat), Greece (cf., Sakamoto & Kobayashi, 1982, not shown on Fig. 3), and Algeria (Constantine, Berteaux, Guelma, Brazza; cf., Trabut, 1919; Maire & Weiller, 1955; Quézel & Santa, 1962).

Ecology: among the parental species in the borders of bread wheat fields.

Flowering time: June (in southern France, cf., Grenier & Godron, 1856: 601)

Etymology: the final epithet refers to the Besançon-based, French botanist J.Ch.M. Grenier (1808-75), collector of the syntype specimens and author (with D.A. Godron) of the three-volume *Flore de France* (1848-56).

Specimens examined:

AFRICA: ALGERIA: El Arrouch, *Julien s.n.* (LY, MPU); Brazza, near Radjradj, *Trabut s.n.* (MPU).

EUROPE: FRANCE, BOUCHES DU RHÔNE: Meyreuil (Meyrargues?), *Delmas s.n.* (BM, LY). HÉRAULT: Montpellier, Veyrasse, *André s.n.* (MPU); Montpellier, *Barrandon s.n.* (MPU); St. Martin de Londres, *Loret/Barrandon s.n.* (BR, MPU). CULT.: ESSONNE: (from garden of de Vilmorin at)

Verrières-le-Buisson (and received by), *Gay 539* (K). HÉRAULT: Montpellier, School of Pharmacy, *Planchon s.n.* (MPU).

ITALY: Verona, *Govron (Godron?) s.n.* (Z).

Notes: 1. Although the name *Triticum vulgari-triaristatum* from Grenier & Godron's *Flore de France* (1856: 601) is the oldest one available for this hybrid species, it is invalid following Art. 23.6*(d)*: the epithet of the species name is a condensed formula, consisting of the epithets of the names of the parents. Following Art. 23.1 an epithet of a species name may consist of two (hyphenated) words, but for names of hybrid species the rule on condensed formulas exists. In both *T. vulgari-triaristatum* Godr. & Gren. and *Ae. vulgari-triuncialis* Lange (see below) the epithet consists of the epithets of the names of the parents, with only one of them with an altered termination (*vulgari*, derived from *T. vulgare* Vill., a renaming of *T. aestivum*). Thus, they are formulae as defined by Art. H.10.3. As a result the oldest available names, x *Triticum grenieri* K.Richt. and *Ae. caudata* L. var. α *langeana* Amo, respectively, have to be taken as the basionym to make the recombination to the hybrid genus.

2. Focke (1881: 414) reports this natural hybrid with the notation '*Aeg. triaristata* Willd. ♀ x *Trit. vulgare* Vill. ♂' from southern France, growing in similar conditions as *Ae. triticoides*.

4.2.2.3 x **Aegilotriticum langeanum** (Amo) van Slageren, **comb. nov.** **Fig. 3**

Basionym: *Aegilops caudata* L. var. α *langeana* Amo, Fl. fan. Penins. Iberica 1: 256 (1871). See note 1.

Lectotype (*nov.*): (Spain) in agris prope Matritum, 27.V.1852, *Lange s.n.* (C; isolectotypes: K, P). See note 2.

Homotypic synonyms:

Aegilops vulgari-triuncialis Lange, Pug. pl. hispan. 1: 56 (1860, as: '*Æ. sp.* forsan hybrida (*Æ. vulgari-triuncialis* nob?) *Æ. cylindrica* Host var. *longearistata* Lge. in sched.'; see note 1); Willkomm & Lange, Prod. fl. hispan. 1: 108 (1861, species name with a '?'); Loret & Barrandon, Fl. Montpellier (ed. 1) 2: 771 (1876), (ed. 2) 578 (1886); Nyman, Consp. fl. eur. 4: 839 (1882, as 'x *Ae. vulgari-triuncialis* Loret'), Suppl. 2: 342 (1890); Loret in Coste, Bull. Soc. bot. France 38: LXX (70) (1891, as '*Æ. vulgari* x *triuncialis* Loret'); Lázaro é Ibiza, Comp. fl. Españ. (ed. 2) 1: 657 (1906), (ed. 3) 2: 72 (1920); Eig, Feddes Repert., Beih. 55: 226 (1929a); Hammer, Feddes Repert. 91: 255 (1980b), *nom. inval.* (Arts. 23.6*(d)*, thus also because of Art. 32.1*(b)*, and H.10.3).

Triticum vulgari-triunciale (Lange) H.Loret, Bull. Soc. bot. France 16: 288 (1869); Percival, Wheat Plant 385 (1921; as '*A. triuncialis* ♀ x *T. vulgare* ♂', but referring to Loret), *nom. inval.* (Arts. 23.6*(d)*, H.10.3, and 32.1*(b)*).

x *Triticum loretii* K.Richt., Pl. eur. 1: 129 (1890, '*Loreti*'); Rouy, Fl. France 14: 330 (1913, '*Loreti*'), *nom. illeg.* (Art. 63.1).

Aegilops loretii (K.Richt.) Husn., Graminées 4: 79 (1899, '*loreti*'); Albert & Jahandiez, Cat. pl. vasc. Var 562 (1908, 'x *Ae. Loreti*'); Eig, Feddes Repert., Beih. 55: 226 (1929a, '*Lorentii* Husnot'); Hammer, Feddes Repert. 91: 247 (1980b, as '*Ae. lorentii* Husnot (-) ? Hybr. *Aegilops* x *Triticum*, (H) *Ae. lorentii* Hochst.', thus considering – because of the misspelling by Eig – this hybrid a later homonym '(H)' of the *Aegilops* species), *nom. illeg.* (Art. 63.1).

Triticum sativum x *triunciale*. Cited in Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 714 (1902).

Triticum aestivum L. x *triunciale* (L.) Rasp. Cited in Thellung, Fl. adv. Montpellier 145 (1912).

x *Aegilotrichum loretii* (K.Richt.) E.G.Camus ex A.Camus, Bull. Mus. Hist. Nat. Paris 33: 538 (1927, '*Loreti*'), *nom. incorr.*

x *Aegilotriticum loretii* (K.Richt.) P.Fourn., Quatre fl. France 89 (1935, '*Loreti*'); Ciferri & Giacomini, Nomencl. fl. ital. 1: 51 (1950, '*Loretii*'), *nom. incorr.*

x *Aegilotricum loretii* (K.Richt.) Maire & Weiller, Fl. Afrique nord 3: 371 (1955, '*Loreti*'); Mouterde, Nouv. Fl. Liban, Syrie 1: 144 (1966, '*loreti*'), *nom. incorr.*

= *Aegilops triuncialis* L. ♀ x *Triticum aestivum* L. ssp. *aestivum* ♂.

Distribution (Fig. 3): throughout the range of the parental species, thus limited by *Ae. triuncialis*. Although the *Aegilops* parent is often abundant and widespread, this rare hybrid (Rouy, 1913; Albert & Jahandiez, 1908: 562), has been reported only from parts of southern France (Languedoc, Var, Hérault, Aveyron, Rhône valley), Spain (Lange, 1860), Lebanon (Mouterde, 1966: 144), and eastern Turkey (Van region, cf., Sakamoto & Kobayashi, 1982, not shown on Fig. 3). Supposed to be present in Algeria; Maire & Weiller (1955: 372) studied a slightly different form of the hybrid that was artificially produced by crossing *Ae. triuncialis* with *T. durum* var. *erythromelas*.

Ecology: among the parental species in borders of wheat fields (Albert & Jahandiez, 1908: 562).

Flowering time: May – July (in southern France, dept. Var, cf., Albert & Jahandiez, 1908: 562), June (in Spain, cf., Lázaro é Ibiza, 1906: 657).

Etymology: the final epithet refers to the Copenhagen-based, Danish botanist J.M.Ch. Lange (1818-98), collector of the type specimen, and co-author (of H.M. Willkomm) of the three-volume *Prodromus florae hispanicae* (1861-80).

Specimens examined:

ASIA: LEBANON: Dahr el Baïdar, *Mouterde 10290, 10348, 10354* (G).

EUROPE: ARMENIA: Erevan reg., near Shorpulagh, *Fedorov s.n.* (ERE).

FRANCE, AVEYRON: Tournemire, near the railway station, *Coste s.n.* (G, LE, LY, MPU); Nant, *Coste s.n.* (BC, LY, MPU); La Camarès, near Briols, *Coste s.n.* (MPU); Camarès, near Rebourgeuil, *Coste s.n.* (LY); Rebourgeuil to Verrières, *Coste s.n.* (MPU); Rebourgeuil, near Petit-Saint-Jean, *Coste s.n.* (MPU); Peyreleau, *Coste s.n.* (MPU); Ségonzac to Poumarédes, *Coste s.n.* (MPU); Calmels to St Izaire, *Coste s.n.* (MPU); Tournemire, Boutinesque, *Coste s.n.* (MPU); Nant, on side of the Liguisse, *Coste s.n.* (MPU); Tournemire, enclos du Couvent, near railway station, *Coste s.n.* (MPU); Camarès, *Delmas s.n.* (G, GE, JE, L, LY, MPU, Z); Tournemire, *Fourès 4229* (MPU), *s.n.* (MPU, Z); Nant, at the Larzac, *Martin s.n.* (LY). HAUTES-ALPES: Pont de Chabestan, *Girod s.n.* (G). HÉRAULT: St. Martin de Londres, *Barrandon s.n.* (MPU). LOZÈRE: near Vialas, *Coste s.n.* (MPU). TARN: St. Juéry, *Coste s.n.* (MPU). VAR: La Crau d'Hyères, *Bouaré & Roux s.n.* (MPU); the Plaine d'Aups, near Ste. Baume, *Autheman s.n.* (G).

RUSSIA, DAGHESTAN: station of WIR at Derbent, *van Slageren & Boguslavskii MSRB-90158H, 90204H* (ICARDA).

SPAIN, MADRID: fields E Madrid, *Lange s.n.* (C, K, P, type of x *Aegilotriticum langeanum*); fields near Madrid on road to Segovia, *Lange s.n.* (C, K, P); Madrid, *Lange s.n.* (FI, G, MPU).

Notes: 1. Although the name *Aegilops vulgari-triuncialis* from Lange's *Pugillus* (1860: 56) is the oldest one available, it is invalid following Art. 23.6*(d)*, and thus for 32.1*(b)*, as well as for H.10.3. (see note 1 at x *Aegilotriticum grenieri*), but *not* because of Art. 34.2 as Lange's question mark does not invalidate publication. The oldest available name now is the variety α *langeana* of *Aegilops caudata*, published by del Amo y Mora in 1871, which precedes the more widely used epithet *loretii* from Richter (1890). Del Amo y Mora (1871: 256) refers in his description to the variety *longearistata* of *Ae. cylindrica* as present on an exsiccatus from Lange (and published with a question mark in 1860 in his *Pugillus*), as well as to

Willkomm & Lange's (1861: 108) *Aegilops* name in their *Prodromus florae hispanicae*, and describes accurately the sterility of the spikelets of this natural hybrid (l.c., 1871: 256 '...glumis spicularum sterilium...').

2. Lange (1860: 56-57) found several specimens near Madrid of which he expressed his doubt as to their identification. One was found together with *Ae. geniculata* and *triuncialis*, and several near a wheat field (l.c., '...in vicinio agrorum *Tritici* plura specimina legi...'). In his opinion they showed characters of both *Ae. cylindrica* and *Ae. triuncialis*, although with his description he supposed a hybrid nature ('*Æ. sp.* forsan hybrida') of the plants. The two locations cited in Lange (1860: 56) refer, after inspection, to two specimens in C, which both carry the notation '*Ae. cylindrica* Host var. *longearistata* nob.'. As there is no difference in quality of the material nor in distribution, I chose as the lectotype the only collection that carries Lange's signature on the label, which is also the only collection cited in Willkomm & Lange's *Prodromus florae hispanicae* (1861: 108).

3. Focke (1881: 414) reports this natural hybrid, noted as '*Aeg. triuncialis* L. ♀ x *Trit. vulgare* Vill. ♂', from southern France, growing in similar conditions as the hybrids with *Ae. ovata* and *triaristata* in the parentage.

4.2.2.4 x **Aegilotriticum rodetii** (Trab.) van Slageren, **comb. nov.** **Fig. 3**

Basionym: x *Triticum rodetii* Trab., Bull. Soc. bot. France 66: 29 (1919, as 'x *Triticum Rodeti* (*Ægilops ventricosa* x *Triticum durum*)'). See note 1.

Type: (Algeria) à Brassa, champs cultivés à Radjradj (propriété Rodet), 1.VII.1918, *Trabut s.n.* (holo: AL, not seen; iso: F, MPU).

Homotypic synonyms:

x *Aegilotricum rodetii* (Trab.) A.Camus, Notul. Syst. 12, fasc. 15 (1945, '*Rodeti*'); Maire & Weiller, Fl. Afrique nord 3: 372 (1955, '*Rodeti*'); Quézel & Santa, Nouv. fl. Algérie rég. dés. merid. 1: 158 (1962, '*Rodetii*'), *nom. incorr.*

Triticum rodetii Trab. var. *longiaristata* Ducell., Bull. Soc. Hist. nat. Afrique nord. 26(b): 169 (1935), *nom. inval.* – Note: next to Art. 36.1 also invalid because of Art. 34.1*(d)* and probably also because of Art. 26.1 as it is (most likely) the typical variety. It is also a *nom. nud.* See note 2.

Triticum rodetii Trab. [var. *longiaristata* Ducell.?] forma *pallescens* Maire ex Ducell., Bull. Soc. Hist. nat. Afrique nord 26(b): 167 (1935), *nom. inval.* (Art. 26.1; because of the remark: '...constituant la forme typique...').

x *Aegilotricum rodetii* (Trab.) A.Camus forma *pallescens* (Maire ex Ducell.) Maire & Weiller, Fl. Afrique nord 3: 373 (1955), *nom. incorr.*

Synonyms:

Triticum rodetii Trab. [var. *longiaristata* Ducell.?] forma *setosa* Ducell., Bull. Soc. Hist. nat. Afrique nord 26(b): 168 (1935), *nom. inval.* See note 2. – Voucher: Algeria, Berteaux, *Ducellier* (?, probably) *s.n.* (holo: AL, not seen). – Homotypic synonym: x *Aegilotricum rodetii* (Trab.) A.Camus forma *setosum* (Ducell.) Maire & Weiller, Fl. Afrique nord 3: 373 (1955), *nom. incorr.*

Triticum rodetii Trab. [var. *longiaristata* Ducell.?] forma *aristata* Ducell., Bull. Soc. Hist. nat. Afrique nord 26(b): 168 (1935), *nom. inval.* See note 2. – Voucher: Algeria, Berteaux, *Ducellier* (?, probably) *s.n.* (holo: AL, not seen).

Triticum rodetii Trab. [var. *breviaristata* Ducell.] forma *spinosa* Ducell., Bull. Soc. Hist. nat. Afrique nord 26(b): 169 (1935), *nom. inval.* (Art. 36.1 but also for 34.1*(b)*: forma and its name considered provisional). See note 2. – Vouchers: Algeria, Guelma reg., Guelaat-bou-Sba, *Ducellier* (?, probably) *s.n.* (holo: AL, not seen); Algeria, Guelma, à la ferme experimentale, *Ducellier* (?, probably) *s.n.* (holo: AL, not seen). – Homotypic synonym: x *Aegilotricum rodetii* (Trab.) A.Camus forma *spinosum* (Ducell.) Maire & Weiller, Fl. Afrique nord 3: 373 (1955), *nom. incorr.* (Art. 68.1).

= *Aegilops ventricosa* Tausch ♀ x *Triticum turgidum* L. ssp. *durum* (Desf.) Husn. ♂.

Distribution (Fig. 3): Algeria (Trabut, 1919; Maire & Weiller, 1955: 372), and France. Probably also in other parts of the western Mediterranean where both parental species are found.

Ecology: among the parental species in borders of *durum* wheat fields.

Etymology: the final epithet was dedicated by Trabut (1919: 29) to 'Commandant Rodet', a (probably military) French landowner in Algeria, on whose land the hybrid was found, and who '...on his vast property, realized notable improvements in the cultivation of cereals and who is an appreciated collaborator with the Botanical Institute of the Colony ['Service botanique de la Colonie']...' (l.c., 1919: 29, transl.).

Specimens examined:

AFRICA: ALGERIA: Aïn Bessem, *Ducellier s.n.* (MPU); Constantine, Aïn Lehma, *Ducellier s.n.* (MPU); Radjradj, near Brazza, *Trabut s.n.* (F, MPU, type of x *Aegilotriticum rodetii*); Radjradj, near Berrouaghia, *Trabut s.n.* (MPU).

EUROPE: FRANCE: durum wheat fields near Bertan, *Constantin s.n.* (WIR 1666, ex hb. Ducellier). CULT.: ESSONNE: garden of de Vilmorin at Verrières-le-Buisson, near Paris, *Groenland s.n.* (K).

Notes: 1. Although Trabut (1919: 29) indicates that this taxon is an intergeneric hybrid, he nevertheless published it in *Triticum*, but with the addition of a multiplication sign before that genus name. Although *Triticum* can be regarded as a bigeneric hybrid (see Chapter 5.2.2. at '1') it need not necessarily be designated as such (cf., Art. H.3.1, Note 1 of the *Code*).

2. Variation has been observed in Algerian material of this hybrid species that has been given formal status by Ducellier (1935: 167-169). For various reasons his names can be discarded. None of them is accompanied by a Latin diagnosis, which is required by Art. 36.1 of the ICBN for new taxa described after 1 January 1935. This makes them invalid as the publication was in December 1935. His var. *longiaristata* lacks any description or diagnosis and is a *nom. nud.* as it is not linked with any of the formae supposedly under this variety. His var. *breviaristata* is not described either at this level, but is linked with the description of the forma *spinosa*. The formae *pallescens*, *aristata* and *setosa* are not connected with the var. *longiaristata*, but are supposedly so as Ducellier divides *Triticum rodetii* at the end of his treatment into two varieties, *longiaristata* and *breviaristata*, whereby *breviaristata* is only linked with the forma *spinosa*. As the first forma described, *pallescens* (l.c., 1935: 167), was considered the typical form of the hybrid species, I have therefore assumed that the next higher taxon of forma *pallescens*, the variety *longiaristata*, therefore was considered the typical variety of the species, in which case the name is invalid as *rodetii* should have been used (Art. 26.1). The same holds for the forma name *pallescens*. A confusing presentation of taxa!

3. Separately from the natural hybrid the artificial cross *Aegilops ventricosa* x *Triticum aestivum* has been produced and described in detail by de Vilmorin & Groenland (1856: 695-696), who used an awned variety of *T.* '*sativum*'. Their paper was later reviewed by Focke (1881: 414, with the cross as '*Aeg. ventricosa*

Tausch ♀ x *Trit. vulgare* Vill. ♂') and Ascherson & Graebner (1902: 714, with the cross as '*T. sativum* x *ventricosum*').

Concerning the *ventricosa* x 'wheat' cross one has to distinguish three described possibilities so far: (1) the natural hybrid of *Ae. ventricosa* x *T. turgidum* ssp. *durum*, called x *Aegilotriticum rodetii* (Trab.) van Slag.; (2) the same cross but artificially produced and invalidly described by Ciferri & Giacomini (1950: 180) as x *Aegilotriticum ventridurum* Cif. & Giacom., and (3) the artificial cross *Ae. ventricosa* x *T. aestivum* ssp. *aestivum*, which is also invalidly described by Ciferri & Giacomini (1950: 51) as x *Aegilotriticum ventricare* Cif. & Giacom. See the Excluded species at the end of this Chapter for the latter two names.

4.2.2.5 x **Aegilotriticum sancti-andreae** (Degen) Soó **Figs. 5, 38**

x *Aegilotriticum sancti-andreae* (Degen) Soó, Magyar Növényv. Kézik. [Handb. Hung. fl.] 2: 939 (1951, '*Sancti-Andreae*').

Basionym: *Aegilops sancti-andreae* Degen, Mat. Termés-Zettud. Ertes. 35: 475 and Tab. 5 (1917, as: 'Aegilops (*Triticum*) Sancti-Andreae hybr. nov. (*Aeg. nova* Winterl [*cylindrica* Host] x *Triticum sativum* Lam.)').

Lectotype (*nov.*): (Hungary, Budapest) Commit. Pest, ad viam inter St. Andream et montem Köhegy (22 Jun. 1913), *von Degen s.n.* (BP, not seen; isolectotype: W, with '*Ae. nova* x *T. sativum*' on the label). See note.

Synonyms:

x *Aegilotriticum cylindrare* Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950, '*Aegilops cylindrica* x *Triticum vulgare*'), *nom. inval.* (Arts. H.10.1, 36.1 and 40.1: no Latin diagnosis or reference; also Art. 63.1: superfluous).

x *Aegilotriticum cylindroaestivum* Gandilyan in: The Reports of the second Soviet – Indian symposium on problems of genetics and selection of cultivated plants, Baku, Azerbaijan S.S.R., USSR: 17 (1976), *nom. inval.* (Arts. H.10.1, 36.1 and 40.1: no Latin diagnosis or reference; also Art. 63.1: superfluous). – Note: although the name appears to be invalidly published and is superfluous after *sancti-andreae* from 1951 it is still possible that x *Aegilotriticum cylindroaestivum* is effectively (even validly) published by Gandilyan in the Russian text of his paper as the cited English text is an abstract. I have been unable to check this.

= *Aegilops cylindrica* Host ♀ x *Triticum aestivum* L. ssp. *aestivum* ♂.

Distribution (Fig. 38): probably occurring throughout the areas of both parental species, thus limited by *Ae. cylindrica*. Reported from localities as far apart as Hungary, Turkey, Armenia (near Erevan, cf., Sakamoto & Kobayashi, 1982), Iran, Turkmenistan, Uzbekistan, and the Crimea. Also found in the U.S.A. (Fig. 38), where *Ae. cylindrica* was introduced and is now widespread.

Ecology: among the parental species in borders of bread wheat fields.

Etymology: the final epithet refers to the Latinized name of the town of Szent-Endre (Sancti-Andreae) in the district of Pest in central Hungary where the hybrid was found by Árpád von Degen.

Specimens examined:

AMERICA: U.S.A., KANSAS: Jewell Co., E Jewell, *Brooks 9989* (A); Rice Co., E Matheson, *McGregor 36344* (NY). OKLAHOMA: Wakita, *Geier s.n.* (Z).

ASIA: IRAN, Zanjan to Dandy, *van Slageren & al. MSMNNL-93168H* (SPII).

TURKMENISTAN: Desht, *Micherjakov & Azarkuliev s.n.* (ASH).

Fig. 5. The natural hybrid x *Aegilotriticum sancti-andreae* (left, *van Slageren & al. MSPGAP-91152H*) of *Aegilops cylindrica* (centre-right, germplasm coll. *van Slageren & al. MSPGAP-91149*) x bread wheat (right) in the edge of a bread wheat field between Dzhizak and Gallya-Aral, Uzbekistan. [Material held together by (the invisible hand of) Dr P.A. Gandilyan.]

UZBEKISTAN: 20 km from Tashkent to Kaplanbek, *Popova s.n.* (WIR 1617, 1621, 1623); near Yang-Arik, *Popova s.n.* (WIR 1618-1622); Dzhizak to Gallya-Aral, *van Slageren & al. MSPGAP-91152H, 91159H, 91163H* (ICARDA).

EUROPE: ARMENIA: Garni, *Gandilyan s.n.* (YAI); hills N Dzhervesh to Gegadir and Muchavan, close to Erebuni Reserve, *van Slageren & al. MSPGNG-92051* (ICARDA); Ararat reg., Urtzazor to Shorap, *van Slageren & Gandilyan MSPG-92059* (ICARDA; *aestivum* parent is cv. 'armeniaca 60'); Shorbulak, near Erevan, *Vavilov s.n.* (WIR 27913).

HUNGARY: (Budapest) Pest, road St. Andreae to Mt. Köhegy, *von Degen s.n.* (W, type of x *Aegilotriticum sancti-andreae*).

RUSSIA, DAGHESTAN: station of WIR at Derbent, *van Slageren & Boguslavskii MSRB-90155H, 90169H, 90203H* (ICARDA); near Chazaviurt, *Zinchenko 379* (LE).

UKRAINE, CRIMEA: Mts. Bahchi-Eli and Abdal, *Drevemovsky s.n.* (LE); Kerch peninsula, Kerch to Lenino, *Stankevich & Dorofeev 2397* (WIR).

Note: two collections are listed by von Degen (1917: 476) in connection with his hybrid: (1) near Szent-Endre (see above), and (2) 'in 1916 in various places between St. Andreae and the village of Izbég always in segetal margins once more found in several tufts' (transl. from the Latin original). The latter collection(s) has not been available and their location was also inexactly described. Hence the Szent-Endre specimen is designated lectotype.

4.2.2.6 x **Aegilotriticum speltaeforme** (Jord.) van Slageren, **comb. nov.** **Fig. 6**

Basionym: *Aegilops speltaeformis* Jord., Ann. Sci. Nat., Sér. 4., Bot., T. 3: 313 (1855), Ann. Soc. Linn. Lyon 4: 1-82, Fig. A 1-8 (1857); Focke, Pfl. Mischl. 413 (1881); Nyman, Consp. fl. eur. 4: 839 (1882); Husnot, Graminées 4: 79 (1899); Percival, Wheat Plant 383-385 (1921, on p. 383 describing the hybrid as '(*Aegilops ovata* ♀ x *Triticum vulgare* ♂) x *Triticum vulgare* ♂ = *Aegilops triticoides* ♀ x *Triticum vulgare* ♂'); Eig, Feddes Repert., Beih. 55: 226 (1929a); Hammer, Feddes Repert. 91: 250 (1980b).

Neotype: (France, Rhône) cultivés à Villeurbanne (Rhône) provenant d'Agde (Hérault). Rec. par *A. Jordan s.n.*. Fleurs le 15 Juin, fruits le 14 Juillet 1857. (Fl. Gall. et Germ. Exsiccata de C. Billot no. 2187) (LY-Jordan; isoneotypes: BM, F, G, JE, LE, LY, M, MPU, MPU-Duval-Jouve, OXF, P, PI, WAG). See note 1.

Homotypic synonyms:

Triticum speltaeforme (Jord.) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 714 (1902, '*speltiforme*'); Rouy, Fl. France 14: 329 (1913), *nom. illeg.* (Art. 64.1), non *T. speltaeforme* Seidl (fide von Steudel, 1854: 341). See note 2.

Triticum per-sativum x *ovatum*. Cited in Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 713 (1902).

Triticum aestivum x *ovatum* forma *speltaeforme* (Jord.) Thell., Fl. adv. Montpellier 145 (1912, '*speltiforme*'). – Note: a combinaton of a name and a formula.

Aegilotrichum speltaeforme (Jord.) E.G.Camus ex A.Camus, Bull. Mus. Hist. Nat. Paris 33: 539 (1927), *nom. incorr.*

= (*Aegilops geniculata* Roth ♀ x *Triticum aestivum* L. ssp. *aestivum* ♂) ♀ x *Triticum aestivum* L. ssp. *aestivum* ♂.

Distribution: botanic gardens and experimental fields. Reported from Sicily by Cosson (1859: 221), who may have seen these backcrossed forms of x *Aegilotriticum triticoides*, the primary hybrid of *Ae. geniculata* x bread wheat.

Vernacular name: German: Spelzartiger Walch [= Walch, which looks like 'Spelz', i.e., spelt wheat, *T. aestivum* L. ssp. *spelta* (L.) Thell.] Present on a herbarium specimen at NY with unknown collector and number, of which the label also carried the following text (translated from the German): 'southern France and through artificial fertilization created progeny ['bastard'] out of *Aegilops triticoides* and *Triticum vulgare*, which maintains itself through seed production'.

Etymology: the final epithet refers to the presumed similarity of the spikes with those of spelt wheat (*Triticum aestivum* L. ssp. *spelta* (L.) Thell.).

(Cultivated) specimens examined:

EUROPE: FRANCE, BAS-RHIN: Strasbourg, *Duval-Jouve s.n.* (BR, MPU). ESSONNE: Verrières-le-Buisson, near Paris, *de Vilmorin s.n.* (K). HÉRAULT: Agde, *Fabre s.n.* (MPU, P, P-CO). ISÈRE: in garden in Grenoble, *s.coll., s.n.* (L). PARIS: Boulogne sur Seine, *Bécourt s.n.* (LY); hortus of Paris, *s.coll., s.n.* (ex hb. Spach) (P). PUY-DE-DÔME: Clermont Ferrand, 'pensionnat des Frères', received from Jordan, comm. Frère *Thérébaud* (MPU-Coste). RHÔNE: (Lyon-)Villeurbanne [from seeds obtained from E. Fabre at Agde], *Jordan s.n.* (Fl. Gall. et Germ. Exsicc. Billot 2187) (BM, F, G, JE, LE, LY, LY-Jordan, M, MPU, MPU-Duval-Jouve, OXF, P, PI, WAG, type of x *Aegilotriticum speltaeforme*); ibid., cult. in 1856, ex hb. Jordan (BR, BM, JE, PI); ibid., cult. in 1860, ex hb. Jordan (G); ibid., cult. in 1876 at Lyon(-Villeurbanne) in garden of A. Jordan, *Jordan s.n.* (Exsicc. Soc. Dauphinoise 2302 from 1879) (G, FI, K, LY, MPU, P, TO, Z); cult. at Lyon(-Villeurbanne) by A. Jordan, ex hb. *Hériband s.n.* (LY); cult. at Lyon(-Villeurbanne) by A. Jordan, ex hb. *Van Heurck* (L); cult. at Lyon(-Villeurbanne) by A. *Jordan* in 1869, 1887 (LY).

GERMANY: 'hybrid of *Ae. triticoides* x *Trit. vulgare*', in Esslingen (am Neckar?) gezogen, *Hohenacker 699* (JE, LE, W, WAG).

Notes: 1. As the collections obtained by Jordan (from E. Fabre) were not specified by him at his publication of the name in 1855, and as piles of material cultivated over various years were found in his herbarium at the Université libre de Lyon (but considered part of LY), it was necessary to identify a type collection to be connected with the name. No material could be found in LY or elsewhere that is 'original' in the sense of Art. 7.5 of the *Code* in order to choose a lectotype. Therefore a neotype is selected through no. 2187 from an exsiccatae series published by C. Billot as this material is: (1) the product of the same cross; (2) produced by Jordan in his experimental garden in (Lyon-)Villeurbanne and present in his herbarium (LY-Jordan); (3) well documented with indication of its artificial nature and origin of the seeds (obtained from [E. Fabre at] Agde, Hérault, as was the case with the original material received by Jordan), and (4) well distributed. It is assumed that these collections were produced on an experimental field in 1857, thus after the original publication of the name in 1855. The neotype and isoneotype specimens are expressly limited here to the progenies obtained in 1857 and distributed in the exsiccatae series from Billot. These typification problems are similar to those relating to Jordan & Fourreau's microspecies of *Aegilops ovata* (see note 2 at 10.8).

2. Von Steudel (1854: 341) writes at *T. speltaeforme*: '*Seidl.* (*Opiz* Verz. 106.)'. This reference probably refers to the Bohemian botanist W.B. Seidl (1773-1842) who may have published material with the name *speltaeforme* in one of the many exsiccatae series of the Czech botanist Ph.M. Opiz (1787-1858), possibly under a no. 106. Von Steudel lists the species *T. speltaeforme* immediately after *T. spelta* and suggests that it may be considered a variety of the latter (l.c., '...Praecedentis var.?...'). In any case it may have looked very similar to Jordan's backcross 'species'. Although the exact date of publication of the Seidl name could not be as-

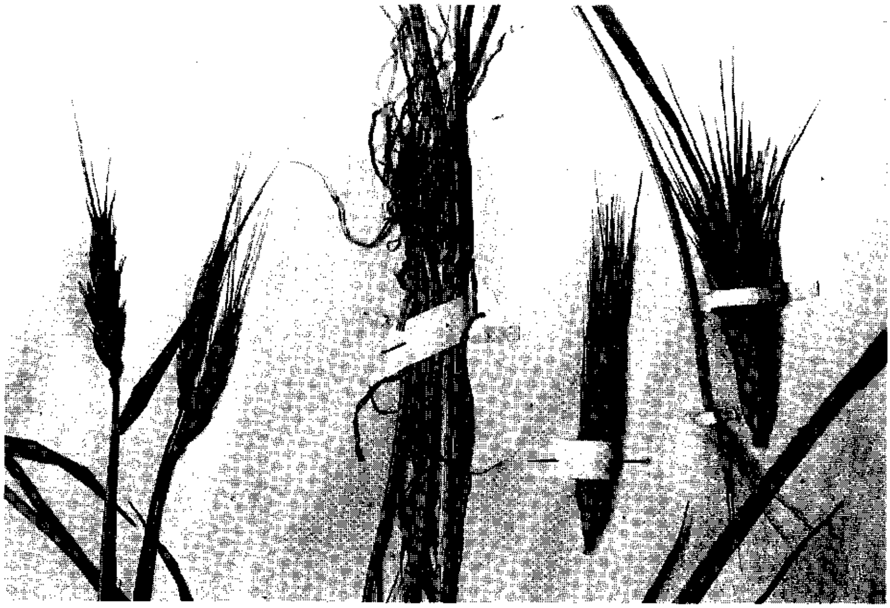


Fig. 6. Spike morphology of x *Aegilotriticum triticoides* (spikes left; coll. *Autheman s.n.*, in FI) and x *Aegilotriticum speltaeforme* (tillers and spikes on the right; coll. *Jordan s.n.* (Exsicc. Soc. Dauphinoise 2302), in FI).

certained it is surely older than the combination of Ascherson & Graebner (1902: 714), which therefore becomes superfluous. I have been unable to see any material related to the Seidl species.

4.2.2.7 x **Aegilotriticum triticoides** (Req. ex Bertol.) van Slageren, **comb. nov.** **Figs. 3, 6**

Basionym: *Aegilops triticoides* Req. ex. Bertol., Fl. ital. 1: 788 (1834); Link, Hort. Berol. 2: 367 (1833); Tenore, Fl. napol. 5: 287 (1835); Mutel, Fl. franç. 4: 155 (1837), Atlas, Tab. 92, fig. 650 (1837); von Steudel, Nomencl. bot. (ed. 2) 1: 29 (1841), Syn. pl. glumac. 1: 354 (1854); Gussone, Fl. sicul. syn. 1: 54 (1843); Parlatore, Fl. palerm. 1: 238 (1845), Fl. ital. 1(2): 512 (1850); Heynhold, Alph. Aufz. Gew. / Nom. bot. hort. 2: 10 (1846); Godron, Ann. Sci. Nat. 4, Sér. 2: 215 (1854); Cosson & Durieu de Maisonneuve, Expl. sci. Algérie 2: 211 (1855, 'Proles Hybrida *triticoides*'); von Regel, Bonplandia 4(16): 243 (1856), Gartenflora 6: 167 (1857); Jordan, Ann. Soc. Linn. Lyon 4: 1-82, Fig. B 1-4 (1857); Tchichatscheff, Asie min., Bot. 2: 582 (1860); Gillet & Magne, Nouv. fl. franç. (ed. 2) 505 (1868); Focke, Pfl. Mischl. 412 (1881); Battandier & Trabut, Fl. Alger 107 (1884, see note 1), Fl. Algérie 1(2): 241 (1895), Fl. Algérie Tunisie 393 (1905); Nyman, Consp. fl. eur. 4: 839 (1882, as 'x *Ae. triticoides* Req.'), suppl. 2: 342 (1890); Gandoger, Fl. Eur. 25: 4 (1892; with microspecies, see note 2); Fiori & Paoletti, Fl. Italia 1: 109 (1896); Husnot, Graminées 4: 79 (1899); Albert & Jahandiez, Cat. pl. vasc. Var 562 (1908, 'x *Ae. triticoides*'); Lojacono, Fl. sicul. 3: 369 (1908-09); Percival, Wheat Plant 380-383, 385 (1921, on p. 380 describing the hybrid as *Aegilops ovata* ♀ x *Triticum vulgare* ♂; see also note 3); Eig, Feddes Repert., Beih. 55: 226 (1929a, author as 'Requ.'); Hammer, Feddes Repert. 91: 252 (1980b).

Type: (France, Vaucluse) environs d'Avignon, *Requien s.n.* (holo: BOLO-Bertoloni (Fl. ital.); iso: AV (not seen), G, K, MPU, NY, P, PI, TO). See note 4.

Homotypic synonyms:

Sub nom. *Aegilops triuncialis* auct. non Linnaeus (1753): Gussone, Pl. rar. 372 (1826). See note 5.

Triticum vulgari-ovatum Godr. & Gren. in Grenier & Godron, Fl. France 3(2): 600 (1856); de Lacoizqueta, Dicc. nombr. eusk. pl. 174 (1888, '*Triticum vulgare obatum*'); Fiori, Nuov. Fl. Italia 1: 161 (1923, '*Tr. vulgare* x *Ae. ovata*'), *nom. inval.* (Arts. 23.6*(d)*, thus for 32.1*(b)*, and H.10.3; also Art. 63.1: superfluous).

Triticum requienii Ces., Pass. & Gibelli, Comp. fl. ital. 1(4): 86 (1869, '*Requieni*'); Richter, Pl. eur. 1: 129 (1890, 'x *Tr. Requieni*'); Durand & Schinz, Consp. fl. afric. 5: 939 (1894, '*Requieni*'); Fiori & Paoletti, Fl. Italia 1: 109 (1896, '*Requienii*'); Rouy, Fl. France 14: 329 (1913, 'x *T. Requieni*'), *nom. illeg.* (Art. 63.1).

Aegilops vulgari-ovata (Godr. & Gren.) H.Loret & Barrandon, Fl. Montpellier (ed. 1) 2: 770 (1876), (ed. 2) 577 (1886); Eig, Feddes Repert., Beih. 55: 226 (1929a, authors as 'Lor. et Bar.' only); Hammer, Feddes Repert. 91: 255 (1980b, cites Eig), *nom. inval.* (Arts. 23.6*(d)*, thus 32.1*(b)*, and H.10.3; also Art. 63.1: superfluous).

Triticum sativum x *ovatum*. Cited in Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 713 (1902).

Triticum aestivum L. x *ovatum* (L.) Rasp. Cited in Thellung, Fl. adv. Montpellier 143 (1912).

x *Aegilotrichum triticoides* (Req. ex Bertol.) E.G.Camus ex A.Camus, Bull. Mus. Hist. Nat. Paris 33: 538 (1927), *nom. incorr.*

x *Aegilotriticum requienii* (Ces., Pass. & Gibelli) P.Fourn., Quatre fl. France 89 (1935, '*Requieni*'); Ciferri & Giacomini, Nomencl. fl. ital. 1: 51 (1950, '*Requienii*' and including x *Aegilotriticum speltaeforme*), *nom. incorr.*

x *Aegilotricum triticoides* (Req. ex Bertol.) Maire & Weiller, Fl. Afrique nord 3: 371 (1955); Cuénod et al., Fl. Tunisie 157 (1954); Quézel & Santa, Nouv. fl. Algérie rég. dés. mérid. 1: 159 (1962); Pignatti, Fl. italia 3: 543 (1982, sub x *Aegilotriticum*, but referring to Maire & Weiller (1955), not to Fournier (1935)); Sagredo, Fl. Almeria 48 (1987, '*Aegilotricum* x *triticoides*'), *nom. incorr.*

= *Aegilops geniculata* Roth ♀ x *Triticum aestivum* L. ssp. *aestivum* ♂.

Distribution (Fig. 3): probably occurring in all regions where both parents are growing together (partly shown in Fig. 3), thus limited by the distribution of *Ae. geniculata*. The great majority of the historic collections are reported only from a few countries: Algeria, France, Italy, Spain, Turkey, e.g., Cosson (1859: 221), Tchichatscheff (1860: 582), Battandier & Trabut (1884: 107; 1895: 241), Lojacono (1908-09: 370), Rouy (1913: 329), Maire & Weiller (1955: 371), Sagredo (1987: 48). More recently also found in other parts of the distribution area of *Ae. geniculata* (e.g., Georgia, Greece, Jordan, Lebanon, Syria, Tunisia)

Ecology: at roadsides among the parental species in borders of wheat fields (Grenier & Godron, 1856: 601), or along and in fields, cultivated with wheat the previous year (Albert & Jahandiez, 1908: 562). Never abundant.

Flowering time: April – May (in Sicily, cf., Lojacono, 1908-09: 370); May – June (in Spain, cf., Sagredo, 1987: 48; in southern France, dept. Var, cf., Albert & Jahandiez, 1908: 562).

Vernacular names: Basque: Herrokia [= wheat of the country] (De Lacoizqueta, 1888: 174). The translation of the name is from Guinea Lopez (1949: 98). This name is also used for *Aegilops geniculata* (see 10.8). French: Égylope bled faux [bled = wheat, faux = false; thus: *Aegilops* (which is) false wheat] (Tenore, 1835: 287); Égilope froment [= wheat *Aegilops*] (Mutel, 1837: 155; Gillet & Magne, 1868: 505). German: queckenähnliches Hartgras [= hard grass (looking like) quecke = *Agropyron*] (Heynhold, 1846: 10). Italian: Egilope fromentina [= wheat

Aegilops] (Tenore, 1835: 287); Orzo formichino [= barley of the little ant] (Bertoloni, 1834: 789; Parlatore, 1845: 238). Spanish (Castilian): Rompe sacos [= sack breaker; (making) holes (in a) sack] (De Lacoizqueta, 1888: 174). Also used for *Aegilops geniculata* (see 10.8) and *Ae. triuncialis* (see 10.18a).

Etymology: the final epithet refers to the similarity of its spike with the wheat (*Triticum*) spike.

Specimens examined:

AFRICA: ALGERIA: Algiers, Aïn el Hammam, R'rira (= Djurdjura Mts.?), *d'Alleizette s.n.* (P); Constantine, Duzerville to Mondovi, *Cosson s.n.* (P); Constantine, *Holly & al. DZA-258* (immature spikes only, ICARDA); Guelma, *Perrot s.n.* (MPU); Drâ-el-Mizam, *Trabut s.n.* (MPU); Radjradj, near Brazza, Berrouaghia reg., *Trabut s.n.* (MPU).

TUNISIA: Nalili, *Serres s.n.* (MPU); Tunis, Exp. sta., *Cuénod s.n.* (G).

ASIA: JORDAN: Karak, 3 km N Qasr, *van Slageren & al. MSBHAJ-88157H* (ICARDA); Ma'an, Humaima, off road Ras En Naqb – Quweira, *van Slageren & al. MSBHAJ-88174H* (ICARDA).

LEBANON: Djebel El Cheikh, *Mouterde s.n.* (Min.Agr.Syr.); Tripoli, *Peyron s.n.* (LY).

TURKEY: Phrygia, SE Ouchak, *Balansa s.n.* (L); Izmir, *s.coll., s.n.* (L).

EUROPE: FRANCE, AVEYRON: St. Jean d'Alcas to St. Paul, *Coste s.n.* (FI, GE, JE, LY, MPU); Rebourgeuil, *Coste s.n.* (MPU, PI); St. Eulalie-de-Cession, *Coste s.n.* (MPU); St. Georges-de-Luzençon, *Coste s.n.* (MPU); St. Rome-de-Cernon, *Coste s.n.* (MPU); valley of the Dourdou at Calmels, *Coste s.n.* (LY, MPU); Belmont to St. Etienne, *Coste s.n.* (LY, MPU); St. Paul-des-Fonts, *Coste s.n.* (MPU); Tournemire, valley of the Boutinesque, *Coste s.n.* (MPU); Les Canaries, near Briols, *Coste s.n.* (MPU); Nant, *Coste s.n.* (MPU); valley of the Dourdon at Calmels, *Coste s.n.* (LY); Tournemire to Penscionnat, *Fourès s.n.* (MPU). BOUCHES DU RHÔNE: near Marseille, *Albaille 6454* (MPU); Roquevaire, near Marseille, *Alioth s.n.* (G); Martigues, *Autheman s.n.* (BM, F, FI, G, L, LD, LY, MPU, PI, PRC, TO, W, Z); St. Julien, near Marseille, *Baraize s.n.* (G); Arles, *Duval-Jouve s.n.* (BC, MPU); les Martegaux à Marseille, Honoré, *Bourg s.n.* (F); Meyreuil (Meyrargues?), *Delmas 1823* (BR, MPU); Arles, Ribesaltu, *Duval-Jouve s.n.* (MPU); Montagieux to Pas de Lanciers, near Marseille, *Huet du Pavillon s.n.* (MPU); near Marseille (St. Velin?), *Roux s.n.* (MPU); Trois-Lucs, near Marseille, *Roux s.n.* (Exsicc. Billot 3943) (BM, G, JE, K, LE, LY, MPU, OXF, P); St. Lore du Duout(?), *Roux s.n.* (G); Etang of Berre, *Roux & Blaisse s.n.* (G); Milles, *Roux & Blaisse s.n.* (G, LY); Martigues to Bouc, *Roux & Blaisse s.n.* (FI, G). GARD: Nîmes, road to Arles, *Courcière s.n.* (BM, BR, FI, MPU, P); Nîmes to Caissargues, *Delavaux s.n.* (K); Uzès, *Diomède s.n.* (BM); Nîmes, *Duval-Jouve s.n.* (MPU); St. Chaptes, *Lombard-Dumas s.n.* (MPU); Caissargues, *Magnien s.n.* (BM, MPU). GERS: Auch, *Laborie 1832* (G, LY, MPU, Z). HAUTE-GARONNE: Auterive, *Duffort s.n.* (BC, Z); Toulouse, Pech David, *Leredde s.n.* (Exsicc. de Retz 1155) (BR, G, RAB). HAUTES-ALPES: Tallard, *Girod s.n.* (JE, FI, MPU, PI, PI-GUAD, PR, SOM, W); Gap to Tallard, *Girod s.n.* (SOM); Tallard, near Vapinco, *Girod 14* (G, GAT, MPU, NY); (Pont de) Chabestan, *Girod s.n.* (MPU); Lettret, *Girod s.n.* (G). HÉRAULT: Villeneuve le Maquelonne, *Barrandon s.n.* (MPU); Montpellier, Grammont, *Berliet s.n.* (LE, LY); Agde, *Fabre s.n.* (A, G, K, P); (les causses de) Bessan, *Biche s.n.* (MPU); Biège, near Pézenas, *Biche s.n.* (MPU); Castelnau, Barbarens, *Duffort s.n.* (GAT); near Montpellier, *Duval-Jouve s.n.* (MPU); St. Martin de Londres, *Duval-Jouve s.n.* (MPU); Rochers de Rigaud at Agde, *Fabre s.n.* (MPU); Roquehaute, near Agde, *Théveneau s.n.* (BR, FI, K, LE, W); Montpellier, *Godron s.n.* (BM, FI, K, LY, P); Montpellier, Mas Bigoureau, *Revelière 381* (BM); Trècoulon, near Montpellier, *Touchy s.n.* (K); La Colombière, near Montpellier, *Touchy s.n.* (MPU, P); Lodève, *s.coll., s.n.* (MPU); Lansargues, *s.coll., s.n.* (BR). INDRE: Rochers de St. André, near Villiers, *Rolland s.n.* (P). ISÈRE: garden in Grenoble, *s.coll., s.n.* (ex hb. Cosson) (P). LOIR-ET-CHER: Le Gué de Loire, near Vendôme, rocks of St. André, *Legret s.n.* (BR, G). LOT: Sérignac, *Bach s.n.* (FI, MPU). LOT-ET-GARONNE: near Ste. Livrade-sur-Lot, *d'Alleizette s.n.* (LD); Thibet, near Agen, *de Pommaret s.n.* (Exsicc. Schultz 1177) (BM, C, G, FI, JE, L, LE, MO, MPU, PRC, OXF); ibid., *Garroute s.n.* (Exsicc. Soc. Dauphinoise 1037) (FI, G, LY, MO, MPU, P, Z). LOZÈRE: foot of the Grézac, *Aubouy s.n.* (MPU). PYRÉNÉES ORIENTALES: Corbières, côte de l'Epervier, *Timbal-Lagrave s.n.* (W). VAR: Draguignan, Pont d'Aups, *Girod s.n.* (G); La Ste. Baume, *Roux s.n.* (P); (Cap) Roux, *Roux & Blaisse s.n.* (FI); La Garde-Freinet, *s.coll., s.n.* (LD). VAUCLUSE: Carpentras, *Feraud s.n.* (LY); Avignon, *Requien s.n.* (BOLO, G, K, LY, MPU, NY, P, PI, TO, type of x *Aegilotriticum triticoides*). CULT.: ESSONNE:

garden of de Vilmorin near Paris and sent to Fiori (FI); garden of de Vilmorin at Verrières-le-Buisson, near Paris: '*Ae. ovata* (female) x *Triticum* cultivars' (male) from France, nos. *180, 183, 270, 318, 396* (BR, G, JE, K, P), *235* (JE, K, P), *236* (BR, JE, K, P), *259* (BR, JE, LE, P), *296* (LE), *391* (G, JE, P), *392* (G, LE, P), all communicated by *de Vilmorin & Groenland*. HÉRAULT: Montpellier, School of Pharmacy, *Planchon s.n.* (MPU, K). PARIS: Hortus Paris, *s.coll., s.n.* (ex hb. Delacour) (P).

GEORGIA: Kaspi, *s.coll., s.n.* (ex hb. Grenier) (P).

GREECE, ATTICA: Athens, Phaleron, *Haussknecht s.n.* (JE).

ITALY: Verona, Porta Nueva, *s.coll., s.n.* (PI). CALABRIA/SICILY: received from Gussone by *Bertoloni* (BOLO). ISLANDS: SARDINIA: s.loc., *Badarò s.n.* (TO). SICILY: Pezzula, *Citarda 13* (JE); Calascalei, *Gussone s.n.* (FI); Casoli, *Gussone s.n.* (FI); Agrigento, *Gussone s.n.* (FI); Caltavuturo, *Todaro 1202* (BR, BM, FI, JE, K, LY, MPU, P, TO, W); Cannata, *Reina s.n.* (FI, TO); Palermo, *Todaro s.n.* (MPU, W); Vicari, *Todaro s.n.* (MPU, P, U, W); Trápani, *Todaro s.n.* (MPU, P, FI, W); Paceco, *Todaro s.n.* (PI).

RUSSIA, DAGHESTAN: Station of WIR at Derbent, *Boguslavskii 199* (WIR).

SPAIN, CÁDIZ: Puerto Real, *Bourgeau s.n.* (P). NAVARRA: Pamplona, *Vavilov 55918-55920* (WIR 1663-1665).

Notes: 1. Although the literature from before 1884 clearly indicates that *Ae. triticoides* is the result of *Ae. geniculata* x bread wheat (but using *ovata* instead of *geniculata* in the formula), Battandier & Trabut (1884: 107) nevertheless state that *Triticum durum* is involved. Superficially the two hybrids may be very similar in outline.

2. Gandoger, Fl. Eur. 25: 4 (1892) published nine 'microspecies' within the (hybrid) species *Aegilops triticoides*. They are not validly published according to Art. 33.4 of the ICBN.

3. Percival (1921: 385) quotes Fabre who stated that *Aegilops triticoides* plants also grew out of the cross *Ae. 'triaristata'* x bread wheat. Thus the name *Aegilops triticoides* was referred to the products of two different crosses. Undoubtly they look similar, but the *neglecta* cross was later also found in a natural habitat and described by Grenier & Godron (1856: 601) as *Triticum vulgari-triaristatum*.

4. Requien found this hybrid during several years near Avignon in southern France and subsequently sent samples of his material to various botanists, e.g., Balbis in Turin (TO) and Bertoloni in Bologna (BOLO). Material from various years ('Requien, 1825', 'Requien, 1827') is present in G, making it difficult to establish from which collection isotypes now derive. Many labels carry notes like 'Requien dedit' (e.g., in MPU) or 'Requien Avignon'. My list of isotypes therefore summarizes all herbaria with handwritten notes indicating that material was received from Requien. As Bertoloni published the species with the aid of notes and material, received from Requien (cf., Bertoloni, 1834: 789: 'Æ. triticoides *Req. Pl. sicc.*'; the label of the holotype has '*Aegilops triticoides* nob.' on it in Bertoloni's handwriting), the BOLO collection is the holotype. Undoubtly there is isotype material at Requien's herbarium at AV, but I have been unable to see it.

5. This assumed misidentification by Gussone is cited as '*Aegilops triuncialis* Guss.' in synonymy of *Ae. triticoides* by Bertoloni, Fl. ital. 1: 788 (1834); Parlatore, Fl. ital. 1(2): 512 (1850); von Steudel, Syn. pl. glumac. 1: 354 (1854); Cosson & Durieu de Maisonneuve, Expl. sci. Algérie 2: 211 (1855); Tchichatscheff, Asie min., Bot. 2: 582 (1860), and Nyman, Consp. fl. eur. 4: 839 (1882); in synonymy of *T. vulgari-ovatum* by Grenier & Godron, Fl. France 3(2): 600 (1856), and in synonymy of *T. requienii* by Richter, Pl. eur. 1: 129 (1890). Although several Gussone collections of the hybrid have been seen (see above at specimens seen), the specimens that have been misidentified as the Linnaean species have not been available.

Excluded species. All species listed here are artificially created crosses that were given botanical names with epithets in the sense of Art. 23, but their publication is not in accordance with other ICBN rules (notably for their invalid generic names x *Aegilotricum* and x *Aegilotrichum*; see Art. H.6.2). For none of the names has a type specimen been indicated, although this is not needed, all being published before 1958 (see Art. 37.1). See below for a note on the Ciferri & Giacomini names. Generic names are alphabetic; within a genus, species names are alphabetic:

Aegilotrichum blaringhemii A.Camus, Bull. Mus. Hist. Nat. Paris 33: 539 (1927, '*Blaringhemii*'), *nom. incorr.* – Homotypic synonym: x *Aegilotriticum blaringhemii* Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Blaringemii*', pro *nom. nov.*), *nom. incorr.* = *Aegilops ventricosa* Tausch x *Triticum turgidum* L. (most probably ssp. *turgidum*). – Note: Camus (1927: 539) based her name on the cross '*Ae. ventricosa* x *Triticum ventricosum*', while Ciferri & Giacomini (1950: 51) based their name on *Ae. ventricosa* x *Triticum turgidum*. As this would indicate different types, ruling of Art. 64.3 on likely confusion of names could be invoked. Camus, however, referred to Blaringhem (1926: 695), where the formula of her cross is not listed, but *Ae. ventricosa* x *T. turgidum* instead, as well as the backcross with the wheat parent. Hence I consider Camus' (1927) notation of the cross involved as erroneous and the cross *Ae. ventricosa* x *T. turgidum* actually being meant by her. The combination of Ciferri & Giacomini is then an isonym, but invalid because of Art. 36.1.

Aegilotrichum hybridum A.Camus, Bull. Mus. Hist. Nat. Paris 33: 539 (1927, with '*Ægilops ovata* x *Triticum Spelta*'), *nom. incorr.* = *Aegilops ventricosa* Tausch x *Triticum aestivum* L. ssp. *spelta* (L.) Thell. – Note: although Camus refers to Blaringhem's (1926: 694) cross, the latter's paper deals with *Ae. ventricosa* rather than '*ovata*' crosses with various wheats. Camus' notation is most likely erroneous.

x Aegilotricum caudata-dicoccon E.Oehler, Züchter 6(11/12): 263 (1934, '*dicoccum*'), *nom. inval.* (Arts. 23.6*(d)*, H.6.2 (and thus for 32.1*(b)*), and H.10.3) = *Aegilops caudata* L. x *Triticum turgidum* L. ssp. *dicoccon* (Schrank) Thell. – Note: no indication of a type specimen, incorrect formation of the generic name (Art. H.6.2), and a condensed formula instead of an epithet (Arts. 23.6*(d)* and H.10.3). Although only a German description is provided the name is not invalid because of Art. 36.1.

x Aegilotricum ovata-turgidum Percival, Ann. Bot. 50(199): 427 (1936), *nom. inval.* (Arts. 23.6*(d)*, H.6.2 (and thus for 32.1*(b)*), 36.1, and H.10.3) = *Aegilops geniculata* Roth x *Triticum turgidum* L. ssp. *turgidum* (var. *iodurum* with released variety name 'Poulard d'Australie'). – Notes: 1. No Latin (Art. 36.1), but a detailed English description of the characters in which the hybrid differs from its parents is provided; no indication of a type specimen, and a condensed formula instead of an epithet (Arts. 23.6*(d)* and H.10.3). The name is also incorrect for its incorrect formation of the generic name (Art. H.6.2). 2. This fertile hybrid from the cross '*Ae. ovata* ♀ x *T. turgidum* ♂ (*T. turgidum* var. *iodurum*. Poulard d'Australie)' (Percival, 1936: 427) was obtained by Percival in 1926, and described in an earlier paper (Percival, 1930: 236), but only in his 1936 paper did Percival attach a botanical name to it, using a condensed formula.

x **Aegilotricum triuncialis-dicoccon** E.Oehler, Züchter 6(11/12): 265 (1934, '*dicoccum*'), *nom. inval.* (Arts. 23.6*(d)*, H.6.2 (and thus for 32.1*(b)*), 36.1, and H.10.3) = *Aegilops triuncialis* L. x *Triticum turgidum* L. ssp. *dicoccon* (Schrank) Thell. – Note: see at x *Aegilotricum caudata-dicoccon*.

x **Aegilotricum triuncialis-durum** E.Oehler, Züchter 8(2): 29 (1936), *nom. inval.* (Arts. 23.6*(d)*, H.6.2 (and thus for 32.1*(b)*), 36.1, and H.10.3) = *Aegilops triuncialis* L. x *Triticum turgidum* L. ssp. *durum* (Desf.) Husn. – Note: see at x *Aegilotricum caudata-dicoccon*.

Ciferri and Giacomini (1950: 51, 179-180) invalidly published many species (in fact names for artificial crosses) in the nothogenus x *Aegilotriticum* in view of Arts. 36.1, 40.1 and H.10.1 of the ICBN, as there is no Latin diagnosis or reference (Art. 36.1). Bowden (1959: 676-677) assessed the status of at least the new names as *nomina nuda*. In their notation of the cross involved Ciferri & Giacomini use *T. dicoccoides*, *T. durum*, etc., for the *Triticum* parent, but these names are altered here in accordance with my classification of *Triticum* of Chapter 5.4.3. The following species names are therefore excluded here until their proper description:

x **Aegilotriticum bleieri** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Bleieri*'), *nom. inval.* = *Aegilops geniculata* Roth x *Triticum turgidum* L. ssp. *durum* (Desf.) Husn.

x **Aegilotriticum caudicoccoides** Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950). *nom. inval.* = *Aegilops caudata* L. x *Triticum turgidum* L. ssp. *dicoccoides* (Körn. ex Asch. & Graebn.) Thell.

x **Aegilotriticum caudicoccum** Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950), *nom. inval.* = *Aegilops caudata* L. x *Triticum turgidum* L. ssp. *dicoccon* (Schrank) Thell. – Note: the same cross as earlier Oehler's (1934: 263) x *Aegilotricum caudata-dicoccon*.

x **Aegilotriticum cylindrurum** Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950), *nom. inval.* = *Aegilops cylindrica* Host x *Triticum turgidum* L. ssp. *durum* (Desf.) Husn.

x **Aegilotriticum forlanii** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Forlanii*'), *nom. inval.* = *Aegilops geniculata* Roth x *Triticum aestivum* L. ssp. *spelta* (L.) Thell.

x **Aegilotriticum kiharae** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Kiharae*'), *nom. inval.* = *Aegilops geniculata* Roth x *Triticum turgidum* L. ssp. *dicoccon* (Schrank) Thell.

x **Aegilotriticum laumontii** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Lau-*

montii'), *nom. inval.* = *Aegilops triuncialis* L. x *Triticum turgidum* L. ssp. *durum* (Desf.) Husn. – Note: the same cross as earlier Oehler's (1936: 29) x *Aegilotricum triuncialis-durum.*

x **Aegilotriticum longleyi** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Longleyi*'), *nom. inval.* = *Aegilops triuncialis* L. x *Triticum aestivum* L. ssp. *compactum* (Host) MacKey.

x **Aegilotriticum mcfaddensii** Cif. & Giacom., Nomencl. fl. ital. 1: 180 (1950, '*Mc-Faddensii*'), *nom. inval.* = *Aegilops uniaristata* Vis. x *Triticum turgidum* L. ssp. *dicoccoides* (Körn. ex Asch. & Graebn.) Thell.

x **Aegilotriticum monaristatum** Cif. & Giacom., Nomencl. fl. ital. 1: 180 (1950), *nom. inval.* = *Aegilops uniaristata* Vis. x *Triticum monococcum* L. ssp. *monococcum.*

x **Aegilotriticum monotoides** Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950), *nom. inval.* = *Aegilops speltoides* Tausch x *Triticum monococcum* L. ssp. *monococcum.*

x **Aegilotriticum oehleri** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Oehleri*'), *nom. inval.* = *Aegilops triuncialis* L. x *Triticum turgidum* L. ssp. *dicoccon* (Schrank) Thell. – Note: the same cross as earlier Oehler's (1934: 265) x *Aegilotricum triuncialis-dicoccon.*

x **Aegilotriticum sandoi** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Sandoi*'), *nom. inval.* = *Aegilops triuncialis* L. x *Triticum aestivum* L. ssp. *spelta* (L.) Thell.

x **Aegilotriticum searsii** Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950, '*Searsii*'), *nom. inval.* = *Aegilops speltoides* Tausch x *Triticum turgidum* L. ssp. *dicoccoides* (Körn. ex Asch. & Graebn.) Thell.

x **Aegilotriticum speltaffine** Cif. & Giacom., Nomencl. fl. ital. 1: 180 (1950), *nom. inval.* = x *Aegilotriticum blaringemii* Cif. & Giacom. x *Triticum turgidum* L. ssp. *durum* (Desf.) Husn.

x **Aegilotriticum speltopheevii** Cif. & Giacom., Nomencl. fl. ital. 1: 180 (1950), *nom. inval.* = *Aegilops speltoides* Tausch x *Triticum timopheevii* (Zhuk.) Zhuk. ssp. *timopheevii.*

x **Aegilotriticum spelturgidum** Cif. & Giacom., Nomencl. fl. ital. 1: 180 (1950), *nom. inval.* = *Aegilops speltoides* Tausch x *Triticum turgidum* L. ssp. *turgidum.*

x **Aegilotriticum sphaerovatum** Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950), *nom. inval.* = *Aegilops geniculata* Roth x *Triticum aestivum* L. ssp. *sphaerococcum* (Percival) MacKey.

x **Aegilotriticum tschermakii** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Tschermakii*'), *nom. inval.* = *Aegilops geniculata* Roth x *Triticum turgidum* L. ssp. *dicoccoides* (Körn. ex Asch. & Graebn.) Thell.

x **Aegilotriticum unipheevii** Cif. & Giacom., Nomencl. fl. ital. 1: 180 (1950), *nom. inval.* = *Aegilops uniaristata* Vis. x *Triticum timopheevii* (Zhuk.) Zhuk. ssp. *timopheevii.*

x **Aegilotriticum unilopoides** Cif. & Giacom., Nomencl. fl. ital. 1: 180 (1950), *nom. inval.* = *Aegilops uniaristata* Vis. x *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell. – Note: *Triticum aegilopoides* at Ciferri & Giacomini

(1950: 180), but this name at species level is illegitimate (see 5.4.3, Table 9).

x **Aegilotriticum ventricare** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950), *nom. inval.* = *Aegilops ventricosa* Tausch x *Triticum aestivum* L. ssp. *aestivum* – Note: *T. vulgare* instead of *aestivum* at Ciferri & Giacomini (1951: 51). See note 2 at 4.2.2.4, x *Aegilotriticum rodetii*.

x **Aegilotriticum ventridurum** Cif. & Giacom., Nomencl. fl. ital. 1: 180 (1950), *nom. inval.* = *Aegilops ventricosa* Tausch x *Triticum turgidum* L. ssp. *durum* (Desf.) Husn. – Note: the same hybrid as x *Aegilotriticum rodetii* but artificially created. See note 2 at 4.2.2.4.

x **Aegilotriticum vonbergii** Cif. & Giacom., Nomencl. fl. ital. 1: 51 (1950, '*Von-bergii*'), *nom. inval.* = *Aegilops geniculata* Roth x *Triticum turgidum* L. ssp. *turgidum*.

Specimens examined (specimens of accepted species are listed under 4.2.2.1-4.2.2.7. In total around 500 specimens of hybrids were examined):

***Aegilops* x *Aegilops* hybrids** (female parent x male parent):

biuncialis x peregrina var. peregrina: EUROPE: GREECE, ISLANDS: SERIFOS: Livadion, near Serifos town, *Runemark & Bentzer 27289* (LD).

biuncialis x triuncialis: EUROPE: BULGARIA: Sadovo, station of IIPGR, *van Slageren & Zacharieva MSMZ-90244H* (ICARDA, IIPGR).

columnaris x triuncialis: EUROPE: RUSSIA, DAGHESTAN: station of WIR at Derbent, *van Slageren & Boguslavskii MSRB-90160H* (ICARDA).

crassa x cylindrica: EUROPA: ARMENIA: canyon Rasdan river, in Erevan, *van Slageren & Gandilyan MSPG-92058* (ICARDA).

cylindrica x triuncialis: EUROPE: RUSSIA, DAGHESTAN: station of WIR at Derbent, *van Slageren & Boguslavskii MSRB-90152H, 90202H* (ICARDA).

geniculata x peregrina var. peregrina: EUROPE: CYPRUS: Ayios Antonios, Sotira, *Della s.n.* (ARI 2038, 3031, 3060, 3063); Kiti beach, Larnaca, *Della s.n.* (ARI 3047, 3059); Amathus, *Holub s.n.* (K); S Kyrenia, *Lang 24* (B); Kokkinotrinithia, *Syngrassides 335* (CYP, K).

geniculata x triuncialis: EUROPE: FRANCE: Campagne, *Loucky s.n.* (ex hb. Cosson) (P). BULGARIA: Sadovo, station of IIPGR, *van Slageren & Zacharieva MSMZ-90240H, 90241H* (ICARDA, IIPGR).

neglecta x biuncialis: EUROPE: BULGARIA: Sadovo, station of IIPGR, *van Slageren & Zacharieva MSMZ-90242B* (ICARDA, IIPGR). UKRAINE, CRIMEA: Tarchankut, *Tzvelev & al. 1108* (LE).

neglecta x cylindrica: EUROPE: BULGARIA: Sadovo, station of IIPGR, *van Slageren & Zacharieva MSMZ-90242A* (ICARDA, IIPGR). RUSSIA, DAGHESTAN: Dzhalgan Mt., near Derbent, *Boguslavskii s.n.* (WIR).

neglecta x triuncialis: EUROPE: BULGARIA: Sadovo, station of IIPGR, *van Slageren & Zacharieva MSMZ-90242H* (ICARDA, IIPGR). FRANCE, VAR: near Toulon, *s.coll., s.n.* (FI).

triuncialis x cylindrica: ASIA: TURKMENISTAN: Kara-Kala reg., near Seiwan farm, near Sakar, *van Slageren & al. MSPGZK-91129H* (ICARDA). EUROPE: RUSSIA, DAGHESTAN: Dzhalgan Mt., near Derbent, *Boguslavskii s.n.* (WIR); station of WIR at Derbent, *van Slageren & Boguslavskii MSRB-90170H* (ICARDA).

triuncialis x peregrina var. peregrina: EUROPE: CYPRUS: Kyrenia, *Casey 445* (K); Agios Antonios, *Della 2035* (K); ibid., Sotira, *Della 2039* (K).

***Aegilops* x *Triticum* hybrids** (female parent x male parent):

Ae. biuncialis x T. turgidum ssp. dicoccoides: ASIA: LEBANON: Rachaya reg., near Qauqaba, coming from Sahmor, *Valkoun et al. JVMSSK-93067* (ICARDA).

Ae. biuncialis x T. aestivum ssp. aestivum: ASIA: LEBANON: Jebl Liban reg., Ba'albek, near Yamouni, coming from Ainata, *Valkoun et al. JVMSSK-93103* (ICARDA).

Ae. columnaris x T. turgidum ssp. durum: EUROPE: BULGARIA: Sadovo, station of IIPGR, *van Slageren & Zacharieva MSMZ-90243H* (ICARDA, IIPGR).

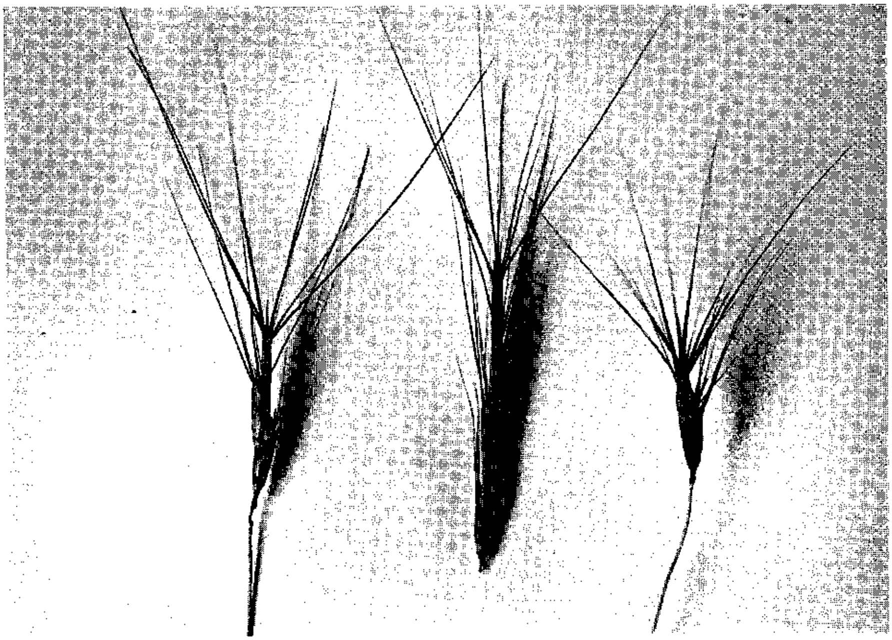


Fig. 7. Natural hybrid (centre, *van Slageren & Boguslavski MSRB-90188H*, ICARDA) of *Aegilops triuncialis* (left) and *Ae. biuncialis* (right) in a grassland on the eastern slope of Dzhalgan Mt., near Derbent, Daghestan, Russia.

Ae. columnaris x Triticum (4n/6n): EUROPE: ITALY: s.loc., given by Campbell to *Chiovenda s.n.* (BOLO).

Ae. crassa x T. aestivum ssp. aestivum: ASIA: IRAN: Karaj to Qasvin, 20 km before Qasvin, *van Slageren & Nikpour MSMN-93152H* (ICARDA). UZBEKISTAN: Kaplanbek, *Popova s.n.* (WIR 1624, 1629, 1635, 1638); 20 km from Tashkent to Kaplanbek, *Popova s.n.* (WIR 1628, 1639); near Yang-Arik, *Popova s.n.* (WIR 1625, 1630, 1636, 1637); Dzhizak to Gallya-Aral, *van Slageren & al. MSP-GAP-91153H, 91158H* (ICARDA, YAI).

Ae. cylindrica x Triticum (4n): ASIA: IRAN: Bushire, *Köie 1042* (C, K, LE, type of *Aegilops bushirica*).

Ae. geniculata x T. turgidum ssp. durum: AFRICA: ALGERIA: Radjradj, near Berrouaghia, received from *Trabut* by WIR (WIR 1626). EUROPE: ITALY, ISLANDS: SICILY: W Catania, *Vavilov s.n.* (WIR 1627). RUSSIA, DAGHESTAN: Station of WIR at Derbent, *Zhukov 60* (WIR).

Ae. geniculata x T. aestivum ssp. spelta 'barbatum': CULT.: EUROPE: FRANCE: s.loc., *Godron 4* (P).

Ae. juvenalis x T. aestivum ssp. aestivum: EUROPE: RUSSIA, DAGHESTAN: Station of WIR at Derbent, *Boguslavskii 681* (WIR), *863* (FI, GAT, K, NY, W).

Ae. neglecta x T. aestivum ssp. spelta: ASIA: AZERBAIJAN: Baku prov., Achmedlu, *Holmberg 628, 628b* (LD).

Ae. neglecta x T. turgidum ssp. durum: ASIA: TURKEY: Boudja, near Izmir, *Balansa s.n.* (L).

Ae. speltoides var. ligustica x T. aestivum ssp. aestivum: ASIA: SYRIA: Jezira, just W Qamishly to Amuda, *van Slageren & Sweid MSFS-91047aH* (ICARDA).

Ae. speltoides x Triticum sp. (4n/6n): ASIA: SYRIA: Jezira, Wadi er Radd, *Pabot s.n.* (G).

Ae. triuncialis x T. aestivum ssp. spelta: EUROPE: AZERBAIJAN: Baku prov., Achmedlu, *Holmberg 633* (K, LD), *629, 633b, 927, 928* (LD, labels give '*T. spelta* x *Ae. triuncialis*'); Baku, Sitek, *Holmberg 465* (LD); Baku, *Holmberg 361, 882* (LD).

Ae. umbellulata x T. aestivum ssp. aestivum: EUROPE: RUSSIA, DAGHESTAN: Station of WIR at Derbent, *Boguslavskii 864* (FI, GAT, K, NY, W), *s.n.* (WIR).

Ae. ventricosa x T. aestivum: CULT.: EUROPE: FRANCE, ESSONNE: (garden of de Vilmorin at) Verrières-le-Buisson, near Paris, *Grönland s.n.* (MPU, sub nom. *Aegilops rodeti*!).

***Aegilops* x *Aegilops* hybrids of unclear parentage** (notation female x male parent or vice versa cannot be given):

biuncialis x cylindrica: EUROPE: BULGARIA: in Pemik, above old town, *van Slageren & al. MSMZNN-90294H* (ICARDA, IIPGR).

biuncialis x geniculata: EUROPE: CYPRUS: Kyrenia, *Atherton 1322* (K).

biuncialis x neglecta: ASIA: TURKEY: 208 km SW Ankara, *Johnson & Hall s.n.* (UCR).

cylindrica x columnaris: EUROPE: ARMENIA: garden of ERE, Erevan (material originating from Erebuni Nature Reserve), *van Slageren & Gandilyan MSPG-92040* (ICARDA).

cylindrica x triuncialis: EUROPE: BULGARIA: NE Svilengrad, close to Turkish border, *van Slageren & Zacharieva MSMZ-90233A* (ICARDA, IIPGR).

neglecta x triuncialis: EUROPE: BULGARIA: Haskovo to Ivanovo, *van Slageren & Zacharieva MSMZ-90222A* (ICARDA, IIPGR); near Kaprivlen, S of Goce Delcev, *van Slageren & al. MSMZNN-90261A* (ICARDA, IIPGR); near Rozen, close to Rozenski Monastir, *van Slageren & al. MSMZNN-90272A* (ICARDA, IIPGR). FRANCE: Montpellier, *Lehmann s.n.* (Z). RUSSIA, DAGHESTAN: E slope Dzhalgan Mt., W of Derbent, *van Slageren & Boguslavskii MSRB-90186H* (ICARDA).

triuncialis x biuncialis: EUROPE: RUSSIA, DAGHESTAN: E slope Dzhalgan Mt., W of Derbent, *van Slageren & Boguslavskii MSRB-90188H* (ICARDA).

triuncialis x cylindrica: EUROPE: RUSSIA, DAGHESTAN: E slope Dzhalgan Mt., W of Derbent, *van Slageren & Boguslavskii MSRB-90187H* (ICARDA).

4.3 Phylogeny — Fig. 8

Clayton & Renvoize (1986: 158) summarized the evolutionary history of *Aegilops* (*sensu lato* as they include *Amblyopyrum* as a section) in what may be called their 'canopy model'. They state that about half of the species are diploid – it is 11 out of 23 species accepted here in the *Aegilops – Amblyopyrum* group – and it is supposed that these have produced occasional hybrids, which have doubled their chromosome number to form amphidiploids. Following this, the buffering effect of shared genomes has then made possible an elaborate network of cross-fertilization at the tetraploid level, while at the same time developing self-pollination as the dominant breeding mode. This system thus provides a rich and readily available source of genetic variation: the self-pollination enables the fitness needed for mass colonization in a changing environment such as the opening up of new agricultural and horticultural lands (Zohary & Feldman, 1962: 59), while through the occasional occurrence of cross-pollination at both the diploid (see, e.g., Ankory & Zohary, 1962) and the tetraploid level (see the compilation by Zohary, 1966) the flexibility for renewed adaptation to a gradual change in environment is maintained. It has proven to be particularly suitable in the dry Mediterranean environments (see also 6.1.4).

Hammer (1980a: 130) assumed that allogamous, self-incompatible plants, resembling species of the *Sitopsis* section – especially *Ae. speltoides* – were ancestral to the genera *Aegilops* and *Amblyopyrum*. He based this on the combination of anther length and the amount of pollen produced, for which he found strong positive correlations. Long anthers that produce great amounts of pollen are an indication of allogamy, with reductions in anther size and/or amount of pollen pointing at increasing autogamy. Pollen-counting being too laborious, Hammer took 'anther length x width' as the criterium, and developed a plausible model of evolution. Elaborating on his model the following scenario is presented below. [Note that '2a' indicates that this separate item – hypothetically – occurred at the time of '2'.]

1 Hammer supposed (l.c., 1980a: p. 140, Fig. 35) the origin of the genus to be in Transcaucasia. From here on, owing to the increasing drought in the late Pleistocene, many grass species, including the ancestral stock of *Aegilops – Amblyopyrum*, started spreading in western and southwestern directions. The areas of distribution of the diploids can thus be explained: the more primitive, the closer to this centre of origin. Thus *Amblyopyrum muticum* and *Aegilops speltoides*, the former restricted to Turkey and Armenia, the latter in Turkey, reaching Bulgaria and along the Fertile Crescent arc, may be considered the most primitive species. Speciation of the *Sitopsis* group apparently happened mainly on the western arc of the Fertile Crescent, with the species with the smallest anthers (*Ae. bicornis*) reaching the furthest (the coast of Cyrenaica in Libya). Other diploids reached the eastern Mediterranean (*Ae. uniaristata, Ae. comosa*), or only partly so (*Ae. caudata, Ae. umbellulata*); one diploid spread mainly to the east (*Ae. tauschii*). In this old group speciation is relatively strong as is shown by, e.g., the reported sterility of artificial hybrids of *Sitopsis* species, for example between *Ae. searsii* and *Ae. longissima* (Feldman & Kislev, 1977: 198). On the other hand, the close genetic relationship of the species in the *Sitopsis* section also accounts for the possibility of fertile F_1s to be produced (Waines, 1969), and the partial allogamy still enables occasional hybridization (see, e.g., Ankory & Zohary, 1962) to occur naturally.

2 Coinciding with the phenomenon, noted at '1', has been a gradual change in fertilization mechanism within the diploids from obligate allogamy (*Ae. speltoides, Amblyopyrum muticum*) to facultative autogamy (e.g., *Ae. caudata, Ae. comosa, Ae. longissima*). Higher levels of autogamy are associated with lower values for 'anther length x width' (as scored by Hammer, 1980a: p. 130, Fig. 32). This development happened at the lowest, most primitive ploidy (here: diploid) level. [It must be noted that this model of distribution, speciation and change to autogamy also can be applied to the wild taxa of *Triticum*. Hammer (1980a: 144) notes that the anther length of the diploid *Triticum* is shorter than of the *Sitopsis* species, while other characters could be interpreted as reductions or subsequent changes in any of the two groups, e.g., two versus only one keel, hairy versus glabrous rachillae, and 1-2 versus 2-3 kernels per spikelet. This, as well as the distribution patterns, underline development of both groups out of a common ancestor, with, according to Hammer, the flower biology of the diploid *Triticum* considered more derived and of *Aegilops* more close to the common ancestor.]

2a At the (early) stage during the late Pleistocene it is supposed that *Amblyopyrum muticum*, an obligate allogamous species, separated from the common stock during the westward migration through Asia Minor (Hammer, 1980a: 132). Eig

(1929b: 204) had previously considered this an old species, being most closely related to the oldest section of *Aegilops* (his sect. *Platystachys* = sect. *Sitopsis*), and showing relatively little plasticity in its morphology. Many morphological characters place this species apart from all *Aegilops* species (enumerated in the key at Chapter 9), while karyotype analysis later showed similarity with what is considered the most primitive *Aegilops*: *Ae. speltoides* (Chennaveeraiah, 1960: 158).

3 After this stage further evolution occured through polyploidization. According to Zohary & Feldman (1962) this has been through the formation of a restricted number of amphidiploids, sharing a common genome, and followed by hybridization among them. The shared genomes caused an ecological and genetical buffering effect, which is an advantage in adapting to changing environments and enabling rapid colonization. Simultaneously, a further change occurred in reproductive strategy towards almost complete autogamy with occasional cross-pollination. Typical examples of the success of this development are the widespread tetraploids *Ae. geniculata* and *Ae. triuncialis*, but it must be noted that this mode of reproduction is already developed by 'advanced' diploids as *Ae. tauschii* and *Ae. umbellulata* (Hammer, 1980a: 126).

4 Out of the initial distribution of the diploids the tetraploids spread further westwards along the Mediterranean basin, as well as in more northern and eastern directions. This process continued until halted by natural boundaries and lack of suitable environments, such as the Saharan and Arabian deserts, the central Asian steppes, the Tian Shan and Himalayan Mountains or the coldness of the continental climate (which particularly affected the spread to the north and east).

5 The complicated interactions that happened in the process of polyploidization resulted in an intergrading network of forms and reproduction strategies that make it impossible to point at any direction of the evolution at this stage (see below). The tetraploid stage is apparently dominant and a further development into hexaploids has been limited. The small areas of distribution of the hexaploids are commented upon in 6.1.1.

Elucidating the phylogeny of *Aegilops* at the generic level or below inevitably leads to the consideration of whether its delimitation is sound and/or natural. From a *theoretical* point this is not the case. If a classification of the *Aegilops – Amblyopyrum* group reflects evolutionary history the recognized taxa should be monophyletic. In the Triticeae the genomic classification of Löve (1982, 1984) attempts to pave the way for this. His system assumes that: (1) a genome type equals a genus, and (2) a genome type should be the single most important determiner for the designation of terminal taxa (in any forthcoming phylogenetical analysis). For *Aegilops* this has led to its split-up into 12 genera (13 when *Amblyopyrum* is included; more on this issue at 5.2). Some of these 'split-genera' are monogenomic, can therefore be considered truly monophyletic, and should consequently appear as terminal taxa in a cladistic analysis. This is the case for *Amblyopyrum* and the diploid *Aegilops* 'genera', which appear as terminal clades in a parsimonious tree of the monogenomic groups in the Triticeae (Fig. 8; see also Kellogg, 1989: Fig. 1).

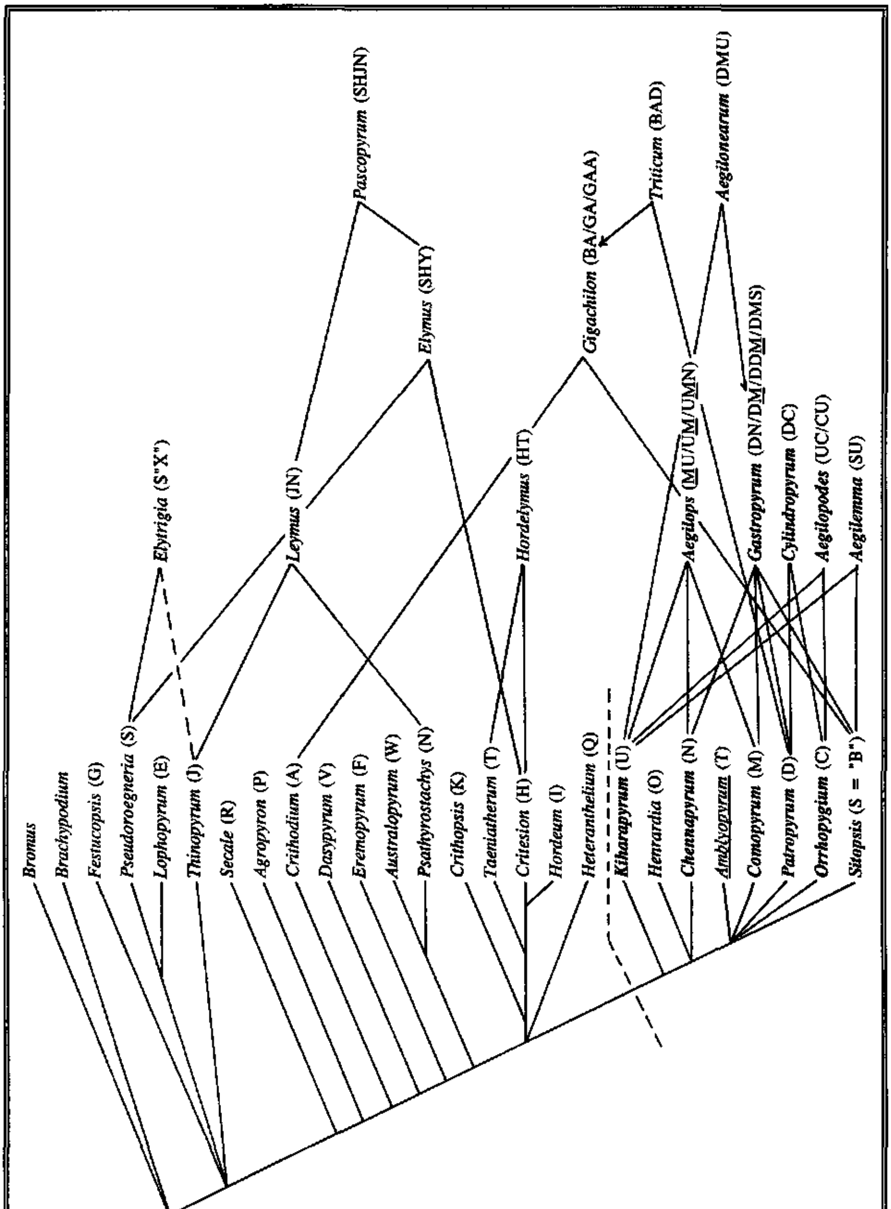


Fig. 8. Cladogram (modified after Kellogg, 1989) of monogenomic genera *sensu* Löve (1984) in the tribe Triticeae. *Aegilops* 'genera' in **bold**, *Amblyopyrum* underlined. Genomic formula for *Aegilops / Amblyopyrum / Triticum* as defined in this publication are according to Waines & Barnhart (1992); the others according to Kellogg (1989).

However, many genomic '*Aegilops*' genera are characterized by a combination of genome types, e.g., *Aegilops sensu* Löve comprises species with the combinations UM, MU, and UMN, thus involving three different genomes (U, M and N) in original (U, N) and modified (M) forms, and must still be considered polyphyletic. A heterogenomic species like *Aegilops triuncialis* (genomes UC and CU; see Table 2) is even considered multiple polyphyletic with its genome combination arising after many reciprocal crosses (in both directions; see Table 2 and its note 6) of the putative parents *Ae. caudata* (genome C) and *Ae. umbellulata* (genome U) (Kellogg, 1989: 797). A recent cladistic analysis of the Triticeae (Frederiksen & Seberg, 1992: 19) suggested that even the coherent *Sitopsis* section of S-genome species may be polyphyletic, but *not* along the line of *Ae. speltoides* vs. the other for species (as expressed by the glume morphology and divided accordingly into two subsections by Eig, 1929a: 69-70), but as *speltoides – sharonensis – bicornis* vs. *longissima – searsii*, and mainly based on characters relating to the disarticulation mechanism. Several recent cladistic analyses of the Triticeae (Kellogg, 1989; Frederiksen & Seberg, 1992) nevertheless show a major clade to be represented by all genomically defined split-genera of *Aegilops* (Fig. 8; Kellogg, 1989: 802), added by *Henrardia*, a genus that frequently accompanied *Aegilops – Amblyopyrum – Triticum* in earlier phenetic, numerical analyses (Baum, 1978a: Fig. 44-46; 1978b: Fig. 1; see also 5.2 and 5.3), as well as in an earlier phylogenetic analysis (Baum, 1983: Fig. 15; see also 5.2.2 at '6'). *Henrardia* is also regarded as related to *Aegilops* by Clayton & Renvoize (1986: 147 (Fig. 13), 158), especially to the section *Vertebrata*. It is therefore not surprising that Kellogg suggests keeping the delimitation of *Aegilops* in its 'traditional' sense, although with the inclusion of *Amblyopyrum* (l.c., p. 804, Tab. 3).

As allopolyploidy and homoploid recombinational speciation are frequent in the Triticeae (Jauhar & Crane, 1989: 574), the origin of the tribe is polypheletic and its evolution at least partially reticulate. On a smaller scale this is also true for the *Aegilops – Amblyopyrum* group in whatever delimitation we can think of, and in spite of the fact that common, solely morphological, characters can define these genera.

Clayton & Renvoize (1986) conclude that, because of the intergradation at the tetraploid level, the diploid species are more distinct among themselves than the species at higher ploidy levels. This, in my opinion, is less true than may be expected theoretically (the morphology and genetic identity is more crystalized in the more primitive diploid species than in the more recently developed tetraploids). The diploid *Sitopsis* species are sometimes difficult to separate, especially as they occasionally produce hybrid swarms, displaying intermediate forms (e.g., between *Ae. sharonensis* and *Ae. longissima*, see Ankory & Zohary, 1962: Fig. 1) in a way similar to that of many tetraploids. From a practical, taxonomic point of view most species are equally distinct at all ploidy levels. The clusters of *Ae. biuncialis – neglecta – columnaris* and *Ae. kotschyi – peregrina* are the most difficult to separate. Of course, the many interspecific hybrids that can be found (see Table 7 at 4.2) will always blur clear-cut distinctions.

5 *Aegilops*, *Amblyopyrum* and *Triticum* are separate genera

5.1 Taxa delimitation in *Aegilops* and *Amblyopyrum*

The great morphological variation displayed within many species in the *Aegilops* – *Amblyopyrum* group has been the cause for extensive recognition of taxa below this rank. In contrast, the rank of species itself and its delimitation does not seem to have been the cause of much disagreement.

During the 'Linnaean history' of *Aegilops sensu lato* many new taxa were described and mainly classified as species (see above at Fig. 2). This resulted in its growth from the initial five species in 1753 to 22 in 1929 (see also 3.2). The many botanists and (cyto)geneticists who have dealt with the genus since the monographs of Zhukovsky (1928; 19 species) and Eig (1929a; 22 species), have not put forward any fundamental change in this number, which has only varied between 21 and 23. Also genome analysis by, e.g., Kihara (1940: 61 – 23 species, 1954: 342 – 21 species) has not radically changed the species concept, but rather highlighted different affinities among them. At the species level the major features have been: (1) whether some species should be included in other species or not (e.g., *Ae. peregrina* also comprising *Ae. kotschyi*, and *Ae. speltoides* including *Ae. aucheri* (sic! he probably meant *Ae. ligustica*) as proposed by Kihara, 1954: 342), and (2) an oscillation between the status of species or that of subspecies or variety of some well-recognized taxa: *Aegilops speltoides* and *Ae. ligustica* separate or within *Ae. speltoides*; *Ae. comosa* and *Ae. heldreichii* versus only *Ae. comosa*; *Ae. triuncialis* and *Ae. persica* or both in *Ae. triuncialis*. But even in these clear cases the non-typical variant was sometimes created at infraspecific rank (e.g., *brachyathera* as a variety of *Ae. triuncialis* (Boissier, 1884)), and later transferred, eventually to their current species. When compared with the last overview by Hammer (1980a, 1980b) the number of species has remained the same in this new revision, but a drastic reduction in subspecific taxa is proposed.

An entirely different situation has developed regarding taxa below species level. Next to morphological differences, be they great or small, that were given taxonomic recognition this situation is compounded by the fact that most species are known to be autogamous and thus the identity of any special form may be maintained to a large extent. Taxonomic recognition of this phenomenon will thus pave the way for, e.g., 27 taxa within *Ae. geniculata* or 26 taxa within *Ae. triuncialis*. When applied to the similarly autogamous wild taxa of *Triticum*, it would lead to no less than 61 infraspecific taxa in the case of *T. monococcum* ssp. *aegilopoides* (cf., Dorofeev & Korovina, 1979, sub nom. *T. baeoticum*)! This would result in a strict, morphologically based, and rigid classification of what is a continuous genetic spectrum within a species. It would also be open-ended to accomodate new forms not yet found, which would not completely fit into this fine-mazed system.

This type of detailed system for *Aegilops* and *Amblyopyrum* was proposed in the last revision by Hammer (1980a, 1980b). His categories of subspecies, variety and forma were motivated as follows:

1. The subspecies category encompasses not only the traditional geographical definition, but also forms with a different chromosome number, as well as various ecotypes and physiological races (as defined by Stace, 1976), even when the morphological differences are limited (Hammer, 1980a: 47). Also, distinctly differing morphology, combined with diverging areas of distribution (examples: *Ae. tauschii* ssp. *tauschii* and ssp. *strangulata*, *Ae. comosa* ssp. *comosa* and ssp. *heldreichii*), and related taxa with known reproductive isolation (e.g., *Ae. longissima* ssp. *longissima* and ssp. *sharonensis*), are assigned subspecies rank by Hammer. His examples are, however, curious: there is considerable variation in the forms of *Ae. tauschii*, which all show intergradations among them (pers. obs., and Kim et al., 1992: 510), and which have a non-divergent distribution. The *comosa* forms, although different in morphology (compare Figs. 26 and 28) are clearly sympatric (see Figs. 27 and 29). The '*longissima*' and '*sharonensis*' are indeed reproductively isolated, except at recently disturbed sites (Waines & Johnson, 1972), which, together with differences in morphology, genome and seed proteins, and an almost completely allopatric distribution, underlines a good separation at the species level.

2. Varieties and formae are not sympatric but distinguished on presence or absence of pubescence, minor variations in pubescence (sic) or on difference in colour (Hammer, 1980a: 48). The hairiness, mainly of the glumes, I have found to vary in all grades possible, while the discolouration of herbarium material poses extra problems.

In my opinion this system is as over-elaborate and inflexible for the classification of the wild taxa as it is for 'groups' such as the major wheat cultivars (Dorofeev & Korovina, 1979; see MacKey's (1981) critique on their classification). In accord with MacKey I prefer a drastic lumping at the infraspecific level, leading to a more simple and flexible classification, which can deal with future emendations in, e.g., colour, hairyness, length of awns, size of plants, etc. Such a system is also practical for users such as gene banks, who, in my experience, have hardly recognized infraspecific taxa in *Aegilops sensu lato*. Also I found that breeders, exploring the variation in the wider gene pool of a crop, are only interested in the source itself – the population or single head progeny – of a desirable character, rather than in its detailed classification.

As a result I decided to maintain only clear discontinuities in, preferably, several (but sometimes only one) characters within species. If these had been corroborated by distinction in ecology or geography, their rank would have been that of subspecies (cf., Davis, 1965: 1). As only local or regional variation was observed without geographical distinction, the rank of variety has been assigned to all these non-typical forms. Only five are here maintained in *Aegilops* and one in *Amblyopyrum*. Thus, for example, the clear difference in hispid hairiness of *Amblyopyrum muticum* is expressed in the two (sympatric) varieties *muticum* and *loliaceum*, but Gandilyan's (1975) varieties, based on glume hairiness and seed colour (e.g., var. *pual* = pubus + albus; var. *nurub* = nudus + rubrus), are not recognized.

5.2 *Aegilops* and *Triticum* are separate genera **Table 8**

5.2.1 Discussion

An overview of the treatment of the two genera is presented in Table 8, using the major treatments of *Aegilops* (see 3.2) as reference points. Although as many as 153 floras (including some prodromi) are included in the survey it is not exhaustive, and interpretation should be made with care. Whether *Aegilops* and *Triticum* should be united or not and on what grounds was not an issue since the inception of both genera in 1753 up to the end of the 19th century. Up to 1851 only Forsskål's *Flora aegyptiaco-arabica* located an *Aegilops* species under *Triticum* (*Ae. bicornis*, l.c., 1775: 26), but the genus *Aegilops* as such was not mentioned by him. Up to Boissier's fifth volume of the *Flora orientalis* from 1884, Grenier & Godron's (1856) classification of *Aegilops* as a section of an enlarged *Triticum* was almost the only one uniting the two genera. [The natural hybrids of the two genera were incorporated along with the cultivated wheats in the section *Eutriticum*. See also at 4.2.1.] The only other one inspected in this survey is de Cesati, Passerini and Gibelli's *Compendio della flora italiana* of which the part with *Aegilops* – *Triticum* appeared in 1869. This book, however, is more a prodromus with generic descriptions and keys than a flora, and cites '*Triticum* Gr. et Godr.' thereby directly referring to Grenier & Godron's flora.

At the end of the last century several authoritive treatments of the plant kingdom appeared, which located *Aegilops* either as a part of *Triticum* but without rank, e.g., Bentham & Hooker's (1883) *Genera plantarum* and Richter's (1891) *Plantae europeae*, or (again) as a section of *Triticum*, e.g., Hackel in Engler & Prantl's *Die natürlichen Pflanzenfamilien*, Vol. 2(2) (1887) and von Dalla Torre & Harms' (1900) *Genera siphonogamarum*. Hackel, however, calls his *Aegilops* and *Sitopyros* 'schwach geschiedene Sectionen' [weakly separated sections], (l.c., 1887: 80), separating them with the one character that covered all species of both groups: 'glumes weakly curved, not or unclearly keeled' (*Aegilops*) vs. 'glumes with sharp keel' (*Sitopyros*). This glume character was mentioned as early as 1850 in the emendation of *Aegilops* in Jaubert & Spach's *Illustrationes plantarum orientalium* (1850: 10), and is still most prominent in recent floras (e.g., Bor, 1968: 23; Davis, 1985: 163; Feinbrun-Dothan, 1986: 155), and overviews of the grasses (e.g., Pilger, 1954: 315; Clayton & Renvoize, 1986: 149). [Note that if *Triticum* had only comprised the wild taxa the glabrous viz. bearded margins of the rachis segments would have been a good, additional character.]

Especially since Hackel's (1887) treatment a notable increase in floras that place *Aegilops* under *Triticum* – for example the treatment in the authorative *Synopsis der mitteleuropäischen Flora* from Ascherson & Graebner (1901-02) – can be seen (Table 8), until the two monographs, by Zhukovsky (1928) and Eig (1929a), firmly re-established the separation of the two genera.

The different treatment of the *Aegilops* – *Triticum* group by Krause (1898: 338-339) is noteworthy. He recognized the presence of hybrids between them, but also of members of this group with *Hordeum*, *Elymus*, and *Secale*. Therefore he proposed uniting these five genera on the basis of their crossability into one, *Frumen-*

Table 8. Floristic treatments of *Aegilops* and *Triticum* between 1753 and 1994 with reference to major *Aegilops* revisions

Period	Number of floras inspected	*Aegilops / Triticum* separate	%
1753-1851	23	22	95.6
1852-1884	16	14	87.5
1885-1929	37	24	64.9
1930-1980	65	59	90.8
1981-1994	12	12	100.0
Total	153	131	85.6

tum Krause (an illegitimate name as he should have taken the name from one of the constituting genera, cf., Butzin (1973: 132)), but immediately subdivided this genus into subgenera with *Aegilops* in its traditional concept being one of them! The notion, however, that taxa – here genera – must be united on the basis of crossability was later picked up by, e.g., Stebbins (1956: 240) and others (see 5.5.2).

It thus appears from Table 8 that most of the floras – arguably for purely practical reasons – maintained the separation of the two genera, but it is noteworthy that individual *Sitopsis* species, as they resemble wild wheats more than the others, were separated from *Aegilops* and put under *Triticum* in several cases. This happened irrespective of Chennaveeraiah's (1960) karyomorphological considerations when he transferred the whole section. Examples are *Ae. bicornis*, which was originally published under *Triticum* by Forsskål (1775: 26), and located as the only species under *Triticum* by, e.g., Kunth (1833: 440), von Steudel (1841: 715), Scholz (1974: 436), and Sherif & Siddiqi in El-Gadi (1988: 112). Also both varieties of *Ae. speltoides* were separated and placed under *Triticum* by, e.g., Parlatore (1850: 507-508), Nyman (1882: 840; 1890: 342), and Gismondi (1950: 155).

Kihara, studying the cytology and genetics of *Aegilops* and *Triticum* since 1918 (Kihara, 1954: 336), published a revised classification of *Aegilops* in 1940 based on his genome analyses, whereby he incorporated the earlier results and generic revision of Senjaninova-Korczagina of 1932. In 1944 both Kihara and McFadden & Sears published evidence that the D-genome of hexaploid wheat was homologous with the genome of *Aegilops tauschii*, while the latter authors also suggested *Ae. bicornis* as the donor of the B-genome of wheat. In 1948 Sears published tables for the *Aegilops* and *Triticum* species with chromosome numbers and formulae (l.c., 1948: Tables 1 and 2). The genetic links between the two genera were thus well established, and their unification was strongly advocated by Stebbins (1956: '...the maintenance of *Triticum* and *Aegilops* as separate genera becomes *an absurdity...*', l.c., 240; my italics). Bowden (1959) appears to be the first to have drawn a taxonomic conclusion from the genetic evidence, and it is remarkable that Kihara never did so. Since Bowden's paper, the taxonomy and nomenclature of the wheat group became more confused than ever because of new principles governing classifications, including those of the Triticeae tribe. On a practical level this has led to a more frequent use of *Aegilops* names under an enlarged genus *Triticum*, and is dealt with in detail at 5.2.2.

5.2.2 Options

Bowden's (1959) proposal to re-order the wheat group set the stage for a series of profound revisions. These include not only *Aegilops – Triticum* but often the Triticeae tribe as well, and are based on widely differing concepts, such as crossability, genome analysis, evolutionary direction and phylogenetic reconstruction. A summary is presented here, with arguments why maintaining the traditional concept of two separate genera, and with *Amblypyrum* also separated, is favoured.

The concepts considered are: (1) unification of *Aegilops* and *Triticum*, thus emphasizing the affinities of the two genera (Stebbins, 1956; Bowden, 1959; Morris & Sears, 1967); (2) separation of the two genera, emphasizing the differences (MacKey, 1968, 1981); (3) partial transfer of *Aegilops*, thus halfway between options (1) and (2) (Chennaveeraiah, 1960); (4) numerical, phenetic analysis of the tribe Triticeae (Baum, 1977, 1978a, 1978b; Schultze-Motel & Meyer, 1981); (5) genomic concept of the tribe Triticeae (Löve, 1982, 1984), and (6) phylogenetic reconstruction of the Triticeae (Baum, 1983; Kellogg, 1989).

1 The merger of *Aegilops* and *Triticum* was first proposed by Stebbins (1956: 238), concluding that only diploid wheat does not contain chromosomes, derived from *Aegilops*, and that with so many genetic links both genera should be united. Bowden (1959), when adapting this idea, considered two options: (1) three separate genera: the diploid wheat parent in *Crithodium* Link, the diploid *Aegilops* parents in *Aegilops* L. emend. Bowden, and all allopolyploids in a third genus, x *Triticum* L. emend. Bowden, or (2) all three groups of (1) united into one genus, *Triticum* L. emend. Bowden. He chose the last option as it would lead to a 'more simple and effective nomenclature' (l.c., 1959: 663). Bowden had linked the traditional separation of the two genera with the notion that is was 'nomenclaturally incorrect'. This is an inappropriate argument, as was argued one year later by Chennaveeraiah, who stated that it is not up to the nomenclature rules to decide about generic delimitation (1960: 154). The preamble of the *Code* clearly states that: '...the purpose of giving a name...is *not* to indicate its characters or history, but to supply a means of referring to it and to indicate its taxonomic rank...' (my italics), and with respect to hybrids the *Code* remarks in note 1 of Art. H.3.4. that 'Taxa which are believed to be of hybrid origin need not be designated nothotaxa.'. If Bowden had been consistent the correct name for his emendated genus would had been x *Aegilotriticum*. He used, however, '*Triticum* L. nom. emend.', thus treating it as a botanical taxon. Gupta & Baum (1986: 145) wanted to restrict the designation of nothotaxa to primary amphidiploids and F_1 hybrids, and suggested that *both* the artificially synthesized taxa such as triticale, x *Triticosecale*, and the naturally evolved bread wheat are established biological units and should be treated as (botanical) taxa. I disagree with Gupta & Baum here, and would rather draw the line of designating a hybrid status at the difference of 'naturally evolved' versus 'artificially created' taxa. When applying this princi-

ple, bread (and other) wheats remain under the botanical taxon name *Triticum* L., while the triticales are under x *Triticosecale* Wittm. ex A.Camus as the correct generic name and authors (see Stace, 1987: 447) and with their nomenclature governed by the *Cultivated Code* (Arts. 8 and 26 are cited by Stace in this respect, l.c., 1987: 445, 452). This is indirectly also Gupta & Baum's opinion when they compare bread wheat with triticale (l.c., 1986: 145). Note that this problem would have interfered with any elaboration of Bowden's (1959: 676) group III, 'other artificial and natural interspecific hybrids', as was correctly remarked by MacKey (1981: 203).

Another problem is the emphasis on crossability. Theoretically this may lead to unification of all genera of the Triticeae into one (Stebbins, 1956: 240), but this has been rejected by many as creating more problems than it solves (e.g., Runemark & Heneen, 1968: 7; MacKey, 1966: 238, 1981: 203), and as being an artificial, single-character subdivision of the tribe. This problem is not unlike the subdivision of the tribe solely on genome type (see below at 5). The merger of *Aegilops* and *Triticum* was later adapted by Morris & Sears (1967) with some changes (e.g., the separation of the *timopheevii* wheats (genome GA) from *T. turgidum* (genome BA)), and is still used by the cytogenetic schools of Columbia, Missouri, and Davis, California, U.S.A.

2 In contrast to Bowden who emphasized the affinities between *Aegilops* and *Triticum*, MacKey (1966, 1968, 1981) argued that different evolutionary tendencies exist in the group. They are towards increased weediness – especially in the polyploids – in *Aegilops*, and towards specialization (that is: selection by man) for tough rachis and free threshing in *Triticum*. [The *Triticum* development as signalled by MacKey, however, refers only to its cultivated members.] Under the influence of man this selection within *Triticum* has relegated almost all hulled and/or brittle-rachis varieties and cultivar groups to gene banks and botanical gardens, unless they are maintained in cultivation (e.g., for good straw quality or special baking properties). Future improvement within the cultivars will only enhance rachis toughness, and threshing and baking quality. However, when revising the group MacKey was caught, in my opinion, in the same nomenclature trap as Bowden was earlier. He felt it 'not against the nomenclature rules' to keep the *Triticum* species with the A-genome separate under *Crithodium*, and *Aegilops* separate for its evolution, but to see the rest of *Triticum* as '...a hybrid genus characterized by all members carrying genome A and B...' (l.c., 1968: 45). But, like Bowden, he also treated his emendated *Triticum* as a botanical taxon and retained its generic name instead of changing its nomenclature to the formula applicable to hybrids. Later he incorporated the concept of a biphyletic origin of the wheats (with the A + G line versus the A + B + D line), and reunited the diploid wheats with the others (MacKey, 1981: 202-203 and Table 5).

His (1968) emendation of *Triticum* also included two 'subgroups', representing the triticales (as 'subgroup' *Triticale* (Tscherm.-Seys. ex Müntzing) MacKey) and the *Triticum* x *Elytrigia* hybrids (as sect. *Trititrigia* MacKey), respectively (note that a rank was only proposed for *Trititrigia*). Both names are invalidly published and can be ignored: the *Triticale* subgroup for Arts. 33.2 (no basionym cited) and 35.1 (no indication of rank, but later given sectional rank by MacKey in 1981) of the *Code*, the sect. *Trititrigia* because of Art. 36.1 (see Stace (1987: 448) for a comment on MacKey's *Triticale* name). It should be noted that x *Triticale* is anyhow superfluous after x *Triticosecale* (Stace, 1987: 447). But besides their invalid publication, MacKey's inclusion of only these intergeneric hybrids and not others appears to be inconsistent. Was he afraid of having to unite all Triticinae genera as well as natural and artificial hybrids involving *Triticum* into a single, emendated *Triticum*, as he denounced in both his 1968 and 1981 papers?

Although referring only to the wild taxa, the argument of a divergent evolution for both genera also follows from Hammer's (1980a) phylogenetic model. The common occurrence of the diploid (and tetraploid) wild *Triticum* species, together with the primitive *Aegilops* species of the *Sitopsis* section, underlines the feasibility of a common ancestor, being followed by a divergent development, even though at a later stage some *Aegilops* species played a part in the evolution of *Triticum* (more arguments at 4.3).

3 Chennaveeraiah (1960) elaborated on Bowden's remarks that species of the *Sitopsis* section closely resemble *T. monococcum*, and concluded that besides this section *Aegilops* is very distinct from *Triticum* (l.c., 1960: 155). On the basis of its widely divergent morphology he singled out *Ae. mutica* as a member of the *Sitopsis* section, although its karyotype is very similar to *Ae. speltoides*. [These karyotype data corroborate Hammer's phylogenetic model in which *Amblyopyrum* at an early phase separated from the ancestral *Aegilops* stock, of which *Ae. speltoides* is thought to be the most primitive representative (see Chapter 4.3).] The contrast in morphology between *Ae. mutica* and all other *Aegilops* species brought Chennaveeraiah to his agreement with Eig (1929b) to position it as the separate genus *Amblyopyrum*. He then transferred the *Sitopsis* section of *Aegilops* to *Triticum* on the basis of: (1) the presence of a rudimentary keel on the (empty) glume, and (2) the presence of a submedian centromere on the chromosomes of both groups. The transfer was, however, made hesitantly and in the hope that the new delimitation of *Aegilops* would make it more distinctive in the Triticeae (l.c., 158-159). This scheme has not been followed for the obvious reason that it is illogical to transfer only one of the *Aegilops* genome donors (the B-genome) to *Triticum*, but not the second one (the D-genome of *Ae. tauschii*) (MacKey, 1968: 39). In addition there is no rudimentary keel on the glumes in the *Sitopsis* species, and Chennaveeraiah must have been deluded by the ridge, which sometimes develops on the outer surface of the glumes of *Ae. speltoides*, and which is in the same place as the genuine keel in all *Triticum* species. An earlier publication by Sarkar & Stebbins (1956), comparing cross-sections of wheats, *Aegilops* and *Agropyron*, clearly showed a rounded keel for *Ae. speltoides* (l.c., 1956: Figs. 15-28). Moreover, the transfer of a group of round-keeled species to *Triticum* would also break down the only sound character separating *Aegilops* from that genus: the presence or absence of a keel on the glumes.

4 Baum analysed the variation in the Triticeae by various numerical techniques (1977, 1978a, 1978b), using as many morphological characters as possible in order to define his 'Operational Taxonomic Units' (OTUs). In his subsequent classification Baum maintained *Aegilops* in its traditional sense, but, surprisingly, *Amblyopyrum* showed up as a separate OTU (l.c., 1977: p. 1719, Tab. 3). Why he did so is nowhere stated, only that he took the characters for his OTUs from floras, monographs, and other treatments, followed by personal checking for consistency. Apparently the morphological differences with *Aegilops* were large enough for Baum to grant separate status to *Amblyopyrum*. After performing cluster analysis using a 45-character matrix, he obtained a total of 43 spanning trees of the tribe Triticeae. All clusters showed *Aegilops* and *Triticum* in the same group, often accompanied by *Amblyopyrum* and to a lesser extent by *Henrardia* and *Dasypyrum*. Baum's 'best' classification included these four genera – the larger wheat group plus *Henrardia* – in one group, but *Aegilops* was considered controversial as *Amblyopyrum* 'could be' united with it (Baum, 1978a: 55).

Investigating only the *Aegilops* (*sensu lato*) – *Triticum* group, Schultze-Motel & Meyer (1981) also defined OTUs on a number of morphological characters. *Aegilops* was represented by 25 OTUs, said to cover 24 species. Their Fig. 1 (l.c., 244) shows what they consider the best clustering, using the Gower coefficient. The 24 species are somewhat deviant from the generally accepted ones: (1) *Ae. crassa* is there twice; I assume these are the 4n and 6n forms, with the 6n probably being *Ae. vavilovii* as this species is lacking; (2) the two varieties of *Ae. speltoides*, as well as of *Ae. comosa* are separate OTUs at species level. They used 11 mathematical and seven clustering methods and produced 70 dendrograms (l.c., 243). In almost all cases *Aegilops* was clearly separated from *Triticum*, with in some cases *Ae. mutica* as a third, separate group. Results were thus rather similar to Baum's analysis at generic level, also in respect to the position of *Amblyopyrum*.

Thus numerical taxonomic methods confirmed the 'traditional' concept of the wheat group.

5 Löve (1982, 1984) reclassified the Triticeae following the extensive analyses of crossability and genomes carried out over the years in this tribe. He felt it logically and biologically most consistent to designate generic status to a genomically homogeneous taxon, based on either a single haplome with or without a polyploid series or on a distinct combination of two or more haplomes (l.c., 1982: 205-206). In 1984 he argued that his 37 recognized genera are clearly distinguished morphologically, and are incompatible or have very low crossability among them (l.c., 1984: 425), suggesting that his scheme is not a single-character classification (which it, in fact, is). The diversity within *Aegilops* and, to a lesser extent, in *Triticum*, consequently led to a split-up into 13 and three genomically defined genera, respectively.

However, the display of intergeneric and interspecific hybridization, illustrated in Chapter 4.2, immediately shows the fallacy of the principles and artificial nature of Löve's scheme. [Some other details: (1) Löve admitted that not all genomes of the taxa were sufficiently studied at that time, and when necessary he resorted to the classical morphological concept (l.c., 1984: 426); (2) he designated genomes A and B, combined as 'AB' and 'AAB' (more correctly 'BA' and 'BAA', see Chapter 5.4.3, Table 9), for *Gigachilon* Seidl (1984: 496), but also included here the *timopheevii* and *zhukovskyi* wheats with their GA and GAA genomes next to the wild and cultivated *turgidum* tetraploids with their 'AB' genome. Their different G genome was already in 1967 a reason to separate them from the *turgidum* wheats (Morris & Sears, 1967: 23), and (3) uniformity was not helped by new designations for several genome types, deviating from those, agreed upon at the International Wheat Genetics Symposia, e.g., 'Z' for *Amblyopyrum muticum* instead of Mt (now T), and 'L' for *Ae. uniaristata* instead of Un (now N). Note that I cite Löve's genome designations here literally as 'AB'. However, consequent citation in the form of 'female parent x male parent' leads to BA, BAD, GA and GAA for the genome types in *Triticum*. See Table 9 below.]

I agree furthermore with criticism levelled at Löve's scheme, which centres around several issues: (1) it ignores function and purpose of taxonomy and nomenclature (Gupta & Baum, 1986); (2) it is a single-character classification, with genome-types generally not connected with morphologically recognizable units; (3) it leads to too many monotypic genera; (4) it is unstable as genome designation and combinations continue to change, and (5) most worrisome of all, the genome designation may be arbitrary divisions within a continuum and thus unreliable (see e.g., Baum et al., 1987; Kellogg, 1989). Even if genome classification is the most useful starting point for phylogenetic reconstruction (West et al., 1988: 1) it has only shown that polygenomic genera cannot be seen as terminal taxa of a cladistic analysis, and thus not as 'good' units in a classification that reflects evolutionary history (Kellogg, 1989; see also Chapter 4.3).

6 Phylogenetic reconstruction has mainly been performed at the tribal level or higher, relating genera with each other. Such an analysis, based on morphology and using his OTUs and character states from his earlier numerical studies – discussed above – was performed by Baum (1983), who used various methods and algorithms to compute the phylogenetic trees (l.c., 1983: 519). Again *Henrardia* accompanied the *Aegilops – Amblyopyrum – Triticum* cluster in most cases, but so did *Elytrigia*, *Roegneria* and *Anthosachne* (Baum, 1983: Figs. 9-12). Another phylogenetic analysis of the tribe using the genomic concept (Kellogg, 1989) is discussed above at 4.3. Here the traditional concept of the genus is abandoned, but all monogenomic split-genera of *Aegilops* as well as *Amblyopyrum* appear as a major clade. Although it is argued here that *Amblyopyrum* should be separated from *Aegilops* (see at 5.3) cladistic analysis does not underscore this viewpoint. The former genus remained part of the major clade, consisting of both genera, added by *Henrardia* (Kellogg, 1989: Fig. 1; Frederiksen & Seberg, 1992: Fig. 1). It is remarkable that I have not come across an analysis *within* the (traditional) genus *Aegilops*, contrary to, e.g., *Avena* (Baum, 1975). Given its complexity and relation with the wheats this is a good subject for a separate publication.

5.3 *Aegilops* and *Amblyopyrum* are separate genera

Since its inception by Boissier (1844b: 74), the isolated position of *Aegilops mutica* Boiss. within the genus has been stressed. Soon after its creation the hispid and glabrous forms were again described as different species, but they were jointly located in a separate subgenus (Jaubert & Spach, 1851a, 1851b). Later monographs or revisions all maintained this distinction, either as subgenus (Eig, 1929a; Hammer, 1980b) or as section (Zhukovsky, 1928).

Boissier (1844b, 1884) considered the species as intermediate between *Aegilops* and *Agropyron*, basing this on the hairiness of the plants and the blunt spikelets (l.c., 1844b: 74: '...Species indumento et spiculis muticis distinctissima inter *Ægilopem* et *Agropyrum*...'). Hairiness of the glumes was described as 'velutino-lanatis' [velvety-woolly] (l.c., 1844b: 74), referring to the typical variety with its hispid glumes, which indeed is not found in any *Aegilops* species (but lacking in the glabrous *loliaceum* forms). The blunt spikelets are also unlike any *Aegilops* and indeed are reminiscent of *Agropyron*. However, the unique glume shape, widest at the erose ('irregularly gnawed', cf., Eig, 1929b: 201) apex and with its diverging nerves, is different from any *Agropyron* species, where the glumes are (narrowly-)oblong to lanceolate-oblong with nerves converging near the apex, and the apex blunt, pointed or (shortly) awned.

Moreover, neither numerical analyses of the Triticeae, nor its phylogenetical reconstruction on the basis of genome types, locate *Agropyron* close to the wheat group (see, e.g., Baum's (1978a: 44, 55) Fig. 28 that he considered his 'best', numerically based dendrogram, and my Fig. 8 / Kellogg's (1989) Fig. 1 of her phylogeny of the tribe Triticeae; both discussed above at 5.2.2).

Also from the various options considered in the relation between *Aegilops* and *Triticum* in 5.2.2, a separate generic status for *Amblyopyrum* may be concluded. Phylogenetic speculation that assumes a change from allogamy (as in *Ae. mutica*) towards almost complete autogamy, coinciding with a divergent development in morphology, makes a separation at an early stage from the ancestral *Aegilops* stock plausible (see Hammer (1980a), and 4.3). Additionally, karyotype analysis (Chennaveeraiah, 1960: 158; see also 5.2.2 at '3') underlines this early separation, confirming Boissier's (1884: 679) speculation that *Ae. mutica* is at most related to *Ae. speltoides*. This is in contrast with Eig (1929b: 202), who thought that *Ae. longissima* was the closest relative, an idea probably founded only on the tallness of the plants and length of the spikes. Numerical analysis (5.2.2 at '4') shows the close relationship of *Amblyopyrum* with *Aegilops* (now *sensu stricto*) and *Triticum*, while, especially in Baum's work, confirming the morphological differences at the same time. Lastly, in phylogenetic analyses based on genome types (see 5.2.2 at '6'), *Amblyopyrum* is a good, monophyletic group, although, admittedly, the relationships of *Amblyopyrum within* the *Aegilops* clade remains at present unresolved (Frederiksen & Seberg, 1992; Frederiksen, 1993).

On the other hand, analysis of the cytoplasm (Maan, 1977) and of nucleotide sequences in the chromosomes (Zhang & Dvořák, 1992) still points at a close genetic relationship with several *Aegilops* species. In the case of the nucleotide sequences with four species, all diploids, that must have been (*Ae. comosa, Ae. uniaristata*) or still are (*Ae. caudata, Ae. umbellulata*) of a very similar distribution in Asia Minor and the eastern Mediterranean (Zhang & Dvořák, 1992: Fig. 3). Thus even nucleotide data can fit into the more general evolutionary model drawn up for the group.

Concluding, I think that a separate generic status for *Amblyopyrum* is justified. Morphological differences of *Amblyopyrum* vs. all *Aegilops* are enumerated in the key of Chapter 9.

5.4 Conclusions, *Triticum* systematics and summary — Table 9

5.4.1 Conclusions

It is remarkable that in the Triticeae the argument of crossability can be used both to unify all genera into one (see 5.2 at '1') and to split up the tribe into no less than 37 genera (5.2 at '5')! Criticism of the two options (e.g., MacKey (1968, 1981), and West et al. (1988), respectively) centres around the notion that both are overemphasizing a single character and are impractical, not only from a taxonomic point of view, but simply at the user-level of, e.g., agronomic studies, wide-crossing in wheat breeding, and gene bank operations. On a smaller scale, even the unification of *Aegilops sensu lato* with *Triticum* has been criticized with the same arguments (both at tribal level and for the wheat group only by, e.g., Miller (1987: 1, 4)).

In view of the various options, discussed at 5.2.2, I therefore conclude that the best and most practical solution is to maintain *Aegilops* and *Triticum* separately in the 'classical', morphological concept. With arguments for a diverging evolution from *Aegilops* of both the cultivated (MacKey, 1968, 1981) and the wild taxa (Hammer, 1980a) of *Triticum*, the separate status of the two genera is the best accommodation to reflect this. The early separation of *Amblyopyrum* from the *Aegilops* stock (see 4.3 and 5.3) has led to my conclusion to confer an independent generic status on *Amblyopyrum*. Subdivision of *Aegilops* will reflect the presence of diploid sections (e.g., *Comopyrum* and *Sitopsis*) vs. (partially-)polyploid sections, and genome types (e.g., *Sitopsis*) vs. polyploid series that combine various genome types (e.g., sections *Aegilops* and *Vertebrata*): Kihara's (1940, 1954) and Kihara & Tanaka's (1970) classification is considered to reflect species relationships best (that is, excluding their section *Amblyopyrum*). [More on subdivisions at Chapter 8.1.]

By keeping *Triticum* separate to include only the cultivated taxa and their closest predecessors, an agronomically useful unit is obtained (MacKey, 1966: 238), designated as the primary gene pool (GP-1) of cultivated wheat. Subsequent application of the gene pool concept will keep the amount of recognized taxa within the cultivars and their wild 'counterparts' to a flexible minimum, enabling analysis of evolutionary trends in both the cultivars and the wild taxa. Moreover, the various degrees of crossability of wild taxa with cultivars are expressed in the classification: *Aegilops – Amblyopyrum* in the GP-2, the wild, directly crossable predecessors of the cultivated wheat under *Triticum* in the GP-1.

5.4.2 A note on a Triticum *classification*

With a lumping species concept for *Aegilops* and *Amblyopyrum* and maintainance of the separation between *Aegilops* and *Triticum*, it may be the place here to consider the consequences for a classification of the taxa in *Triticum sensu stricto*. With this an overview of all taxa in the GP-1 and GP-2 of cultivated wheat is presented, although the extensive literature relating to this subject for cultivated wheat is only partly studied. Description and detailed nomenclature of the *Triticum* taxa are the subject of separate publications, and Table 9 in Chapter 5.4.3 only enumerates the 26 accepted taxa (three sections, six species, four autonym subspecies, and 13 non-typical subspecies) of the genus as I see them at the moment.

With the genome-types being of obvious importance in any classification of *Triticum*, and having the biphyletic origin of the allopolyploids in this genus in mind, the recognition of only six biological 'species' in this genus by MacKey (1981: 203) seems the best classification to me.

These six species evolved from the original five, analysed and enumerated earlier by MacKey (1966: 267-269). The difference is that he included *Triticum urartu* in *T. monococcum* ssp. *aegilopoides* (under the name ssp. *baeoticum*), but it was later shown that the former is a good biological species, separable from *aegilopoides* by various morphological characters and through reproductive isolation (Johnson & Dhaliwal, 1976). The original five species all had a different genome designation, but the genomes of two wild, diploid taxa are both designated 'A' (but obviously somewhat different).

This classification is elegant, simple – and therefore flexible – and based on a genetic concept. In matters of genetic resources and wheat breeding it is not surprising that this system was adopted by the (former) International Board for Plant Genetic Resouces (IBPGR; now IPGRI). It abandons all taxa below the recognition of a (limited) number of cultivar 'groups', which are given subspecies rank, and stands in remarkable contrast with the highly hierarchical, strictly morphological system of Dorofeev & Korovina (1979). However, I agree with Miller (1987: 18) that MacKey's classification of the cultivated tetraploids is somewhat cumbersome, distinguishing a number of convarieties within the subspecies *turgidum*, while other groups are only at the subspecies level. [By contrast the hexaploid *aestivum* cultivars are only subdivided at the subspecies level.]

Infraspecific subdivision of cultivated plants is a much-debated issue, with formal taxonomy enhancing confusion as none of the proposed systems has become widely adopted (Harlan & de Wet, 1971: 513-514). Although the gene pool concept proposes abandonment of all formal categories below the rank of subspecies it does use a number of informal categories, whereby 'variety' is avoided for its confusion with the use of this term in agriculture and horticulture (l.c., 1971: 514). On the other hand, the rank of 'convariety', used by MacKey to group, e.g., the *durum* wheats under the ssp. *turgidum* in the tetraploid BA-genome wheats, is not recognized by the botanical *Code* (Art. 4.1), although it may be added (Art. 4.2).

Because of all the tinkering and hybridizations formal ranks in the cultivated members of *Triticum* have become all but impossible. Recognizable taxa presuppose the presence of discontinuities, while here we have a continuous cline connecting one form with the other. In such a situation one can recognize 'entities' or 'cultivars' or 'convarieties' only. MacKey's (1966) system is an attempt to recognize 'useful' entities in combination with a formal name to maintain a connection with a type specimen and other rules following application of the *Code*, and thus to provide a point of reference. As his system is based on a genetic concept it includes all known combinations of genome types, but neglects whether the resulting entities mean anything more than being 'research materials'. For the moment I have taken his system as the basis for a proposed classification of the wheats, if only because his system at best connects with the practice of gene banks and plant breeders as I have observed over the years.

Thus, there seem to be many obstacles for a practical, infraspecific classification that also reflects (phylo)genetic relationships. Bearing in mind that my classification is a 'state-of-the-art' one that may be modified later, I have distinguished here four categories of taxa in *Triticum* of which I propose to maintain only the first as 'genuine' members of the genus, as follows:

1 Taxa at species and subspecies level, containing only the 'commercially' cultivated wheats and their direct, wild relatives. These are grouped into three sections, six species, four autonym subspecies and 13 non-typical subspecies, enumerated in Table 9.

For these taxa I would prefer the adoption of the subspecies status for, e.g., hexaploid groups such as *macha* and *sphaerococcum*, as used by MacKey (1966), above the loose 'cv. group' designation, used by, e.g., Bowden (1959) and Morris & Sears (1967). This expresses their classification as a *botanical* taxon, similar to the higher ranks of species and genus (see also 5.2.2 at '1'). Each subspecies that represents cultivated material, and which is in a sense a 'cv. group' as mentioned above, should, next to the maintainance of the categorical name and type, consist only of released cultivars, the names of which should remain attached. For example, *Triticum turgidum* L. ssp. *durum* (Desf.) Husn. 'Omrabi', as the official, botanical name of an ICARDA-developed *durum* wheat variety. This is more or less similar to the system proposed for the triticales by Stace (1978: 452). Elevation of MacKey's subspecies to species rank (e.g., by Dorofeev & Korovina, 1979, and Miller, 1987) is not preferred as this obscures the genetic relationships. For example, *Triticum sphaerococcum* Percival and its cultivars have the BAD-genome, and their classification as a subspecies under *T. aestivum* expresses this. Similarly, *T. turgidum* L. ssp. *carthlicum* (Nevski) Á.Löve & D.Löve indicates that the *carthlicum* wheats are tetraploids within the *turgidum* group, and with the BA-genome (and thus not with the GA-genome as they would then have been a ssp. of *T. timopheevii*). Whether MacKey's (1966: 267) convarieties in the tetraploid *turgidum* wheats should be maintained next to a number of separate subspecies remains debatable. For the moment I have used the classification as subspecies, which is available for all 'valid' tetraploid groups (Table 9).

An apparent weakness of the criterium for this first group is my inclusion of *T.*

zhukovskyi and (at least momentarily) exclusion of, e.g., *T. isphahanicum*, *T. pyramidale*, and *T. vavilovii*. The former is included for its genome type, but unlikely to have been commercially cultivated (but see at 5.4.3., Table 9 at '6'), while the others may have been, even though originating from a discovered or induced mutation (and therefore located under group '2'). It should also be kept in mind that 'commercially cultivated' obscures tremendous differences among the various groups: from the obvious abundance of *aestivum* and the Mediterranean *durum* to the restriction to western Georgia of *macha*, while *zhukovskyi* is only a component of 'Zanduri', also in western Georgia of which the total acreage was estimated in 1932 as being only 300-500 ha (Dekaprelevicz & Menabde, 1932). Except for *aestivum* and *durum* the other wheats are, in fact, relicts with only local importance for, e.g., *compactum*, *dicoccon*, *macha*, and *spelta*.

2 Species described only on the basis of a discovered or induced mutation, subsequently selected and multiplied when the created form was found to be stable, but never released as a commercial cultivar. These taxa should be made synonyms under the cultivated (sub)species from which they were isolated. This list is surely incomplete, but applies at any rate to the following species:
- tetraploid (BA) *T. jakubzineri* Udachin & Schachm., Bull. Appl. Bot., Gen., Pl. Breeding 56(2): 147 (1976). – Note: this species appears to be a form of *T. turgidum* (cf., Dorofeev & Korovina, 1979: Fig. 8 on p. 78);
- tetraploid (GA) *T. militinae* Zhuk. & Migush., Herald Agric. Sci. [Vestn. Sel'skokhoz. Nauki] 2: 16 (1969). – Note: a free-threshing mutant, selected from a single specimen (Miller, 1987: 27) of cultivated *T. timopheevii*;
- tetraploid (BA) *T. petropavlovskyi* Udachin & Migush., Herald Agric. Sci. [Vestn. Sel'skokhoz. Nauki] 9: 20 (1970). – Note: appearing to be a mutated form of *T. polonicum* (cf., Dorofeev & Korovina, 1979: Fig. 21 on p. 278);
- diploid (A) *T. sinskajae* A.Filat. & Kurk., Bull. Appl. Bot., Gen. & Pl. Breeding 54(1): 239 (1975). – Note: a free-threshing mutant of cultivated *T. monococcum*, developed in the Vavilov Institute in Daghestan, Russia;
- hexaploid (BAD) *T. vavilovii* (Tumanian) Jakubz. in Zhuk., Zemledeltcheski Turtcii 705 (1933, thus on the same page as the basionym (see below)!); the pages of this book are cited by Bowden (1959: 675) as '705-707, 805', while Tan in Davis (1985: 253) cites the authors as '(Tuman.) Jakubz. *ex* Zhuk.'). Two more options on the author citation of this name are possible, both also cited by Dorofeev & Korovina (1979: 208; see note 3), and all from 1933: (1) 'Jakubz.', Sotsialistiteschki Rastenivotstva [Socialist Agronomy], 'Ser. A, 7': 222 (1933; according to Tzvelev, 1976: 168 / 1984: 241) / Bull. Appl. Bot., Gen. & Pl. Breeding 'A 7': 222 (1933; according to MacKey, 1966: 268; see note 3), and (2) 'Jakubz.', Priroda 11: 73 (1933; '72-73' according to Bowden, 1959: 675). – Basionym: *T. vulgare* Vill. var. *vavilovii* Tumanian in Zhuk., Zemledeltcheski Turtcii [Agriculture (of) Turkey] 705 (1933). See note 1. – Homotypic synonym: *T. aestivum* L. ssp. *vavilovii* (Tumanian) Sears, Handb. Pflanzenzücht. (ed. 2) 2: 164 (1959; considered invalid by Do-

rofeev & Korovina (1979: 209), but not by Tzvelev, 1976: 168 / 1984: 241); Löve, Feddes Repert. 95: 499 (1984, as a *comb. nov.*, but an isonym if the earlier combination by Sears is valid). – Notes: 1. It appears from Dorofeev & Korovina (1979: 208) that in the book by Zhukovsky the basionym is contributed by Tumanian and that its recombination to a species is made on the same page (705) by Jakubziner. 2. It is unclear which of the three options in 1933 for the species name is the oldest one, but as I assume that Dorofeev & Korovina are the most familiar with Russian literature their citation from *Zemledeltcheski Turtcii* is followed here. 3. Contrary to MacKey, the 'A 7: 222 (1933)' is not connected with the Bulletin by Tzvelev and Dorofeev & Korovina. Both their citations of *Sotsialistiteschki Rastenivotstva* 'A 7' may indicate a title of a (series of) papers or books instead. 4. And to add to this confusion, the type of this (sub)species is cited by Tzvelev as *probably* in WIR!

This species is a branching mutant found by Tumanian during the 1929-30 season as an admixture in a stand of a bread wheat landrace called 'Dir' from northeast of lake Van at 1780 m alt. In the 1970s it was also found as admixtures in Azerbaijan by Mustafaev and in Armenia by Gandilyan. Plants with branched spikes of the *vavilovii* type were produced, by MacKey (1966) among others, in progenies of wide 'interspecific' (that is, between various cultivated wheat groups) crosses (Dorofeev & Korovina, 1979: 211-213).

Three species are located in this second category but may be reconsidered later in view of them being commercially cultivated. [In addition, *vavilovii* may be included here also as MacKey (1966: 242), quoting Jakubziner's original paper (but see above), calls this species 'a winter wheat endemic of the Armenian highlands'.] Miller (1987: 20) describes these three, however, as 'minor forms'. Their genetic background as well as morphology may locate these three species readily under any of the taxa of the first category:

- tetraploid (BA) *T. aethiopicum* Jakubz., Selektsii i Semenovodsvo [Plant breeding and seed growing] 14(5): 46 (1947), a *nom. nov.* for *T. abyssinicum* Vavilov in Flaksberger, Opredelitel Nastioashchikh klebov [Key to the true cereals] (ed. 4) 92 (1939), *nom. illeg.* (Art. 64.1) because of *T. abyssinicum* Steud., Syn. pl. glumac. 1: 342 (1854). – Note: while MacKey (1966: 267) is probably referring to *turgidum* for the location of this species, Miller is confusing: '...a group of free-threshing emmers from Ethiopia, [is] included in *T. durum*.' (l.c., 1987: 20). His reference to emmer points at a mutation within local *dicoccon* rather than *durum*, although free-threshing in the latter group is a clear distinction with the former;
- tetraploid (BA) *T. isphahanicum* Heslot, Compt. Rend. Acad. Sci., Paris 247: 2479 (1958). – Note: according to MacKey (1966: 263) a form of *T. polonicum* expressing a tendency towards a more standard *Triticum* glume morphology. Miller (1987: 20), however, recons this species under *T. dicoccon*. This species may have been cultivated in the Isfahan region in Iran;
- tetraploid (BA) *T. pyramidale* Percival, Wheat Plant 156, 262 (1921) (Egyptian cone wheat). – Note: considered by MacKey (1966: 263) as a special form

of *T. durum*, but by Miller (1987: 20) as a form of *T. turgidum* (*sensu stricto*, as he does not recognize any of the infraspecific taxa from MacKey). May have been or is maybe still cultivated in Egypt.

3 Species described on the basis of an artificial autoploid or amphidiploid between *Triticum* species or between *Aegilops* and *Triticum* species. For the moment I have included any such intergeneric amphidiploid in the nothogenus x *Aegilotriticum* when in the parental generation *only wild taxa* were involved. It is, however, debatable if this should remain so in view of the artificial process of creating the amphidiploid itself and the selection for stable forms in later generations. At any rate the intergeneric hybrids should be excluded from *Triticum*, and I propose to do the same here with forms relating to interspecific *Triticum* crosses or autoploids. The list of this category is, like at '2' above, surely incomplete, but at any rate applies to:

- hexaploid (GAD) *T. kiharae* Dorof. & Migush., Bull. WIR 83: 71 (1977). – Note: a stable form resulting from the cross *T. timopheevii* (Zhuk.) Zhuk. x *Aegilops tauschii Coss.*
- tetraploid (AA) *T.* x *boeoticourarticum* Gandilyan et al. in Gandilyan, Schakarjan & Petrosian, Biol. J. Armenia 39(1): 7 (1986), *nom. inval.* (Arts. H.10.1, 36.1 and 40.1). – Note: created in 1984 and resulting from the cross *T. monococcum* L. ssp. *aegilopoides* (Link) Thell. x *T. urartu* Tumanian ex Gandilyan.
- Tetraploid (AD) *T.* x *boeoticotauschicum* Gandilyan et al. in op. cit. 9; Gandilyan & Nazarova, Cytol. & Genet. 26(2): 3-10 (1992), *nom. inval.* (Arts. H.10.1, 36.1 and 40.1). – Note: created in 1983 and resulting from the cross *T. monococcum* L. ssp. *aegilopoides* (Link) Thell. x *Aegilops tauschii* Coss. Both this name and the previous one should be under x *Aegilotriticum*, but they have not been published under any of the three generic names for the *Aegilops* x *Triticum* hybrids, nor do I consider them *Triticum* species. Until stable forms are obtained enabling their valid publication it is useless to transfer this epithet as a Latin diagnosis (Art. 36.1), type specimen (Art. 37.1) and type herbarium (Art. 37.5) have not been published as yet (P.A. Gandilyan, pers. comm.).
- tetraploid (AA) *T.* x *monococcourarticum* Gandilyan et al. in op. cit. 7; Gandilyan & Petrosian, Biol. J. Armenia 43(7): 559-565 (1990), *nom. inval.* – Note: created in 1983 this not yet stable form (and therefore not yet 'officially' published, cf., P.A. Gandilyan, pers. comm.) resulted from the cross *T. monococcum* L. ssp. *monococcum* x *T. urartu* Tumanian ex Gandilyan. Later generations of this cross yielded various forms that were invalidly published by Gandilyan & Petrosian as subspecies *monococcumoformae*, ssp. *urartuformae*, and (without indication of rank but probably ssp.) *sinskoformae*, respectively.
- tetraploid (AA) *T.* x *sinskourarticum* Gandilyan et al. in op. cit. 7. – Note: created in 1983 and resulting from the cross *T. sinskajae* A.Filat. & Kurk. x *T. urartu* Tumanian ex Gandilyan.
- tetraploid (AA) *T.* x *sinskoboeoticum* Gandilyan et al. in op. cit. 8. – Note:

created in 1983 and resulting from the cross *T. sinskajae* A.Filat. & Kurk. x *T. monococcum* L. ssp. *aegilopoides* (Link) Thell.
- tetraploid (AA) *T. tetraurartu* Gandilyan et al. in op. cit. 8. – Note: created in 1984 and the autotetraploid result from the cross *T. urartu* Tumanian ex Gandilyan x *T. urartu* Tumanian ex Gandilyan.
- octaploid (GGAA) *T. timonovum* Heslot & Ferrary, Compt. Rend. Acad. Paris 248: 455 (1959). – Note: created by chromosome doubling in *T. timopheevii*, but reported by Tzvelev (1976: 165 / 1984: 236) as not being significantly different from the tetraploid parental generation.

4 Any other species described in *Triticum* but taxonomically not belonging to this genus. This is a sizeable group, probably of several hundred taxa, and including at least all the perennials described under *Triticum*.

5.4.3 Summary of taxa

The accepted taxa discussed in Chapter 5.4.2. are summarized below in Table 9, while further elaboration than presented here of the accepted taxa in *Triticum* and their nomenclature lies beyond the scope of this publication. It should be realized that this is only the outside of a huge subcontinent, consisting of thousands of names and taxa, often published in remote literature, and strongly in need of revision – that is: clean-up – given its agricultural importance. The confusion, outlined above, around *T. vavilovii* may serve as an example. It must therefore be kept in mind that Table 9 presents the state-of-the-art as I see it at the moment rather than the final solution for a wheat classification.

Table 9. Summary of accepted taxa in the primary and (partially) secondary gene pools of cultivated wheat

Aegilops L., Sp. pl. (ed. 1) 2: 1050 (1753).
- *Ploidy level: diploid, tetraploid, hexaploid; genome types: C, D, M, N, S, U*
- 22 species, 5 autonym varieties, 5 non-typical varieties. See Tables 1 and 2, and Chapter 10.
- Type species: *Aegilops triuncialis* L.

Amblyopyrum (Jaub. & Spach) Eig, P.Z.E. Inst. Agric. Nat. Hist., Agric. Rec. 2: 199 (1929b).
- *Ploidy level: diploid; genome type: T*
- 1 species, 1 autonym variety, 1 non-typical variety. See Tables 1 and 2, and Chapter 11.
- Type species: *Amblyopyrum muticum* (Boiss.) Eig.

Triticum L., Sp. pl. (ed. 1) 1: 85 (1753).
- *Ploidy level: diploid, tetraploid, hexaploid; genome types: A, B, D, G*
- 6 species, 4 autonym subspecies, 13 non-typical subspecies.
- Type species: *Triticum aestivum* L.

I Sect. **Monococcon** Dumort., Observ. Gramin. belg. 94 (1824); Flaksberger, Ann. State Inst. Exp. Agric. 6(2): 39 (1928, '*Monococca*', orth. var.), Feddes Repert., Beih. 56: 107 (1929, '*Monococca*', orth. var.). – Type species: *Triticum monococcum* L. – Selected synonyms: *Crithodium* Link, Symb. fl. graecam, Linnaea 9: 132 (1834). *Triticum* L. sect. *Crithodium* (Link) Nevski in Komarov (ed.), Fl. URSS 2: 677 (1934, Russian) / 539 (1963, English). *Niviera* Ser., Céréales européennes, Ann. Soc. roy. Agric. Lyon 4: 73 (1841). *Triticum* L. 'congregatio' *Diploidea* Flaksb., Klebnyie zlaki – pshenitsa [Cereals – wheat], Fl. Cult. Pl. SSSR 1: 31 (1935).
Ploidy level: diploid; genome type (female x male parent): AA ('A')

1 **Triticum monococcum** L., Sp. pl. (ed. 1) 1: 86 (1753).
a. ssp. **monococcum**. – Cultivated form. – Einkorn or Small Spelt wheat (cf., Bor, 1968: 206).
b. ssp. **aegilopoides** (Link) Thell. – Wild form.
The name of this well-known taxon is the source of considerable confusion. Given its importance as a genetic resource for wheat improvement its essential nomenclature is briefly (that is ignoring the 61(!) infraspecific taxa, distinguished by Dorofeev & Korovina, 1979, under its synonym *T. baeoticum*) as follows:

T. monococcum L. ssp. *aegilopoides* (Link) Thell., Neu. Wege bot. Syst., Naturw. Wochenschr., Neue Folge 17(33): 470 (18 Aug. 1918, as 'subsp. I. *aegilopoides* (Link)') / Mitt. naturw. Ges. Winterthur 12: 146 (Nov. 1918, reprint). See note 1.
Basionym: *Crithodium aegilopoides* Link, Symb. fl. graecam, Linnaea 9: 132 (1834).
Lectotype (*nov.*): the illustration with analysis, presented by Link in Tab. III, figs. 1-5, accompanying his 1834 article. – Note: Stafleu & Cowan (1981: 65) write that Link's herbarium is in B, but has been destroyed for the greater part. Although theoretically the chance exists that plant material described by Link may still be extant from Greece ('...inter Naupliam et Cortinthum nec non in Achaea...', cf., Link, 1834: 132), and which will then have precedence over an illustration, nomenclature presently is best served with the designation of the clear illustration with analysis presented by Link as the type of the name in accordance with Art. 7.5 of the *Code*.
Homotypic synonyms:
T. monococcum var. ('β') *lasiorrachis* Boiss., Fl. orient. 5(2): 673 (1884), **syn. nov.** – This name includes four elements: (1) *T. baeoticum* Boiss.; (2) *T. thaoudar* 'Reuter in Bourg. exs.' (thus before the valid publication by Haussknecht; see below); (3) *Crithodium aegilopoides* Link (Link's paper and description is directly referred to), and (4) *Aegilops crithodium* Steud., but the last one is an illegitimate renaming of *Crithodium aegilopoides* (see Chapter 13). Three names thus remain. If one wants to use the varietal level for the wild diploid wheat '*lasiorrachis* Boiss'. is the correct epithet, lectotypified here with the type of its included element, the epithet *aegilopoides*.
T. aegilopoides (Link) Balansa ex Körn. in Körnicke & Werner, Handb. Getreideb. 1: 109 (1885), *nom. illeg.* (Art. 64.1), non Forsskål, Fl. aegypt.-arab. 26 (1775), nec Turcz. ex Griseb. in Ledeb., Fl. ross. 4: 339 (1853).
T. monococcum L. A *aegilopoides* (Link) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 701 (1901). – Note: the rank of 'A' (most likely a subspecies or a variety) is not further interpreted, making this (otherwise validly published) name inoperative in questions of priority (Art. 35.2 of the *Code*). The rank can thus be established as a subspecies following Thellung (1918). The confusion in use of ranks by Ascherson & Graebner is aptly demonstrated at this taxon as the 'A' is designated a 'Rasse' [variety], but the subdivisions 'I.' *baeoticum* and 'II.' *thaoudar* also!
Triticum spontaneum Flaksb. ssp. *aegilopoides* (Link) Flaksb., Klebnyie zlaki – pshenitsa [Cereals – wheat], Fl. Cult. Pl. SSSR 1: 349 (1935).

Triticum baeoticum Boiss. emend. E.Schiem. ssp. *aegilopoides* (Link) E.Schiem., Weiz. Rogg., Gerste 28 (1946).

Crithodium monococcum (L.) Á.Löve ssp. *aegilopoides* (Link) Á.Löve, Feddes Repert. 95: 490 (1984).

Heterotypic synonyms:

T. baeoticum Boiss. emend. E.Schiem., Weiz. Rogg., Gerste 28 (1946; thus not 1948 as on titlepage of the book, see Stafleu & Cowan, 1985: 149). – Based on: *T. baeoticum* Boiss., Diagn. pl. orient., Sér. 1(13): 69 (1854, '*Bœoticum*'). – Type: (Greece, Voiotia) in planitie Bæotica, *von Spruner s.n.* (holo: G-BOIS; iso: G). – Homotypic synonym: *T. monococcum* L. ssp. ('I') *baeoticum* (Boiss.) Hayek, Prod. fl. pen. Balcan. 3: 228 (1932); Löve & Löve, Bot. Not. 114(1): 49 (1961, as a *comb. nov.*, thus an isonym), MacKey, Hereditas, Suppl. Vol. 2: 267 (1966, as a *comb. nov.*, thus an isonym); Yen, Acta Phytot. Sinica 21(1): 292, 296 (1983, as a *comb. nov.*, thus an isonym). – Note: As Boissier's original spelling of his new species was '*Bœoticum*' this is best transcribed as *baeoticum* instead of the more common *boeoticum*. Only a few authors, e.g., Humphries in Tutin et al., *Flora Europaea, Vol. 5* (1980: 202), and Tan in Davis, *Flora of Turkey, Vol. 9* (1985: 247), follow this spelling.

T. thaoudar Reut. in Bourg. ex Hausskn., Mitt. Thür. Bot. Ver., Neue Folge 13/14: 86 (1899). – Based on: *T. thaoudar* Reut. in Bourgeau, Pl. Exs. (1860) no. 281, *nom. nud.* – Type: (Turkey) Lycia, in collibus incultis ad Ouvarendan prope Elmalu, 30.VI.1860, *Bourgeau 281* (holo: P; iso: BM, C, E, FI, G, G-BOIS, K, LE, LY, MPU, NY, OXF, PI).

Notes: 1. Thellung (1918: 470) writes at his new combination: '...(diese sich gliedernd in die Rassen *boeoticum* [Boiss.] und *Thaoudar* [Reuter]...' [this dividing in the varieties...], thus including the two distinguished forms (see below), and emendating his subspecies in the same sense as Schiemann (1946: 28) did at species level. The variation within this (sub)species centres around the number of grains per spikelet, 1-2, and the development of the awn of the second lemma in a spikelet. Based only on this gradual distinction, '1 vs. (1-)2' (e.g., Tan in Davis (1985: 247): 'only 1 floret fertile vs. *often* with both florets fertile' – my italics), the two-grained form, described as *T. thaoudar*, has been separated. As all intergradations occur (Harlan & Zohary, 1966: 1078) Thellung's concept to include these forms into one subspecies is followed.

2. Both the basionym and the combination at subspecies level of the names containing *aegilopoides* are older than the more widely known name *baeoticum*.

3. The name of this wild diploid wheat is different at the three levels involved: at species level it is *Triticum baeoticum* Boiss. emend. E.Schiem.; at subspecies level it is *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell., and at varietal level it is *Triticum monococcum* L. var. *lasiorrachis* Boiss.

2 **Triticum urartu** Tumanian ex Gandilyan, Bot. Zhurn. 57: 176 (1972). – Based on: *Triticum urartu* Tumanian, Trans. Armenian Br. Acad. Sci. USSR, Biol. Ser. 2: 210 (1937), *nom. inval.* (Russian descr. only; Art. 36.1). – Wild form.

II Sect. **Dicoccoidea** Flaksb., Ann. State Inst. Exp. Agric. 6(2): 39 (1928), Feddes Repert., Beih. 56: 107 (1929). – Lectotype species (*nov.*): *Triticum dicoccoides* (Körn. ex Asch. & Graebn.) Schweinf. (= *Triticum turgidum* L. ssp. *dicoccoides* (Körn. ex Asch. & Graebn.) Thell.). – Selected synonyms: *Triticum* L. sect. *Spelta* Dumort., Observ. Gramin. belg. 94 (1824) *pro parte* (*T. dicoccon* only). *Triticum* L. sect. *Orthatherum* Nevski in Komarov (ed.), Fl. URSS 2: 681 (1934, Russian) / 542 (1963, English). *Triticum* L. 'congregatio' *Tetraploidea* Flaksb., Klebnyie zlaki – pshenitsa [Cereals – wheat], Fl. Cult. Pl. SSSR 1: 31 (1935).

Ploidy level: tetraploid; genome type (female [B] x male [A] parent): BBAA ('BA')

3 **Triticum turgidum** L., Sp. pl. (ed. 1) 1: 86 (1753). – Cultivated and wild forms. – Note: the cultivated races of this gene pool consist of a number of tetraploid cultivar groups (a-g) that have been classified in various ways: at equal subspecific rank, separately from the typical form, or partially included in the typical form as convarieties (see 5.4.2), or, for that matter, simply as separate species. They are all listed here at subspecies rank and, except for the autonym, in alphabetical order, while the name at species level is added as a homotypic synonym when not serving as the basionym:

a. ssp. **turgidum**. – Rivet, Cone, or Pollard wheat (cf., Bor, 1968: 208).

b. ssp. **carthlicum** (Nevski) Á.Löve & D.Löve, Some Nomenclatural Changes in the European Flora II. Subspecific Categories, Bot. Not. 114(1): 49 (1961). – Basionym: *T. carthlicum* Nevski in Komarov (ed.), Fl. URSS 2: 685 (1934). – Note: the epithet was renamed by Nevski to replace *T. persicum* Vavilov ex Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 13: 46 (1923), which is illegitimate because of *T. persicum* (Boiss.) Aitch. & Hemsl., Trans. Linn. Soc., Ser. 2(3): 127 (1888). – Persian wheat, Persian black wheat (cf., Bor, 1968: 203).

c. ssp. **dicoccon** (Schrank) Thell., Naturw. Wochenschr., Neue Folge 17: 470 (1918). – Basionym: *T. spelta* [L.] * *dicoccon* Schrank, Baier. Fl. 1: 389 (1789). – Homotypic synonym: *T. dicoccon* (Schrank) Schübl., Diss. char. descr. cereal. 29 (1818). – Note: the infraspecific rank of the basionym is unclear as it was indicated by an asterisk in Schrank's (his extensive family name von Paula von Schrank is usually abbreviated to Schrank) flora. Bowden (1959: 670) argues that *T. dicoccon* as a species was intended by Schrank rather than as a variety of *spelta*. I disagree, as after the treatment of *T. spelta*, listed as a species at no. 263 in his flora, Schrank writes: 'Hierher, denke ich, gehört das Emmerkorn, das man im Herzogthume Würtemberg baut, wenn es nicht eine eigene Art ißt; ich nenne es einsweilen * dicoccon...' (l.c., 1789: 389) [Here, I think, belongs the Emmer wheat, which is cultivated in the dukedom Würtemberg, when it is *not a separate species*; I call it for the present * dicoccon. (my italics)] Emmer is thus clearly *not* positioned at the same level as the (species) *spelta*, and Schrank expresses his intention not to do so. Schrank's name is a variety following Art. 35.3 of the *Code*. Percival (1921: 186) and MacKey (1966: 268) both omit the author of the *spelta*-name, probably for literally citing Schrank. – Emmer wheat.

d. ssp. **durum** (Desf.) Husn., Graminées 4: 80 (1899). – Basionym: *T. durum* Desf., Fl. atlant. 1(1): 114 (1798). – Note: the suggestion by Dorofeev & Korovina (1979: 93) that the subspecies combination was made by Löve & Löve (1961) is erroneous. – Macaroni wheat, Hard wheat, or simply 'durum' wheat.

e. ssp. **paleocolchicum** (Menabde) Á.Löve & D.Löve, Some Nomenclatural Changes in the European Flora II. Subspecific Categories, Bot. Not. 114(1): 50 (1961; basionym cited as published in Menabde's (1948: 41) 'Gruzin. Weizen', which is later than the original publication from 1940 – see below); MacKey, Species relationship in *Triticum*, Proc. Second Int. Wheat Gen. Symp., Hereditas Suppl. Vol. 2: 268 (1966; as a *comb. nov.*, thus an isonym). – Basionym: *T. paleocolchicum* Menabde, Soobshch. Gruzinskoi Fil. Acad.

Nauk SSSR [Reports Georgian Dept. Acad. Sci. USSR] 1(9): *689* (1940), *nom. illeg.* (according to Tzvelev, 1976: 165 / 1984: 237, and Dorofeev & Korovina, 1979: 69; I have not seen Menabde's publication). – Note: at species level the older name *T. karamyschevii* Nevski, Sov. Bot. 6: 127 (1935), probably has to be adopted over the apparently illegitimate *T. paleocolchicum* (as is done by Tzvelev, 1976 / 1984), but Löve & Löve's combination at subspecies level is valid. This is, however, only in the case that the basionym is just illegitimate and not invalid (in which case Löve & Löve's combination would be incorrect, probably even invalid).

f. ssp. **polonicum** (L.) Thell., Naturw. Wochenschr., Neue Folge 17: 470 (1918). – Basionym: *T. polonicum* L., Sp. pl. (ed. 2) 1: 127 (1762). – Polish wheat.

g. ssp. **turanicum** (Jakubz.) Å.Löve & D.Löve, Some Nomenclatural Changes in the European Flora II. Subspecific Categories, Bot. Not. 114(1): 49 (1961). – Basionym: *T. turanicum* Jakubz., Selektsii i Semenovodsvo [Plant breeding and seed growing] 14(5): 46 (1947), a *nom. nov.* for *T. orientale* Percival, Wheat Plant 240 (1921), *nom. illeg.* (Art. 64.1) because of *T. orientale* M.Bieb., Fl. taur.-caucas. 1: 86 (1808). – Note: it may still be possible to maintain the epithet *orientale* at the subspecies level. – Khorassan wheat (cf., Percival, 1921: 204).

h. ssp. **dicoccoides** (Körn. ex Asch. & Graebn.) Thell., Naturw. Wochenschr., Neue Folge 17: 470 (1918). – Basionym: *T. sativum* Lam. A *dicoccoides* Körn. ex Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 679 (1901), which is based on *T. vulgare* Vill. var. *dicoccoides* Körn., Verh. Nat. Ver. Pr. Rheinl. 46: 21 (1889, *nom. nud.*). – Homotypic synonym: *Triticum dicoccoides* (Körn. ex Asch. & Graebn.) Schweinf., Ber. Deut. Bot. Ges. 26a: 310 (1908). – Note: similar to 'A' *aegilopoides* (see above) the rank of the validly published 'A' *dicoccoides* Körn. ex Asch. & Graebn. will not be further interpreted as no rank was indicated by Ascherson & Graebner. The rank of the epithet involved can now be fixed at subspecies level following Thellung's (1918) designation. – Wild form: wild emmer wheat.

Ploidy level: tetraploid; genome type (female [G] x male [A] parent): GGAA ('GA')

4 **Triticum timopheevii** (Zhuk.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 19(2): 64 (1928). – Cultivated and wild forms.

a. ssp. **timopheevii.** – Cultivated form.

b. ssp. **armeniacum** (Jakubz.) van Slageren – Wild form.
It appears that the combination of *armeniacum* and *Triticum timopheevii* has not been made thus far. The essential nomenclature is now as follows:

T. timopheevii (Zhuk.) Zhuk. ssp. *armeniacum* (Jakubz.) van Slageren, **comb. nov.**

Basionym: *T. dicoccoides* (Körn. ex Asch. & Graebn.) Schweinf. ssp. *armeniacum* Jakubz., Bull. Appl. Bot., Gen. & Pl. Breeding, Ser. 5, vol. 1: 164, 195 (1932a), Bull. Appl. Bot., Gen.

& Pl. Breeding, Suppl. 53-e: 160, 256 (1932b), Priroda [Nature] 8-9: 100, fig. 1 (1933). – Note: in Jakubziner's first (1932a) paper with authors as '(Tum.) M.' ('M' referring to 'mihi'), in his second paper with '(Tum.) Jakubz.'. In both cases he referred to Tumanian's (1930) suggestion that: '...They evidently represent a separate individual group characteristic of the Armenian highland which admits of singling them out as a separate Armenian section in distinction of the Syrian section established by C.A. Flaksberger.' (l.c., 1930: 13 – English summary). Tumanian, however, did not name this Armenian section.

Neotype: (Azerbaijan) Nakhichevan, Chachbuz reg., Aznaburt, Ali-Chapan, near Dash-Agl, *Jakubziner s.n.* (WIR-28238; isoneotypes: WIR colls. 28240-28242, 28260, 30216, 30217). Here designated. – Note: chosen among various Jakubziner collections of 'Transcaucasian forms' (l.c., 1932a: 195) for its accuracy in location and because isoneotypes exist. Jakubziner is not listed in *Taxonomic Literature, ed. 2*, nor in Chaudhri et al.'s (1972) *Index herbariorum, Part II(3)*, but as collaborator of N.I. Vavilov, his herbarium is obviously in WIR. This designation of a neotype is conform Arts. 7.4 and 7.9 of the *Code* and may be superseded if any material can be found, designated by Jakubziner as the type specimens.

Homotypic synonyms:

T. armeniacum (Jakubz.) Makush., Compt. Rend. (Doklady) Acad. Sci. URSS 21(7): 345 (1938), *nom. illeg.* (Art. 64.1), non *T. armeniacum* (Stolet.) Nevski in Komarov (ed.), Fl. URSS 2: 683 (1934).

T. araraticum Jakubz., Selektsii i Semenovodsvo [Plant breeding and seed growing] 14(5): 46 (1947), Bull. Appl. Bot., Gen. & Pl. Breeding 28(1): 218 (1948), Bot. Zhurn. 35(2): 191 (1950), *nom. nov.* for *T. armeniacum* (Jakubz.) Makush.

T. turgidum L. ssp. *armeniacum* (Jakubz.) Á.Löve & D.Löve, Some Nomenclatural Changes in the European Flora. II. Subspecific Categories, Bot. Not. 114(1): 50 (1961), Chrom. num. eur. pl., Opera Bot. 5: 56 (1961b; with ploidy level indicated as 2n = 28).

T. timopheevii (Zhuk.) Zhuk. ssp. *araraticum* (Jakubz.) MacKey, Species relationship in *Triticum*, Proc. Second Int. Wheat Gen. Symp., Hereditas Suppl. Vol. 2: 267 (1966), *nom. illeg.*

T. timopheevii (Zhuk.) Zhuk. var. *araraticum* (Jakubz.) C.Yen, Acta Phytot. Sinica 21(1): 294, 296 (1983), *nom. illeg.*

Gigachilon timopheevii (Zhuk.) Á.Löve ssp. *armeniacum* (Jakubz.) Á.Löve, Feddes Repert. 95: 497 (1984).

Note: Tzvelev (1976: 164 / 1984: 236) correctly considered MacKey's combination of *araraticum* and *Triticum timopheevii* as illegitimate. At species level *araraticum* is correct, but the older epithet *armeniacum* should have been used both at the subspecies and varietal levels.

III Sect. **Triticum**. – Type species: *Triticum aestivum* L. – Based on: *Triticum* sect. *Frumentum* Dumort., Observ. Gramin. belg. 94 (1824; oldest name but to be replaced by the autonym as it includes the type species). – Selected synonyms: *Triticum* L. sect. *Spelta* Dumort., Observ. Gramin. belg. 94 (1824) *pro parte* (*T. spelta* only). *Triticum* L. sect. *Speltoidea* Flaksb., Ann. State Inst. Exp. Agric. 6(2): 39 (1928), Feddes Repert., Beih. 56: 107 (1929). *Triticum* L. sect. *Spelta* Nevski in Komarov (ed.), Fl. URSS 2: 686 (1934, Russian) / 546 (1963, English), *nom. illeg.* (Art. 64.1, superfluous because of Dumortier, 1824). *Triticum* L. 'congregatio' *Hexaploidea* Flaksb., Klebnyie zlaki – pshenitsa [Cereals – wheat], Fl. Cult. Pl. SSSR 1: 31 (1935), *nom. illeg.* (Art. 63.1).

Ploidy level: hexaploid; Genome type (female [BA] x male [D] parent): BBAADD ('BAD')

5 **Triticum aestivum** L., Sp. pl. (ed. 1) 1: 85 (1753) emend. Fiori & Paol., Fl.

Italia 1: 107 (1896) *pro parte*. – Note: Hanelt et al. (1983: 496) point out that Fiori & Paoletti's emendation was actually not the first one to unite the spring and winter bread wheats, separately described by Linnaeus as *T. aestivum* L. and *T. hybernum* L., respectively, but should be followed in view of their proposal to conserve the name *Triticum aestivum* (now incorporated in the *Code* at Appendix IIIB). This emendation then antedates the more widely known one by Thellung (1918: 470), but includes also the *turgidum, durum, polonicum, spelta* and *dicoccon* wheats. Hence the bread wheats are only a part of the emendation. Hanelt et al. (l.c.) propose citing the species as: *T. aestivum* L. emend. Fiori & Paol. or with only 'L.' as author, in any case not as '(L.) Thell.', as many erroneously do. *Triticum aestivum* at species level includes a number of cultivated groups, all with the BAD-genome and listed here in alphabetical order and, following MacKey's (1966: 268-269) concept, at subspecies level for convenience. – Only cultivated forms.

a. ssp. **aestivum** – Bread wheat.
b. ssp. **compactum** (Host) MacKey, Svensk Bot. Tidskr. 48: 586 (1954). – Basionym: *T. compactum* Host, Icon. descr. gram. austriac. 4: 4, Tab. 7 (1809). – Club, Dwarf, Cluster, or Hedgehog wheat (cf., Bor, 1968: 203).
c. ssp. **macha** (Dekapr. & Menabde) MacKey, Svensk Bot. Tidskr. 48: 586 (1954). – Basionym: *T. macha* Dekapr. & Menabde, Bull. Appl. Bot., Gen. & Pl. Breeding, Ser. 5(1): 14 (1932).
d. ssp. **spelta** (L.) Thell., Naturw. Wochenschr., Neue Folge 17: 471 (1918). – Basionym: *T. spelta* L., Sp. pl. (ed. 1) 1: 86 (1753). – Large Spelt or Dinkel (cf., Percival, 1921: 325).
e. ssp. **sphaerococcum** (Percival) MacKey, Svensk Bot. Tidskr. 48: 586 (1954). – Basionym: *T. sphaerococcum* Percival, Wheat Plant 321 (1921). – Indian dwarf wheat (cf., Percival, 1921: 321).

Ploidy level: hexaploid; genome type (female [GA] x male [A] parent): GGAAAA ('GAA')

6 **Triticum zhukovskyi** Menabde & Ericz., Soobshch. Acad. Nauk Grusinskoi SSR [Reports of the Sci. Acad. of the Georgian SSR] 25(6): 732 (1960). – Cultivated form. – Notes: 1. This allohexaploid species is included here for its unique genome type, and also as it is a *natural* hybridization of *T. monococcum* and *T. timopheevii*, which developed stable forms that were able to compete with the parents in the 'Zanduri' mixture (Dorofeev & Korovina, 1979: 319), which is grown only in the Racha-Lekhumi district in western Georgia. Although extremely limited it is 'commercially' cultivated, not as such but as a component of 'Zanduri'. The three components are genetically effectively isolated (MacKey, 1966: 242). 2. Page 733 is cited by MacKey (1966: 268) instead of 732.

6 Geographical distribution and ecology

6.1 *Aegilops* L. — Figs. 9-12; Tables 10-11

6.1.1 Discussion

Excluding its adventive introduction into the U.S.A., China, the Canary Islands and northwestern Europe, the genus *Aegilops* occurs over 90 grades of longitude, from around 10^0 West to around 82^0 East. Its latitudinal distribution varies from 24 to 47^0 North (but locations below 30^0 and above 45^0 North are few). *Aegilops* may be characterized as a Mediterranean-Western Asiatic element. In the terminology of Takhtajan's (1986) phytogeographical system the centre of diversity is in the Mediterranean and Irano-Turanian Regions. [Regions, Provinces, etc. referring to his nomenclature, thus not any particular country.] The presence of *Aegilops* on the Sinai peninsula and on the north coast of Egypt, as well as in Kuwait and on the southern shores of the Persian Gulf, indicated its spread into the Egyptian-Arabian Province of the Saharo-Arabian Region. The spread into central and southwestern Europe of some tetraploid species (e.g., *Aegilops cylindrica* and *geniculata*, respectively) extended their area of distribution into the Circumboreal Region (the occurrence in France and northern Spain of, e.g., *Ae. geniculata, Ae. neglecta, Ae. triuncialis*, and *Ae. ventricosa* even into the so-called Arctic Province!).

The genus occurs in the following regions: in Europe (the central and Mediterranean parts); in southern Ukraine and the Crimea, as well as both the Cis- and Transcaucasus; in Africa, north of the Sahara; in western and central Asia, the region bordered by the deserts of the Arabian peninsula in the south, the steppes of Turkmenistan and Uzbekistan in the central-north, and the Tian Shan and Himalaya mountain ranges in the east. All provinces of the Mediterranean region that are distinguished by Takhtajan are within this area. From the Irano-Turanian Region all Provinces of the Western-Asiatic Subregion are included with the exception of the Western-Himalayan Province, but none of the Central Asian Subregion is included. *Aegilops* thus fits very well into this classification of phytogeographical regions and its gross characterization as a Mediterranean-Western Asiatic element is accurate.

Figs. 9 and 10, showing the sympatric occurrence of species, locate the centre of diversity in the so-called 'Fertile Crescent' region of Palestine, Lebanon, southeastern Turkey, Syria, northern Iraq, northwestern Iran (Zagros Mountains), and most of Turkey, Transcaucasia and the Aegeis. This is roughly the same as Eig's 'zentrales Massif' of the genus (1929a: 150, Tab. 16, fig. 1), although he considered Turkey and Syria-Palestine more the centre of diversity than the Fertile Crescent arc. Within this area the region of greatest diversity can only be approximated owing to the complexity of overlapping distribution patterns. When arbitrarily defined as having over ten species present (Fig. 9), it consists of the central part of the

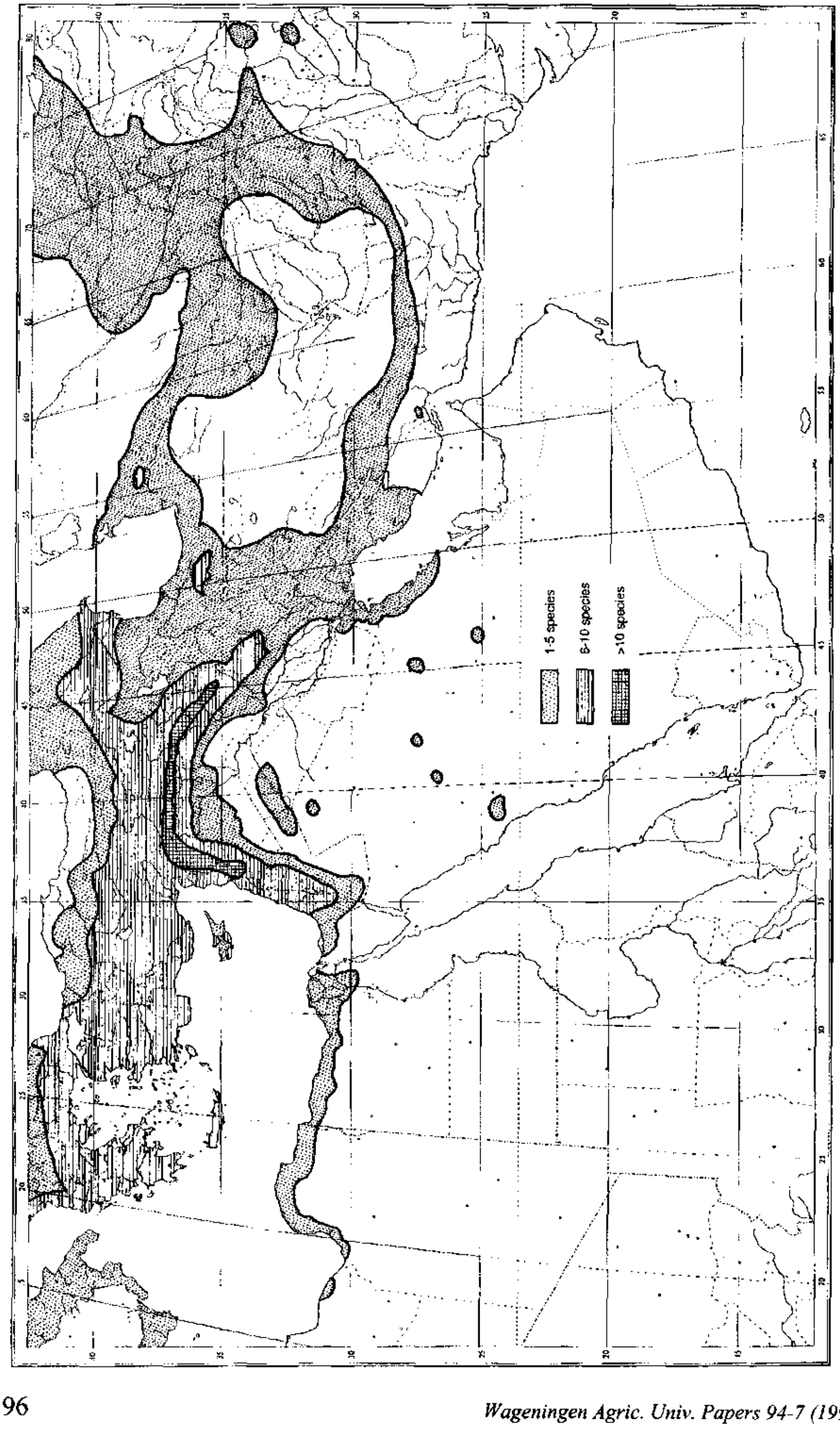


Fig. 9. Distribution of sympatric *Aegilops* species in western Asia and northern Africa (partially).

Fertile Crescent, where the southern slopes of the mountain ranges meet the lowlands and steppes of the Syrian and Iraqi Jezira (the region between the Euphrates and Tigris Rivers).

It must be noted that this region of greatest diversity of the genus is not necessarily the region in which the genus is thought to have developed during its evolution. This so-called primary region of origin, according to Hammer (1980a: 135), must be sought in the Transcaucasus, from which the originally diploid species migrated in western and southwestern directions (all of them except one), as well as to the east (*Ae. tauschii* only). It then seems plausible to postulate that out of this region and after their network-like development, the group of tetraploid species with their wider adaptation capacity spread again both west and southwest (Fig. 10) around the Mediterranean basin, as well as east (Fig. 9) into 'central' Asia. [The notation 'central' Asia is misleading as Takhtajan's Provinces of his Central Asian Subregion are more appropriate here. My terminology derives from usage by workers in the former USSR, who traditionally refer to 'Central' or 'Middle' Asia as a joint notation for the republics of Turkmenistan, Uzbekistan, Kyrgyzstan, Tajikistan and Kazakhstan.]

This marked difference in spread between the diploid and tetraploid species is demonstrated by the sympatric distribution for the five diploids of the *Sitopsis* section, *Ae. bicornis*, *searsii*, *longissima*, *sharonensis*, and *speltoides*, shown in Fig. 12. Their total distribution is rather limited (see also below). Most other diploids (*Ae. caudata*, *comosa*, *umbellulata* and *uniaristata*) are also of limited distribution (see Figs. 22, 27, 28, 86 and 88). The only exception is *Aegilops tauschii* (Figs. 72-73), which, due to its weediness and segetal growth habit, has spread widely (see also below).

The wider spread of the tetraploid species is particularly illustrated by *Aegilops biuncialis*, *crassa*, *cylindrica* (but see below), *geniculata*, *neglecta*, *triuncialis*, and *ventricosa*. Less widely spread are mainly Western Asiatic elements such as *Ae. columnaris*, *kotschyi*, and *peregrina*, which have, in fact, not dispersed much wider than the diploids. In most cases their distribution (still) at least partially overlaps with that of their putative parents, but some cases are hard to explain in this respect, e.g., *Ae. crassa* (genome DM) as being *Ae. tauschii* (D) x *Ae. comosa* (M), and *Ae. ventricosa* (DN) as being *Ae. tauschii* (D) x *Ae. uniaristata* (N). In both cases there is no overlap of the putative parents and their 'offspring' (see the distribution maps of these species; more on *Ae. ventricosa* at 6.1.2).

The hexaploid species (*Ae. juvenalis* and *vavilovii*) are again limited in distribution, but their evolutionary origin can make this plausible. If *Aegilops juvenalis* (genome DMU) evolved as a natural hybrid of *Ae. crassa* (DM) and *triuncialis* (UC; opinions are divided on this; see at 10.9, note 2), then this apparently happened only at some isolated places throughout the large and partially sympatric distribution areas of the putative parents with the C-genome of *triuncialis* being eliminated (compare Figs. 32, 46 and 80). If it is the result of *Ae. crassa* (DM) x *Ae. umbellulata* (U) (cf., Kimber & Feldman, 1987: 125) then its isolated distribution in central Asia becomes is much harder to explain. *Ae. vavilovii* (DMS) is the result of hybridization of *Ae. crassa* (DM) x a *Sitopsis* ('S') species. The *Sitopsis* species is

Ae. longissima according to Kimber & Feldman (1987: 125) and in western Jordan both species overlap (compare Figs. 32 and 52). However, there is a larger area of sympatric distribution of *Ae. vavilovii* with another *Sitopsis* species, *Ae. searsii* (compare Figs. 62 and 90). The parentage of *Ae. searsii* was recently confirmed with molecular data (Zhang & Dvořák, 1992: 812).

A special problem of distribution is posed by the weedy diploid *Ae. tauschii* and tetraploid *Ae. cylindrica.*

The weedy growth of *Ae. cylindrica* is dramatically demonstrated by its introduction and subsequent wide spreading in the U.S.A. (see Fig. 38). When the introduction occurred is unclear, but the oldest specimen I have seen (*Wakabayashi s.n.* (herb. US) from Pullman, Washington state) is from 1918. The species has become troublesome in fields and pastures (Kearney & Peebles, 1960), where its long, scabrous awns cause injury to grazing aminals (Kucera, 1961: 69). Its growth on the edges and within wheat fields is also reported as troublesome (Cronquist et al., 1977: 334). Its distibution in Europe is also difficult to classify as being natural or adventive. The distribution shown in Fig. 37 therefore has to be interpreted with caution. I have assumed that spread from the Balkan further northwards along the Danube river into Hungary and Slovakia has been natural, and that even the Istrian peninsula and northeastern Italy were reached. The many locations in the Piemonte and Aosta area are, on the contrary, from sites such as railway stations, indicating introduction with grain refuse or similar artificial means. Fiori & Paoletti (1896: 108) mention the occurrence of *Ae. cylindrica* in the Aosta, Genoa and Puglia regions in Italy as being adventive. Comparing the flora of Switzerland and surrounding areas, Hess et al. (1967: 383) also doubt if the presence of *Ae. cylindrica* in the Aosta region is natural. I have therefore assumed that the further spread through western and northern Europe has been adventive.

Aegilops tauschii is also known for its weedy behaviour. I have nevertheless interpreted all known sites as being natural rather than adventive (Figs. 72-73) as the spread is continuous and is limited only by natural boundaries such as the Tian Shan mountain ranges in the east. There is a considerable variation in habitats: from steppes and margins of deserts to the very wet and more temperate hyrcanian forests of the southern Caspian seashores in Iran to the cool and dry central Asian steppes. From these habitats it has developed as a successful weed of cultivated cereals (Zohary et al., 1969). The only places considered adventive are some sites in Europe and the established growth in the middle region of the Yili River area in China (see notes on distribution and ecology at 10.17).

Some aspects of the distribution of *Aegilops* are considered in the following notes:

1 In spite of 200 years of botanical exploration of the Orient resulting in many herbarium collections, recently supplemented by substantial germplasm collections, the known distribution is still incomplete. The conspicuous absence of *Aegilops* in central and eastern Iran and in western Afghanistan can be only partly explained. The presence of the widespread *Ae. tauschii* and *triuncialis* in a

'band' through southern Iran into Baluchistan, Pakistan, roughly follows the old trading route (Shiraz – Kerman – Quetta). Similarly, the Silk Route connected places in northern Iran through Turkmenistan to Uzbekistan's Fergana Valley and beyond, probably bringing *Ae. tauschii* to the Yili River area in China. The environment of the great salt deserts Dasht e-Kavir and Dasht e-Luz in central Iran, the latter partly extending into western Afghanistan, accounts for the absence of *Aegilops* there. However, it would be worthwhile to see if any *Aegilops* can be found along the roads from Mashad to Kerman and Zahedan. In Afghanistan the route Herat – Kandahar was with certainty only explored by Vavilov, who collected only cultivated crops along it (J. Valkoun, pers. comm.). Climate and vegetation in this region, however, are not different from other, more eastern and northern regions in Afghanistan where *Aegilops cylindrica, tauschii* and *triuncialis* are reported. On the other hand, the route from Ashkhabad via Chardzhou to Bukhara and beyond was part of the Silk Route and traverses the steppes of the Peski Karakumy [Sands of the Black Dust] in Turkmenistan. Yet no *Aegilops* is reported from here and its absence seems natural.

My own collections revealed *Aegilops triuncialis* var. *persica* and *Ae. comosa* var. *comosa* new for Cyprus in 1989, and the latter taxon was found for the first time in Bulgaria in 1992 by Zacharieva and Dimitrov. Similarly, my 1991 visit to ASH revealed *Ae. kotschyi* for the first time in Turkmenistan. As a result, the map of Fig. 9 shows the range of 6-10 species for the western Kopet Dag in Turkmenistan as well as for several places on Cyprus.

2 Collection activities of I.S. Collenette have revealed several species (*Ae. kotschyi, peregrina, vavilovii*) for Saudi Arabia. Except for the sites near Medina and on the Persian Gulf coast – the latter a continuation from the presence in southwestern Iran into more dry and sandy areas by *Ae. kotschyi* – they are considered adventive introductions, having spread accidently along the few major roads in that country and mainly coinciding with oil exploration sites. [Contrary to adventive locations in northwestern Europe I have put the Saudi sites on the map of Fig. 9, as they are rather unknown and may inspire new explorations.]

3 After distributions of 17 species in Turkey were superimposed, a conspicuous gap appeared on the northern rim of this country (see Figs. 9 and 10). This coincides with a part of Takhtajan's Euxine Province of his Circumboreal Region (which extends further along the eastern shore of the Black Sea), and is more northern-temperate in character than the Mediterranean. The region is characterized by high rainfall, varying from 800 to over 2000 mm per year (Naiboğlu, 1977), which, especially in the eastern part of Lazistan, is continuous throughout the year (Davis, 1965: 5). This is unsuitable for most *Aegilops* species as perennial grasses have an advantage in such a climate. Note that equal rainfall is recorded from mountains in the southwest near Antalya, but, in contrast, this is very seasonal. Similar rainfall is recorded from the nearby shores on the southwestern Caspian Sea in Iran where *Ae. tauschii* can be found. It can be speculated that only this species may have been able to spread into Lazistan. However, this apparently has not happened (Fig. 9). The more western parts of the Euxine

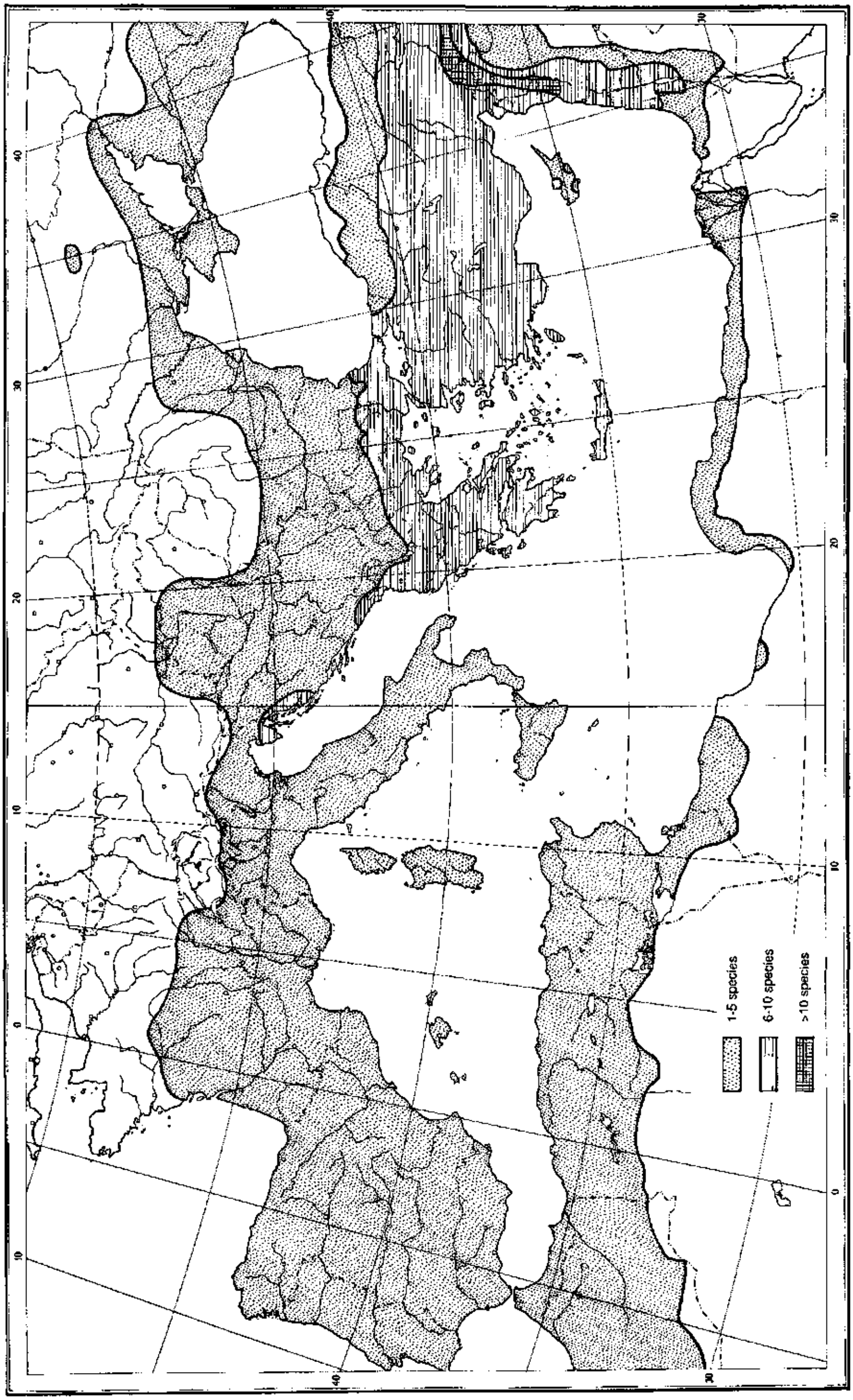


Fig. 10. Distribution of sympatric *Aegilops* species in Europe and northern Africa (partially).

Province in Turkey are seasonal and/or dry enough to permit more *Aegilops* species to grow there.

4 On the other side of the Black Sea the Crimean peninsula is in marked contrast with the absence of the genus in northern Turkey. The southern slopes of the mountains on the Crimean peninsula and the adjacent coastal area of Russia are the so-called Crimea-Novorossiysk Province of Takhtajan's Mediterranean Region. Six species are recorded here, viz. *Ae. biuncialis*, *cylindrica*, *geniculata*, *neglecta*, *tauschii*, and *triuncialis* (but nowhere all overlapping, thus the shading indicates 1-5 species only). Only the weedy *Ae. cylindrica* has spread further over the rest of the Crimea and can be found continuously along the northern shores of the Black Sea.

5 The distribution of *Aegilops* in most parts of (former) Yugoslavia and in Romania, Moldova and the Ukraine is mainly through *Ae. cylindrica*. However, one has to be cautious with the data for other species in, especially, Yugoslavia and Romania. Adjacent countries – Albania, Bulgaria, and, most of all, Greece – are fairly rich with totals of 6, 8 and 11 species respectively (Table 11). But, as I have not seen any of the national herbaria of Slovenia, Croatia, Bosnia, Macedonia, Yugoslavia, or Romania, I would predict a wider spread of *Aegilops* species in these countries than I can substantiate at present. Excluding *Ae. cylindrica*, the contour on the Balkans for *Aegilops* would be rather close to the Adriatic Coast, through southern Bulgaria, and would cover only a very small part of southeastern Romania.

6 *Aegilops* has been found as an adventive in many parts of northwestern and northern Europe, with the weedy *Ae. cylindrica* being the most prominent species. The presence of *Aegilops geniculata* on the Canary Islands must have been accidental as prevailing winds would counteract their introduction naturally. Introduction must have happened prior to 1849 as the species was reported by Webb & Berthelot's (1849) *Histoire naturelle des Iles Canaries*, which even includes a local vernacular. Two other species reported from adjacent Morocco and Iberia, *Ae. triuncialis* and *Ae. ventricosa*, were not introduced to the archipelago.

Seven species have been accidently introduced in the United States of America, of which *Aegilops cylindrica* is widespread in the plains of the midwest and in the western states on the Pacific Coast (see above). Two species, *Ae. geniculata* and *Ae. triuncialis*, are locally spread in California, of which *Ae. triuncialis* is reported as a serious weed of rangelands, able to crowd out forage species and avoided by livestock (Crampton, 1974). Four species, *Ae. crassa*, *neglecta*, *tauschii* and *ventricosa*, as well as the *Ae. cylindrica* x *Triticum aestivum* hybrid, are known from a few locations only (Fig. 38).

Aegilops tauschii has been introduced (probably with the Silk Route) in the middle region of the Yellow River (also known as the Yili River or Huang He) in the Chinese provinces of Shaanxi and Henan (see the distribution at 10.17 for more details). Adventive distribution in inland Saudi Arabia of, e.g., *Ae. peregrina* var. *peregrina* and *Ae. vavilovii* is discussed above (note 2).

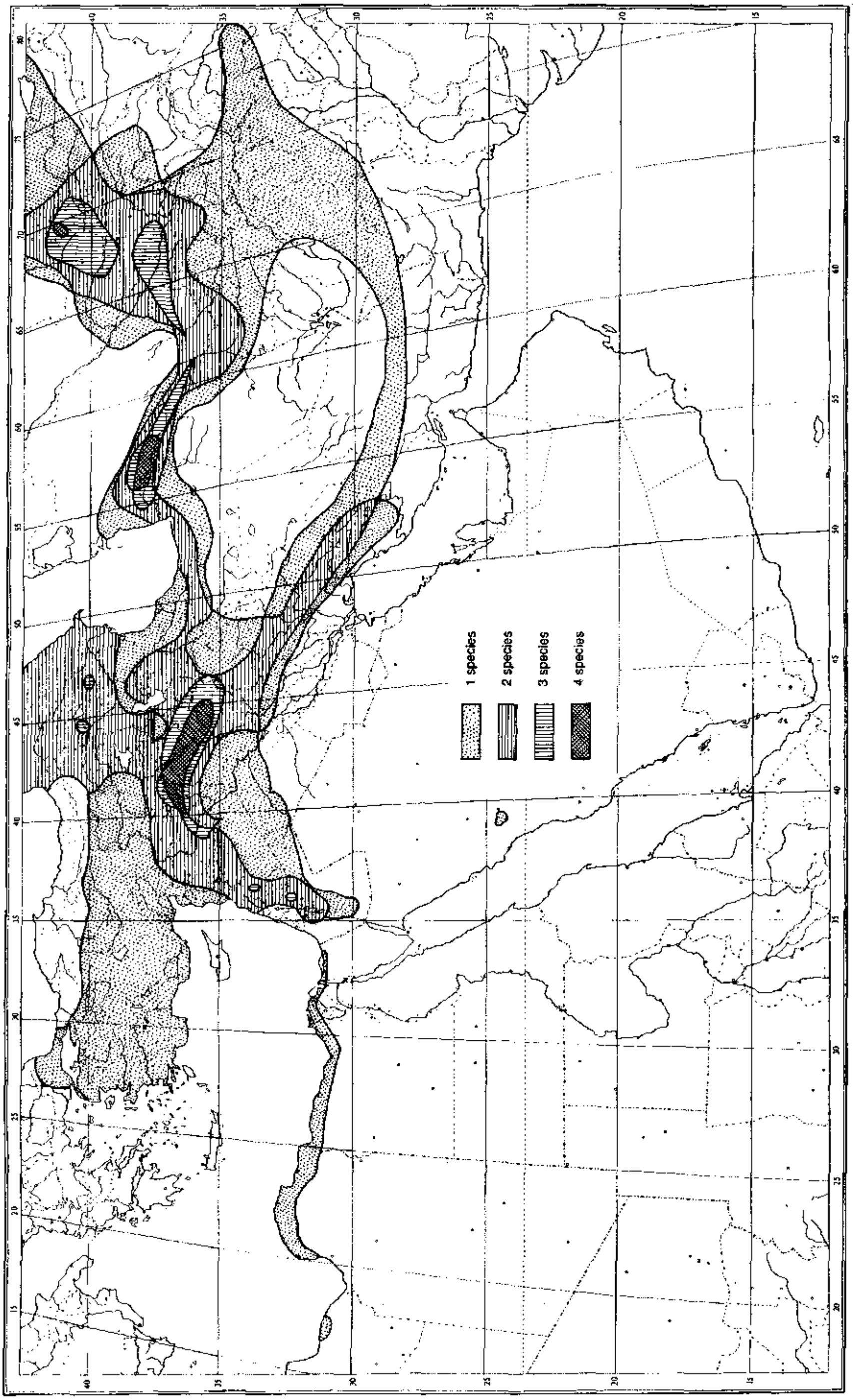


Fig. 11. Sympatric distribution of D-genome species of *Aegilops* (sect. *Vertebrata* and *Ae. cylindrica*).

The geographical distribution for many species has been outlined in detail by Eig (1936). Since then a great deal of collection for herbarium specimens and, more recently, for germplasm, has been carried out. An up-to-date overview of all species in terms of Takhtajan's system with their occurrence is presented in Table 10. Estimates of occurrence in each country where *Aegilops* and *Amblyopyrum* are found are presented in Table 11.

6.1.2 Distribution of D-genome species of Aegilops *L.* *Fig. 11*

Of special interest is the distribution of the species carrying the D-genome, viz. *Aegilops tauschii, cylindrica, crassa, juvenalis, vavilovii,* and *ventricosa* (Fig. 11; see Table 1 for their genomic formula). The central part of the Fertile Crescent is again the region with the greatest diversity for these species, with abundant sympatric growth also in the western Kopet Dag Mountains of Turkmenistan, and in mountainous regions in Uzbekistan and Tajikistan (all due to the presence of *Ae. juvenalis*). Only one species, *Aegilops ventricosa*, occurs exclusively west of the Fertile Crescent, while the others have spread in a mainly northern (e.g., *Ae. cylindrica*, but this species went in fact north, east and west) and eastern (e.g., *Ae. juvenalis* and *tauschii*) direction out of the centre of diversity of the genus. With the exception of *Ae. juvenalis* and, to a lesser extent, *Ae. vavilovii* (both hexaploids, see above), all D-genome species are widespread, even the diploid *Ae. tauschii* (see above). The distribution of *Ae. vavilovii* as presented here is to a large extent based on recent findings and germplasm collections, and this species is now reported throughout the entire western and central parts of the Fertile Crescent. This area is larger than hitherto supposed (see Fig. 90).

Most difficult to explain in an evolutionary sense is the distribution of *Ae. ventricosa* (genome DN). This species is distinctly *not* overlapping with the areas for any of its putative parents. Hammer (1980a: 140) supposes *Ae. tauschii* (D) and *comosa* (M) and, as they do not overlap with *Ae. ventricosa*, he postulates a bridging of the gap through *Ae. crassa* (D<u>M</u>), reported by him as occurring in north Africa. This is not the case (see the distribution of *Ae. crassa*, Fig. 32), and moreover nowhere do *Ae. crassa* and *comosa* overlap. Yen & Kimber (1992: 962), however, reviewing the assignment of genomes in *Ae. ventricosa*, state that, next to the D-genome of *Ae. tauschii*, it is not the M-genome of *Ae. comosa* that is involved, but the N-genome of *Ae. uniaristata*. Kimber & Feldman (1987: 125) also have these species as progenitors. Comparing the distributions of the three species involved (Figs. 72, 88 and 93) does not solve the problem. There seems only a theoretical overlap on the Istrian peninsula of Croatia of *uniaristata* and *ventricosa*, but *tauschii* is still far away, and a spread entirely out of the Istrian peninsula seems highly unlikely.

In general, D-genome species are found at higher latitudes and altitudes, and may show better adaptation to cold than most species of *Aegilops*. On the other hand the D-genome may be responsible for the overall poor performance of species with this genome in resisting rust infection (Hammer, 1987: 274-275).

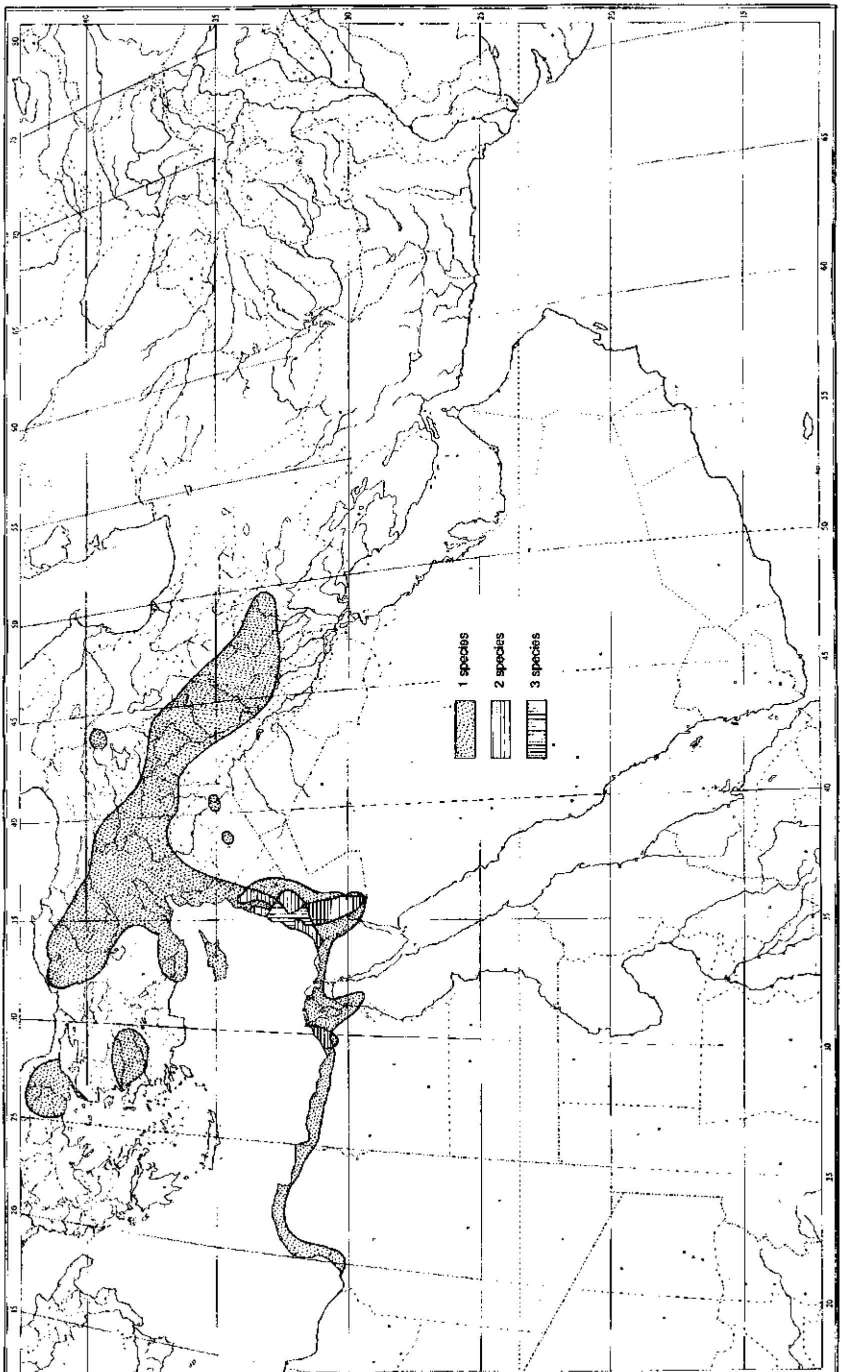


Fig. 12. Sympatric distribution of S-genome species of *Aegilops* (sect. *Sitopsis*).

6.1.3 Distribution of S-genome species of Aegilops *L.* *Fig. 12*

As (any of) the species of the *Sitopsis* section may have contributed to the B-genome of cultivated wheat, the distribution of all species is of interest. All five species are diploids and of limited distribution, concentrated in the southeastern corner of the Mediterranean (Fig. 12). *Aegilops speltoides*, on the other hand, is the only one to be found along the entire Fertile Crescent and in most parts of Turkey, with both varieties often occurring sympatrically (see Figs. 66-67) and without different ecological tendencies (Hammer, 1980a: 131). The four other species of the section (*Ae. bicornis*, *longissima*, *searsii*, and *sharonensis*) all occur within a very limited area (see also Figs. 16-17, 52, 62 and 64). Of these, the closely related *Ae. sharonensis* and *bicornis* are an example of biregional vicariance (Zohary, 1962: 57), the former confined to the coastal plain and within Takhtajan's Mediterranean Region, the latter replacing it inland and spreading towards the Saharo-Arabian Region. Perhaps *Ae. searsii*, also distinctly allopatric with *Ae. sharonensis* (compare Figs. 62 and 64), should be included here as well. Next to *Ae. bicornis*, *Ae. longissima* occurs in two different phytogeographical regions and in a remarkably disjunct area of distribution: limited to the Egyptian coast in the vicinity of Alexandria on the one hand, and in central and southern Palestine and adjacent northwestern Jordan on the other hand. Although its presence may be expected on the Sinai coast it has not been reported west of Rafah in the northeastern corner of the Sinai. It should also be noted that the distribution of *Ae. searsii*, similar to *Ae. vavilovii*, is mainly based on recent findings and germplasm collection work, and may thus be larger than hitherto supposed.

The question of domestication of the tetraploid (emmer) wheats now arises. If *Ae. speltoides* was the donor of the B-genome (especially the var. *ligustica*, cf., Sarkar & Stebbins, 1956), then this may have happened over a large area, comprising almost the entire Fertile Crescent arc and large parts of Turkey. If, on the other hand, any of the other *Sitopsis* species was involved, the most likely region must have been the Jordan River basin, thus within a rather small area in the western half of the arc only.

6.1.4 Ecology of Aegilops *L.*

The genus *Aegilops* L. is a typical representative of Sakamoto's (1982) Mediterranean group in the Triticeae, comprising Mediterranean-central Asiatic genera. Other annual genera included in this group are *Eremopyrum* (Ledeb.) Jaub. & Spach, *Henrardia* C.E.Hubb., *Heteranthelium* Jaub. & Spach, and *Triticum* L., all of them, like *Aegilops* (and *Amblyopyrum*) with solitary spikelets at each rachis node, and *Crithopsis* Jaub. & Spach and *Taeniatherum* Nevski with spikelets in groups (l.c., 98). *Aegilops* fits well into a number of eco-genetical characteristics, enumerated by Sakamoto: (1) the geographical distribution is limited to the Mediterranean-central Asiatic region with a climate of hot, dry summers and winter rainfall, changing inland to more dry continental with cold winters. (2) An annual growth habit, which is an advantageous life strategy with seasonal rainfall: growth, flowering and fruiting during and shortly after the winter, followed by seed dormancy to survive the hot summer. (3) Morphological diversification of the spike and variation in seed dispersal. In *Aegilops* there are three types of spike dis-

Table 10. Summary of distribution of *Aegilops* and *Amblyopyrum* species

Species	Takhtajan (1986) term	Notes
Aegilops		
bicornis	Mediterranean element	(both varieties) Confined to coastal areas of Libya, Egypt, Palestine; rarely more inland. Uncommon.
biuncialis	Mediterranean / Western Asiatic element	Mainly Aegean, also Turkey, Cyprus, western arc of FC* and Transcaucasia. Locally abundant.
caudata	Mediterranean element	Greece, Turkey; scattered but in most parts of FC. Locally abundant.
columnaris	Mediterranean / Western Asiatic element	Mainly in Turkey and western arc of FC, but scattered in eastern part as well. Westward to Crete, eastward to Transcaucasia; rare in Iran. Uncommon.
comosa	Mediterranean element	(both varieties) Mainly Greece. Turkish locations probably all historical. Var. *comosa* new for Cyprus and Bulgaria. Uncommon.
crassa	Western Asiatic element	Throughout FC, but mainly northern parts; well represented in Central Asia up to Tian Shan mountain ranges. Occasionally in steppe (Syria, W Iraq). Locally common.
cylindrica	Mediterranean / Western Asiatic / Circumboreal element	Widespread, with tendency to weedy behaviour. Adventive in W and NW. Europe and USA. Mainly at higher latitudes. Common throughout, but rare in W part of FC.
geniculata	Mediterranean / Western Asiatic / Circumboreal element	Throughout southern Europe and North Africa (more rarely in the eastern parts); only western arc of FC. Adventive in central and northwestern Europe. Common.
juvenalis	Western Asiatic element	Mainly Armeno-Iranian, Turanian and Turkestanian provinces. Scattered in N part of FC. Rare.
kotschyi	Mediteranean / Western Asiatic element	Coastal Libya, Egypt. Throughout FC but mainly western arc. Scattered in Central Asia, eastern arc of FC, Kuwait and E Saudi Arabia. Locally common.
longissima	Mediterranean / Saharo-Arabian element	Coastal Egypt, Palestine; rare in Jordan. Limited distribution and uncommon to rare.
neglecta	Mediterranean / Western Asiatic / Circumboreal element	Widespread in S Europe, westward to Portugal; rare in western North Africa; scattered throughout FC; eastward to W Turkmenistan. Locally abundant.
peregrina	Mediterranean element	(both varieties) Mainly western part of FC and locally common. Rare in Greece, Egypt, Turkey. Both vars. adventive in Morocco.
searsii	Mediterranean element	Limited to Palestine, Syria, Jordan, Lebanon. Uncommon.
sharonensis	Mediterranean element	Endemic in Sharon plain, Palestine, and S Lebanon. Locally common.
speltoides	Western Asiatic element	(both varieties) Widespread in but mainly limited to entire FC. Locally common.
tauschii	Western Asiatic element	Almost exclusively east of 40^0 longitude in Western Asiatic subregion. Only in northern part of FC. Locally common.
triuncialis	Mediterranean / Western Asiatic / Circumboreal element	Widespread in southern Europe, western and central Asia; less so in western part of North Africa. Common. Var. *persica* rare and only Western Asiatic.
umbellulata	Mediterranean / Western Asiatic element	Turkey, Iran, and mainly northern and eastern FC. Uncommon.
uniaristata	Mediterranean element	Adriatic coast, Greece; rare in Turkey. Uncommon, but mainly rare.
vavilovii	Western Asiatic element	Western and northern FC. Uncommon to rare.
ventricosa	Mediterranean / Circumboreal element	Western parts of North Africa and Mediterranean; rare in Italy, Libya, and Egypt. Uncommon.
Amblyopyrum		
muticum	Western Asiatic element	Central Anatolian and Armeno-Iranian provinces only. Uncommon.

* : FC = Fertile Crescent (see text)

articulation: wedge, barrel, and whole-spike (see Chapter 4.1). This diversity makes possible a wide adaptation to the diverse environments of the region. (4) An adaptation to somewhat disturbed environments, such as pastures, roadsides, garrigue and maquis vegetation, park-forests of e.g., oaks and pistachio, and edges of cultivation (cereals, legumes, but also in orchards, olive groves, etc.), thus within both ruderal and segetal environments. Usually *Aegilops* species grow intermingled with other grasses (including other *Aegilops* and wild *Triticum* species) and low shrubs like *Poterium* spp. They rarely dominate a vegetation, but occasional exceptions have been seen. For example, a population of *Ae. biuncialis* dominated a grassland of hundreds of square meters on an eastern slope of the Dzhalgan mountains in Daghestan, Russia, and within the Erebuni Nature Reserve in Armenia *Ae. triuncialis* formed the grass cover of an area estimated at over 50 hectares, with additional growth of various *Aegilops* and wild *Triticum* species. (5) A predominance for self-pollination, which is a selective advantage once a niche is occupied during the process of (comparatively) rapid evolution, as well as when adaptating to a dry and/or continental habitat. This is illustrated by the 'canopy-model' of *Aegilops* of Clayton & Renvoize (1986) with its self-pollinating species network at the tetraploid level 'on top' of the diploids, of which several are still (partially) outcrossing (cf., Hammer, 1980a: 125-126; see also Chapter 4.3).

Exceptions to these general characteristics are: (1) the size of the genus, with 22 species instead of the usual 1-5 (*Triticum*, with its cultivated members, is a special case; the wild taxa are only four). However, when Löve's (1982, 1984) genomic system is adopted, *Aegilops* would be split up into no less than 13 genera of sizes that would fit more into the average of the Mediterranean group. (2) The natural intergeneric hybridization in the Mediterranean group is very limited, except in the *Aegilops – Triticum* group (that is, of course, when seen as separate genera).

The altitudinal distribution of the genus varies from -400 m (Dead Sea area) up to 2700 m, but differs greatly among the species. Hodgkin et al. (1992) present data on altitudinal distribution at 200-m intervals for some species. It appears that *Aegilops caudata* is a typical lowland species, with a few accessions from 1800 m, whereas *Ae. speltoides*, and especially *Ae. tauschii*, show a more even distibution over the altitudinal classes. Their report of *Ae. tauschii* at 2900 m is not confirmed by me. Except for *Ae. speltoides*, the *Sitopsis* species can be defined as typical lowland elements, with only a few locations at higher altitude (*Ae. longissima* at 400-600 m in Jordan). No species can be characterized as a typical high-altitude element, and many can be found in the elevations of 500-1200 m.

6.2 *Amblyopyrum* (Jaub. & Spach) Eig — Figs. 98-99, 101; Tables 10-11

This monospecific genus occurs only in the central Anatolian and Armeno-Iranian Provinces of Takhtajan's Western-Asiatic Subregion. The two varieties of the outcrossing species always occur intermingled. Hammer (1980a: 132) considers this species as a primitive diploid that must have taken a separate development from the hypothetical ancestor of the *Aegilops sensu lato* group in an early stage. Its distrib-

Table 11. Distribution by country of *Aegilops* and *Amblyopyrum* species (varieties not separately considered; adventive distribution excluded)

Country	**Species**											
	bic.	*biu.*	*cau.*	*col.*	*com.*	*cra.*	*cyl.*	*gen.*	*juv.*	*kot.*	*lon.*	*neg.*
AFRICA:												
Algeria	–	4*	–	–	–	–	–	2	–	–	–	4
Egypt	4	–	–	–	–	–	–	5	–	2	4	–
Libya	4	5	–	–	–	–	–	4	–	2	–	–
Morocco	–	5	–	–	–	–	–	1	–	–	–	5
Tunisia	–	5	–	–	–	–	–	2	–	5	–	–
ASIA:												
Afghanistan	–	–	–	–	–	4	5	–	–	5	–	–
India	–	–	–	–	–	–	–	–	–	–	–	–
Iran	–	5	5	5	–	4	2	–	–	4	–	5
Iraq	–	5	4	4	–	2	5	5	4	4	–	4
Jordan	4	2	–	–	–	5	5	2	–	2	5	–
Kazakhstan	–	–	–	–	–	–	–	–	–	–	–	–
Kyrgyzstan	–	–	–	–	–	5	4	–	–	–	–	–
Kuwait	5	–	–	–	–	–	–	–	–	3	–	–
Lebanon	–	1	5	5	–	5	5	1	–	4	–	–
Palestine	4	2	–	–	–	–	–	2	–	2	3	5
Pakistan	–	–	–	–	–	–	5	–	–	–	–	–
Saudi Arabia	–	–	–	–	–	–	–	–	–	5	–	–
Syria	5	2	5	4	–	2	5	2	5	4	–	4
Tajikistan	–	–	–	–	–	4	5	–	–	–	–	–
Turkey	–	3	3	4	5	5	3	4	–	5	–	2
Turkmenistan	–	–	–	–	–	2	4	–	5	5	–	5
Uzbekistan	–	–	–	–	–	2	3	–	5	5	–	–
EUROPE:												
Albania	–	4	–	–	5	–	–	5	–	–	–	5
Armenia	–	4	–	2	–	5	2	–	–	–	–	5
Azerbaijan	–	2	–	4	–	–	4	5	5	4	–	5
Bosnia and Hercegovina	–	4	–	–	–	–	–	5	–	–	–	5
Bulgaria	–	2	5	–	5**	–	2	4	–	–	–	3
Croatia	–	5	5	–	–	–	5	2	–	–	–	3
Cyprus	4	1	–	–	5	–	–	1	–	5	–	–
France	–	4	–	–	–	–	–	2	–	–	–	2
Georgia	–	5	–	–	–	–	4	5	–	–	–	5
Greece	–	1	1	4	3	–	5	3	–	–	–	1
Hungary	–	–	–	–	–	–	2	5	–	–	–	–
Italy	–	4	–	–	–	–	–	1	–	–	–	1
Macedonia	–	2	–	–	–	–	4	5	–	–	–	2
Moldova	–	–	–	–	–	–	2	–	–	–	–	–
Portugal	–	–	–	–	–	–	–	1	–	–	–	3
Romania	–	5	–	–	–	–	4	–	–	–	–	–
Russia	–	5	–	–	–	–	2	–	–	–	–	5
Slovenia	–	–	–	–	–	–	5	5	–	–	–	–
Spain (a)	–	5	–	–	–	–	–	1	–	–	–	3
Switzerland	–	–	–	–	–	–	–	5	–	–	–	–
Ukraine	–	4	–	–	–	–	2	4	–	–	–	5
Yugoslavia (b)	–	4	–	–	–	–	4	5	–	–	–	4

Table 11 (continued)

Country	Species											Total no.
	per.	*sea.*	*sha.*	*spe.*	*tau.*	*tri.*	*umb.*	*uni.*	*vav.*	*ven.*	*A.mut.*	spp.
AFRICA:												
Algeria	–	–	–	–	–	2*	–	–	–	2	–	5
Egypt	4	–	–	–	–	–	–	–	–	4	–	6
Libya	–	–	–	–	–	–	–	–	–	4	–	5
Morocco	–	–	–	–	–	2	–	–	–	2	–	5
Tunisia	–	–	–	–	–	–	–	–	–	2	–	4
ASIA:												
Afghanistan	–	–	–	–	3	3	–	–	–	–	–	5
India	–	–	–	–	5	–	–	–	–	–	–	1
Iran	5	–	–	5	2	3	4	–	–	–	–	12
Iraq	5	–	–	2	4	2	4	–	5	–	–	15
Jordan	3	4	–	5	–	5	–	–	2	–	–	12
Kazakhstan	–	–	–	–	2	2	–	–	–	–	–	2
Kyrgyzstan	–	–	–	–	4	4	–	–	–	–	–	4
Kuwait	–	–	–	5**	–	5	–	–	–	–	–	4
Lebanon	1	5	5**	1	5	1	5	–	4	–	–	15
Palestine	1	4	2**	4	–	5	–	–	5	–	–	12
Pakistan	–	–	–	–	5	5	–	–	–	–	–	3
Saudi Arabia	5	–	–	–	–	–	–	–	5	–	–	3
Syria	2	4	–	2	5	2	4	–	2	–	–	17
Tajikistan	–	–	–	–	2	2	–	–	–	–	–	4
Turkey	5	–	–	2	5	1	2	5	5	–	4	17
Turkmenistan	–	–	–	–	2	2	–	–	–	–	–	7
Uzbekistan	–	–	–	–	2	2	–	–	–	–	–	6
EUROPE:												
Albania	–	–	–	–	–	5	–	5	–	–	–	6
Armenia	–	–	–	–	2	1	5	–	–	–	5	9
Azerbaijan	5	–	–	–	1	1	5	–	–	–	–	11
Bosnia and Hercegovina	–	–	–	–	–	4	–	–	–	–	–	4
Bulgaria	–	–	–	5	–	2	–	–	–	–	–	8
Croatia	–	–	–	–	–	2	–	4	–	5	–	8
Cyprus	1	–	–	–	–	1	–	–	–	–	–	7
France	–	–	–	–	–	2	–	–	–	4	–	5
Georgia	–	–	–	–	4	4	5	–	–	–	–	7
Greece	–	–	–	5	–	1	4	4	–	–	–	11
Hungary	–	–	–	–	–	–	–	–	–	–	–	2
Italy	–	–	–	–	–	2	–	5	–	5	–	6
Macedonia	–	–	–	–	–	1	–	–	–	–	–	5
Moldova	–	–	–	–	–	–	–	–	–	–	–	1
Portugal	–	–	–	–	–	1	–	–	–	–	–	3
Romania	–	–	–	–	–	–	–	–	–	–	–	2
Russia	–	–	–	–	4	4	–	–	–	–	–	5
Slovenia	–	–	–	–	–	–	–	–	–	–	–	2
Spain (a)	–	–	–	–	–	1	–	–	–	3	–	5
Switzerland	–	–	–	–	–	–	–	–	–	–	–	1
Ukraine	–	–	–	–	5	2	–	–	–	–	–	6
Yugoslavia (b)	–	–	–	–	–	4	–	5	–	–	–	6

*: 1 = Common and widespread; 2 = common in restricted areas; 3 = not so common, but distributed over large area; 4 = not so common and distributed in a restricted area only; 5 = uncommon and in a few locations only, or endemic

**: Personal communication or literature; no specimens seen

(a) Excluding the Canary Islands (see text);

(b) Montenegro and Serbia only (separately listed with specimens seen) ution fits neatly in Hammer's model that the origin of this group has been in Transcaucasia with mainly westward migration. It appears as disjunct with its main spread on the Anatolian plateau and only a few sites in Armenia, and it is surprising that no sites are known from more inland eastern Turkey, which has a similar continental climate (Figs. 98-99; Tables 10-11). Expected distribution in Iraq (Bor, 1968: 226) has not materialized thus far. Reported occurrence near Qamishly in northeastern Syria and from near Khvoy in northwestern Iran by Tanaka (1983: 1018-1019) has not been confirmed either, but I would not consider them as adventive. The Iranian site is, however, questioned by Tanaka (l.c., Tab. 1 on p. 1022).

The ecology is similar to that of *Aegilops*, being also a typical representative of Sakamoto's Mediterranean group in the Triticeae (see 6.1.4), occurring frequently on roadsides, the edges of cultivation, dry hillsides (Fig. 101) and grassy steppes, and apparently tolerating a degree of disturbance. Altitudinal distribution varies from 600-1250 m (rarely up to 1480 m), but can be as low as 450 m, as at Qamishly. I have never seen this species in 'dense stands' in either Turkey or Armenia, as reported by Kimber & Feldman (1987: 87), but always in rather loosely dispersed populations.

7 Description of the genus *Aegilops*

Family: Poaceae Barnhart, Bull. Torrey Bot. Club 22: 7 (1895), *nom. cons.* – Alternative name: Gramineae Juss., Gen. pl. 28 (1789), *nom. cons.* – Type genus: *Poa* L.

Subfamily: Pooideae. Autonym; used for the first time by A.C.H. Braun in Ascherson, Fl. Brandenburg 1(2): 810 (1864, 'Poeideae R. Br.'; see note 1); Butzin, Willdenowia 7: 120 (1973); MacFarlane & Watson, Taxon 29: 646 (1980); Watson, Clifford & Dallwitz, Austr. J. Bot. 33: 447-450 (1985). – Type genus: *Poa* L.

Supertribe: Triticanae T.D.Macfarl. & L.Wats., Taxon 31: 192 (1982); Macfarlane & Watson in Watson, Clifford & Dallwitz, Austr. J. Bot. 33: 450 (1985). – Type genus: *Triticum* L. – Alternative name: Triticodae L.Wats. in Chapman, Reprod. versat. grasses 258 (1990); to be rejected; see note 2.

Tribe: Triticeae Dumort., Observ. Gramin. belg. 84 (1824). – Type genus: *Triticum* L.

Subtribe: Triticinae Griseb., Spic. fl. rumel. 2(5/6): 422 (1846, 'Tribus I. Poaceae, subtribus I. Triticeae'. Name to be corrected under Art. 19.6 of the ICBN). – Type genus: *Triticum* L. – Heterotypic synonym: Aegilopinae Bluff, Nees & Schauer, Comp. fl. German. (ed. 2) 1(1): 52 (1836); Butzin, Willdenowia 7(1): 141 (1973). – Type (and only) genus: *Aegilops* L. – Note: the Aegilopinae are presented by Bluff et al. as a part of the Triticeae but without indication of rank. Following the termination of the word, the rank was interpreted as subtribe by Butzin (l.c.), who remarked that when *Triticum* is included in the subtribe, Triticinae must be used.

Aegilops L. **Figs. 13-14**

Aegilops L., Sp. pl. (ed. 1) 2: 1050 (1753), (ed. 2) 2: 1489 (1763), Gen. pl. (ed. 5) 470 (1754); Gouan, Fl. monsp. 132 (1765); Honckeny, Syn. pl. Germ. 1: 484 (1792, '*Aegylops*' with *Ae. ovata* only; see note 3); von Willdenow, Sp. pl. (ed. 4) 4(2): 942 (1806); Palisot de Beauvois, Ess. Agrostogr. 104, 146, Tab. 20, f. 5 (*Ae. ovata*) (1812, '*Aegylops*'); Dumortier, Observ. Gramin. belg. 85 (1824); Link, Hort. berol. 1: 12 (1827); Kunth, Enum. pl. 1: 457 (1833, excl. *Ae. bicornis*), Suppl. 371 (1835); Richter, Codex bot. linn. 998 (1835-39); Endlicher, Gen. Pl. 104 (1836); von Steudel, Nomencl. bot. (ed. 2) 1: 29 (1840), Syn. pl. glumac. 1: 354 (1854); Jaubert & Spach, Ill. pl. orient. 4: 10-23, Tab. 309-317 (1850-51a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 351 (1851b); Walpers, Ann. bot. syst. 3: 787 (1852); Cosson & Durieu de Maisonneuve, Expl. sci. Algérie 2: 209 (1855); Pfeiffer, Nomencl. bot. 1(1): 63 (1871); Boissier, Fl. orient. 5(2): 673 (1884); Zhukovsky, Kritiko-systematischeskii obzor vydov roda *Aegilops* L. (Specierum generis *Aegilopis* L. revisio critica), Trudy Prikl. Bot., Genet. & Seleks. [co-title, cited here but used as only title elsewhere: Bull. Appl. Bot., Gen. & Pl. Breeding] 18(1): 417-609 (1928); Eig, Monographisch-kritische Übersicht der Gattung *Aegilops*, Feddes Repert., Beih. 55: 1-228 (1929a), in E. Hannig & H.J.P. Winkler, Die Pflanzenareale 4(4): 43, Maps 38-41 (1936, on distribution); Nevski in Komarov, Fl. URSS 2: 669 (1934, Russian) / 533 (1963, English); Hitchcock, Man. Grasses U.S., USDA Misc. Publ. 200: 243 (1935), (ed. 2, rev. Chase) 245 (1951), Gen. grasses U.S. (ed. 2), USDA Bull. 772: 90 (1936); Roshevitz, Zlaki. Vvedenie v izuchenie kormovykh i khlebnykh zlakov [Grasses. Introd. fodder, cereal grasses] 343 (1937, Russian) / 340 (1980, English); Kihara, Züchter 12: 49-62 (1940), Cytologia 19: 336-357 (1954); Pilger, Das System der Gramineae, Bot. Jahrb. 76: 315 (1954); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960, excl. sect. *Sitopsis*); Chase & Niles, Index Grass Species 1: 4-13 (1962); MacKey, Relationships in the Triticinae, Proc. Third Int. Wheat Gen. Symp. 45 (1968); Tzvelev in Fedorov, Zlaki SSSR 154-155 (1976, Russian) / 221 (1984, English); Baum, Can. J. Bot. 56: 377 (1978b), Can. J. Bot. 61: 518-535 *pro parte* (1983); Farr et al., Index Nominum Genericorum (Plantarum) 1: 33 (1979); Hammer, Feddes Repert. 91: 225-258 (1980b, with subgenera *Aegilops*, *Amblyopyrum* and *Sitopsis*); Croston & Williams, A World Survey Of Wheat Genetic Resources 1-37 (1981; see note 3); Witcombe, Guide species *Aegilops* 1-74 (1983); Chapman, Genetic resources of wheat 1-39 (1985; see note 3); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 157 (1986, with sect. *Aegilops*); Watson, Damanakis & Dallwitz, Grass gen. Greece 35 (1988); Tzvelev, The System of Grasses (Poaceae) and Their Evolution, Bot. Rev. 55: 161 (1989); Watson & Dallwitz, The grass genera of the world 65 (1992), non '*Aegilops* Rchb. 1831', quoted by Pfeiffer, Nomencl. bot. 1(1): 63 (1871), q.e. *Quercus* L. sect. ('c') *Aegilops* Rchb., Fl. germ. excurs. 1(2): 177 (1831), which comprises *Q. aegilops* L., *Q. austriaca* Willd., and *Q. cerris* L. See note 4.

Type species: *Aegilops triuncialis* L. Designated by Hammer (1980b: 228), sustained by Jarvis (1992: 555) on behalf of the Special Committee on Lectotypification, Subcommittee on Lectotypification of Linnaean Generic Names. See note 5.

Homotypic synonyms:

Aegicon Adans., Fam. pl. 2: 36, 513 (1763); Pfeiffer, Nomencl. bot. 1(1): 63 (1871), *nom. illeg.* (Art. 63.1).

Perlaria Heist. ex Fabr., Enum. (ed. 2) 371 (1763), *nom. illeg.* (Art. 63.1).

Triticum L. sect. *Aegilops* (L.) Godr. & Gren. in Grenier & Godron, Fl. France 3: 601 (1856); Hackel in Engler & Prantl, Nat. Pflanzenfam. 2,2: 80 (1887); J.D. Hooker, Fl. Brit. India 7: 367 (1896); von Dalla Torre & Harms, Gen. siphon. 27 (1900); Stojanov & Stefanov, Fl. Bulg. (ed. 1) 1: 168 (1924).

Triticum L. *pro parte*: Bentham, J. Linn. Soc., Bot. 19: 131 (1882); Bentham & Hooker, Gen. pl. 3(2): 1204 (1883); Kuntze, Pl. Orientali-Rossicae, Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 20: 255 (1887); Richter, Pl. eur. 1: 127 (1890); Durand & Schinz, Consp. fl. afric. 5: 937 (1894); de Cesati, Passerini & Gibelli, Comp. fl. ital. 1(4): 85 (1896); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 703 (1901); Bubani, Fl. pyren. 4: 395 (1901-02); Briquet, Prod. fl. Corse 1: 190 (1910); Coutinho, Fl. Portugal (ed. 2) 116 (1939); Diapulis, Syn. fl. graec. 166 (1939); Stojanov & Stefanov, Fl. Bulg. (ed. 3): 171 (1948); Bowden, Can. J. Bot. 37: 663 (1959); Morris & Sears in Quisenberry & Reitz, Wheat and Wheat Improvement 19-87 (1967); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat pp. 1-142 (1987).

Triticum L. subg. *Aegilops* (L.) Schmahlh., Fl. ssredn. jushn. Rossii [Fl. central and southern Russia] 2: 661 (1897).

Frumentum E.H.L.Krause subg. *Aegilops* (L.) E.H.L.Krause, Bot. Centralbl. 73(10): 339 (1898), *comb. incorr.* (Art. 68.1). – Note: presented as one of four subgenera of the illegitimate generic name *Frumentum*, which was a superfluous renaming of *Triticum* L., *Hordeum* L., *Elymus* L., *Aegilops* L., and *Secale* L. (l.c., 339). Any of the constituent Linnaean names should have been chosen instead (Butzin, 1973: 132).

Aegilops L. subg. *Eu-Aegilops* Eig, Feddes Repert., Beih. 55: 56 (1929a), P.Z.E. Inst. Agric. Nat. Hist., Agric. Rec. 2: 204 (1929b); Maire & Weiller, Fl. Afrique Nord 3: 351 (1955), *nom. inval.* (Arts. 21.3 and 32.1*(b)*).

Aegilopodes Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 500 (1984); Hammer, Kulturpflanze 33: 128 (1985), *nom. illeg.* (Art. 63.1). See notes 5, 6 and 8.

Heterotypic synonyms (generic level; for full references to subgenera and sections included in or synonymous with them, see Chapter 8 at 8.3):

Aegilops L. emend. Á.Löve, Biol. Zentralbl. 101: 208 (1982), Feddes Repert. 95: 503 (1984; consists only of *Ae. lorentii* Hochst. (= *Ae. biuncialis* Vis.), *Ae. columnaris* Zhuk., *Ae. ovata* L. emend. Roth (= *Ae. neglecta* Req. ex Bertol. 4n), *Ae. geniculata* Roth, and *Ae. recta* (Zhuk.) Chennav. (= *Ae. neglecta* Req. ex Bertol. 6n); Kerguélen, Lejeunia, Nouv. Sér. 120: 185 (1987, *Ae. geniculata* Roth (= *Ae. ovata* auct. non L.), *Ae. lorentii* Hochst. (= *Ae. biuncialis* Vis.), and *Ae. ovata* L. emend. Roth (= *Ae. neglecta* Req. ex Bertol. 4n (cited as '*Ae. triaristata* Willd. *nom. illeg.*') only). – Type species:

Aegilops ovata L. (in the sense of 'auct. non L.' = *Ae. geniculata* Roth). See note 7.

Aegilemma Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 499 (1984); Hammer, Kulturpflanze 33: 128 (1985). – Type species: *Aegilemma kotschyi* (Boiss.) Á.Löve (= *Aegilops kotschyi* Boiss.). See note 8.

Aegilonearum Á.Löve, Biol. Zentralbl. 101: 208 (1982), Feddes Repert. 95: 502 (1984); Hammer, Kulturpflanze 33: 128 (1985). – Type (and only) species: *Aegilonearum juvenale* (Thell.) Á.Löve (= *Aegilops juvenalis* (Thell.) Eig). See note 8.

Chennapyrum Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 494 (1984); Hammer, Kulturpflanze 33: 129 (1985). – Basionym: *Aegilops* L. sect. *Uniaristatopyrum* Chennav., Acta Horti Gotoburg. 23: 161 (1960). – Type (and only) species: *Chennapyrum uniaristatum* (Vis.) Á.Löve (= *Aegilops uniaristata* Vis.). See notes 6 and 8.

Comopyrum (Jaub. & Spach) Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 493 (1984); Hammer, Kulturpflanze 33: 129 (1985). – Basionym: *Aegilops* L. subg. *Comopyrum* Jaub. & Spach, Ill. pl. orient. 4: 19 (1851a). – Type (and only) species: *Comopyrum comosum* (Sm. in Sibth. & Sm.) Á.Löve (= *Aegilops comosa* Sm. in Sibth. & Sm.). See note 8.

Cylindropyrum (Jaub. & Spach) Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 500 (1984); Hammer, Kulturpflanze 33: 129 (1985). – Basionym: *Aegilops* L. subg. *Cylindropyrum* Jaub. & Spach, Ill. pl. orient. 4: 12 (1850). – Type species: *Cylindropyrum cylindricum* (Host) Á.Löve (= *Aegilops cylindrica* Host). See note 8.

Gastropyrum (Jaub. & Spach) Á.Löve, Biol. Zentralbl. 101: 208 (1982), Feddes Repert. 95: 501 (1984); Hammer, Kulturpflanze 33: 129 (1985). – Basionym: *Aegilops* L. subg. *Gastropyrum* Jaub. & Spach, Ill. pl. orient. 4: 17 (1851a). – Type species: *Gastropyrum ventricosum* (Tausch) Á.Löve (= *Aegilops ventricosa* Tausch). See note 8.

Kiharapyrum Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 495 (1984); Hammer, Kulturpflanze 33: 129 (1985). – Type (and only) species: *Kiharapyrum umbellulatum* (Zhuk.) Á.Löve (= *Aegilops umbellulata* Zhuk.). See note 8.

Orrhopygium Á.Löve, Biol. Zentralbl. 101: 206 (1982), Feddes Repert. 95: 492 (1984); Hammer, Kulturpflanze 33: 129 (1985). – Type (and only) species: *Orrhopygium caudatum* (L.) Á.Löve (= *Aegilops caudata* L.). See note 8.

Patropyrum Á.Löve, Biol. Zentralbl. 101: 206 (1982), Feddes Repert. 95: 492 (1984); Hammer, Kulturpflanze 33: 129 (1985). – Basionym: *Aegilops* L. sect. *Vertebrata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 450 (1928). – Type species: *Patropyrum tauschii* (Coss.) Á.Löve (= *Aegilops tauschii* Coss.). See notes 6 and 8.

Sitopsis (Jaub. & Spach) Á.Löve, Biol. Zentralbl. 101: 206 (1982), Feddes Repert. 95: 491 (1984); Hammer, Kulturpflanze 33: 129 (1985). – Basionym: *Aegilops* L. subg. *Sitopsis* Jaub. & Spach, Ill. pl. orient. 4: 10 (1850). – Type species: *Sitopsis bicornis* (Forssk.) Á.Löve (= *Aegilops bicornis* (Forssk.) Jaub. & Spach). See note 8.

Diagnostic characters: annual herbs with few to many tillers; leaf blade margins at least in basal part of culms ciliate; spikes with at least the uppermost spikelet with glumes and/or lemmas awned, with 2-10(-12) spikelets, falling entire or individually, (sub)cylindrical, moniliform, or more or less ovoid in outline, and with or without rudimental spikelets at the base; glumes rounded at the back and without keel, apex with teeth and/or awns; caryopsis adherent to the palea or not.

Distinguished from the closely allied genus *Triticum* by the *absence* of a well-developed keel on the glumes, which causes the sharp angle in the glume outline of both the wild and cultivated *Triticum* taxa.

Generic description (Figs. 13-14): tufted *annuals* with few to (usually) many tillers. *Culms* unbranched, with (1-)2-4(-5) nodes, usually geniculate at base; foliage dense at base, sparse in ascending part of culm. *Roots* fibrose, 10-30 cm long, unbranched and with thin, short lateral rootlets only, whitish. *Leaves* green, sometimes purplish- or glaucous-green, with ciliate venation and margins at base of

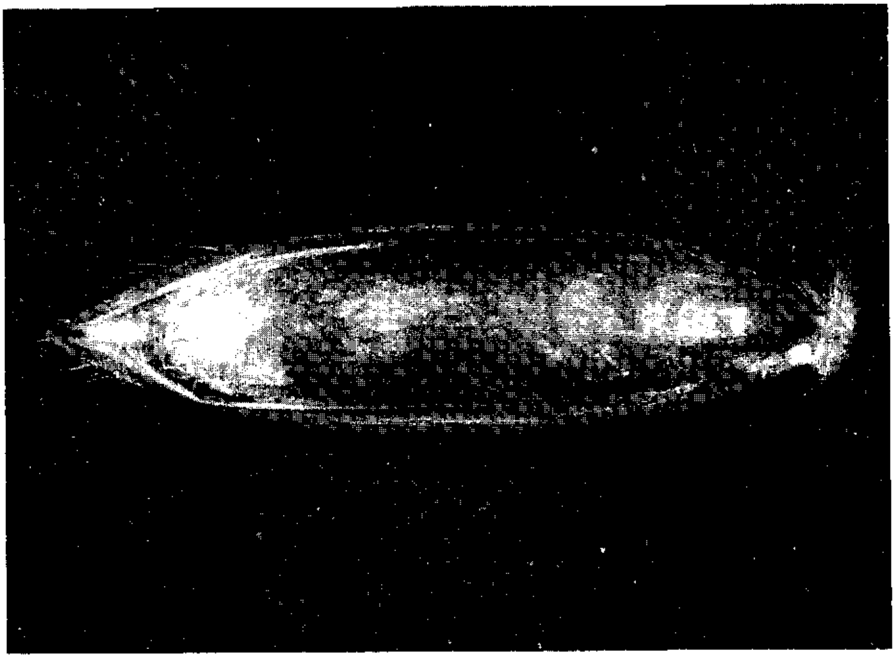


Fig. 13. Palea, lodicules, and mature seed with hairy apical tuft and embryo (*Aegilops cylindrica*).

culm, which gradually becomes more reduced to totally absent in upper parts; ligule short, membranous, transversely linear, up to 1 mm long, apical margin eroded; auricles at base of leaf blade, falcate, usually more yellowish than other parts of leaf, margins ciliate; leaf blade (narrowly-) linear-acuminate, surface scabrid, especially adaxial, to glabrous, margins setulose, often ciliate in basal part and this more strongly so in the basal part of the culm where almost whole margin can be ciliate. *Inflorescence* a (sub)cylindrical, moniliform or narrowly ovoid spike, round or somewhat laterally compressed in cross-section, at least the uppermost spikelet awned; disarticulation at maturity entire or in individual spikelets; rudimentary spikelets at base of the spike 1-3 or absent. *Rachis segments* noded; internodes coriaceous, yellowish- to purplish-green, (narrowly) cuneate-rectangular, flat at the base, gradually becoming concave and thickened above; nodes broadly reniform, supporting the single spikelet and the linear base of next higher internode; ornamentation of outer surface as of corresponding glumes (but venation sunk into surface and not protruding as parallel ridges as on glumes of *Ae. bicornis*, *Ae. kotschyi*, and *Ae. peregrina*); margins setose; venation on outer surface diverging towards truncate apex; inner surface smooth. *Spikelets* sessile, somewhat laterally compressed, usually closely appressed to the concave rachis internodes, with fertile and sterile florets. *Glumes* 2, coriaceous, rounded at the back; apex truncate, subentire, toothed and/or 1-5 awned; outer surface glabrous, scabrid or appressed-velutinous; venation irregular, sunk into the surface (except in *Ae. bicornis*, *Ae. kotschyi*, and *Ae. peregrina*). *Lemmas* elliptic-obtuse, thin, hyaline except in the

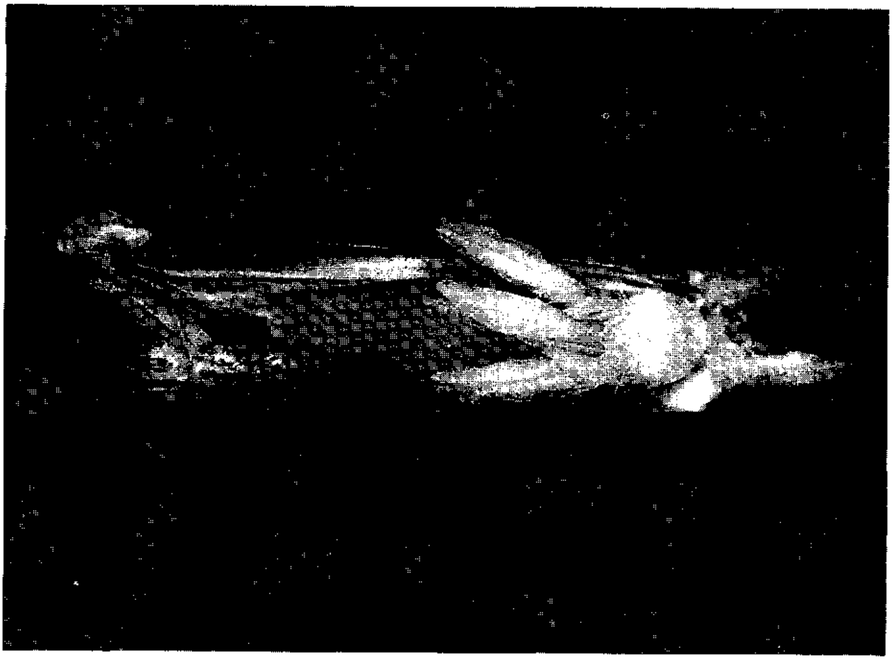


Fig. 14. Partially dissected spikelet showing three anthers and the ovary with plumose pistil (*Aegilops cylindrica*).

apical part which is more coriaceous, veined and more or less conduplicate; apex truncate with 1-3 teeth and/or 1-3 awns. *Paleas (Fig. 13)* hyaline, narrowly ovate, oblong or elliptic, with distinct setulose to toothed keels, each ending in a sharp, acute apex (more obtuse in *Ae. crassa*). *Lodicules* (*Fig. 13*) at the base of the palea, 2 per floret, hyaline, trullate to angular-ovate; margins irregularly ciliate. *Stamens* (*Fig. 14*) 3 per fertile floret; anther loculaments green, yellowish or (occasionally) purplish before release of pollen, white or (occasionally) purplish after release of pollen, 1.5 mm long in self-pollinating species, up to 4 mm in cross-pollinating species. *Pistil* (*Fig. 14*) about 3 mm long; ovary hyaline before fertilization, broadly obovate-triangular, surface covered with short, hyaline hairs; styles 2, very short, free from each other; stigmas 2, plumose, free from each other, diverging at anthesis. *Fruit* (*Fig. 13*) a caryopsis, compressed, ovate, elliptic or oblong, light-brown, with a ventral groove over the entire length, adherent to the palea or not; embryo around one quarter of the length of the grain; hilum in the ventral groove almost as long as the grain; terminal appendage a tuft of white hairs.

Distribution: central and Mediterranean Europe, southern Ukraine, the Crimea, as well as Cis- and Transcaucasus; in Africa north of the Sahara; in western and central Asia the region bordered by the deserts of the Arabian peninsula in the south and by the Tian Shan mountains in the east. Seven species introduced in the United States of America (Fig. 38), of which *Aegilops cylindrica* is widespread, two (*Ae. geniculata*, *Ae. triuncialis*) are locally spread, and four adventive with a few locations only. Several species are adventive in northern and northwestern Europe, and on the Canary Islands (e.g., Figs. 19, 37, 93). The centre of diversity in the 'Fertile Crescent' region of Palestine, Lebanon, southeastern Turkey, Syria, northern Iraq, and northwestern Iran. Additional abundant presence in Transcaucasia. See Chapter 6 for an analysis of the distribution patterns.

Ecology: in somewhat disturbed habitats, such as pastures, roadsides, garrigue and maquis vegetation, various types of park-forest, and in edges of and within cultivation (cereals, legumes, but also in orchards, olive groves, etc.), thus both in ruderal and segetal environments. Usually growing intermingled with other grasses (including other *Aegilops* and wild *Triticum* species), thistles and low shrubs. Almost never dominating a vegetation, but with occasional exceptions.

Altitude: from -400 m (Dead Sea area) up to 2700 m. Altitudinal distribution varies greatly among the species.

Flowering and fruiting time: May – August. In north Africa from February – July.

Genome: x = n = 7. The genus as presented here consists of ten diploid (2n = 14), ten tetraploid (2n = 28), and two hexaploid (2n = 42) species. *Aegilops crassa* and *Ae. neglecta* are known with both tetraploid and hexaploid forms (see Table 2).

Rarity: varies from common, widespread and a serious pest (with some species) to common in a more restricted area (most species) to occurring in a small area only (some species). Literature indicating that species are endangered is scarce. Dakov (1984: 50-51) lists three *Aegilops* species as endangered in Bulgaria, but presumably only because of the limited distribution in that country. Even *Ae. sharonensis*, the species with the smallest distribution area and present only in the coastal plain of Palestine and in southern Lebanon, seems not endangered. It is reported from there as being common and occurring in dense stands (Kimber & Feldman, 1987: 30). Probably only the rare European *Ae. uniaristata* and both varieties of *Ae. comosa* might be or become endangered because of a combination of limited distribution and grazing pressure.

Cultivation status: none of the species exists in cultivated or otherwise improved forms next to the wild forms. Populations of all species, however, are intensively collected, grown out and evaluated for their use in wheat breeding. Artificial amphidiploids (such as autotetraploids) with double chromosome numbers have been created (e.g., *Aegilops tetratauschii* with 2n = 28; see Excluded species). These are, however, research materials only and cannot be regarded as 'improved' or (commercially released) varieties.

Vernacular names:

Albanian: Halmuca (Demiri, 1981: 80).

Arabic: Dawsar (Al-Khatib, 1978: 11). With variations this name is widespread in many Arabic-speaking countries of North Africa, West Asia and the Arabian peninsula. Old transcriptions of the Arabic name are: Dausir, Dalisit, Dauser, Duser (all from Mattioli, 1560: 584), Dasser, Dalesit, Desana (all from Bauhin (1658: 150), who indicates that these names, in fact, relate to wild oats, *Avena fatua*), and Dalisit (Daléchamps, 1587: 405). Dayosar Arabum [= *Aegilops* (of the) Arabs] (Bubani, 1901-02: 395 at '*Triticum sylvestre*', a pre-Linnaean name for

Aegilops geniculata). 'Dawsar' is also used for *Ae. geniculata* (see 10.8). Oum el Guemah [= mother of (*durum*) wheat] (Battandier & Trabut, 1905: 393). Also used for *Ae. geniculata* only (see 10.8).

Armenian: Aytzagn [ayt = goat; zagn = eye] (Gandilyan et al., 1975: 86); Karachot [kara = stone; chot = grass] (Gandilyan in Kazarjan, 1990: 248).

Azeri: Bugdayliot (Grossheim, 1949: 719); Bugdayiot (Karjagin, 1950: 334). Bugda = wheat. Compare with Turkish and Turkmenian.

Basque: Olo-soilkia [olo = oloa = oats (genus *Avena*); soilkia = thing that falls down] (de Lacoizqueta, 1888: 174). The 'thing that falls down' refers to the individual spikelets, breaking up beneath each lemma in *Avena*. This name is also used for *Ae. triuncialis* (see 10.18a), but there the entire spike falls rather than the individual spikelets.

Catalonian: Blat de cabra [blat = wheat; cabra = goat] (Sennen, 1920: 122).

Czech: Mnohoštetnik (Presl, 1820: 47), Mnohoštět [= with many awns] (Dostál, 1989: 1366).

Dutch: Geitenoog [= goat's eye], wild koorn [= wild wheat], wilde gerst [= wild barley] (all Gerth van Wijk, 1909: 30). The names of Gerth van Wijk also refer to Dutch-speaking regions such as Flanders (in Belgium) and countries such as South Africa.

English: Goat grass / Goatgrass (e.g., Hitchcock, 1935: 243); Hard grass (Gerth van Wijk, 1909: 30) / Hard-grass (Aiton, 1813: 432; deducted from vernaculars, listed at five species); Goat's face grass (Post, 1933: 783; Täckholm et al., 1941: 268).

French: Averon, Aveneron, Avoine fole [= fake oats, *Avena*], Avoine sterile, Avoine sauvage [= wild oats] (all from Bauhin, 1651: 435, pointing at the confusion with the oat species); Égilope (de Lamarck & de Candolle, 1805 (reissue 1815): 79; Mutel, 1837: 153); égilope, blad daou [= du] diable [= wheat from the devil], coquiole, espangassat, orge batarde [= bastard barley; probably in the sense of: hybrid of, or looking like barley] (all from Gerth van Wijk, 1909: 30). Gerth van Wijk cites most of his names from other sources. Coquiole is an old name from Celtic France (Bauhin, 1651: 435 'Coquiele'). Blad and bled (a.o. in Dodoens, 1644: 793) are old spellings for blé (= wheat).

German: Taubhaber / Taubhafer [= pigeon oats], wild und unfruchtbarer Hafer [= wild and sterile oats], Gerstenratten [Gersten = barley; (die) Ratte = (the) rat; thus acting as a 'rat' in barley fields] (all from Bauhin, 1651: 435); Ziegenhafer [Ziege = goat; Hafer = oats, *Avena*] (Alschinger, 1832: 23); Hartgras (Heynhold, 1846: 10); Walch (a.o. Koch, 1907: 2798; Hegi, 1936: 499; Hess et al., 1967: 381); Twalch, Bartgras, Dort, Durt, fremder Walch, Geissauge [= goat's eye], Ziegenauge [Ziege = (female) goat; Auge = eye] (all from Gerth van Wijk, 1909: 30).

Greek: αιγιλωψ (Baillon, 1876: 57); αιζιφ (Merino y Román, 1909: 385) [in fact the transliteration of the name]. See also at the etymology of the genus name of this Chapter. Aloupotzitis (Della & Bari, 1993: 385).

Hungarian: Kalászbojt [kalász = ear; bojt = tassel, fringe, pompom, bobble], Kecskeszem [kecske = goat; szem = eye] (both from Jávorka, 1924: 114), Kecskebúza [kecske = goat; búza = wheat] (Soó, 1951: 939, 1973: 354).

Italian: Egilopo, orza, sive grano salvatico [= *Aegilops*, barley, or wild wheat] (Bauhin, 1658: 151); Egilope (Tenore, 1835: 287); Cerere [a reference to the Roman god of agriculture Ceres; also used for *Ae. geniculata*, see at 10.8] (Pignatti, 1982: 541).

Kurdish: Kharken keina [= donkey choke (sic); also used for *Ae. crassa*, see at 10.6]; Jaganma [= wild wheat / wheat grass; also used for *Ae. crassa*, see at 10.6] (Bor, 1968: 174). Jaganma is possibly similar to Gîyā ganma [gîyā = barley; ganma = wheat], with wild wheat thus referring to both wheat and barley. Ganma can also be spelled as Ganim (pers. comm. S. Altounji).

Russian: Kolenitza [koleno = knee; the rest of the word is a conjugation of the first part] (Kozlovsky & Rakipov, 1983: 354; Rokitsky, 1965: 262). The name might refer to the geniculate growth habit of many species. Both sources present this vernacular name under 'goat grass'.

Serbo-Croatian: Ostika [= ?; note that Oštrica (shaker, shiverer) is used for *Ae. uniaristata* (see 10.20)] (Schlosser & Vukotinovič, 1869: 1293; Domac, 1967: 516); Dhrtavac [drhtati = to shake or shiver, thus: tremorer, shaker, shiverer], Glota [= ?], Zečji uho [zečji = hare; uho = ear], Zečji kruh [zečji = hare; kruh = bread] (all names from Šulek, 1879: 272, 492).

Slovenian: Sverepek [= with many long hairs and then forming a tail (like from a horse); pers comm. M. Penčić] (Šulek, 1879: 272, 492).

Spanish (Castilian): Egilope; *Avena* estéril [= sterile *Avena* or oats] (de Lacoizqueta, 1888: 174). This last name is also used for *Ae. triuncialis* (see 10.18a).

Turkish: Buğday otu [buğday = wheat; otu = grass] (Sabanci, 1984: 1).

Turkmenian: Bogdayok [= little wheat] (Nikitin & Geldykhanov, 1988: 45); Bogdayli-tchair [bogdayli = like wheat; tchair refers to *Cynodon dactylon*] (Nikitin & Kerbabayev, 1962: 141). Note that both names refer to Bogday = wheat.

Uses: Douin (in Bonnier, 1934: 62) cites Dioscorides who suggested that species of this genus heal an eye disease from which goats are suffering. This healing capacity is more in particular ascribed to *Aegilops geniculata* (see at 10.8). I have found no effective medicinal capacities of any kind described in recent literature, however. See Chapter 3.1, pre-Linnaean history, for more details on supposed healing properties.

Several species are reported to be useful as pasture and forage grasses (e.g., Bor, 1968; Watson & Dallwitz, 1992: 66). See under Uses of various species in Chapter 10.

Etymology: the generic name *Aegilops* is derived from the Greek αιγιλωψ, *Aegilops*, which is found with Theophrastus and Dioscorides (see at 3.1), and related to goat, *aex* (Löve, 1984: 503), *aix* (Bor, 1968: 174), or *aïgos* (Coste, 1906: 656; Douin in Bonnier, 1934: 62). Baillon (1876: 57) transcribes the Greek αιγιλωψ into 'désirée par la chèvre' [= desired by the goat]. Coste (1906: 656) translates the Greek *ôps* from his etymology of *Aegilops* (*aïgos* and *ôps*) as 'eye' and interprets the genus name as 'épillets ressemblant à un œil de chèvre par les longues arêtes qui les entourent' [spikelets looking like a goat's eye because of the long awns that surround them]. A similar translation (αιζ [aig] = goat, ωφ [ops] = eye) is presented by Merino y Román (1909: 385) and Douin (in Bonnier, 1934: 62). Bor (1968:

174) translates '*ops*' as 'similar to' and '*aegilos*' (thus not 'aegil*ops*') as 'a herb liked by goats' and concludes that the generic name means: 'a grass similar to that liked by goats'. Thus: a herb liked by goats, or resembling the eye of a goat. In this respect, Hegi (1908: 390) presents a curious etymological link between the Greek αιζ = Ziege [= goat] and the word 'Haber' = old-northern (he probably means a local dialect from northern Germany) 'Hafr' = Bock [= male goat].

Notes: 1. The name Pooideae was first used by A.C.H. Braun in Ascherson's *Flora der Provinz Brandenburg*, Vol. 1(2) of 1864. Braun cites his name as 'Poeideae R. Br.', erroneously ascribing it to Robert Brown (fide Butzin, 1973: 120). It is now the required autonym epithet following Art. 19.3 of the *Code*. Recently, detailed descriptions of the subfamily have been presented by Macfarlane & Watson (1980: 646-647) and by Watson et al. (1985: 447-450).

2. As the Triticeae are the subject of intensive study because of their economic importance, many subdivisions have been proposed recently including the grouping of tribes and/or parts of tribes in so-called 'supertribes'. This category between tribe (Triticeae) and subfamily (Pooideae) was given the name 'Triticanae' by Macfarlane & Watson (1982: 192) and included the tribes Triticeae, Brachypodieae and Bromeae *pro parte* [The Brachypodieae are included in the Triticeae by Clayton & Renvoize, 1986.]. A Latin diagnosis was provided as was a type genus: *Triticum* L. This supertribe was again described in detail by Macfarlane & Watson in Watson et al. (1985: 450-452), but its constituent tribes were not specified.

More recently the name 'Triticodae' was proposed by Watson (in Chapman, 1990: 258-259) for the same Triticanae, but in a slightly different arrangement. Although no rules exist for categories not listed in Art. 4.1 of the *Code*, the name Triticodae L.Wats. (1990) – if its rank should ever be included – has to be rejected as it lacks a Latin description, diagnosis or reference to it (Art. 36.1), and is superfluous after Triticanae T.D.Macfarl. & L.Wats. (1982) (Art. 63.1).

3. Although dealing with the genetic resources of wheat and its wild relatives and not primarily treating the group in any taxonomic way, the publications of Croston & Williams (1981) and Chapman (1985) are nevertheless useful summaries of recent treatments. They also deal with one of the most important aspects of the *Triticum – Aegilops* group: their use in wheat breeding. The taxonomic concept of the wheat group, used by the (then) International Board for Plant Genetic Resources (IBPGR, now renamed as the International Plant Genetic Resources Institute, IPGRI) is basically MacKey's (1966, 1968) treatment, keeping *Aegilops* as a separate genus (Croston & Williams, 1981: 5).

4. Von Dalla Torre and Harms (1900: 27) list '*Aegylops* Honck., Synops. I: (1792) 484' separately from *Aegilops* L. as two synonyms of *Triticum* L. sect. *Aegilops* (L.) Gren. & Godr. This concerns only an orthographic variant of the generic name as Honckeny clearly referred to the Linnaean concept of the genus.

Pfeiffer (1871: 63) referred to '*Aegilops* Rchb.' in Reichenbach's *Flora germaniae excursiorae* (1831) as a section of *Quercus*. Reichenbach divided *Quercus* L. into three separately diagnosed 'groups' (there is no indication of rank), indicated as: 'a. *Suber*', 'b. *Robur*' and 'c. *Aegilops*', respectively. The 'c. *Aegilops*' comprised *Quercus cerris* L., *Q. austriaca* Willd. and *Q. aegilops* L. As Spach (1841: 166-168) included *Quercus aegilops* L. later in his section *Cerris* of the genus, this sectional name became superfluous. The history of the connection of *Aegilops* with *Cerris* as the name for an oak species goes back to Plinius, according to Pfeiffer (1871: 63, '...Αιγιλοψ, nomen arboris glandiferae apud Plinium...'). Long before Pfeiffer, Dodoens also mentioned Plinius (1583: 819, '...De AEgilope ex Plinio & aliis...', and above an icon of the oak species: '...Ægilops sive Cerris maiore glande...'). See Chapter 3.1.

5. The initial choice of the type species by Green in Hitchcock & Green, Standard-species of Linnaean genera of Phanerogamae (Proposal IV for the International Botanical Congress, Cambridge (England), 1930) (1929: p. 193: '*A. ovata* L., the type species'), was reiterated by Hitchcock (1935: 243): 'Type species: *Aegilops ovata*', and augmented in his Gen. grasses U.S. (ed. 2) of 1936: '*Ae. ovata*, which best agrees with the generic description, is taken as the type' (l.c., 91). The designation of *Aegilops ovata* L. as the lectotype species is in accordance with Art. 8 (especially 8.1 and 8.3) of the *Code*, and has been followed by most authors since the formal introduction of typification by the International Botanical Congress of 1935. Hammer (1980b: 228), on the other hand, proposed *Aegilops triuncialis* as he saw disagreement with Art. 8 (that is, of the 'Leningrad'-*Code* of 1978) in the case of *Ae. ovata*, but reasons for his objection are not stated. Thus far, his choice was only followed by Clayton & Renvoize (1986: 157).

However, due to the lectotypification through the illustration in Scheuchzer's *Agrostographia* (1719, Tab. 1, fig. 2A, B, C, referred to on p. 11; q.e. *Ae. neglecta* Req. ex Bertol.) of *Ae. ovata* L. by Greuter (in Greuter & Rechinger, 1967: 171) the identity of this species became once again mixed up with *neglecta* (see note 2 at 10.12, *Ae. neglecta*). Jarvis (1992: 556) correctly argued that this confusion makes *Ae. ovata* an unfortunate choice as the type species. His proposal to accept *Ae. triuncialis* L., chosen earlier by Hammer (1980b: 228), was almost unanimously sustained by the Subcommittee on Lectotypification of Linnaean names. A new lectotypification of *Ae. ovata* on LINN 1218.1 (which is excellent material of this species) will not be pursued here as this would reopen the case for generic typification in the original sense of Green. That would hardly be a contribution to nomenclatural stability!

With *Aegilops triuncialis* now the lectotype species of the genus *Aegilops*, the generic name *Aegilopodes* Á.Löve (1982, 1984) becomes superfluous as the type species of that genus is also *Ae. triuncialis*. His considerably emendated genus *Aegilops* is, on the other hand, still based on *Ae. ovata* (in the sense of *Ae. geniculata* Roth; see note 7). Thus *Aegilops* L. emend. Löve becomes a heterotypic synonym of the genus as accepted here.

6. The elevations to generic rank with simultaneous change in name of sect. *Surculosa* Zhuk. (to *Aegilopodes* Á.Löve), sect. *Uniaristatopyrum* Chennav. (to *Chennapyrum* Á.Löve) by Löve (1982: 207), and of sect. *Vertebrata* Zhuk. (to *Patropyrum* Á.Löve), also by Löve (1984: 492), are valid since their basionyms were validly published. A new name is permitted since the type species remained the same (Art. 7.11) and also in view of Art. 60.1. In Recommendation 61A.2 it is indicated, however, that the original name should be retained unless becoming contrary to the *Code*. This was possible in all three cases. [Being a Recommendation only, one is not obliged to retain the names, however.] Löve (1982: 206) at first based his genus *Patropyrum* on Eig's (1929a) subsection *Oligomorpha*, which contains only *Ae. tauschii*, but later corrected this to the earlier name *Vertebrata* from Zhukovsky (1928), which also contains only this species.

7. Löve (1982: 208; 1984: 503) presented a considerable (as outlined by Art. 47.1 and Recommendation 47A.1 of the *Code*) emendation of *Aegilops*, limiting it to the species with genome types M and U (combined as MU and MMU, l.c., 1984: 503), and thereby excluding the type species of *Aegilops* as the genus is interpreted here. Löve's designation of the genome of hexaploid *Ae. neglecta* as 'MMU' differs from Kimber & Tsunewaki's (1988: 1210, 'UMN') more generally accepted one (but see Table 2 and its note 6). Kerguélen (1987: 185) followed Löve's genomic concept and interpreted the genus accordingly, but with exclusion of *Ae. columnaris*.

8. The genomic genera *Aegilopodes* Á.Löve, *Aegilemma* Á.Löve, *Aegilonearum* Á.Löve, *Chennapyrum* Á.Löve, *Comopyrum* (Jaub. & Spach) Á.Löve, *Cylindropyrum* (Jaub. & Spach) Á.Löve, *Gastropyrum* (Jaub. & Spach) Á.Löve, *Kiharapyrum* Á.Löve, *Orrhopygium* Á.Löve, *Patropyrum* Á.Löve, and *Sitopsis* (Jaub. & Spach) Á.Löve are not accepted by the following authors and cited in synonymy of *Aegilops* L.:

- Watson, Clifford & Dallwitz, Austr. J. Bot. 33: 452 (1985);
- Clayton & Renvoize, *Genera Graminum*, Kew Bull. Add. Ser. 13: 157 (1986);
- Kerguélen, Lejeunia, Nouv. Sér. 120: 185 (1987, with orth. var. '*Aegiloneurum*', and excluding *Chennapyrum*, *Comopyrum*, *Kiharapyrum*, *Orrhopygium*, and *Patropyrum*, but including Löve's emendated *Aegilops*);
- Tzvelev, The System of Grasses (Poaceae) and Their Evolution, Bot. Rev. 55: 193-194 (1989);
- Watson & Dallwitz, *The grass genera of the world* 65 (1992, *Sitopsis* is not mentioned). [It must be realized that Watson's work is in principle *compilatory*, and he does not want to be cited as an authority pro or contra the acceptance of (genomically defined) genera. – J.F. Veldkamp, pers. comm.]

8 Sectional arrangement

8.1 Discussion

Jaubert & Spach, in the fourth volume of their *Illustrationes plantarum orientalium* (1850-51a: 10-23), and, almost simultaneously, in the Annales des Sciences Naturelles (1851b: 351-358), proposed for the first time a subdivision of the genus *Aegilops*. Six subgenera were recognized, as follows (bracketed diagnoses are abbreviated and partly translated from their Latin originals):

1. *Sitopsis* (spike slender, elongated, sublinear; spikelets 7 (occasionally 20-25), long internode rachillas; glumes of all spikelets exaristate; lemmas of lateral spikelets at the base of the spike exaristate, upwards gradually with one awn): *Ae. bicornis*, *Ae. speltoides* (= *Ae. speltoides* var. *ligustica* only, cf., Jaubert & Spach's (1851a) description on p. 22 and Tab. 316).

2. *Cylindropyrum* (spike elongated, moderately thick, subterete, subulate-cylindrical; spikelets 5-11, terminal ones with either glumes or lemmas awned; glumes and lemmas without or with one awn, awns in lateral spikelets as well as in terminal ones short and slender): *Ae. caudata*, *Ae. cylindrica*, *Ae. squarrosa* (in the sense of 'auct. non L.' = *Ae. tauschii*).

3. *Gastropyrum* (spike elongate, thick, subulate-cylindrical, moniliform knotted; spikelets 7; glumes and lemmas without or with one awn): *Ae. platyathera* (= *Ae. crassa*), *Ae. ventricosa*.

4. *Comopyrum* (spike short, thick, conic to conic-cylindrical, knotted; spikelets 2-3, ovoid-ventricose, terminal ones with 3-5 stiff awns; glumes terminal spikelet 1-3 awned; palea in lateral spikelet 2-3 cuspidulate and 'exaristate' (= muticous), in terminal spikelet uni-aristate): *Ae. comosa* (= *Ae. comosa* var. *subventricosa* only, cf., Jaubert & Spach's (1851a) description on p. 19 and Tab. 314).

5. *Uropyrum* (spike slender, sublinear, flexible, loosely distichous; spikelets 7-9, terminal ones with long awns; glumes 'exaristate' (muticous); lateral lemmas 'exaristate' (muticous) and mucronate, terminal ones with one long awn): *Ae. macrura* (= *Ae. speltoides* var. *speltoides*, cf., Jaubert & Spach's (1851a) description on p. 21 and Tab. 315).

6. *Amblyopyrum* (spike slender, linear, flexible, subterete, ecaudate; spikelets 7-15; glumes 'exaristate' (muticous); apex of lemmas round, blunt): *Ae. tripsacoides* (= *Amblyopyrum muticum* var. *muticum* only, cf., Jaubert & Spach's earlier (vol. 2 of 1847) description on p. 121 and Tab. 200; see also Chapter 11), *Ae. loliacea* (= *Amblyopyrum muticum* var. *loliaceum*, cf., Jaubert & Spach's (1851a) description on p. 23 and Tab. 317).

It must be noted that this subdivision excluded all species now located in the section *Aegilops*, including a number of very common tetraploids, widespread in the

Orient, such as *Ae. biuncialis*, *Ae. geniculata*, and *Ae. triuncialis*! The subgeneric names *Comopyrum*, *Cylindropyrum*, and *Sitopsis* still serve as basionyms for currently recognized sections. Unfortunately no type species were chosen by Jaubert & Spach.

Until the next subdividing scheme of Zhukovsky (1928), none of the newly described species (e.g., in Boissier's *Diagnoses* (1844b, 1846), or his *Flora orientalis* (1884), or in von Steudel's *Synopsis* (1854)), nor any of the species that were not included by Jaubert & Spach in 1850-1851a were accommodated in Jaubert & Spach's scheme. Boissier's *Flora orientalis* did not employ a formal subdivision, but rather grouped the taxa according to an identification key (see also at 3.2), as did, in fact, all of the 53 floras inspected from the period 1852-1929 (Table 8). However, between 1928 (Zhukovsky's monograph) and 1980 (Hammer's revision) no less than 12 new subdivisions of the genus in its traditional sense were proposed using various principles, as follows: classical taxonomy, based on morphology (Zhukovsky, 1928, and Eig, 1929a), karyomorphology (Senjaninova-Korczagina, 1930, 1932, and Chennaveeraiah, 1960), genome analysis (Kihara, 1940, 1954, Kihara & Tanaka, 1970, and MacKey, 1968), genetic relationships and ploidy levels (Bowden, 1959, Morris & Sears, 1967), leaf anatomy (Gendels, 1980), and classical taxonomic, but partially based on crossing behaviour and germplasm collections (Hammer, 1980a, 1980b). Senjaninova-Korczagina's two papers (1930, 1932) presented identical schemes. The one published by Kihara in a paper by Lilienfeld (1951: 115) is identical to his classic 'analyser' paper of 1954, and therefore not considered here. Lastly, the two papers by Hammer (1980a, 1980b) are to be seen as one: the general part of his revision was separated from the taxonomic summary of taxa, which was published later that year. On the other hand, the various papers by Kihara (1940, 1954), and later Kihara & Tanaka (1970) all present emendations. It is surprising that of these 12 schemes only Gendels and Hammer present some other data on combinations and synonyms related to the sectional (and subgeneric) names.

A compared line-up of these 12 schemes may be more confusing than revealing. Six of them (Zhukovsky, Eig, Kihara (1954), MacKey, Bowden and Morris & Sears) were compared by Croston & Williams (1981: Appendix III), showing a sea of names and underscoring that only minor changes occurred in most of the subdivisions, or that subdivisions in the traditional sense were absent (in Bowden, 1959, and Morris & Sears, 1967). A new line-up would now be twice the size without adding anything significant, and therefore only some remarks are made here:

1 Formal subdivisions are absent in Bowden (1959) and Morris & Sears (1967) as their grouping is strictly according to ploidy level. The latter is, however, identical with the former except for some changes involving the cultivated *timopheevii* and *zhukovskyi* wheats. Designation of rank is also absent in Kihara's (1940, 1954), and MacKey's (1968) subdivisions, but with MacKey putting at least the author's name with the taxa. However, the use of '*Polyeides*' and '*Vertebrata*' in all these schemes clearly refers to Zhukovsky's sections, and, consequently, I have assumed in my treatment of the nomenclature that these authors view their groups as sections as well.

2 Zhukovsky (1928) distinguished no less than nine sections, but one year later Eig (1929a) united three of them, *Vertebrata*, *Polyploides* and *Gastropyrum* into one, *Pachystachys* Eig (for the correct name, however, he should have taken one of the constituting names; see 8.3.5). This unification (under the name *Vertebrata*) has more or less remained so, with Senjaninova-Korczagina (1930) and, especially, Gendels (1980; see note at 8.3.1) being the exceptions. Chennaveeraiah (1960) maintained only four sections in *Aegilops* after transfer of *Sitopsis* to *Triticum* and elevating *Amblyopyrum* to separate generic status. As he split off *Uniaristatopyrum* from *Comopyrum* his actual number of sections is five, but this has not been followed since.

For most sections minor changes can be found in the 12 schemes regarding their included taxa, mainly because of their lumping or splitting, and because of additions owing to insufficient knowledge (compare Kihara, 1940, 1954, and Kihara & Tanaka, 1970). Whether these emendations for purpose of citation are 'considerable' in the sense of Art. 47.1 and Recommendation 47A.1 of the *Code* is debatable, and only in the case of *Vertebrata* have I decided positively (see note at 8.3.5). The enumeration of species in the subdivision proposed here is not found in any of the 12 schemes considered. However, as stated earlier at 5.4.1, I think the interpretation of sections by Kihara (1940 et seq.) according to the genome types reflects species relations best. Thus, the schemes of Kihara & Tanaka (1970: 2), and, being rather similar, Hammer (1980b) resemble my subdivision the most. Genomic properties are reflected in, e.g., the unification of all barrel-type disarticulating species in one section, *Vertebrata*. A difference with both other schemes is the recognition of *Ae. sharonensis* and *Ae. vavilovii* as separate species, contrary to Kihara & Tanaka and Hammer, respectively, while separation of *Ae. kotschyi* from *Ae. peregrina* is another difference with Kihara & Tanaka.

It must be noted that for three sectional names (*Comopyrum*, *Cylindropyrum*, and *Sitopsis*) the diagnostic characters and circumscription alter from Zhukovsky (1928), but as their type species are not excluded and their emendation is not 'considerable', Zhukovsky's name is maintained as author, following Art. 47.1 of the *Code*. For *Vertebrata* the emendation is considerable, as, is the emendation of section *Surculosa* Zhuk. (in which Zhukovsky contained only one species; see at 8.3.1). For the latter name, however, the autonym rule has to be invoked, changing it to *Aegilops*.

3 The section *Sitopsis* emerged in Zhukovsky's (1928) revision as a clearly defined unit, effectively uniting Jaubert & Spach's subgenera *Sitopsis* and *Uropyrum* (although the latter taxon is nowhere mentioned). Since the designation of the common genome type 'S' – with variations – by Kihara (1940: 61), the number of species in this section varied only through recognition at species level of included taxa (e.g., *Ae. longissima* 'incl. *Ae. sharonensis* Eig' in Kihara's (1954) scheme). The only addition was the more recent description of *Ae. searsii* by Feldman & Kislev (1977, 1978).

Similarly clearly defined has been the position of *Aegilops mutica*, which constituted a separate subgenus *Amblyopyrum* by Jaubert & Spach (1851a: 23), uniting the hispid and glabrous varieties that were by then still described as two separate species. Ever since then *Ae. mutica*, when regarded as a part of *Aegilops*, has been in a section of its own. Except by Chennaveeraiah (1960), its separate generic status, proposed by Eig (1929b), has not been followed, although Hammer (1980a: 132; 1987: 279) was definitely inclined to do so. Eig (1929a) underscored the unique position of *Ae. mutica* by maintaining a separate subgeneric status for it, while locating all other species in the only other subgenus, '*Eu-Aegilops*'. Hammer (1980b) agreed, but gave the *Sitopsis* group subgeneric status as well, accommodating the rest under the subgenus *Aegilops*.

4 Eig's (1929a) names at sectional level are *all* superfluous renamings for taxa, '...definitely including the holotype...or previously designated lectotype of a name which ought to have been adopted, or whose epithet ought to have been adopted, under the rules...' (Art. 63.1). He may have been perfectly aware of this as it is remarkable that his otherwise careful nomenclatural treatment of names at (infra)specific level is totally lacking at the (infra)sectional level.

5 A recent classification was proposed by Gandilyan (1978: 228-230) on strictly practical characters and without including genomic information. His subdivision leads to five 'groups' (an informal category not recognized by the ICBN) based on (1) spike morphology (short with broader base vs. long cylindrical), (2) spike rachis (brittle vs. non-brittle), (3) apical spikelet (sterile vs. fertile), and (4) caryopsis (free vs. adherent lemma and palea). This classification therefore deviates significantly from the previous ones.

8.2 Key to the sections of *Aegilops*

1 Spike disarticulation *entire* (whole spike falls as one unit) or *wedge-type* (breaking up into spikelets with their supporting rachis internode remaining attached); – spike slender, (narrowly) cylindrical, or moniliform, or narrowly ovoid; plants slender 2

Spike disarticulation *barrel-type* (breaking up into spikelets with the rachis segment of the next higher spikelet remaining attached); – spike stout, cylindrical or moniliform; plants stout .... sect. **Vertebrata**

2 Spike disarticulation *entire* 3

Spike disarticulation *wedge-type*; – spike slender, narrowly cylindrical but somewhat dorso-ventrally flattened; lateral spikelets with lemma awns (only 5 to 7 uppermost ones in *Ae. bicornis* var. *anathera*) .... sect. **Sitopsis**

3 At least glumes of apical spikelets with well-developed awns; – spike either *(a)* narrowly cylindrical and then at least 10 times as long as wide, or *(b)* moniliform, or *(c)* narrowly ovoid, and then less than 10 times as long as wide 4

Glumes of apical spikelets obtuse, acute to apiculate, toothed or with a short, up to 1 cm long, central awn; lemma of lateral spikelets awnless, lemma of apical spikelets with two equally long awns (*Ae. longissima*, *Ae. speltoides* var. *speltoides*), or unequal with one long and one shorter awn (*Ae. searsii*); – spike narrowly cylindrical, at least 30 times as long as wide .... sect. **Sitopsis**

4 Glumes of apical spikelet with 1 awn and spike then moniliform, or with 3-5

awns and spike then moniliform, narrowly cylindrical, or narrowly ovoid; – spike up to 10 times as long as wide but usually less 5

Glumes of apical spikelet with only 1 awn, with or without small lateral teeth; – spike narrowly cylindrical, at least 10 times as long as wide (usually more than 20 times) .... sect. **Cylindropyrum**

5 Spike narrowly cylindrical or moniliform with all spikelets of similar shape; glumes of apical spikelets either with 3 awns, a well-developed central one and 2 more reduced, lateral ones which are sometimes reduced to teeth, or with 1 awn only (in the moniliform *Ae. uniaristata*); glumes of lateral spikelets with 1 broad, conspicuous, triangular tooth and 1 awn ....sect. **Comopyrum**

Spike narrowly ovoid with an inflated, ovoid-ellipsoid basal part, gradually or abruptly narrowing into a subcylindrical upper part; glumes of apical spikelets with 3-4 awns of similar size and position (except in *Ae. triuncialis*: a strong, central, erecto-patent awn and 2 reduced and less diverging awns); glumes of lateral spikelets with 2-4(-5) awns and/or teeth, never broadly triangular .... sect. **Aegilops**

8.3 The sections of *Aegilops*

8.3.1 Section **Aegilops**

Recognized under this name by: Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973), in Fedorov, Fl. part. Eur. URSS 1: 155 (1974), Zlaki SSSR 158 (1976, Russian) / 226 (1984, English); Gendels, Bot. Zhurn. 65(6): 864 (1980; includes *Ae. juvenalis* (sic), see note); Hammer, Feddes Repert. 91: 236 (1980b); Feinbrun-Dothan, Fl. Pal. 4: 173 (1986); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 158 (1986); Schulze-Motel, Kulturpflanze 35: 67 (1987).

Synonym: *Aegilops* L. sect. *Surculosa* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 449 (1928). – Note: although this is the oldest name for this taxon, it is based on the same lectotype species, and has to be replaced by *Aegilops* following the autonym rule of Art. 22.1.

Type species: *Ae. triuncialis* L.

Homotypic synonyms:

Aegilops L. sect. *Pleionathera* Eig, Feddes Repert., Beih. 55: 117 (1929a); Nevski in Komarov, Fl. URSS 2: 672 (1934, Russian) / 535 (1963, English); Maire & Weiller, Fl. Afrique nord 3: 358 (1955); Bor, Fl. Iranica 70/30: 197 (1970), *nom. illeg.* (Art. 63.1).

Aegilops L. [sect. *Pleionathera* Eig] subsect. *Libera* Eig, Feddes Repert., Beih. 55: 118 (1929a); Maire & Weiller, Fl. Afrique nord 3: 358 (1955).

Aegilopodes Á.Löve, Biol. Zentralbl. 101: 207 (1982, err. reference to '*Aegilops* sect. *Sarculosa* Zhuk. 1928: 503' as this misspelled section name is not mentioned there), *nom. illeg.* (Art. 63.1).

Synonyms:

Aegilops L. sect. *Polyeides* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 447 (1928); Senjaninova-Korczagina, Proc. USSR Congr. Gen., Pl.-Anim. Breeding, vol. 2: 455 (1930), Bull. Appl. Bot., Gen. & Pl. Breeding, Ser. 2(1): Tab. 15 (1932); Kihara, Züchter 12: 61, Tab. 12 (1940), Cytologia 19: 342, Tab. 3 (1954); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960, author as '(Zhuk.) Kihara'); MacKey, Relationships in the Triticinae, Proc. Third Int. Wheat Gen. Symp. 45 (1968, author as '(Zhuk.) Kihara'); Kihara & Tanaka, Wheat Info. Serv. 30: 2 (1970); Witcombe, Guide species *Aegilops* 2 (1983). – Type species: not indicated. – Note: this well-known section, the name of which is used by, e.g., Kihara (1940, 1954) and many others in the field of (cyto)genetics, does *not* contain *Ae. triuncialis*, the type species of the section *Aegilops*, and is thus a synonym.

Aegilops L. [sect. *Pleionathera* Eig] subsect. *Adhaerens* Eig, Feddes Repert., Beih. 55: 118 (1929a);

Maire & Weiller, Fl. Afrique nord 3: 358 (1955). – Type species: not indicated.

Aegilemma Á.Löve, Biol. Zentralbl. 101: 207 (1982). – Type species: *Aegilemma kotschyi* (Boiss.) Á.Löve (= *Aegilops kotschyi* Boiss.).

Kiharapyrum Á.Löve, Biol. Zentralbl. 101: 207 (1982). – Type (and only) species: *Kiharapyrum umbellulatum* (Zhuk.) Á.Löve (= *Aegilops umbellulata* Zhuk.).

Diagnosis: plants slender; spike narrowly ovoid with subventricose spikelets in the ovoid-ellipsoid basal part, and reduced and not inflated spikelets in the gradually or abruptly narrowed, subcylindrical upper part, usually less than 10 times as long as wide, rarely more; glumes of apical spikelets with 3-4 awns, those of lateral spikelets with 2-4(-5) awns and/or teeth.

Disarticulation: whole-spike type (see, e.g., Fig. 18-2).

Genome types: C, M, N, S, U, and modified M. As follows: diploid U; tetraploid UC, CU, U<u>M</u>, <u>M</u>U, SU; hexaploid U<u>M</u>N. See also Table 2.

Species:

Ae. biuncialis Vis.
Ae. columnaris Zhuk.
Ae. geniculata Roth
Ae. kotschyi Boiss.
Ae. neglecta Req. ex Bertol.
Ae. peregrina (Hack. in J.Fraser) Maire & Weiller
Ae. triuncialis L.
Ae. umbellulata Zhuk.

Note: in a leaf-anatomical study of *Aegilops*, Gendels (1980: 864) presents a deviating subdivision of the genus. Most remarkable is the absence of the section *Vertebrata*, of which most species are relocated under the section *Cylindropyrum*, except for *Ae. juvenalis*, which, strangely enough, was included in the section *Aegilops*.

8.3.2 Section **Comopyrum** (Jaub. & Spach) Zhuk.

Section *Comopyrum* (Jaub. & Spach) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 451 (1928); Senjaninova-Korczagina, Proc. USSR Congr. Gen., Pl.-Anim. Breeding, vol. 2: 456 (1930), Bull. Appl. Bot., Gen. & Pl. Breeding, Ser. 2(1): Tab. 15 (1932); Kihara, Züchter 12: 61, Tab. 12 (1940), Cytologia 19: 342, Tab. 3 (1954); Chennaveeraiah, Acta Horti Gotoburg. 23: 160, 165 (1960, with author as '(Jaub. & Spach) Senyan.'); MacKey, Relationships in the Triticinae, Proc. Third Int. Wheat Gen. Symp. 45 (1968, author as '(Jaub. & Spach) Sen.-Korch.'); Kihara & Tanaka, Wheat Info. Serv. 30: 2 (1970); Gendels, Bot. Zhurn. 65(6): 864 (1980, also including *Ae. caudata*; see note at 8.3.1); Hammer, Feddes Repert. 91: 235 (1980b); Witcombe, Guide species *Aegilops* 2 (1983); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 158 (1986).

Basionym: *Aegilops* L. subg. *Comopyrum* Jaub. & Spach, Ill. pl. orient. 4: 19 (1851a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 357 (1851b); Walpers, Ann. bot. syst. 3: 790 (1852).

Type species: *Ae. comosa* Sm. in Sibth. & Sm. Designated by default by Jaubert & Spach (1851a: 19) as it was the only species in their subgenus. Zhukovsky (1928: 451), who included several species in this section, did not indicate a type species.

Homotypic synonyms:

Aegilops L. sect. *Macrathera* Eig, Feddes Repert., Beih. 55: 104 (1929a); Maire & Weiller, Fl. Afrique nord 3: 356 (1955); Bor, Fl. Iranica 70/30: 197 (1970), *nom. illeg.* (Art. 63.1).

Comopyrum (Jaub. & Spach) Á.Löve, Biol. Zentralbl. 101: 207 (1982).

Heterotypic synonym:

Aegilops L. sect. *Uniaristatopyrum* Chennav., Acta Horti Gotoburg. 23: 161 (1960). – Type (and only) species: *Aegilops uniaristata* Vis. – Homotypic synonym: *Chennapyrum* Á.Löve, Biol. Zentralbl. 101: 207 (1982).

Diagnosis: plants slender; spike narrowly cylindrical or moniliform, up to 10 times as long as wide, but usually less, with all spikelets of similar shape; glumes of apical spikelets either with 3 awns (a well-developed central one and 2 more slender, lateral ones which are sometimes reduced to teeth), or with 1 awn only (in the moniliform *Ae. uniaristata*); glumes of lateral spikelets with 1 broad, conspicuous, triangular tooth and 1 awn.

Disarticulation: whole-spike type.

Genome types: diploid M and N.

Species:

Ae. comosa Sm. in Sibth. & Sm.
Ae. uniaristata Vis.

8.3.3 Section **Cylindropyrum** (Jaub. & Spach) Zhuk.

Section *Cylindropyrum* (Jaub. & Spach) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 449 (1928); Senjaninova-Korczagina, Proc. USSR Congr. Gen., Pl.-Anim. Breeding, vol. 2: 455 (1930), Bull. Appl. Bot., Gen. & Pl. Breeding, Ser. 2(1): Tab. 15 (1932); Kihara, Züchter 12: 61, Tab. 12 (1940), Cytologia 19: 342, Tab. 3 (1954); Chennaveeraiah, Acta Horti Gotoburg. 23: 166 (1960, author as '(Jaub. & Spach) Kihara'); MacKey, Relationships in the Triticinae, Proc. Third Int. Wheat Gen. Symp. 45 (1968, author as '(Jaub. & Spach) Kihara'); Kihara & Tanaka, Wheat Info. Serv. 30: 2 (1970); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 36 (1973; includes *Ae. cylindrica* only, added by species from sect. *Vertebrata*: *Ae. crassa, tauschii, juvenalis*), in Fedorov, Fl. part. Eur. URSS 1: 154 (1974; includes *Ae. cylindrica* only, added by *Ae. tauschii* from sect. *Vertebrata*), Zlaki SSSR 156 (1976, Russian; contains the species of Tzvelev, 1973) / 224 (1984, English); Gendels, Bot. Zhurn. 65(6): 864 (1980; includes *Ae. cylindrica* only, added by species from sect. *Vertebrata*: *Ae. crassa, tauschii, vavilovii,* and *ventricosa*; see note at 8.3.1); Hammer, Feddes Repert. 91: 232 (1980b); Witcombe, Guide species *Aegilops* 2 (1983); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 158 (1986).

Basionym: *Aegilops* L. subg. *Cylindropyrum* Jaub. & Spach, Ill. pl. orient. 4: 12 (1850), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 353 (1851b); Walpers, Ann. bot. syst. 3: 789 (1852).

Type species: *Aegilops cylindrica* Host. Designated by default by Zhukovsky (1928: 450) as it was his only species in this section.

Homotypic synonyms:

Aegilops L. sect. *Monoleptathera* Eig, Feddes Repert., Beih. 55: 97 (1929a); Nevski in Komarov, Fl. URSS 2: 670 (1934, Russian) / 534 (1963, English); Bor, Fl. Iranica 70/30: 196 (1970), *nom. illeg.* (Art. 63.1).

Cylindropyrum (Jaub. & Spach) Á.Löve, Biol. Zentralbl. 101: 207 (1982).

Heterotypic synonyms:

Aegilops L. sect. *Macrathera* Eig, Feddes Repert., Beih. 55: 104 (1929a) *pro parte*.

Orrhopygium Á.Löve, Biol. Zentralbl. 101: 206 (1982). – Type species: *Orrhopygium caudatum* (L.) Á.Löve (= *Aegilops caudata* L.).

Diagnosis: plants slender; spike narrowly cylindrical, at least 10 times as long as wide, but usually more than 20 times, with all spikelets of similar shape; glumes of apical spikelet with only 1 awn, at least 3 cm long, with or without small lateral teeth at the base.

Disarticulation: whole-spike type.

Genome types: C and D, as follows: diploid C; tetraploid DC.

Species:

Ae. caudata L.

Ae. cylindrica Host

8.3.4 Section **Sitopsis** (Jaub. & Spach) Zhuk.

Section *Sitopsis* (Jaub. & Spach) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 454 (1928); Senjaninova-Korczagina, Proc. USSR Congr. Gen., Pl.-Anim. Breeding, vol. 2: 456 (1930), Bull. Appl. Bot., Gen., Pl. Breeding, Ser. 2(1): Tab. 15 (1932); Kihara, Züchter 12: 61, Tab. 12 (1940), Cytologia 19: 342, Tab. 3 (1954); MacKey, Relationships in the Triticinae, Proc. Third Int. Wheat Gen. Symp. 45 (1968, author as 'Jaub. & Spach'); Kihara & Tanaka, Wheat Info. Serv. 30: 2 (1970); Witcombe, Guide species *Aegilops* 2 (1983); Feinbrun-Dothan, Fl. Pal. 4: 170 (1986); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 158 (1986).

Basionym: *Aegilops* subg. *Sitopsis* Jaub. & Spach, Ill. pl. orient. 4: 10 (1850), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 352 (1851b); Walpers, Ann. bot. syst. 3: 788 (1852); Hammer, Feddes Repert. 91: 230 (1980b).

Lectotype species: *Aegilops speltoides* Tausch. Designated by Hammer (1980b: 230) and including both varieties. See note.

Synonyms:

Aegilops L. subg. *Uropyrum* Jaub. & Spach, Ill. pl. orient. 4: 21 (1851a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 357 (1851b); Walpers, Ann. bot. syst. 3: 791 (1852). – Type (and only) species: *Aegilops macrura* Jaub. & Spach (= *Aegilops speltoides* Tausch var. *speltoides*). See note.

Aegilops L. sect. *Platystachys* Eig, Feddes Repert., Beih. 55: 68 (1929a); Maire & Weiller, Fl. Afrique nord 3: 351 (1955); Bor, Fl. Iranica 70/30: 193 (1970), *nom. illeg.* (Art. 63.1).

Aegilops L. [sect. *Platystachys* Eig] subsect. *Emarginata* Eig, Feddes Repert., Beih. 55: 69 (1929a); Maire & Weiller, Fl. Afrique nord 3: 351 (1955). – Type species: not indicated.

Aegilops L. [sect. *Platystachys* Eig] subsect. *Truncata* Eig, Feddes Repert., Beih. 55: 70 (1929a). – Type species: not indicated, but containing two species, *Ae. speltoides* and *Ae. ligustica*, now considered to be varieties of only one species, *Ae. speltoides*. See note.

Triticum L. sect. *Sitopsis* (Jaub. & Spach) Chennav., Acta Horti Gotoburg. 23: 163 (1960), *comb. inval.* – Note: invalid because of Art. 33.2. The basionym was cited as the combination at sectional level by Zhukovsky instead of the subgeneric, epithet-bringing combination of Jaubert & Spach, which is required by the Article.

Aegilops L. [sect. *Sitopsis* (Jaub. & Spach) Zhuk.] subsect. *Truncata* (Eig) Gendels, Bot. Zhurn. 65(6): 864 (1980), *comb. inval.* (Art. 33.2).

Aegilops L. [sect. *Sitopsis* (Jaub. & Spach) Zhuk.] subsect. *Emarginata* (Eig) Gendels, Bot. Zhurn. 65(6): 864 (1980), *comb. inval.* (Art. 33.2).

Sitopsis (Jaub. & Spach) Á.Löve, Biol. Zentralbl. 101: 206 (1982). – Type species: *Sitopsis bicornis* (Forssk.) Á.Löve (= *Ae. bicornis* (Forssk.) Jaub. & Spach).

Diagnosis: plants slender; spike at least 20 times as long as wide, either *(a)* narrowly cylindrical, but distichous and somewhat dorso-ventrally flattened, disarticulating wedge-type, or *(b)* narrowly cylindrical but not distichous and disarticulating as one unit; apex of glumes of lateral spikelets bidentate with a hyaline depression in between (except *Ae. speltoides*); at least lemmas of apical spikelets with 1 well-developed awn.

Disarticulation: wedge-type (*Ae. bicornis* (Fig. 15-4), *Ae. sharonensis*, *Ae. speltoides* var. *ligustica*) and whole-spike type (*Ae. longissima*, *Ae. searsii* (Fig. 61-2), *Ae. speltoides* var. *speltoides*).

Genome type: S.

Species:

Ae. bicornis (Forssk.) Jaub. & Spach
Ae. longissima Schweinf. & Muschl.
Ae. searsii Feldman & Kislev ex Hammer
Ae. sharonensis Eig
Ae. speltoides Tausch

Note: the subgenera *Sitopsis* and *Uropyrum* were published simultaneously by Jaubert & Spach (1851a). The subgenus *Sitopsis* contained *Ae. speltoides*, but their description only refers to what is now its var. *ligustica*. The subgenus *Uropyrum* consisted only of *Ae. macrura*, a heterotypic synonym of *Ae. speltoides* var. *speltoides*. In the section as delimited here both subgenera are included, but for its name none of these two names has priority (Art. 60.1).

The choice of the type species of the section *Sitopsis* may have been *Ae. speltoides* by default if the epithet *Uropyrum* had been retained at sectional level. However, it now appears that out of the two species (*Ae. bicornis* and *speltoides*) included in the subgenus *Sitopsis* (cf., Jaubert & Spach, 1850: 10) Hammer (1980b: 230) has chosen *Ae. speltoides* to serve as such. Although the typical variety is involved here, and not the var. *ligustica*, at species level the same species is involved. This choice antedates the designation of *Ae. bicornis* by Löve (1982: 206) when *Sitopsis* is placed at generic level. None of the previous revisions that included *Sitopsis* at whatever rank or under whatever name has designated a type species (cf., Jaubert & Spach, 1850; Zhukovsky, 1928; Eig, 1929a; Kihara, 1940, 1954; Chennaveeraiah, 1960). Although Eig (1929a: 70) included in his subsection *Truncata* only what is now one species (namely *Ae. speltoides*), he expressly listed both varieties as two separate species without choosing one of them as the type.

8.3.5 Section **Vertebrata** Zhuk. emend. Kihara

Section *Vertebrata* Zhuk. emend. Kihara, Züchter 12: 61, Tab. 12 (1940), Cytologia 19: 342, Tab. 3 (1954; further emendation); Chennaveeraiah, Acta Horti Gotoburg. 23: 166 (1960, author as '(Zhuk.) Kihara'); MacKey, Relationships in the Triticinae, Proc. Third Int. Wheat Gen. Symp. 45 (1968, author as '(Zhuk.) Kihara'); Kihara & Tanaka, Wheat Info. Serv. 30: 2 (1970; further emendation); Hammer, Feddes Repert. 91: 233 (1980b; author as 'Zhuk.' but 'emend. Kihara' is also mentioned, and the species included are those of Kihara's (1954) emendation); Witcombe, Guide species *Aegilops* 2 (1983); Feinbrun-Dothan, Fl. Pal. 4: 173 (1986); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 158 (1986). See note.

Based on: section *Vertebrata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 450 (1928); Senjaninova-Korczagina, Proc. USSR Congr. Gen., Pl.-Anim. Breeding, vol. 2: 456 (1930), Bull. Appl. Bot., Gen. & Pl. Breeding, Ser. 2(1): Tab. 15 (1932). See note.

Type species: *Aegilops tauschii* Coss. Designated by default by Zhukovsky (1928: 451) as it was the only species in his section. Clayton & Renvoize (1986: 158) erroneously mention *Ae. ventricosa* as the type species.

Homotypic synonyms:

Aegilops L. sect. *Pachystachys* Eig, Feddes Repert., Beih. 55: 84 (1929a); Nevski in Komarov, Fl. URSS 2: 671 (1934, Russian) / 534 (1963, English); Maire & Weiller, Fl. Afrique nord 3: 353 (1955); Bor, Fl. Iranica 70/30: 194 (1970), *nom. illeg.* (Art. 63.1).

Aegilops L. [sect. *Pachystachys* Eig] subsect. *Oligomorpha* Eig, Feddes Repert., Beih. 55: 85 (1929a).

Patropyrum Á.Löve, Biol. Zentralbl. 101: 206 (1982), Feddes Repert. 95: 492 (1984).
Heterotypic synonyms:
Aegilops L. sect. *Gastropyrum* (Jaub. & Spach) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 453 (1928); Senjaninova-Korczagina, Proc. USSR Congr. Gen., Pl.-Anim. Breeding, vol. 2: 456 (1930), Bull. Appl. Bot., Gen. & Pl. Breeding, Ser. 2(1): Tab. 15 (1932). – Basionym: *Aegilops* L. subg. *Gastropyrum* Jaub. & Spach, Ill. pl. orient. 4: 17 (1851a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 356 (1851b); Walpers, Ann. bot. syst. 3: 790 (1852). – Type (and only) species: *Aegilops ventricosa* Tausch. – Note: designated by default by Zhukovsky (1928: 453) as he included only *Ae. ventricosa* in his section. – Homotypic synonyms: *Aegilops* L. [sect. *Pachystachys* Eig] subsect. *Occidentalis* Eig, Feddes Repert., Beih. 55: 85 (1929a); Maire & Weiller, Fl. Afrique nord 3: 353 (1955). *Gastropyrum* (Jaub. & Spach) Á.Löve, Biol. Zentralbl. 101: 208 (1982). See note.
Aegilops L. sect. *Polyploides* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 456 (1928). – Type species: not indicated.
Aegilops L. [sect. *Pachystachys* Eig] subsect. *Polymorpha* Eig, Feddes Repert., Beih. 55: 85 (1929a). – Type species: not indicated. – Note: containing the similar two species (*Ae. crassa* and *Ae. juvenalis*) that were included in Zhukovsky's sect. *Polyploides*, but at a different rank. Eig's name is therefore not illegitimate for superfluity (Arts. 60.1 and 63.1).
Aegilonearum Á.Löve, Biol. Zentralbl. 101: 208 (1982). – Type (and only) species: *Aegilonearum juvenale* (Thell.) Á.Löve (= *Aegilops juvenalis* (Thell.) Eig).

Diagnosis: plants robust; spike stout, (3-)6-10(-15) cm long, 3-7 mm wide, cylindrical or moniliform, disarticulating barrel-type; lemmas of apical spikelets with 1 well-developed awn.

Disarticulation: barrel-type (see, e.g., Figs. 33 and 74).

Genome types: D, M, N, S, U, and modified M, as follows: diploid D; tetraploid D$\underline{M}$, DN; hexaploid DD$\underline{M}$, DMS, DMU.

Species:

Ae. crassa Boiss.
Ae. juvenalis (Thell.) Eig
Ae. tauschii Coss.
Ae. vavilovii (Zhuk.) Chennav.
Ae. ventricosa Tausch

Note: *Aegilops* subg. *Gastropyrum* Jaub. & Spach included two species, *Ae. platyathera* Jaub. & Spach (= *Ae. crassa* Boiss.) and *Ae. ventricosa* Tausch, but Jaubert & Spach did not indicate a type species among them. Later, Zhukovsky (1928: 453) only included *Ae. ventricosa* in his section *Gastropyrum*, allocating *Ae. crassa* to his new section *Polyploides* Zhuk. Simultaneously he created a section *Vertebrata* (l.c., 1928: 450), including only *Ae. squarrosa* auct. non L. (= *Ae. tauschii* Coss.). As all three the species (*crassa*, *tauschii*, and *ventricosa*) were included in one section by Kihara (1940: 61), his section can therefore be seen as an emendation of any of the sections *Gastropyrum*, *Polyploides*, and *Vertebrata* of Zhukovsky. For the name of this section a choice among these three cannot be decided through the basionym *Gastropyrum* Jaub. & Spach being the oldest name, as its original rank (that of subgenus) is not maintained here (see Art. 60.1 of the *Code*). It seems therefore that for matters of nomenclature the sectional name *Vertebrata* has been a choice among three equals by Kihara (1940), which was taken over by many authors (e.g., Hammer (1980b: 233), Clayton & Renvoize (1986: 158)). As Zhukovsky included only one species in his section *Vertebrata* (similar to his section *Gastropyrum*) the type species automatically became *Ae. tauschii* at the adoption of this sectional name by Kihara.

Earlier than Kihara, Senjaninova-Korczagina (1930: 456; 1932: Tab. 15) made emendations to the one species included in section *Vertebrata* by Zhukovsky. However, as she only added one species (*Ae. tauschii* Coss.), I consider this not as 'considerable' in the sense of Recommendation 47.A.1 of the *Code*. Kihara (1940: 61), on the other hand, added both ploidy forms of *Ae. crassa* (separately listed) and *Ae. tauschii*, and later *Ae. juvenalis* (Kihara, 1954: 342). Finally, Kihara & Tanaka (1970: 2) added *Ae. vavilovii* as a separate species to the section *Vertebrata*, thereby uniting all barrel-type disarticulating *Aegilops* species. Although Hammer (1980b: 233) included the species of Kihara's (1954) emendation in his section *Vertebrata*, *Ae. vavilovii* is also included, but as a subspecies under *Ae. crassa*.

9 Key to the (wild) taxa of the genera *Aegilops*, *Amblyopyrum* and *Triticum*.

This key distinguishes all accepted species and varieties in *Aegilops* and *Amblyopyrum*. To illustrate the relation with *Triticum* the wild species and subspecies of this genus are also included, although a full revision will be the subject of a future study. However, the cultivar groups, which make up the larger part of *Triticum*, are not included, and are keyed out as a whole at couplet '2'. As is indicated in Chapters 5.4.2 and 5.4.3, the delimitation, classification, and correct names of these groups are still uncertain, and well-founded conclusions on these considerable problems are outside the scope of this publication.

The key combines 'static' and 'dynamic' characters: 'static' in the sense of strict comparison of morphological features; 'dynamic' indicating the disarticulation process (used at '2', '9' et seq.). The disarticulation types (*barrel-type*, *wedge-type* and *whole-spike-type*; see Chapter 4.1) are also used to separate sections of *Aegilops* (see Chapter 8.2). This useful character is best visible in the wild at the stage of seed dispersal (the right moment for any germplasm collector), but in immature plants the spikes will break up in a similar fashion. The use of a '-' in this and other keys indicates that the characters listed after them are either valid for one lead, but variable in the other, or that they partially overlap.

The numbers before the *Aegilops* and *Amblyopyrum* taxa are those of their Chapters.

1 Distinct keel present on all glumes of lateral spikelets, ending in a broad to sharp, triangular tooth or short awn: inner side of glumes with a sharp angle at the location of the keel 2

Glumes rounded on the back or at most with a thickened dorso-ventral rim only at the location of the keel: inner side of glumes always smooth and rounded 7

2 Spikes either *(a)* with a brittle rachis, breaking at each joint and disarticulating *wedge-type*, spikelet with 1 or 2 (or 3) seeds (wild taxa), or *(b)* tenaceous with most spikelets completely sterile (hybrid forms) 3

Spikes with a tenaceous rachis (not disarticulating); spikelets with 2-4(-5) seeds; – cultivated species .... **Triticum** cultivar groups

3 Rachis brittle and spikes thus often incomplete at maturity; spikelets all fertile; – glumes with a broadly to sharply triangular tooth at the keel or tooth slender and with a more rounded apex (wild taxa; see couplet 2 above at '*(a)*') 4

Rachis tenaceous, spikes remaining complete, with most spikelets completely sterile or some with occasionally a few seeds; – plants from margins of wheat fields or where wheat has been cultivated the previous year, usually among additional presence of *Aegilops* species; morphology (stems, leaves, spikes) intermediate between wheat and *Aegilops* (hybrids; see couplet 2 above at '*(b)*') .... **x Aegilotriticum** (= *Aegilops* x *Triticum*; see Chapter 4.2)

4 Apical spikelet in the same plane as the lateral ones, spike thus appearing as if abruptly cut off; – spike long and slender, dorso-ventrally compressed and almost rectangular in cross section; leaves mainly confined to basal part of the tillers, flag-leaf short, peduncles long; tillers not lodging at maturity (diploids with 2n = 14) 5

Apical spikelet on a 90^0 angle with the lateral ones (as in tetraploid, cultivated wheats); – spike shorter, robust, more elliptical in cross section and not so strongly dorso-ventrally compressed; leaves more equally distributed over the tillers, flag-leaf well-developed, peduncles shorter; tillers lodging at maturity (tetraploids with 2n = 28) 6

5 Leaf blade surface loosely covered with short, whitish hairs and longer, stiffer, whitish hairs, giving a distinct 'rough' feeling upon touch; anthers 5-6 mm long; – glumes with the length of the tooth on the keel and the abaxial tooth roughly in a 4 : 3 configuration .. **Triticum monococcum** ssp. **aegilopoides**

Leaf blade surface densely covered with very short, whitish hairs, giving a distinct 'velvety' feeling upon touch; anthers 2-3 mm long; – glumes with a well-developed tooth at the keel, about 7 times as long as the much reduced, abaxial second tooth .... **Triticum urartu**

6 leaf blade surface loosely covered with short, whitish hairs and longer, stiffer, whitish hairs, giving a distinct 'rough' feeling upon touch; – glume with tooth at the keel that is usually with a rounded apex, rarely tapering into a short, sharp point .... **Triticum timopheevii** ssp. **armeniacum**

Leaf blade surface smooth or with short, whitish hairs only, giving a distinct 'velvety' feeling upon touch; – glume with tooth at the keel varying from large and triangular to smaller and more finely pointed .... **Triticum turgidum** ssp. **dicoccoides**

7 Spikelets awnless, narrowly cylindrical; spikes (15-)20-35(-45) cm long, 3-4 mm wide, with (9-)12-20(-24) spikelets; glumes without teeth or awns, cuneate-truncate, widest at the erose apex and with diverging nerves; apex of lower lemmas rounded to emarginate; keels of the paleas smooth, the apex rounded to emarginate; – outer surface of glumes glabrous or hispid (*Amblyopyrum*) 8

At least the uppermost spikelet with awned glumes and/or lemmas; spikes (narrowly) ovoid, moniliform, or (narrowly) cylindrical, 1.5-20 cm long (widely varying between species), 2-7 mm wide, with 2-10(-19) spikelets; glumes with 2-5 teeth or awns, widest just above, at, or below the middle, but never at the apex, nerves converging towards the apex; apex of lemmas extending into 1-3 teeth and/or awns; keels of the paleas setose, the apex sharply acute; – outer surface of glumes glabrous, scabrous, or closely adpressed-velutinous, but never hispid (*Aegilops*) 9

8 Glumes and upper parts of lemmas hispid ....11.1a **Amblyopyrum muticum** var. **muticum**

Glumes and upper parts of lemmas glabrous ....11.1b **Amblyopyrum muticum** var. **loliaceum**

9 Spike disarticulation '*barrel-type*': breaking up into units of a spikelet with the

rachis segment *of the next higher* spikelet remaining attached; – plants robust, occasionally more slender; spike narrowly cylindrical or moniliform (= like a string of beads) 10

Spike disarticulation '*wedge-type*': breaking up into units of a spikelet with its *supporting* rachis segment remaining attached, or '*entire*': whole spike falls as one unit; – plants slender; spike narrowly cylindrical, or moniliform, or (narrowly) ovoid 14

10 Spike distinctly moniliform 11

Spike (narrowly) cylindrical to slightly moniliform 12

11 Glume closely adpressed-velutinous; apex of lemmas of fertile florets in the apical spikelet with a clearly flat awn of up to 8.5 cm; – spikelets with 4-7 florets, the upper 2 sterile .... 10.6 **Ae. crassa**

Glume glabrous; apex of lemmas of fertile florets in the apical spikelet with a clearly triangular awn of up to 4 cm; – spikelets with 2-5 florets, the upper 1 or 2 sterile .... 10.22 **Ae. ventricosa**

12 Lateral spikelet glumes with 2 or 3 teeth, one of which may develop into a short awn, or apex with a single mucro; spike narrowly cylindrical, 4-15 cm long, 3-6 mm wide, with (5-)6-12 spikelets 13

Lateral spikelet glumes with 2, 0.5-2(-3.5) cm long, awns, spaced at 2-3 mm from each other, one of which may sometimes be reduced to a sharp tooth; spike cylindrical to slightly moniliform, 3-7 cm long, 5-7 mm wide, with 3-6 spikelets .... 10.9 **Ae. juvenalis**

13 Glume scabrid, apex of glumes of lateral spieket truncate with a thickened rim and an adaxial mucro, apex of glumes of apical spikelet obtuse with a central mucro; apex of lemmas of lateral spikelets thickened and with a mucro (in basal part of the spike) that may develop into an awn of up to 4 cm long on the adaxial side of the lemma apex with often a small tooth on the abaxial side, apex of lemmas of the apical spikelet with a slender, up to 5.5 cm long, triangular awn; – spike 4-8(-10) cm long, only slightly tapering towards the apex; rachis sinuate .... 10.17 **Ae. tauschii**

Glume closely adpressed-velutinous, apex of glumes of lateral spikelet with 2 or 3 teeth, the adaxial one sharply acute and extending into a short awn of up to 1 cm, apex of apical glumes with a central awn, flanked by 2 lateral teeth; apex of lemmas of lateral spikelets with a sharp tooth, of the apical spikelet with a 5-8(-10) cm long, flat awn; – spike (7.5-)10-15 cm long, gradually tapering in the upper half; rachis straight .... 10.21 **Ae. vavilovii**

14 Spike disarticulation '*wedge-type*'; – spike narrowly cylindrical, but distichous and somewhat dorso-ventrally flattened 15

Spike disarticulation '*entire*'; spike moniliform, narrowly cylindrical, (sub)cylindrical, or narrowly ovoid, but *not* distichous nor flattened 18

15 Apex of lateral glumes with two triangular teeth, separated by a hyaline central part 16

Apex of lateral glumes truncate with a thickened rim and a mucro at the adaxial side .... 10.16b **Ae. speltoides** var. **ligustica**

16 Plants (10-)20-40 cm excluding spikes; lemma awns without teeth at the base; –

spike 4-7.5 cm long excluding awns; apex of apical glumes with 1 central tooth and sometimes 2 lateral teeth 17

Plants (30-)40-70 cm excluding spikes; lemma awns with 2 lateral teeth at the base; – spike 7-10 cm excluding awns; 1 apical glume apex with 2 triangular teeth (similar to the lateral glume apex), 1 with a short, central tooth and 2 lateral teeth .... 10.15 **Ae. sharonensis**

17 All lemmas awned .... 10.1a **Ae. bicornis** var. **bicornis**

Lemmas of the upper 5-7 spikelets awned ..... 10.1b **Ae. bicornis** var. **anathera**

18 Spike moniliform 19

Spike narrowly cylindrical, (sub)cylindrical, or narrowly ovoid 20

19 Rudimentary spikelets 1 (or 2), fertile spikelets 1 or 2 (or 3); lateral glume apex with a broad, triangular tooth and a short, 2-4 mm long awn; apical spikelet glumes with one broad, flat, 3-5.5 cm long, awn and 2 lateral teeth or more slender, 2-2.5 cm long, awns .... 10.5b **Ae. comosa** var. **subventricosa**

Rudimentary spikelets (2 or) 3, fertile spikelets 3-5; lateral glume apex with a broad, triangular tooth and an increasing, 0.7-4 cm long, awn; apical spikelet glumes with a flat, 3-5 cm long, awn without lateral teeth or awns ....10.20 **Ae. uniaristata**

20 Spike narrowly cylindrical, (10-)30-65 times as long as wide 21

Spike (sub)cylindrical or narrowly ovoid, widest in the basal part, then gradually or abruptly narrowing into a more slender, cylindrical upper part, usually less than 10 times as long as wide (but in *Ae. triuncialis* up to 20 times) .. 26

21 Apex of apical glumes either *(a)* obtuse and without teeth, or *(b)* with 1 shorter or longer awn, or *(c)* variable: with a short, up to 1 cm long awn flanked by lateral teeth, or with 2 teeth, or acute to apiculate; – spike (3-)5-12(-20) cm long, with (2-)6-12(-20) spikelets 22

Apex of apical glumes with 3 awns: central awn 4-11 cm long, and 2 lateral awns of 3-7.5(-10) cm that are occasionally reduced and only 0.5-3 cm; – spike 1.5-4(-5) cm long, 0.2-0.3 cm wide, with 3-4(-5) spikelets ....10.5a **Ae. comosa** var. **comosa**

22 Apex of apical glumes either *(a)* with an awn of at least 3 cm, or *(b)* variable: with a short, up to 1 cm long, awn flanked by lateral teeth, or with 2 teeth, or acute to apiculate; apex of glumes of lateral spikelets not thickened, with teeth and/or awns 23

Apex of apical spikelet glumes obtuse, thickened, and without teeth; apex of lateral glumes truncate with a thickened rim and a mucro at the adaxial side . ...10.16a **Ae. speltoides** var. **speltoides**

23 Apex of glumes of apical spikelet with 1 awn of at least 3 cm long 24

Apex of glumes of apical spikelet variable: with a short, up to 1 cm long, awn flanked by lateral teeth, or with 2 teeth, or acute to apiculate 25

24 Apex of glumes of apical spikelet with a 4.5-12 cm long awn, which is *longer* than the entire spike, lateral teeth at the base absent; lemmas of apical spikelet mucronate to subulate only .... 10.3 **Ae. caudata**

All awns of the apical spikelet *shorter* than the entire length of the spike: glumes with a 3-6 cm long awn with (1 or) 2 lateral teeth at the base; lemmas with 4-8 cm long awns, longer than those of the glumes 10.7 **Ae. cylindrica**

25 Culms (30-)40-70 cm excluding spikes; apical spikelet with 2 fertile and 2 sterile florets, lemmas of fertile florets both extending into an equally long awn of 6-13 cm, each with 2 slender, up to 6 mm long, aristulate, lateral teeth at the base; – spike 10-20 cm long excluding awns, with 8-17 spikelets; one of the glumes of the apical spikelet with the apex acute to apiculate .... 10.11 **Ae. longissima**

Culms (10-)15-35 cm excluding spikes; apical spikelet with 1 fertile and 2 sterile florets, lemma of the fertile floret extending into a 5-13 cm long awn with 1 or 2 aristulate, up to 3 cm long, lateral teeth in the basal part (but *not* at the base) of the awn, lemma of the lower, sterile floret extending into a shorter, (0.5-)1.5-7 cm long awn, usually without lateral teeth (sometimes 1 or 2 aristulate teeth developed in the basal part), ratio between apical lemma awns varying from 10:1 to 9:5; – spike 6.5-13.5 cm long excluding awns, with 7-10(-14) spikelets; one of the apical glumes with the apex bidentate .... 10.14 **Ae. searsii**

26 Glumes with veins equal in width, ± parallel, protruding from the surface, equally spaced 27

Glumes with veins unequal in width, sunk into the glume surface, unequally spaced 29

27 Spike stout, with an 'irregular' appearance, caused by wide variation in glume and lemma awn development; glumes of lowest fertile spikelets with 2 or 3 awns or teeth (of which 1 or 2 may develop into an awn) 28

Spike with a slender, 'regular' appearance, caused by the awns of all glumes and lemmas being more or less equally long; both glumes of the lowest fertile spikelet always with 3 awns, equally wide at the base .... 10.10 **Ae. kotschyi**

28 Glume of lateral spikelets with 2 or 3 awns, 1.5-5 cm long, glume of apical spikelet with 3 awns; lemmas of all spikelets with 1 or 2 awns of widely uneven length, 0.3-3 cm long, flanked by 1 or 2 teeth .... 10.13a **Ae. peregrina** var. **peregrina**

Glume of lateral spikelets with 2 or 3 sharp teeth, 1 or 2 of which may develop into a short 7-15 mm long, awn, glume of apical spikelet with 1-3 awns, 1-3 cm long (when 1 awn only then flanked by short, acute teeth); lemma apex of all spikelets with 2 or 3 teeth only .... 10.13b **Ae. peregrina** var. **brachyathera**

29 Rudimentary spikelets 1 (rarely 2) 30

Rudimentary spikelets (2 or) 3 31

30 Spike with 2 (or 3) spikelets, all fertile; all spikelets narrowly ovoid-ellipsoid, not constricted above; the glume apex with 2 or 3 awns, longer towards the apex of the spike: 1-4 cm at the basis, increasing to 4-7 cm .... 10.2 **Ae. biuncialis**

Spike with (2-)3-4 spikelets, the upper one sterile, the lowest 1-3 subventricose, widest at or below the middle, constricted above; the glume apex with (3-) 4-5 awns (rarely even only 2), shorter towards the apex of the spike: 2-4.5

cm at the basis, decreasing to 1-3.5 cm at the apex .... 10.8 **Ae. geniculata**

31 Glumes of apical spikelets with 3 awns, the central one the longest awn of the spike, 5-8 cm long, erecto-patent in position (only 2.5-5.5 cm long only in var. *persica*), the 2 lateral awns shorter and clearly less divergent in position (lateral awns sometimes reduced to teeth in var. *persica*); – spike subcylindrical, 2.5-6 cm long 32

Glumes of apical spikelets with 3-4(-5) awns of similar size and position; – spike (narrowly) ovoid to oblong, 1.5-4.5(-6) cm long 33

32 Glumes of lateral spikelets with 2 or 3 well developed awns, widely varying in length: 1.5-6 cm; apical glumes with a well developed, 5-8 cm long, central awn (the longest of the spike), and with shorter lateral awns ....10.18a **Ae. triuncialis** var. **triuncialis**

Glumes of lateral spikelets with 2 teeth or 1 tooth and 1 short, up to 1 cm long awn only; apical glumes with a central awn of 2.5-5.5 cm long, and short lateral awns of 0.6-2.5 cm only, or lateral awns reduced to teeth .... 10.18b **Ae. triuncialis** var. **persica**

33 Glumes of lowest 2 or 3 spikelets oblong, or obovate-elliptical, gradually widening and constricting, widest at the middle, the apex with 2 or 3 awns; – lower glume surface adpressed-velutinous, rarely scabrid 34

Glumes of lowest 2 or 3 spikelets obovate, widest above the middle and then abruptly constricted, the apex with 3-4(-5) awns; – lower glume surface glabrous or scabrous, rarely adpressed-velutinous ... 10.19 **Ae. umbellulata**

34 Glumes of lower 2 or 3 spikelets elliptic-oblong, the apex usually with 2 awns: one large, 1.5-2.5 mm wide at the base and often bifurcating above, and one very small and linear, 1 mm or less at the base; – spike ovoid in the lower part, more linear in the upper part, with 3-4(-6) spikelets, all fertile .... 10.4 **Ae. columnaris**

Glumes of lower, fertile spikelets obovate-elliptical, the apex usually with 3 awns of equal length and width at the base; – spike ovoid-ellipsoid and inflated in the lower part, then abruptly constricted and narrowly cylindrical, with 3-6 spikelets of which the upper 1-3 sterile (however, these may be fertile under well-developed conditions) .... 10.12 **Ae. neglecta**

10 Enumeration of species in *Aegilops*

10.1 **Aegilops bicornis** (Forssk.) Jaub. & Spach **Figs. 15-17**

Aegilops bicornis (Forssk.) Jaub. & Spach, Ill. pl. orient. 4: 11, Tab. 309 (1850), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 352 (1851b); Walpers, Ann. bot. syst. 3: 788 (1852); von Steudel, Syn. pl. glumac. 1: 355 (1854); Boissier, Fl. orient. 5(2): 677 (1884) *pro parte*; Ascherson & Schweinfurt, Ill. fl. Égypte, Mém. Inst. Egypte 2: 178 (1887); Durand & Barratte, Fl. libyc. prodr. 276 (1910); Muschler, Man. fl. Egypt 1: 156 (1912); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 455, 538 (1928); Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 325 (1928a, with var. *typica*), Feddes Repert., Beih. 55: 73 (1929a, with var. *typica*); Pampanini, Prodr. fl. ciren. 138 (1930, with var. *typica*); Post, Fl. Syria (ed. 2) 2: 788 (1933); Täckholm et al., Fl. Egypt 1: 269 (1941); Maire & Weiller, Fl. Afrique nord 3: 353 (1955, with var. *typica*); Keith, Checklist Libyan Fl. 197 (1965, with var. *typica*); Mouterde, Nouv. Fl. Liban, Syrie 1: 152 (1966); Täckholm, Students' Fl. Egypt (ed. 2) 702 (1974); Hammer, Feddes Repert. 91: 231 (1980b, with var. *bicornis*); Cope, Key Grasses Arab. Penin., Arab. J. Sci. Res., Spec. Publ. 1: 74 (1985); Meikle, Fl. Cyprus 2: 1822 (1985); Feinbrun-Dothan, Fl. Pal. 4: 170 (1986); Al-Rawi, Fl. Kuwait 2: 326 (1987), non Post, Fl. Syria (ed. 1) 901 (1896), q.e. *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori *pro parte* (see at 10.16b).

Basionym: *Triticum bicorne* Forssk., Fl. aegypt.-arab. 26 (1775); Delile, Descr. Egypte, Hist. nat. 179, Tab. 15, fig. 1 (1813), (ed. 2) 19: 182, Tab. 15, fig. 1 (1824); Kunth, Enum. pl. 1: 440 (1833); Heynhold, Alph. Aufz. Gew. / Nom. bot. hort. 2: 742 (1847); Bentham, J. Linn. Soc., Bot. 19: 131 (1882); Durand & Schinz, Consp. fl. afric. 5: 937 (1894); Bowden, Can. J. Bot. 37: 665 (1959), Can. J. Gen. Cyt. 8: 132 (1966); Chennaveeraiah, Acta Horti Gotoburg. 23: 163 (1960a); Scholz, Liste Gräs. Libyens, Willdenowia 7: 436 (1974); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 28 (1987); Sherif & Siddiqi in El-Gadi, Fl. Libya 145: 112 (1988), non *T. bicorne* Forssk. as cited in Godron, Fl. juvenalis (ed. 1) 46 / Mém. Acad. Montp., sect. Méd. 1: 453 (1853), (ed. 2) 113 / Mém. Acad. Stan. (Nancy) 432 (1854), q.e. *T. monococcum* (fide Zhukovsky, 1928: 524).

Type: Egypt, Alexandria, *Forsskål s.n.* (holo: C, not seen). See note 1.

Homotypic synonyms:

Sitopsis bicornis (Forssk.) Á.Löve, Biol. Zentralbl. 101: 206 (1982), Feddes Repert. 95: 491 (1984).

Sub nom. *Ae. ligustica* auct. non (Savign.) Coss. (1864): Osorio-Tafall & Seraphim, List Vasc. Pl. Cyprus 10 (1973); Meikle, Fl. Cyprus 2: 1823 (1985, as a note).

Heterotypic synonym:

Ae. bicornis (Forssk.) Jaub. & Spach var. *minor* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 326 (1928a), **syn. nov.** – Type: Palestine, Rafah, 30.IV.1925, *Eig s.n.* (holo: HUJ, not seen).

For literature, typification and synonyms referring specifically to the varieties, see under there.

10.1a **Aegilops bicornis** (Forssk.) Jaub. & Spach var. **bicornis** **Figs. 15(1-2, 4-12), 16**

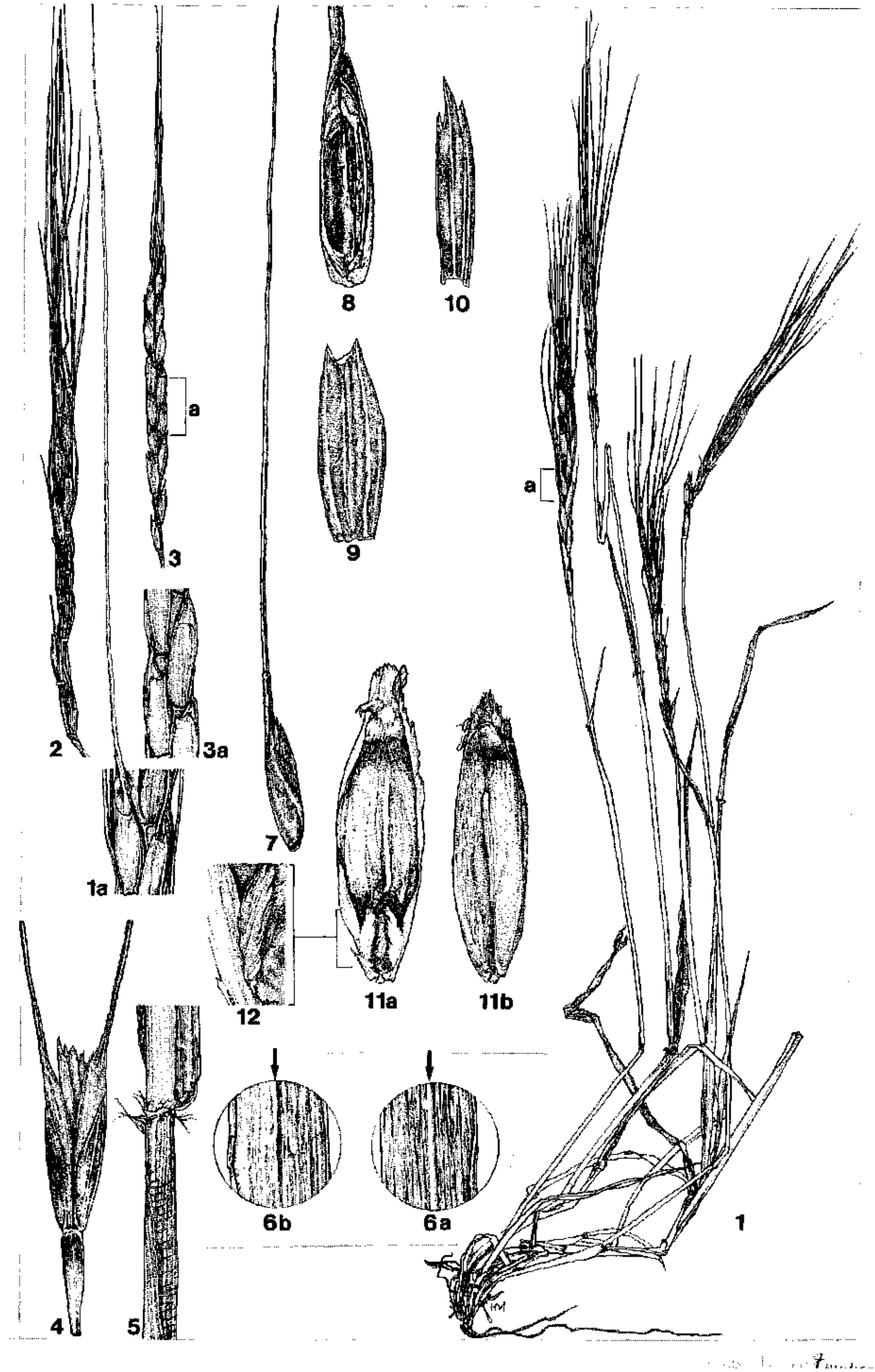
Diagnostic characters: annuals, usually with a few, sometimes with many tillers; culms slender, erect, (10-)20-40 cm tall excluding spikes; spikes 4-7.5 cm long excluding awns, narrowly cylindrical, distichous, somewhat compressed, with 8-15(-19) spikelets, rudimentary spikelets absent; glumes with protruding, ± parallel veins, apex with 2 teeth separated by hyaline depression; lemmas with 4.5-6 cm awn, more reduced in basal part of spike, awns without teeth at the base; caryopsis adherent.

Description (Fig. 15: 1-2, 4-12): *annuals* with usually a few, more rarely up to 25 tillers (*Fig. 15-1*). *Culms* slender, erect, (10-)20-40 cm tall excluding spikes; foliage sparse. *Leaf* blades linear-acuminate (4-)6-11 cm long, 0.2-0.4 cm wide; margins of sheaths ciliate, especially in the upper part (*Fig. 15-5*). *Inflorescence* (*Fig. 15-2*) a narrowly cylindrical spike, distichous, somewhat compressed laterally, tapering in basal and apical parts, 4-7.5 cm long excluding awns, 0.2-0.3 cm wide; disarticulating wedge-type at maturity but a few lower spikelets usually remaining attached to the culm; with 8-15(-19) spikelets, rudimentary spikelets absent; apical spikelet usually at a 90° angle compared with the lateral ones. *Spikelets* (*Fig. 15-4*) sessile, narrowly obovoid-elliptical, 6-9 mm long excluding awns, around 0.2 cm wide, laterally compressed, 0.8-1.5(-2) times the length of the supporting rachis internode; with 3(-4) florets, the lower 2(-3) fertile. *Glumes* (*Fig. 15-9*) 2, coriaceous, elliptic-oblong, green to purplish-green, 4.5-7 mm long, the surface scabrid, the apex bidentate; with 5-6 major veins of which 2 extend in short teeth, the adaxial one somewhat stronger developed than the abaxial one; lateral margins and depression between the teeth hyaline; veins protruding, slender, ± parallel, scabrous to setulose; apical glume (*Fig. 15-10*) with one small, central tooth with sometimes also 2 lateral ones developed. *Lemmas* (*Fig. 15-7*) 5-7 mm long, narrowly elliptical, boat-shaped, of the fertile florets conduplicate at apex; apex of lemmas of fertile florets extending into a slender, setulose awn, 0.3-0.4 cm long in basal spikelets but quickly increasing in length to 4.5-6 cm, awn of the third, fertile floret (when developed) much more reduced, awns without teeth at the base. *Paleas* (*Fig. 15-8*) narrowly elliptical, with 2 sharp, setose keels, each ending in a sharply acute apex. *Caryopsis* (*Fig. 15-11b*) 4-5 mm long, adherent to lemma and palea.

Distribution (Fig. 16): a Mediterranean element occurring on the coastal regions of Cyprus, Libya, Egypt and Palestine, as well as in southern Jordan and coastal Kuwait. [Reported from Kuwait by Al-Rawi (1987: 326) from Khiran, *Al-Rawi 11674, 11950, AR-1557* (KTUH?), but these collections not seen.] A few locations known from inland Syria. Uncommon throughout its range.

Adventive distribution in France (Coste, 1906: 659) and Italy (Genoa area, Fiori & Paoletti, 1896: 108; Zangheri, 1976: 980) all concern *Ae. speltoides* var. *ligustica*, as do reports from northern Iraq (e.g., Handel-Mazetti, 1913: 33) and Iran (Parsa, 1952: 827). See at 10.16b.

Fig. 15. *Aegilops bicornis*. 1, habitus (x 1/2); 1a, enlarged part of spike, showing spikelets *in situ* (x 2); 2, spike (x 1); 4, two spikelets, adaxial view (x 3); 5, stem, leaf sheath, ears and leaf blade (x 3); 6a, abaxial leaf surface, midway (x 6); 6b, adaxial side of 6a (x 6); 7-9, spikelet in centre of spike: 7, lemma, side view (x 2), 8, palea in situ, with part of lemma (x 5), 9, glume (x 5); 10, glume of apical spikelet (x 5); 11a, palea with lodicules, encapsuling seed (x 7); 11b, ventral surface of mature seed (x 7); 12, enlarged part of 11a, showing part of palea and lodicules (x 14). *Aegilops bicornis* var. *anathera*. 3, spike with lemma awns in upper part only (x 1); 3a, enlarged part of 3 (x 3). (1-2, 4, 7-12. *van Slageren & al. MSBHSS-89017H*; 3. *van Slageren & al. MSBHSS-89058H*; 5-6. *van Slageren & al. MSBHAJ-88173H*.)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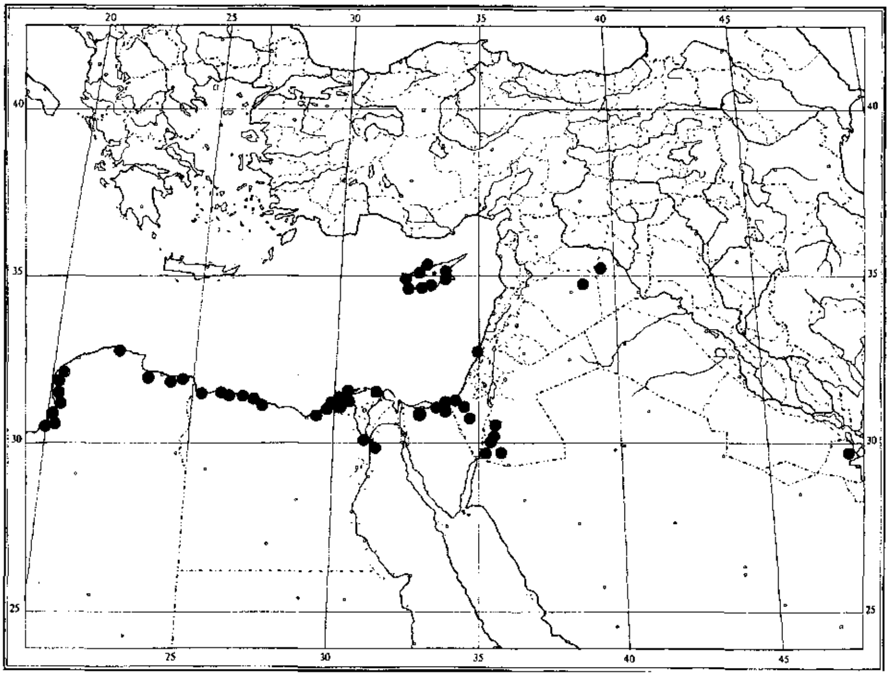

Fig. 16. Distribution of *Aegilops bicornis* var. *bicornis* in the eastern Mediterranean and the Near East.

Ecology: in grasslands, under palms, pines, in *Acacia* thickets, in plantations, and on edges of wheat fields. Mainly in coastal lowland areas of sandy loams, open sands or stabilized sand dunes. In Cyprus once found as one of the grasses stabilizing beach sands (coll. *van Slageren & al. MSLGAD-89092H*). Considered an indicator of the steppico-desert region in Palestine (data on *Eig & al. 24*). Soil types are light sandy, sandy-calcareous or sandstones. Rainfall data indicate good drought tolerance as the range observed is only 75-275 mm annually (but up to 450 mm in Cyprus).

Altitude: from sea level up to 200 m; in Jordan found at 700-900 m.

Flowering and fruiting time: March – May (in Libya, cf., Durand & Barratte, 1910: 276, and Palestine, cf., Feinbrun-Dothan, 1986: 170). Probably somewhat later in Syria and Cyprus.

Genome: S^b with 2x = 2n = 14 (Chennaveeraiah, 1960: 90; Waines & Barnhart, 1992: Table 1). For all taxa treated in this revision Chennaveeraiah's (1960) study (especially pages 89-92) will be cited as the main source for information on chromosome numbers as his work extensively summarizes relevant literature. In addition, Waines & Barnhart (1992: Tables 1-2) present the latest, emended version of symbols for the genome types (see at the Introduction, Table 2 and its note 6).

Vernacular names:

Arabic: Dawsar zu Carnen [= two-horn *Aegilops*; exactly like the Latin etymology of the name!]; Sha'ier al Far [= barley (of the) mouse/rat] (both from Al-Khatib,

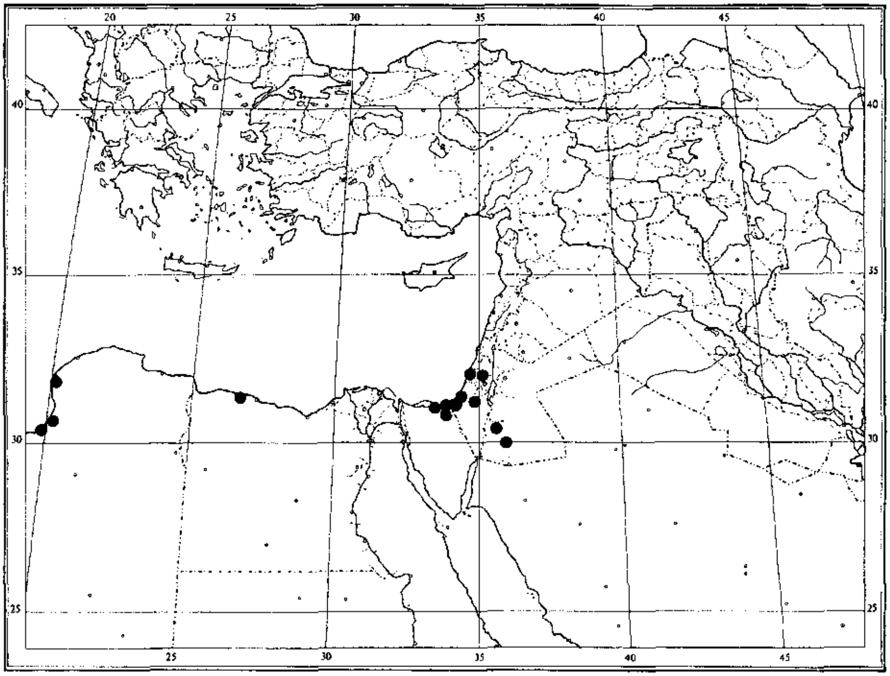

Fig. 17. Distribution of *Aegilops bicornis* var. *anathera* in the eastern Mediterranean and the Near East.

1978: 11). No distinction is made between the two varieties of the species, but Sha'ier al Far is under the var. *bicornis* with Täckholm et al. (1941: 269).

Etymology: the final epithet is derived from the Latin 'bi-cornis' [= two-horned] (Stearn, 1978: 392), and refers to the glume outline.

Most of the ca 250 herbarium specimens examined:

AFRICA: EGYPT: Rosetta, El Mandur, *Ascherson s.n.* (MO); Qatich, *Ascherson s.n.* (MO); Sidi Barrani, *Amin s.n.* (CAI); Sinai, *Aucher-Éloy 2996* (G, P); beach of Mersa Matrouh and Sidi Barrani, *Botschantzev s.n.* (LE); Ramleh to Abukir, near El Mandara, *Bornmüller 11108* (BM, E, G, PR, W, Z); Alexandria, Sidi-Geber, *Bornmüller 11109* (G, JE, LD, LE); Sinai, Rafah, 1 km from frontier, *Boulos s.n.* (CAI); Cairo, *Brown 3* (K); Sinai ('Isthmus Aegyptiaco-Palestinus'), wadi El Arish, *Deflers 108* (MPU); Bulkely station, near Ramleh, *du Parquet 545 & s.n.* (BM); Mustapha to Ramleh, *du Parquet s.n.* (BM, BR); Idku, *El Hadidi & al. s.n.* (CAI, MO, NY); Alexandria, *Ehrenberg s.n.* (C, LE, Z); Alexandria, Dumyat (Damietta), *Ehrenberg s.n.* (B, G-BOIS, K, L, LD, US, W); road Alexandria – Mersa Matrouh at km 21, *El Khanagry & Makhtar 17* (CAIM); Victoria, *Hassib s.n.* (CAI, G); road Alexandria – Burg el Arab at Kilo 17, *Imam s.n.* (CAI); El Busseyly farm, *Khattab 140* (CAIM); Bulkely station, near Ramleh, *Letourneux s.n.* (RAB); Ramleh, Aegypto inferiore, *Letourneux 171* (E, FI, G, G-BOIS, K, LE, LY, MPU, PR, PRC, W), *s.n.* (A, BR, CAI, E, F, FI, G, K, LD, MPU, NY, PRC, W, Z); Dekheliah, *Maire s.n.* (CAI); Sinai, Rafah, *Meyers & Dinsmore 3381b* (G); Nile delta, *Murat s.n.* (C); Ikingi – Mariut, *Romeé s.n.* (LD); Agami, W Alexandria, *Romeé s.n.* (LD, ULT); El Ma'mura, Rosetta, *Sa'ad s.n.* (CAIM); Ras El Kanayis, *Sa'ad 100* (CAIM, MO); Burg el Arab – El Alamein, *Sa'ad 144* (CAIM); El Mandara, *Schweinfurth s.n.* (Z); Sinai, Rafah, *Shabetai Z 1032, Z 3727* (CAIM); Wadi El Remla, Sellum, *Shabetai Z 3280* (CAIM); El Busseyly farm, *Shabetai Z 7390* (CAIM); Hayar El Hawatiya, near Alexandria, *Shabetai Z 5944* (CAIM); S Dekheliah, *Simpson 4734* (K); El Ma'adiya, *Simpson 4778* (K); Rosetta, *Simpson 3946* (CAIM, K); Sidi Bishi, E of Alexandria, *Simpson 2025, 3145*

(CAIM, K); 5 km NNW Rashid (Rosette), *Snogerup & al. 2620* (LD); Mariut, Amria, *V. Täckholm s.n.* (CAI); Saniet Hagg Ayyad, Wadi Habs, Mersa Matrouh to Agiba, *V. Täckholm & al. s.n.* (CAI); near Mersa Matrouh, *V. Täckholm & al. s.n.* (CAI); El Maadia on road Alexandria – Rosetta, *V. Täckholm & al. s.n.* (CAI); Mariut, Burg el Arab, *V. Täckholm s.n.* (CAI, LE, U); Alexandria, Abukir, *Petry s.n.* (FI, MPU, US); Sinai, 2 km W El Rafah, *van Slageren & al. MSBHSS-89061H* (ICARDA); Umm Raham, W Mersa Matrouh, *van Slageren & al. MSBHSS-89014H* (ICARDA, WAG); Wadi El Habs, W Mersa Matrouh, *van Slageren & al. MSBHSS-89017H* (ICARDA, WAG).

LIBYA: Cyrenaica, Marmarica, Marsa to Badia, *Armitage s.n.* (TO); Marsa El Buga – Agadabia, *Boulos s.n.* (CAI); Marsa El Brega to Agedabia road, *Boulos 1966* (ULT); Marmarica, El Omaied, foot Jebl Chasm-el-Aish, *Gauba 56* (W); Cyrenaica, near Tarzaniet, SE Bescer, *Guichard CYR/73/58* (BM); Tripolitania, 32 km W Nafilia to Sirte, *Maire & Weiller 1642* (MPU); opposite Adjebadia, *Maire & Weiller 1643* (FI, MPU, P); Cyrenaica, *Pachô s.n.* (G-BOIS); Cyrenaica, Benghasi, Juliana, *Ruhmer 401* (BR, E, FI, G, LD, LE, MPU, Z), *s.n.* (G); 29 mi from Agadabia to Benghasi, *Simpson 39152* (BM); Ain el Sibil, 10 mi W Derna, *Simpson 39471* (BM); Tripolitania, Wadi Msid, near Sidi Ben Nur, *Strobler 10* (W); Benghasi, Sabre, *Vaccari 167* (E, LE, MPU).

ASIA: JORDAN: near Wadi Rum resthouse, *Boulos & Wallad 7825* (K); Jebl Rum, *Dinsmore 13556* (K); Petra, *Loring s.n.* (A); Aqaba, *Park s.n.* (G-BOIS); Ma'an, W Humaima, *van Slageren & al. MSBHAJ-88176H* (ICARDA); Ma'an, in the Wadi Rum, *van Slageren & al. MSBHAJ-88177H* (ICARDA, WAG).

KUWAIT: Al-Subiyah, facing Bubyan Island, near gulf shore, *Boulos 15505* (CAI, E).

PALESTINE: Goret El-Lout, Khan Yunis, *Boulos 229* (CAI); Beersheba, *Eig & al. 24* (A, BC, BM, C, E, ERE, FI, G, K, LE, MPU, RAB, RNG, P, PR, US, W, Z); C Negeb, E Dimona, *Imber 2* (K); near Rafah, *Eig s.n.* (L); Haifa, *Post s.n.* (US); Gunlot, western Negeb, *Zohary s.n.* (UCR); N Gvulot, W Beersheba, NW Negeb, *Zohary s.n.* (UCR).

SYRIA: S Jebl Bishri, *Pabot s.n.* (G); Qasr Rhabarel, Soukni to Deir-ez-Zor, *Post s.n.(5211)* (G, Min.Agr.Syr.).

EUROPE: CYPRUS: Moni to Limassol, *Della s.n.* (ARI 3179, 3204); Salamis, N of Famagusta, *Druce 38* (OXF, voucher of *Triticum bicorne* var. *nana*); W Dhekelia to Larnaca, *van Slageren & al. MSLGAD-89092H* (ICARDA); Ayia Irini, *Meikle 2384* (C, CYP, K); Syrianochori, *Merton 796* (K); Ayia Irini, Dhiorios, *Syngrassides 1206* (CYP, K); Moni, E Limassol, *van Slageren & al. MSLGAD-89100H* (ICARDA).

Notes: 1. Stafleu & Cowan (1976: 856) are followed here in the spelling of the name Forsskål as they mention that variation exists. I have to assume that the type collection was made by Forsskål himself. The material at C, which would have enabled checking handwritten notes (if any), has not been available. Forsskål was on the 1761-63 Danish expedition to Egypt and other Arabian lands during which he died. After his death his manuscript was edited by Carsten Niebuhr and published as the *Flora aegyptiaco-arabia* as late as 1775 (Stafleu & Cowan, 1976: 856).

2. The varieties *bicornis* and *anathera* are retained here as they are distinct and as intermediate forms are only rarely found (e.g., *Simpson 2523* (K) from Egypt). They are allopatric in distribution (see Figs. 16 and 17).

3. *Aegilops bicornis* is superficially similar to *Ae. speltoides* var. *ligustica* and *Ae. sharonensis*, especially with sub-optimal material of the latter species. Differences are presented in the following key:

1 Apex of lateral glumes truncate with a thickened rim and a mucro at the adaxial side 2
Apex of lateral glumes with two triangular teeth, separated by a hyaline central part 3

2 Only lemmas of apical spikelet with 4.5-10 cm long awns; spike narrowly cylindrical, 5-15(-20) cm long excluding awns, disarticulating as one unit upon maturity (*Fig. 65-2*) .... **speltoides** var. **speltoides**

Lemmas of all lateral and apical spikelets with awns, increasing from 2.5 cm at base of spike to 10 cm in apical spikelets; spike narrowly cylindrical but distichous and somewhat compressed laterally, disarticulating wedge-type upon maturity into individual spikelets (*Fig. 65-1*) .... **speltoides** var. **ligustica**

3 Plants (30-)40-70 cm excluding spikes (*Fig. 15-1*); spike 7-10 cm excluding awns; lemma awns with 2 lateral teeth at the base (*Fig. 63-6a*); one apical glume apex with 2 triangular teeth (similar to the lateral glume apex), one with a short, central tooth and 2 lateral teeth .... **sharonensis**

Plants (10-)20-40 cm excluding spikes (*Fig. 63-1*); spike 4-7.5 cm excluding awns; lemma awns without teeth at the base (*Fig. 15-4, 7*); apex of apical glumes with 1 central tooth and sometimes 2 lateral teeth (*Fig. 15-10*) 4

4 All lemmas awned (*Fig. 15-2*) .... **bicornis** var. **bicornis**

Lemmas of the upper 5-7 spikelets awned (*Fig. 15-3*) .... **bicornis** var. **anathera**

10.1b **Aegilops bicornis** (Forssk.) Jaub. & Spach var. **anathera** Eig

Figs. 15(3), 17

Aegilops bicornis (Forssk.) Jaub. & Spach var. *anathera* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 325 (1928a); Pampanini, Prodr. fl. ciren. 138 (1930); Maire & Weiller, Fl. Afrique nord 3: 353 (1955); Keith, Checklist Libyan Fl. 197 (1965); Feinbrun-Dothan, Fl. Pal. 4: 170 (1986).

Lectotype: (Libya) Cyrenaica, Juliana (Djouliana), near Benghasi, 3.IV.1883, *Ruhmer s.n. (401?)* (PR, here designated; isolectotypes: BR, FI, JE, MPU-Maire, P). – Notes: 1. Eig (1928a: 325) cites two collections in relation to his var. *anathera*, but one of them (Egypt, Ramleh, 21.III.1872, *Letourneux s.n.*, in B (probably †) but also in many other herbaria) is the typical variety *bicornis* (see specimens seen at 10.1a). 2. The collection no. 401 is cited by Ascherson (1902: 10) in relation with his *Triticum bicorne* ssp. ('B') *muticum*, but material with this number (and present in BR, E, FI, G, LD, LE, MPU, Z) is considered var. *bicornis* (see at 10.1a). 3. G.F. Ruhmer worked at B when he was collecting in Libya during 1882-83 (Stafleu & Cowan, 1983: 981). A holotype should have been located there, but these collections were most likely destroyed. The collection from PR is now chosen as the lectotype.

Homotypic synonym:

Aegilops bicornis (Forssk.) Jaub. & Spach var. *mutica* (Asch.) Eig, Spec. nov. reg. veget., Beih. 55: 73 (1929a); Täckholm et al., Fl. Egypt 1: 269 (1941); Täckholm, Students' Fl. Egypt (ed. 2) 702 (1974); Hammer, Feddes Repert. 91: 231 (1980b), *nom. illeg.* (Art. 64.1), non Post, Fl. Syria (ed. 1) 901 (1896), q.e. *Ae. sharonensis* (see at 10.15). – Basionym: *Triticum bicorne* Forssk. ssp. ('B') *muticum* Asch., Magyar Bot. Lapok 1(6): 10 (1902).

Heterotypic synonym:

Ae. bicornis (Forssk.) Jaub. & Spach var. *exaristata* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 326 (1928a), **syn. nov.** – Type: Palestine, Rafah, 30.IV.1925, *Eig s.n.* (holo: HUJ, not seen). – Note: synonym follows the description from Eig, which states that the spike is awnless (muticus) or with awns on the few most apical spikelets only.

Description (Fig. 15-3): plants as var. *bicornis* but with lemma awns present in the uppermost 5-7 spikelets only.

Distribution (Fig. 17): a Mediterranean element occurring in the coastal regions of eastern Libya, Egypt and Palestine, as well as southern Jordan. Often found together with the var. *bicornis* but more rare to only sporadic. Not present in Cyprus.

Ecology, altitude, flowering and fruiting time, genome type, vernacular names: as with var. *bicornis*.

Etymology: the final epithet is derived from the Greek 'an' [= lacking, without, cf. Stearn, 1978: 384], and 'thera' [= awn], and refers to the lower spikelets, which are awnless.

Herbarium specimens examined:

AFRICA: EGYPT: oasis of El Qatiyeh, *Deflers 51* (MPU); Sinai ('Isthmus Aegyptiaco-Palestinus'), wadi El Arish, *Deflers 108* (MPU); Sinai, Rafah, *Meyers & Dinsmore 3381* (G); Matrouh to Sidi Barrani, *Shabetai F 4806* (K); Sinai, 6 km W El Arish, *van Slageren & al. MSBHSS-89058H* (ICARDA, WAG).

LIBYA: Cyrenaica, Agedabia, 35 km W Marsa Brega, *Faruqi 222* (GAT cult.); Cyrenaica, near Bescer and Agedabia, *Guichard CYR/68/58, CYR/134/58* (BM); Cyrenaica, Benghasi, Juliana, *Ruhmer s.n. ('401')* (BR, FI, JE, MPU-Maire, P, PR, type of *Aegilops bicornis* var. *anathera*).

ASIA: JORDAN: Wadi Rum, *Davis 8933, 10442* (K); Petra and vicinity, *Loring s.n.* (A).

PALESTINE: El Dhoheriye, *Barbey 955* (G, G-BOIS); Tel-Aviv, *Feinbrun s.n.* (BR, HUJ); NW Negeb, Nirim road, *Imber & Zohary 4* (K, UCR); S Palestine, *Percival 880* (BM, K).

Germplasm collection examined:

AFRICA: EGYPT: Sinai, 6 km E El Arish, *van Slageren & al. MSBHSS-89058* (ARCG, ICARDA).

Note: the oldest combination of *mutica* with *Aegilops bicornis* is from Post (1896: 901). As the type specimen represented *Ae. sharonensis*, the epithet was later combined as the variety *mutica* under that species by Eig (1929a: 75). Eig (1928a) explained that the epithet *anathera* served as a *nom. nov.* for a recombination in *Aegilops* as he could not use Ascherson's (1902: 10) name in *Triticum* for reasons of homonymy after the older name from Post. Remarkably, he nevertheless decided in 1929 in his monograph to make this recombination.

10.2 **Aegilops biuncialis** Vis. **Figs. 18-20**

Aegilops biuncialis Vis., Fl. dalmat. 1, Tab. 1, fig. 2 (1842, illustration), 3: 344 (1852, description); Schlosser von Klekovski & Vukotinovič, Fl. croat. 1295 (1869); Nyman, Consp. fl. eur. 4: 839 (1882), Suppl. 2: 342 (1890); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 448, 480 (1928, with var. *vulgaris*); Eig, Feddes Repert., Beih. 55: 135 (1929a, with var. *typica*); Post, Fl. Syria (ed. 2) 2: 784 (1933); Nevski in Komarov, Fl. URSS 2: 673 (1934, Russian) / 536 (1963, English); Grossheim, Fl. Kavkaza (ed. 2) 1: 353 (1939), Opredelitel rastenich Kavkaza [Key to Caucasus plants] 719 (1949); Jansen & Wachter, Nederl. Kruidk. Arch. 141 (1931); Oppenheimer & Evenari, Florul. Cisiord. 171 (1941, with var. *typica*); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 767 (1943); Karjagin, Fl. Azerbaijana 1: 338 (1950); Jansen, Fl. neerl. 1(2): 123 (1951); Thiébaut, Fl. Lib.-Syr. 3: 318 (1953); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960); Bor in Rechinger, Fl. Lowland Iraq 113 (1964); Mouterde, Nouv. Fl. Liban, Syrie 1: 147 (1966); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 482 (1969); Rubtsova, Opredelitel vysschich rastenich Kryma [Key to higher pl. Crimea] 68 (1972); Takhtajan & Fedorov, Fl. erevana

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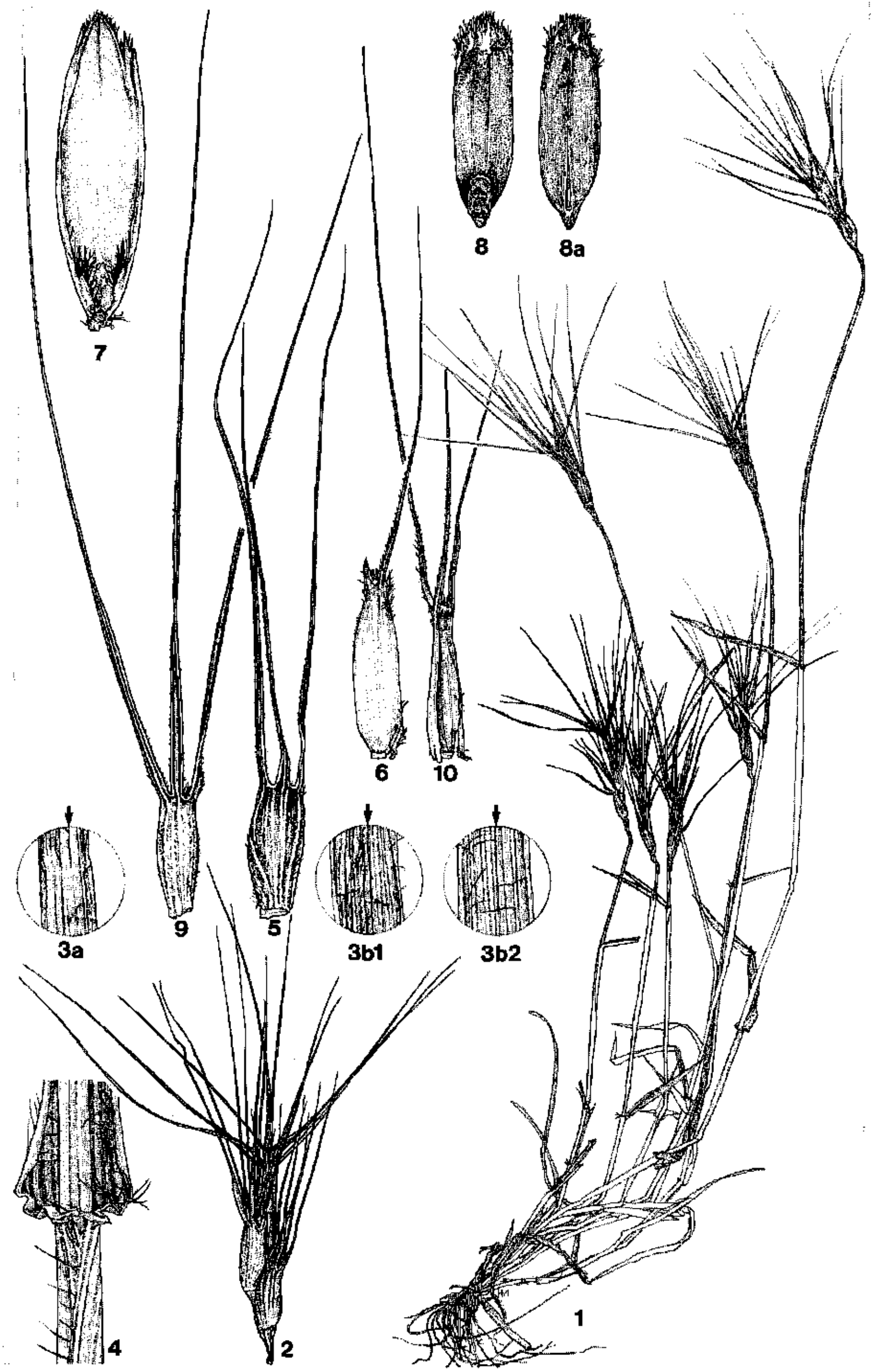
Fig. 18. *Aegilops biuncialis*. 1, habitus (x 1/2); 2, spike (x 1); 3a, abaxial leaf surface, midway; 3b1, adaxial side of a more basal leaf, showing more ciliate ornamentation; 3b2, adaxial side of 3a (3a-b all x 5); 4, stem, leaf sheath, ears and leaf blade (x 5); 5-8, lowest floret of lowest fertile spikelet of a spike: 5, glume (x 21/2), 6, lemma (x 21/2), 7, palea with lodicules at the base (x 5), 8, dorsal surface of seed (x 5), 8a, ventral surface of 8 (x 5); 9-11, lowest floret of upper spikelet of a spike: 9, glume (x 21/2), 10, lemma, inner view (x 21/2). (1-11. *van Slageren & al. MSMZNN-90283H*.)


7
8
8a
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10
3a
9
5
3b1
3b2
4
2
1

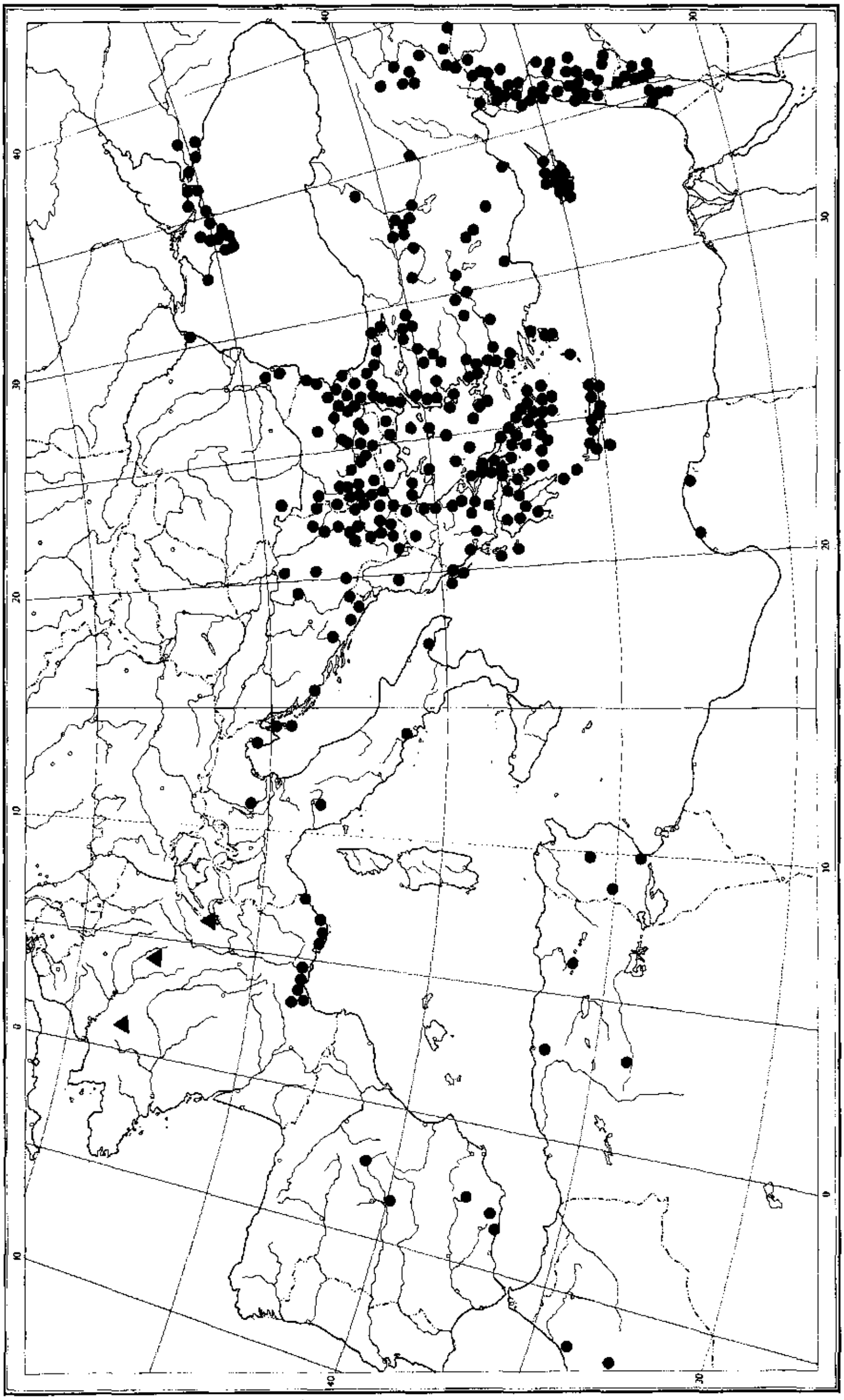


Fig. 19. Distribution of *Aegilops biuncialis* in the Mediterranean, the Black Sea region, and western Asia (partially). ● = locations; ▲ = adventive locations.

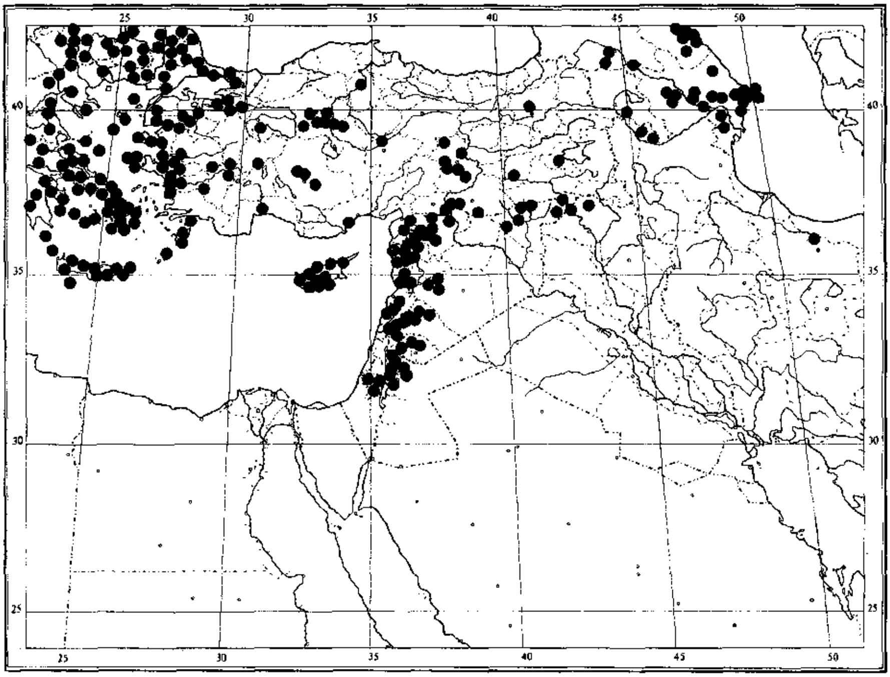


Fig. 20. Distribution of *Aegilops biuncialis* in western Asia and the Caucasus.

(ed. 2) 366 (1972); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 38 (1973), in Fedorov, Fl. part. Eur. URSS 1: 155 (1974), Zlaki SSSR 159 (1976, Russian) / 227 (1984, English); Josifovič, Fl. rep. soc. serbie 8: 445 (1976); Sljusarenko in Prokudin et al., Zlaki Ukrainy 94 (1977); Davis, Fl. Turkey 9: 242 (1985); Meikle, Fl. Cyprus 2: 1820 (1985); Feinbrun-Dothan, Fl. Pal. 4: 176 (1986); Mattatia & Feinbrun-Dothan, Isr. J. Bot. 35: 53 (1986); Nikitin & Geldykhanov, Opredelitel rastenich Turkmenistana [Key to Turkmenistan plants] 46 (1988); Gandilyan in Kazarjan, Red data book Armenian SSR 248 (1990).

Lectotype: the illustration with dissection presented in R. de Visiani's, *Flora dalmatica*, Vol. 1, Tab. 1, fig. 2 (1842). Designated by Gandilyan (1980: 190). See note 1.

Homotypic synonyms:

Triticum biunciale (Vis.) K.Richt., Pl. Eur. 1: 128 (1890), *nom. illeg.* (Art. 64.1), non Villars, Hist. pl. Dauphiné 2: 167 (1787), q.e. *Vulpia unilateralis* (L.) Stace. See note 2.

Ae. ovata L. var. ('β') *biuncialis* (Vis.) Fiori & Paol., Fl. Italia 1: 109 (1896); von Halácsy, Consp. fl. graec. 3: 431 (1904); Fiori, Nuov. Fl. Italia 1: 160 (1923); Borg, Descr. fl. Malt. isl. 790 (1927); von Hayek, Prod. fl. pen. Balcan. 3: 225 (1932, as 'E' *biunciale*; see note 3 for the interpretation of 'I', 'A', 'a' and 'α' by von Hayek); Diapulis, Syn. fl. graec. 167 (1939, with var. γ *biunciale* 'Asch. & Graebn.' thus with rank as var. but with authors that are seen here as ranking the taxon as a subspecies.).

Triticum ovatum auct. non Rasp. ssp. ('B. II.') *biunciale* (Vis.) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 706 (1902; on the use here and elsewhere of 'I.', 'II.', 'B.', etc. by Ascherson & Graebner, see note 1 at 10.16b); Holmboe, Veg. Cyprus 38 (1914; as 'ssp. *biunciale* (Vis.)' and a *comb. nov.* although not stated as such, thus an isonym if the above combination by Ascherson & Graebner is to be interpreted as a subspecies); Stojanov & Stefanoff, Fl. Bulg. (ed. 3) 174 (1948).

Ae. ovata L. ssp. *biuncialis* (Vis.) Emb. & Maire, Cat. pl. Maroc 4: 947 (1941); Maire & Weiller, Fl.

Afrique nord 3: 366 (1955); Stojanov et al., Fl. Bulg. (ed. 4) 1: 148 (1966); Anghel & Beldie in Savulescu, Fl. Rep. Soc. Romania 12: 563 (1972, as 'ssp. *biuncialis* (Vis.)' and a *comb. nov.* although not stated as such; to be interpreted as an isonym). – Note: although the first three volumes of the *Catalogue des plantes du Maroc* are by Jahandiez & Maire, the fourth volume is by Emberger & Maire (Stafleu & Cowan, 1979: 417) who are thus the authors of this combination.

Ae. geniculata Roth ssp. *biuncialis* (Vis.) Zangh., Fl. ital. 1: 979 (1976); Pignatti, Fl. italia 3: 542 (1982), *comb. inval.* (Art. 33.2).

Heterotypic synonyms:

Ae. lorentii Hochst. in von Lorent, Wanderungen im Morgenlande, Flora 28: 25 (1845, '*Lorentii*'); von Steudel, Syn. pl. glumac. 1: 354 (1854, '*larenti*'); Post, Fl. Syria (ed. 2) 2: 784 (1933, '*Lorentii*'); Bor, Fl. Iraq 9: 176 (1968), Fl. Iranica 70/30: 201 (1970); Osorio-Tafall & Seraphim, List Vasc. Pl. Cyprus 10 (1973); Guinea Lopez & Ceballos Jiménez, Elenco Fl. Vasc. Españ. 357 (1974); Haslam, Sell & Wolseley, Fl. Maltese isl. 457 (1977); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980); Hammer, Feddes Repert. 91: 239 (1980b, with var. *lorentii*); Löve, Feddes Repert. 95: 503 (1984, with ssp. *lorentii*); Dakov, Red book Bulg., distr. threatened pl., anim., 1: 51 (1984); Sagredo, Fl. Almeria 49 (1987). – Type: (Turkey) prope Seleuciam, *von Lorent s.n.* (holo: TUB). – Note: the name Seleucia may refer to three ancient cities, viz., (1) SW Tarsus and (2) on the mouth of the Orontes, both in present-day Turkey, and (3) to the chief city of the Seleucids, now ruins SSE Baghdad, Iraq. Von Lorent's travel description to which Hochstetter contributed the species description excludes, however, the Iraqi location. The Turkish location is not specified in more detail. – Homotypic synonyms: *Ae. ovata* L. var. ('γ') *lorentii* (Hochst.) Boiss., Fl. orient. 5(2): 674 (1884, '*Lorentii*'); Post, Fl. Syria (ed. 1) 899 (1896, '*Lorentii*'). *Triticum ovatum* auct. non Rasp. var. ('B. II. b.') *lorentii* (Hochst.) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 706 (1902). *Triticum lorentii* (Hochst.) Zeven, Taxon 22: 321 (1973).

Ae. connata Steud., Syn. pl. glumac. 1: 356 (1854); Hammer, Feddes Repert. 91: 245 (1980b), **syn. nov.** – Type: (Greece) Epidaurus, *von Steudel s.n.* (holo: P; iso: L). – Note: Hammer has a question mark when equating this species with *Ae. biuncialis*; the status as a synonym is now confirmed after inspection of the type specimens.

Ae. intermedia Steud., Syn. pl. glumac. 1: 354 (1854); Duval-Jouve, Bull. Soc. bot. France 16: 385 (1869); Greuter & Rechinger, Chloris Kythereia, Boissiera 13: 171 (1967). – Type: (Syria) in lapicidinis prope Aleppum, *Kotschy s.n.* (Pl. Alepp. Kurd. Moss. 176) (holo: P; iso: BM, G-BOIS, K, LE, LY-Jordan, TUB, US).

Ae. ovata L. var. ('β') *latearistata* Lange, Pugillus pl. hispan. 1: 56 (1860); Willkomm & Lange, Prod. fl. hispan. 1: 107 (1861, 'β *late aristata*'); Eig, Feddes Repert., Beih. 55: 145 (1929a, '*latiaristata*'); Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931, '*latiaristata*', and as a var. of ssp. *atlantica* Eig); Maire & Weiller, Fl. Afrique nord 3: 368 (1955, '*latiaristata*', and as a var. of ssp. *atlantica* Eig), **syn. nov.** – Note: the rank of the combination by Lange is that of a variety because of Art. 35.3 of the *Code*. – Type: (Spain) in campis ad Jaén, 5.V.1852, *Lange s.n. ('Pl. Eur. Austr. 1851-52 no. 97')* (holo: C). – Homotypic synonym: *Ae. geniculata* Roth var. *latearistata* (Lange) Hammer, Feddes Repert. 91: 241 (1980b, '*latiaristata*').

Ae. macrochaeta Shuttlew. & A.Huet ex Duval-Jouve, Bull. Soc. bot. France 16: 384, 385 (1869); Loret & Barrandon, Fl. Montpellier (ed. 2) 577 (1886); Albert & Jahandiez, Cat. pl. vasc. Var 561 (1908); Coste, Fl. descr. France 3: 657 (1910); Nábělek, Iter turc.-pers. 5, Publ. Fac. Sci. Univ. Masaryk 111: 30 (1929); Cadevall y Diars, Fl. Catalunya 6: 273 (1937); Ginochet & Vilmorin, Fl. France 3: 967 (1978). – Type: (France, Var) Mont Faron près Toulon, lieux secs et pierreux, 15 mai 1864, *Huet du Pavillon et Jacquin s.n.* (holo: MPU-Duval-Jouve). – Homotypic synonyms: *Triticum macrochaetum* (Shuttlew. & A.Huet ex Duval-Jouve) K.Richt., Pl. eur. 1: 128 (1890); Bowden, Can. J. Bot. 37: 675 (1959), Can. J. Gen. Cyt. 8: 135 (1966); Greuter & Rechinger, Chloris Kythereia, Boissiera 13: 171 (1967); Morris & Sears in Quisenberry & Reitz, Wheat and Wheat Improvement 20 (1967); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 56 (1987). *Triticum ovatum* auct. non Rasp. var. ('B. I. b.') *macrochaetum* (Shuttlew. & A.Huet ex Duval-Jouve) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 706 (1902); von Hayek, Prod. fl. pen. Balcan. 3: 225 (1932, as 'C' *macrochaetum*); Diapulis, Syn. fl. graec. 167 (1939, as 'var. β *macrochaetum* Hayek'). *Ae. ovata* L. ssp. *macrochaeta* (Shuttlew. & A.Huet ex Duval-Jouve) Rouy, Fl. France 14: 332 (1913); Douin in Bonnier, Fl. ill. France 12: 63 (1934). *Ae. biuncialis* Vis. var. *macrochaeta* (Shuttlew. & A.Huet ex

Duval-Jouve) Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 329 (1928a, '*macrachaeta*'), Feddes Repert., Beih. 55: 137 (1929a); Karjagin, Fl. Azerbaijana 1: 338 (1950).

Ae. triaristata Willd. var. *trispiculata* Hack. ex Trab. in Battandier & Trabut, Fl. Alger 107 (1884), **syn. nov.** – Type: (Algeria) Jebl Mouzaïa, 21.IV.1878, *Trabut s.n.* (holo: MPU). – Note: the type collection in MPU is kept in the separate herbarium for north African floras. – Homotypic synonyms: *Ae. trispiculata* (Hack. ex Trab.) Battand. & Trab., Fl. Algérie 1(2): 241 (1895), Fl. Algérie Tunisie 393 (1905, author as 'Hackel'). *Triticum triaristatum* (Willd.) Gren. & Godr. var. *trispiculatum* (Hack. ex Trab.) Th.Durand & Schinz, Consp. fl. afric. 5: 939 (1894). *Ae. ovata* L. forma *trispiculata* (Hack. ex Trab.) Maire & Weiller, Fl. Afrique nord 3: 367 (1955, '*trispicudata*').

Ae. biaristata Lojac., Fl. sicul. 3: 370 (1908-09), **syn. nov.** – Type: (Italy, Sicily) colli maritimi, Messina Tin, Cefalù Tin, *Lojacono (?, probably) s.n.* (holo: PAL, not seen). – Note: Lojacono (1908-09: 370) writes that it looks like *Ae. intermedia* Steud. and *Ae. triaristata* var. *trispiculata* Hack. ex Trab. Both taxa are *Ae. biuncialis* as it is here understood.

Ae. biuncialis Vis. var. *velutina* Zhuk., Bull. Appl. Bot. Gen. & Pl. Breeding 18(1): 483 (1928); Tzvelev in Fedorov, Zlaki SSSR 159 (1976, Russian) / 228 (1984, English), **syn. nov.** – Type: (Turkey) Asia Minor, Galatia, prope Angora, in collibus herbosis, *Zhukovsky s.n.* (holo: WIR). – Homotypic synonym: *Ae. lorentii* Hochst. var. *velutina* (Zhuk.) Hammer, Feddes Repert. 91: 239 (1980b).

Ae. biuncialis Vis. var. *archipelagica* Eig, Feddes Repert., Beih. 55: 137 (1929a); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 767 (1943, '*archipelagicus*'), **syn. nov.** – Syntypes (five collections cited by Eig, 1929a; inspected ones listed): (Cyprus) in monte Pentedactylos, *Sintenis & Rigo s.n.* (B (not seen), K); (Greece) island Syra (Thíra), *Octave & Denis s.n.* (G); (Greece) island Cea (Kéa), Episkopi, 21-24.V.1898, *von Heldreich s.n.* (G, Z); (Greece) island Karpathos, in collibus aridis prope Menelaes, 27.V.1886, *F.(Forsyth-?) Major 62* (G); (Greece) island Karpathos, in incultis montis Melloura a prope Yoladha, 9.V.1886, *F.(Forsyth-?) Major 62a* (G). – Notes: 1. *Major* is most likely F. Major, who collected with Pichler a.o. on Karpathos. However, Vegter (1976: 494) indicates that this F. Major is probably Ch.I. Forsyth-Major, who also collected in the Aegaean. 2. Eig (1929a: 137) lists 'Karpathos, leg. Major 1886'. This applies to two collections in G (not in G-BOIS as is stated by Eig). – Homotypic synonyms: *Triticum ovatum* auct. non Rasp. var. ('F') *archipelagicum* (Eig) Hayek, Prod. fl. pen. Balcan. 3: 225 (1932); Diapulis, Syn. fl. graec. 167 (1939, as 'var. δ *archipelagicum* Hayek'). *Triticum macrochaetum* (Shuttlew. & A.Huet ex Duval-Jouve) K.Richt. ssp. *archipelagica* (Eig) Greuter in Greuter & Rechinger, Chloris Kythereia, Boissiera 13: 171 (1967). *Ae. lorentii* Hochst. var. *archipelagica* (Eig) Hammer, Feddes Repert. 91: 239 (1980b, '*archiedlagica*'). *Ae. lorentii* Hochst. ssp. *archipelagica* (Eig) Á.Löve, Feddes Repert. 95: 504 (1984).

Ae. macrochaeta Shuttlew. & A.Huet ex Duval-Jouve ssp. *pontica* Degen, Magyar Bot. Lapok 30: 111, Tab. 1, fig. 5 (1931); Stojanov & Stefanoff, Fl. Bulg. (ed. 3) 174 (1948, in syn.); Stojanov et al., Fl. Bulg. (ed. 4) 1: 148 (1966, in syn.), **syn. nov.** – Type: (Bulgaria) Bulgarica. In decliv. septentr. monti Ma Tepe prope Burgas, 5-20 m, 11.VI.1929, *Pénzes s.n.* (holo: BP, photocopy of sheet seen). – Homotypic synonyms: *Triticum ovatum* auct. non Rasp. var. ('D') *ponticum* (Degen) Hayek, Prod. fl. pen. Balcan. 3: 225 (1932). *Ae. pontica* (Degen) Vălev. Cited in Stojanov et al., Fl. Bulg. (ed. 4) 1: 148 (1966, author as 'Waleff' and in syn.); Dakov, Red book Bulg., distr. threatened pl., anim., 1: 51 (1984, in syn.). – Note: author is spelled as 'Waleff' by Stojanov et al. (1966: 148), as 'Vălev' and with date '1963' by Dakov (1984: 51). It refers to S.T. Vălev (1910-74), but I have been unable to trace any of his publications, including the one where the elevation to species level is made. *Ae. lorentii* Hochst. ssp. *pontica* (Degen) Á.Löve, Feddes Repert. 95: 504 (1984).

Diagnostic characters: tufted, many-tillered annuals, 10-40 cm tall excluding spikes; spikes narrowly ovate, 1.5-3.5 cm long excluding awns, with 2(-3) fertile and 1(-2) rudimentary spikelets; glumes with 2-3 awns, increasing in length towards the spike apex: 1-4 cm to 4-7 cm; lemmas with awns and/or teeth, awns shorter than the glume awns; caryopsis free.

Description (Fig. 18): tufted *annuals*, usually with many tillers (*Fig. 18-1*). *Culms* semi-erect, geniculate and prostrate at base, then ascending, (10-)20-40 cm tall excluding spikes; foliage ± evenly distributed but more dense at base of culms. *Leaf* blades linear-acuminate, 2.5-6 cm long, 0.2-0.4 cm wide; upper part of sheath margins ciliate (*Fig. 18-4*). *Inflorescence* (*Fig. 18-2*) a narrowly ovoid spike, 1.5-3.5 cm long excluding awns, 0.3-0.9 cm wide; disarticulating as one unit at maturity with the rudimentary spikelet(s) remaining attached to the culm; with 2(-3) fertile and 1(-2) rudimentary spikelets. *Spikelets* sessile, ellipsoid, 0.6-1 cm long excluding awns, 0.3-0.5 cm wide, 0.8-1.5 times the length of the supporting rachis internode; with 2-4(-5) florets of which the lower (1-)2-3 fertile. *Glumes* (*Fig. 18-5, 9*) 2, coriaceous, ovate-oblong, 8-10 mm long, of the apical spikelets obtriangular to obtrapezoid and 5-8 mm long; the surface scabrid or (mainly) adpressed-velutinous, green to purplish-green; venation unequal in width, flattened, sunk into the surface, unequally spaced, usually more yellowish and lighter in colour than the rest of the glume surface; the truncate apex of the lateral spikelets extending into 2-3 awns, of the apical spikelet always in 3 awns; awns setulose, ± equally wide at the base, flat, erecto-patent to deflexed in position, green to purplish-green, increasing in length towards spike apex: 1-4 cm in the lowest fertile spikelet up to 4-7 cm in the apical spikelet, inner base of awns velutinous. *Lemmas* (*Fig. 18-6, 10*) of fertile florets 8-10 mm long, narrowly ovate-elliptical, boat-shaped; apex with 2(-3) slender, setulose awns, (0.4-)2-4 cm long, and/or 1-2 lateral teeth, awn position similar to glume awns; both inner and outer apical parts of the lemmas velutinous. *Paleas* (*Fig. 18-7*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 18-8*) 5-8 mm long, free from lemma and palea.

Distribution (Figs. 19-20): a Mediterranean / Western Asiatic element occurring mainly in southeastern Europe and adjacent Asia (Aegaeis, Turkey, Bulgaria, Cyprus), on the western arc of the Fertile Crescent, in the eastern Cis- and Transcaucasus, and in the southern part of the Crimea alongside adjacent parts of Russia and the Ukraine. Less frequent also in other Mediterranean countries of Europe and north Africa. Comparatively well-represented in southern France. A location in Turkmenistan (Kushtang, Aul, Chodja-Pil, *Chepanov s.n.* in ASH; not shown on Fig. 20) is probably not adventive, but rather far away from the rest of the distribution area. Further collecting in northern Iran may link these locations. Common throughout most of its range.

Adventive records in northwestern Europe are from Germany, Switzerland, Scotland and the Netherlands (Rotterdam, cf., Jansen, 1951: 124, no specimens seen).

Ecology: locally abundant on generally dry, somewhat disturbed places such as fallow, roadsides, edges of cultivation, olive groves, vineyards, and various forest types (frequently with *Pinus halepensis* and *Quercus* sp.). Also in grasslands, maquis and kafkalla vegetation, steppe and dry, rocky mountain slopes. More rarely in river valleys and palm plantations. Extensive populations, estimated at several hundred square metres, have been observed (e.g., in Daghestan A.R., Russia). This species, which is often found together with other *Aegilops* species, grows on a variety of bedrock types: mainly limestone but also on schists, shales, basalt, granite, and pillow lavas. Soil textures are mainly clay- or sandy loam, or clay, or (rarely) pure sandy soils (e.g., in Tunisia). Collated annual rainfall data of 225-800 mm indicate some drought tolerance, but also occurs in areas with as much as 1250 mm (e.g., in the mountains of western Syria).

Altitude: from -200 m (Jordan, Magdala, eastern slope of the Dead Sea) up to 1750 m.

Flowering and fruiting time: May – August. May – July reported for Spain (Cadevall y Diars, 1937: 273; Sagredo, 1987: 49), and S France, dept. Var (Albert & Jahandiez, 1908: 561). Fruiting in highlands as late as August (pers. obs. in Turkey).

Genome: U<u>M</u> (female parent 'U' x male parent '<u>M</u>') with 2x = 4n = 28 (Chennaveeraiah, 1960: 91; Waines & Barnhart, 1992: Table 2).

Vernacular names:

Armenian: Aytzagn yergmadya / Karachod yergmadya [yerg/yerko = two; mad = finger] (Gandilyan in Kazarjan, 1990: 248).

Azeri: Ikiduimeli bugdayiot (Karjagin, 1950: 338).

English: Mediterranean *Aegilops* (Haslam et al., 1977: 457).

French: Égilope à grosses arêtes [= *Aegilops* with thick awns] (Douin in Bonnier, 1934: 63, sub *Aegilops ovata* ssp. *macrochaeta*).

Kurdish: Pîvîr (from Dahuk, Iraq: *Makki 3294* (K), quoted by Bor, 1968: 178).

Uses: Bor (1968: 178) cites the use of this species as a forage grass in Iraq.

Etymology: the final epithet is the Latin 'biuncialis' [= two inches (long)], and may refer to the spike or glume-awn length.

A geographical selection of ca 1020 herbarium specimens examined:

AFRICA: ALGERIA: Oued, Laghout to Tadjemout, *Alston & Simpson 97* (BM); near Batna, *du Colombier 11* (P); Sersou, *Trabut s.n.* (MPU); Berrouaghia, *Trabut 170* (W); Jebl Mouzaïa, *Trabut s.n.* (MPU, type of *Aegilops triaristata* var. *trispiculata*).

LIBYA: Wadi Derna, *Simpson 39460* (BM); Al Beida (Badiyah) to El Marj (Al Mari), *s.coll., s.n. (Hammer?)* (GAT cult.).

MOROCCO: Oued Grou, Rommani to Maaziz, *Davis 54349* (BM, E); forest of Jaba, *Mathez 979* (RAB).

TUNISIA: 60 km Tunis to Gafsa, *Klika s.n.* (PR); N Gabes on Sfax – Gabes road, *Soderstrom 1481* (US).

ASIA: IRAN: near Mamudieh, N Tehran, *Aellen 1863* (K); Azerbaijan, Dasht-e Moghan, Eyvaz, SE Aslanduz, *Lamond 3200* (Rechinger itinera 40172) (E, G); Azerbaijan, Dasht-e-Moghan, *Merton 3479* (K); Sarre, *Prescott s.n.* (E).

IRAQ: N Kirkuk, *Al-Rawi 21572* (K); Zinta gorge, *Chapman 26127* (K); Kursi, Jebl Sinjar, *Gillett 10902* (K); Arbil reg., valley W Pirmum Dag, *Gillett 8170* (K); Khabur desert, *Haussknecht 1061* (JE); Jarmo, above camp, *Helbaek 1195* (K); Gali Ali Beq, *Kasim & al. 40928* (A); Dahuk, *Makki 3294* (K); Salahuddin, *Springfield S-63* (K).

JORDAN: Ajlun, Ishtafeina, NW Ajlun, *van Slageren & Jaradat MSAJ-88083H* (ICARDA); Jarash, Kufr Kha, off road Irbid – Jarash, *van Slageren & Jaradat MSAJ-88043H* (ICARDA, WAG); Jarash, Quafqafa, N Jarash, *van Slageren & Jaradat MSAJ-88053H* (ICARDA); Zarqa, El Juheiba to Yajuz, *van Slageren & Shibli MSRS-88046H* (ICARDA, WAG).

LEBANON: SSE Rachaya, *Berton 156* (P); Beirut, *Blanche s.n.* (L); Terbol, *Blanche 801* (G-BOIS); Baalbek plain, *Edgecombe A-805-1* (BEI); Ras Baalbek road, *Edgecombe B-902* (BEI); Afqa, *Gombault 854* (P); Brummana, *Mooney 4426* (MO); Ras Chekka to Harroum, *Pabot s.n.* (G); near Beirut, *Pabot s.n.* (G); Zahle, *Post s.n.* (BEI); Bcharre to Azz er Rab, *Samuelsson 2324* (BM).

LEBANON/SYRIA: Jebl Kenisse, *Mouterde 5275* (G); towards Aïn Rehbane, *Mouterde 11931* (G); Antilebanon Mts., Wadi Shibah, *Post s.n.* (BEI); Antilebanon, Mt. Hermon, *Post s.n.* (BEI).

PALESTINE: S Jerusalem, *Feinbrun & Amdursky 708* (A, ANK, B, BC, BM, C, E, ERE, FI, G,

HUJ, K, L, LD, LE, MO, NY, PRC, RNG, SO, SOM, U, US, W, WAG, Z); castle of Subebeh, *Meyers & Dinsmore 724b* (L), *1787* (E); near Bethlehem, *Planche 85* (LY-Gandoger); Ramot, near Jerusalem, *Zohary 517* (Z).

SYRIA: Dolou Dagh, *Gombault 598* (P); near Aleppo, *Kotschy s.n.* (Pl. Alepp. Kurd. Moss. 176) (BM, G-BOIS, K, LE, LY-Jordan, P, TUB, US, type of *Aegilops intermedia*), *176b, 280* (TUB); Kfar Chima, *Mouterde 5250* (G); Ras el Bassit, *Mouterde 12873* (G); Quneitra, Massaade, *Pabot s.n.(346)* (G, Min.Agr.Syr.); Ain Diwar, Jezira, near Tigris river, *Pabot s.n.(347)* (G, Min.Agr.Syr.); lake Khatouniye, *Pabot s.n.* (G); Qtaife, *Pabot s.n.* (G); Bludan, *Pabot s.n.* (G); Lattakia, E Slonfah on road to Ghab valley, *van Slageren & al. MSWRKA-88236H* (ICARDA, WAG); Lattakia, after Ouem Abrehan before Al Krendeh, *van Slageren & al. MSWRKA-88266aH* (ICARDA, WAG); Sweida, Ma'ada, E Sweida, *van Slageren & al. MSGMNR-88093H* (ICARDA); N Jebl Abd-el-Aziz, coming from Tall Tamr, *van Slageren & Sweid MSFS-91027H* (ICARDA); W Amuda to Derbasiye, *van Slageren & Sweid MSFS-91054H* (ICARDA).

TURKEY: Izmir, Kemalpaşa, *Alava & Bocquet 4977* (E); Yacadjik, *Aznavour s.n.* (G); Kourdkeny, *Aznavour s.n.* (G); Kartal, Soghanlik, *Aznavour s.n.* (G); Pendik, Aya-Yami, *Aznavour s.n.* (G); Sarayönu, *Birand & Davis 2348* (ANK); Ankara, *Bornmüller 3198* (B); Anatolia, Amasya, *Bornmüller 466* (B), *468 p.p.* (K), *469* (BR, BM, E, G, JE, K, LE, OXF, PH, PRC, SO); Bithynia, Vesin-Han, *Bornmüller 14733* (A, B); Bilečik, river Kara-Su, *Bornmüller 14746* (B); S Kuşadasi, *Bowen 3556* (RNG); Muğla, Bozburun, *Carlström 12017* (LD); Hierapolis ruins, near Denizli, *Castagne 75* (BR); Corum to Merzifon, *Coode & al. 1867* (E); Sak to Sivasli, *Coode & Jones 2433* (E); Diyarbakir to Kahta, W Siverek, *Cribb T88* (K); Siirt, Botan Çay gorge, *Davis 43242* (E); Konya, Cihanbeyli, *Davis & Dodds 18647* (BM, K, E); Iskenderun – Antakya, Amik lake, *Davis & Hedge 27142* (ANK, BM, E, K); Urfa – Akçakale, *Davis & Hedge 28165* (ANK, BM, E, K); Gaziantep, Nisib – Bireçik, *Davis & Hedge 27929* (ANK, BM, E, ERE, G, K); Antakya, St. Peter's church, *Davis & Hedge D27243* (K); Tarsus, Bağlarbase, *Deaver T107* (E); Izmir, Yarmananlar Dag, *Dudley 34899* (E); Gallipoli penin., *Durham s.n.* (K); Eskişehir, Turkmen Dag, *Ekim 2219* (ANK); Afyon, Dumlupinar, Berbercam Tepe, *Ekim & al. 5500* (ANK); Afyon, Selkisaray, *Ekim & al. 5501* (ANK); Babaeski, Kirklareli, *Harlan 2488-A* (UCR); E Cardak, *Johnson & Hall s.n.* (UCR); 66 and 84 km E Eregli, *Johnson & Hall s.n.* (UCR); 28 km NW Denizli, *Johnson & Hall s.n.* (UCR); Ankara, Dikmen, *Kotte s.n.* (ANK); Ankara, Çankaya, *Krause 4379* (ANK); Gâvur Daglari (Amanus range), *Meinertzhagen s.n.* (BM); Malatya, Akcadag yolu, *Pamukçuoğlu-Quezel s.n.* (ANK); Antalya, Kemer, *Peşmen 3718* (ANK); Bireçik (Biredjik), *Sintenis 540* (BR, E, G, JE, LD, LE, PR, PRC); Çanakkale, near ancient Troy, in valley of Dumbrek, *Sintenis 207* (BM, E, K, LD, LE, P); Muğla, Ortakent to Dağbelen, *Sorger & Tan 84-11-8* (E); Kirklareli, SW Dereköy, *Tüten & al. CNM-280689-0204* (ICARDA, IZ, WAG); Edirne, NE Lalapaşa, at Süleci, *Tüten & al. CNM-280689-0604* (ICARDA, IZ); Edirne, S Sarayakpinar, *Tüten & al. CNM-290689-0203* (ICARDA, IZ); Edirne, S Üzünköprü, *Tüten & al. CNM-290689-0403* (ICARDA, IZ); near Seleuciam, *von Lorent s.n.* (TUB, type of *Aegilops lorentii*); Galatia, near Angora, *Zhukovsky s.n.* (WIR, type of *Aegilops biuncialis* var. *velutina*); SW Manisa, *Zohary s.n.* (UCR).

EUROPE: ALBANIA: Kalis, Ura i Lopes to Buštrica, *Dörfler 739* (LD); E Prenjas, Kruj, *Strid 0805* (G, LD).

ARMENIA: Ararat reg., Urtzazor, *Arutyunyan s.n.* (ERE, YAI). NAGORNO-KARABACH: Karabach, near Karjagina, Durachmanli, *Karjagin s.n.* (LE); near Tchitumas and Chanishchom, *Vvedensky 8* (LE).

AZERBAIJAN: Sumgait, *Alexeenko 1243, 1256, 1257* (LE); near Sumgait, Jilch Dag, river Sumgait-Chai, *Alexeenko 1252* (LE); Baku, Geokczai, Kurt-Marchi to Karamarjan, *Alexeenko 1612* (LE); Baku reg., Baladshary, *Alexeenko s.n.* (LE); Milski steppe, near Karabach, Ak-Burun, *Beideman s.n.* (LE); Achsu to Gindarg, *Beideman s.n.* (LE); Apcheron, *Goebel s.n.* (LE); Apcheron, near Baku, Zongelan reg., Padar, *Grossheim & al. s.n.* (LE); Kjurdamir, near Padar, *Grossheim s.n.* (LE); Agalu, Karjagin reg., *Grossheim & al. s.n.* (LE); near Baku, cape Bailov, *Grossheim s.n.* (LE); Baku reg., Balazhary, *Grossheim s.n.* (LE); Baku, Bibi-Heibat, *Grossheim s.n.* (ERE); Baku, Hurdalai steppe, *Gursky s.n.* (LE); Baku, Sikh, *Holmberg 460* (K, LD); Baku, Kischley, *Holmberg 234* (LD); Baku, Achmedlu, *Holmberg 625, 632* (LD); Baku, Tchovny Gorod, *Holmberg 57* (LD); Apcheron, near Zagulba, *Ivanova 281* (LE); Apcheron, near Djemaridze, *Ivanova 291* (LE); Shirvan steppe, *Jaroschenko s.n.* (LE); Baku Hort. Bot., *Karjagin 4356* (C, E, ERE, G, K, LD, NY, MO, W); near Kuba, Tolneruz, *Karjagin s.n.* (ERE, LE); Mugan steppe, *Levandovski s.n.* (LE); near Baku, Balakhane, *Petunnikow s.n.* (LE); near

Baku, Balachan, *Petunnikow s.n.* (LE); Baku, Chemacha, Adzhikabul to Pirsagat, *Sachokia s.n.* (LE); Baku reg., Karadag Mts., Gjuzdek, *Sachokia s.n.* (LE); Shemacha, Baliuski reg., *Shelkownikow s.n.* (LE); near Baku, *von Meyer 605* (US); Gibreel, *Zacharieva s.n.* (IIPGR); Naftalan, *Zacharieva s.n.* (IIPGR); Galitz, near Ismaeli, *Zacharieva s.n.* (IIPGR). NAKHICHEVAN: Ordubad desert, *Yegorova & al. 88* (LE).

BOSNIA and HERCEGOVINA: Mostar, *Jelter s.n.* (LY-Gandoger).

BULGARIA: Chemic, Stara Zagora, *Achtarov s.n.* (SOM); Slatina, near Sofia, *Achtarov s.n.* (SOM); Trnovo, *Bisse and Schneider 4, 7* (JE); near Mihajlovgrad, *Bondev s.n.* (SOM); Konjavska Planina, near Bajkal, *Cercian s.n.* (L, SO); near Jambol, *Cheshmedjiev s.n.* (SOA); near Varna, *Davidov s.n.* (SOM); Kenana, near Khaskovo, *Delipavlov s.n.* (SOA); Bulgarovo, near Ajtos, *Delipavlov s.n.* (SOA); Dinia, near Stara Zagora, *Delipavlov s.n.* (SOA); Derwischka Mogila and Lisovo, near Topolovgrad, *Delipavlov s.n.* (SOA); near Kharmanli, *Delipavlov s.n.* (SOA); Pernik, near Zemen, *Delipavlov s.n.* (SOA); Paril, near Blagoevgrad, *Delipavlov & al. s.n.* (SOA); near Pazardzik, *Delipavlov s.n.* (SOA); S Ajtos at Malka Poljana, *Delipavlov s.n.* (SOA); Vlas, near Burgas, *Delipavlov s.n.* (SOA); Tekira, near Pazardjik, *Georgiev s.n.* (SO); Bunardjik Tepe, near Plovdiv, *Georgiev s.n.* (SO); Jambol, St. Spas Monastir, *Janev s.n.* (SO); near Varna, *Javaceff s.n.* (SOM); Zemen, Kjustendil to Pernik, *Jordanov s.n.* (SO); Malevo, near Khaskovo, *Kožuharov 21328, 21329* (SOM); Sadovo, Slavjanka Mt., Goletzovo, *Kuzmanov s.n.* (SOM); E Balcik, *H. & R. Manitz s.n.* (JE); Sadovo, *Mervicka s.n.* (SOM); Ajtos, Tundja valley, *Nenova s.n.* (SOM); SW Sliven, *Panov s.n.* (SOM); near Micurin, *Stojanov & Achtarov s.n.* (SOM); Rodopi Mts., near Kardzali, *Stojanov & al. s.n.* (SOM); Sadovo, *Stribrný s.n.* (SOM); Blagoevgrad to Delcevo, *van Slageren & al. MSMZNN-90283H* (ICARDA, IIPGR); Malktchiflik, near Veliko Ternovo, *Vihodcevsky s.n.* (SO); Tsjerpan, Izvorovo, *Vihodcevsky s.n.* (SO); near Pazardjik, Ogjanovo, *Vihodcevsky s.n.* (SO); near Asenovgrad, *Vihodcevsky s.n.* (SO); Stara Zagora, near Kairaka, *Vihodcevsky s.n.* (SO); Patlenitza, near Pazardjik, *Vihodcevsky s.n.* (SO); Pestera, near Trun, *Vihodcevsky s.n.* (SO); Beledie-Chan, near Sofia, *Vihodcevsky s.n.* (ERE, SO); Stara Zagora, Ajasmoto, *Vihodcevsky s.n.* (SO); Ardino, *Zacharieva s.n.* (IIPGR); near Kozlec, *Zacharieva s.n.* (IIPGR).

CROATIA, DALMATIA: Cres, *Kristiansen s.n.* (C); Losinj island, *Petter s.n.* (W). ISTRIA: Isola, *Veselsky s.n.* (LE).

CYPRUS: Oyvounda, *Della s.n.* (ARI 2007); Athalassa, Agric. Res. Inst., *Della s.n.* (ARI 2021); Nicosia, at English School, *Della s.n.* (ARI 2023, K); Mosphiloti, *Della s.n.* (ARI 2043, 2044, 2044a, K); Lysos to Stavros tis Psokas, *Della s.n.* (ARI 2056, K); Ayios Ioannis, Malounda, *Della s.n.* (ARI 2027, 2028, K); Kambia – Kapedhes area, *Della s.n.* (ARI 3070); Aredhiou area, *Della s.n.* (ARI 3077a, 3079); Klirou, *Della s.n.* (ARI 3093a); Ayios Epiphanios to Palechori, *Della s.n.* (ARI 3096, 3107); above Palechori, *Della s.n.* (ARI 3144b); Papoutsa to Limassol, *Della s.n.* (ARI 3149); Amargetti area, *Della s.n.* (ARI 3217); Kykkos to Pedhoulas, *Della s.n.* (ARI 3226); Larnaca, Bade Pasha Tchiffik, *Deschamps 520* (G, PRC); Pedhieos valley, near Pano Dheftera, SW Nicosia, *Edmondson & McClintlock 2938* (E, K); 15 km N Limassol, *Edmondson 2701* (K); Khirokitia, *Holub s.n.* (K); Plathres, Perapevi, *Kennedy 55* (K); Kyrenia range, *Mapple 63* (K); Karavas, *Merton 2182* (CYP, K, W); near Mosphiloti on Nicosia – Limassol road, *Merton s.n.* (ARI 600, K); Campos, *Platt 438* (K); Bella Pais, Kyrenia, *Price 973* (K); Distr. Paphos, Ayios Georgios to Kithasi, *Rechinger 62024a* (W); Irini, near Morphou, *Semple 305f* (US); Pentedactylos Mt., *Sintenis & Rigo s.n.* (B, K, type of *Aegilops biuncialis* var. *archipelagica*), *657* (LD, LE); N Panayia, *van Slageren & al. MSLGAD-89117H* (ICARDA, ARI).

FRANCE, ALPES MARITIMES: Menton, *Gandoger s.n.* (SOM). BOUCHES DU RHÔNE: Arles, *Duval-Jouve s.n.* (MPU-Duval-Jouve). HÉRAULT: Castelnau-le-Lez, E Montpellier, *Sennen s.n.* (B, BC, BR, C, FI, L, LY, MPU, PR, PRC, W, U); ibid., *Warion s.n.* (Exsicc. Soc. Dauphinoise 2301) (G, K, LY, LY-Gandoger, MPU, P, TO, Z), *Loret s.n.* (Exsicc. Soc. Dauphinoise 2301b) (FI, G, K, LY, LY-Gandoger, MPU, P, TO, Z), *Mandon 692* (G, LY, MPU, P, Z), *s.n.* (A, B, BC, BM, F, G, GE, JE, L, LD, LE, LY, LY-Gandoger, MPU, P, PR, OXF, SO, SOM, US, W, Z); Maritau, near Montpellier, *Duval-Jouve s.n.* (MPU-Duval-Jouve); La Pompiniane, near Montpellier, *Gadeceau s.n.* (BM, F); Les Vautes, N Montpellier, *Hekking 247* (CAI, U); Port Juvénale, near Montpellier, *Mandon s.n.* (PR). VAR: Mont Faron, near Toulon, *Huet du Pavillon s.n.* (G, LY, LY-Gandoger, US, Z); ibid., *Huet du Pavillon & Jacquin s.n.* (MPU-Duval-Jouve, type of *Aegilops macrochaeta*); Toulon, rocks of Clairet, *Tholin s.n.* (LY-Gandoger).

GEORGIA: Tbilisi, *von Pallas s.n.* (LE); Kaspi, *s.coll., s.n.* (P).

GREECE, ATTICA: Hagia Glykéria, near Athens, *Chaboisseau 140* (BM); Piraeus, *Druce s.n.*

(OXF); Ep. Kìthira, W Kapsali, *Greuter 6536* (G); near Rheitoi, *Guiol 559* (BM); near Athens, *Haussknecht s.n.* (JE, NY); near Pentelikon monastery, *Haussknecht s.n.* (BM, JE, LE); Turco Wani, *Haussknecht s.n.* (JE); Phaleron, *Haussknecht s.n.* (BM, BR, JE, LD, LE); Elevsís (Eleusia), Mt. Kerata, *Haussknecht s.n.* (JE); Cape Sunion, *Koster 6237* (L); Mandra, *Pichler s.n.* (G, G-BOIS); Hymetti to Tankrati, *Rechinger 474* (BM); Athens, at Akropolis, *Rothmaler 17023* (JE); W Pentelikon, E Kifissia, *Strid 19615* (G); Athens, Lykabettos, *Vestergren s.n.* (US); near Athens, *von Heldreich 2549* (FI, G-BOIS). ELLAS: Krissa, Delphi to Stea(?), *van Soest 589* (L); Delphi, *Samuelsson & Zander 354* (G, LD). MACEDONIA: Gorbets Mts., near Breznitza, *Alston & Sandwith 235* (BM, K); above Armensko, *Alston & Sandwith 721* (BM); N Drama, *Burri & Krendl s.n.* (W); Almopia reg., Livadhia to Arkhangelos, *Greuter 13964* (G); Sithoniá penins., Koufos, *Greuter & Rechinger 44621* (G); near Micra bay, S Saloniki, *Preston 49* (BM); Kaputsides, near Thessaloniki, *Rechinger 8972* (G). PELEPONNESUS: Achaia, near Kalavryta, *Bornmüller 1704* (LD, Z); near Corinth canal, *Bowen 2191* (RNG); Messinia, Gerolimin, *Bowen 1381* (RNG); Nauplion, *Haussknecht s.n.* (JE); 32 km Tripolis to Megalopolis, *Rechinger 20412* (K); Achaia, Patras, Akropolis, *Samuelsson s.n.* (C); Argolis Ermionis, Portoheli, *Stamatiadou 14847* (BM); Achaia prov., Ejialia distr., SE Paleostafidha, *Stamatiadou 12131* (RNG); Epidaurus (gulf of Epídhavros?), *von Steudel s.n.* (L, P, type of *Aegilops connata*); Isthmus of Corinthe, Kalamáki, *von Halácsy 431* (BM). STEREA: Nomas Arkananikis, SSE Préveza, *Jury & Warren 65* (RNG); Mt. Tymprestos, Karpenísion, *Rechinger 2898* (BM). THESSALIA: Lárisa, *Beauverd s.n.* (G); Thessalia plain, Aïvali, *Haussknecht s.n.* (BM, JE); Orman Magula, *Haussknecht s.n.* (JE); Pindus Tymphaeus, near Malakási, *Haussknecht s.n.* (JE); Kalampaka, near Metochi, *Sintenis 233* (GE, JE, LD, P, SO); Saraskina, *Sintenis 178* (G, JE, LD, P, PR, SO); Aïvali, Pheras to Pharsalum, *von Heldreich 119* (G, US). THRACE: Adrianopol – Karasareli, *Nejceff s.n.* (SOM). ISLANDS: ADELPHI: SE Allonisos, *Snogerup & al. 43739* (LD). ANAFI: Kalamos, *Runemark & Snogerup 8129* (LD). ANDIKITHIRA: Potamós, *Rechinger 24408* (G). ANIDROS: SW part of island, *Runemark & Snogerup 8316* (LD). AGIOS EVTATIOS: Nom. Lesvou, Ep. Limnou, *Snogerup 5635, 5636, 5798* (LD). ANDROS: Nom. Kikladhou, NE Ateni, *Snogerup 7923* (LD); NW Akr. Steno, *Snogerup 9134* (LD); Nomos Kikladion, Agios Simeon, *Snogerup 8049* (LD); Akr. Thiakion, SSE Batsi, *Snogerup 7984* (LD); Gavronisia, Makedona islet, *Snogerup 7877* (LD); Gavronisia, Akramatis islet, *Snogerup 7895* (LD); Nom. Kikladion, Vitalio, *Snogerup 7939* (LD); S Akramatis, S of Gavrion, *Snogerup & von Bothmer 31393* (LD); Megalo island, S Gavrion, *Snogerup & von Bothmer 31205* (LD); Gaidaros island, S Gavrion, *Snogerup & von Bothmer 31297* (LD). ÁNIDHROS: SW part of island, *Runemark & Snogerup 8316* (LD). ANTIPAROS: s.loc., *Runemark & Bentzer 28778* (LD). ASTIPALEA: above Agios Ioannis, *Burri & Krendl s.n.* (W); NW Skała, Livadia, *Burri & Krendl s.n.* (W); Porto Maltesana, *Runemark & Nordenstam 13362* (LD). CHIOS: Ile Kámpas, *Platt 438* (L); W of Khios, *Rechinger 5334* (BM, LD); NNW Langada, *Snogerup 7150, 7368* (LD); NNE Vrondatos, *Snogerup 6902* (LD); Daskalopetra, N Vrondatos, *Snogerup 7502* (LD); N Kataraktis, *Snogerup 7028* (LD); Nea Moni, *Snogerup 6769* (LD); NW Valissos, river Pirama, *Snogerup 7185* (LD); WSW Karies, *Snogerup 8390* (LD). CORFU: Papanti, near Kastellani, *Baenitz s.n.* (Baenitz Herb. Eur. 9197) (L, LE, OXF, P, PRC, US); Forlezza Abrama, *Baenitz s.n.* (L, LY, P, US, Z). CRETE: N Sitia, *Barclay 1814* (K); Agios Nikolaos, *Bowen s.n.* (RNG); Armeni to Rethymnon, *Damanakis 1093* (K); Candia, Gorgolaino, *Gandoger 11163* (G, K); Candia, Roni, *Gandoger 10665* (G); Lassithi, Kroustallenia, *Gandoger 2203* (MO); Georgioupolis, Ep. Àpokorono, *Gradstein & Smittenberg 312* (U); Ep. Kydonia, Skines to Nea Rumata, *Gradstein & Smittenberg 266* (U); Hierapetra, near Males, *Leonis 117* (G); Cnossos, *Patten C136* (A); near Chania, *Raulin 72* (P); Sitia, Guduras, Mawrijalos, *Rechinger 12814* (US); Selinos, Levka Ori, *Rechinger 13058* (BM, LD, US), *13712* (US); Sitia, Mt. Modi, *Rechinger 12524* (BM, K, US); Achladi, WSW Chamaetule, *Runemark & al. 17784* (LD); SW Chamaetule, *Runemark & al. 17651* (LD); near Turloti, *Runemark & al. 17341, 17455* (LD); Dri, *Runemark & al. 17106* (LD); Iraklion, Knossos, *Runemark & Snogerup 17032* (LD); Gorlyna, *van Soest 298* (L); Mt. Ida, *Whiteford 54* (BM). DENOUSA: Ormos Rousa, *Runemark & Snogerup 9439* (LD). DILOS: ruins, *Runemark & Engstrand 35745, 35827* (LD). EUBOEA: plain of Chaleis, *Mill s.n.* (BM, PH); Papades, *Rechinger 19259a* (US); Psachna to Achmet Aga, *Rechinger 17133* (K, US). FALKONERA: s.loc., *Runemark & von Bothmer 47149* (LD). GAIDARONISI: s.loc., *Runemark & Bentzer 29222* (LD). GAVDHOS: SW Kastri, *Runemark & Snogerup 47754* (LD). IRAKLIA: s.loc., *Rechinger 4923* (BM). KÁRPATHOS: Pigadhia to Vrondi, *Greuter 5115* (Z); near Menelaes, *Major 62* (G, type of *Aegilops biuncialis* var. *archipelagica*); Mt. Melloura near Yoladha, *Major 62a* (G, type of *Aegilops biuncialis* var. *archipelagica*). KEA: SW Kéa, *Snogerup & von Both-*

mer 33717 (LD); Episkopi, *von Heldreich s.n.* (G, Z, type of *Aegilops biuncialis* var. *archipelagica*). KEFALLINIA: Argostolion, *Bornmüller 1705* (BC, BM, G, JE, K, LD, PR, W, Z). KHALKI: W Skala, *Carlström 7647, 7685* (LD). KIMOLOS: Ormos Vroma, *Runemark & Bentzer 26107* (LD). KINAROS: s.loc., *Runemark & Snogerup 12156* (LD). KITHNOS: s.loc., *Rechinger 4974* (BM). LESVOS: N Mithimna, *Edmondson & McClintlock 2580* (E); near Eressos, *Mitchell 88-14* (E); Mitilini, *Post s.n.* (BEI); Mitilini, Kolperteras, *Rechinger 5420b* (BM); Amali Mts., Agios Marina, *Rechinger 5495a* (BM, K, LD); Ordymnos Mts., at Rutissa, *Rechinger 5869a* (BM, LD); Mytilene, *Rechinger 1205* (LD). LIMNOS: *Prior s.n.* (BM). MIKONOS: S slope Mt. Agios Elias, *Runemark & Engstrand 35415* (LD); Rinia island, Kounellonisi, *Runemark & Engstrand 35939* (LD); Rinia, *Runemark & Engstrand 35993* (LD). MILOS: Kastro to Adamas, *Runemark & Bentzer 26552* (LD); hivadolimni, *Runemark & Bentzer 26728* (LD). NAXOS: Koronos to Oromos Lionas, *Burri & Krendl s.n.* (W); NE Mytria, *Runemark 2597* (LD); SE Akr. Axapsis, *Runemark 3149, 3893* (LD); Faneromeni, *Runemark 3371* (LD); NE Apiranthos, *Runemark 2840* (LD); ENE Tripodes, *Runemark 1769* (LD); Profites Elias, E Sangri, *Runemark 1670* (LD); ENE Moni, *Runemark 3608* (LD); NW Liona, *Runemark & Snogerup 9098a* (LD). OFIDHOUSA: s.loc., *Runemark & Nordenstam 13687* (LD). PARAPÓLA: s.loc., *Runemark & von Bothmer 47068* (LD). PSARA: Ahladhokambos, *Greuter 10835* (G). RHODES: near Bastida, *Bourgeau s.n.* (P); Kamíros, *Burbridge 159* (E); S Psinthos, Phrygana, *Carlström 5482* (LD); Plati, *Carlström 8445* (LD); E Agios Isidora, *Carlström 4407b, 5308* (LD); NW Phanaes, *Carlström 5601* (LD); Mt. Phileramo, *Carlström 6204* (LD); Mt. Marmara, *Carlström 6107* (LD); S Glyphada, *Carlström 5184* (LD); Mt. Attaviros, SSE Embona, *Carlström 6923* (LD); Trianda, *Rechinger 7051a* (BM). SAMOS: Vathy, *Davis 1697K* (E, K). SAMOTHRAKE: Xeropotamos, *Stojanov & Kitanov s.n.* (SOM). SERIFOS: Livadion, *Runemark & Bentzer 27371* (LD). SIFNOS: Khoudropo, *Runemark & Snogerup 8597* (LD); Ormos Koudos, *Runemark & Snogerup 8430, 8463* (LD). SIRINA: Tria Nisia, *Runemark & Nordenstam 14320* (LD); N Agios Ioannis Ormos, *Runemark & Snogerup 7238* (LD). SIROS: Oros Kapari, *Runemark & Snogerup 5200* (LD); Aspronisos island, *Snogerup & von Bothmer 33441* (LD). SKIROS: Agios Mamos to Agios Trias, *Snogerup & Gustavsson 44272* (LD); NW Krini, *Snogerup & Gustavsson 44160* (LD); E Atsítsa, *Snogerup 3978* (LD); Skiros town, *Snogerup & Gustavsson 44302* (LD). THIRA (SYRA): s.loc., *Octave & Denis s.n.* (G, type of *Aegilops biuncialis* var. *archipelagica*). TILOS: E Skala, *Carlström 7249* (LD). TINOS: S Tinos town, *Runemark & Engstrand 36770* (LD). TRIKERI: Spetsai, *Runemark & von Bothmer 47051* (LD). YIOURA: valley Liadromatika, *Snogerup 4392* (LD). ZÁKINTHOS: s.loc., *Bornmüller 1703* (G, JE, LD, W).

ITALY: Verona, *Bracht s.n.* (U); near Florence, *Groves s.n.* (BM); near Naples, *Guadagno s.n.* (BM); Puglia, Taranto, Leucaspide, *Lacaita s.n.* (Exsicc. Italia Fiori & Béguinot 219b) (BM, FI, GE, K, LE, LY, OXF, PI, PI-GUAD, TO, Z); ibid., *Groves s.n.* (G, voucher of *Aegilops biuncialis* var. *biaristata*).

MACEDONIA: Vodno, near Skopolje, *Behr s.n.* (GAT, JE, W); Skopje (Üsküb), near Vodno, *Bornmüller 2274* (B, NY), *5250* (B, JE); Arĭdava, near lake Doiran, *Bornmüller 5286* (B); Ohrid, Tzar Samuil, *Chater 221* (BM); Rosždan, *Dörfler 389* (G, JE); near Gradešnitza, *Dörfler 388* (PRC); Serrai (Seres), *Rechinger 9194* (BM); Rasen, Naum, *Röthlisberger s.n.* (G); Katlanova to Tito Veles, *van Oostroom & Hennipman 23464* (L).

ROMANIA: Dobrogea, Distr. Caliacra, Capul Caliacra to Chiaur Suiuciuc, *Borza & Nyárády 517* (A, BM, BOLO, BR, C, G, MO, P, PR, SO, Z); Oltenia, Mehedinţi, Coasta Dumări, Cladovei, *Roman s.n.* (BUCA, LD); Dobrogea, near Constanta, Limanu Hagieni, *Tabacaru 382* (BM, SO).

SPAIN: Baix Cinca, La Serreta Negra de Fraga, *de Bolòs y Vaireda s.n.* (BC); Motril, *Boom 11735* (L); Madrid, Cerro Negro, *Gros 542* (BC); fields at Jaén, *Lange s.n. ('97')* (C, type of *Aegilops ovata* var. *latearistata*); Aranjuez, *Lange s.n. ('98')* (C, FI, G); Granada, Huéscar, Sierra de Guillímona, near La Vidriera, *Leal 350b* (MO); Almeria, Sierra de Gador, Aguadulce to Felix, *Reading Univ. Bot. Exp. 331* (RNG).

RUSSIA, 'CAUCASUS': Krasnodarsk reg., Anapa, *Czerniakowska-Reinecke 2* (LE); Glebovka, *Lipsky s.n.* (LE); near Novorossysk and Gelendzhik, near Aderba river, *Litvinov 5335* (A, BM, C, E, ERE, G, K, LE, NY, MO, SOM, US, W); Caucasus ('Tauria merid.'), Gelendzhik, *Litvinov s.n.* (LE); Novorossysk, Markotch, *Pojarkova s.n.* (LE); near Taman, just E Crimea, *Schiffers 3, 69, 70* (LE). DAGHESTAN: Kaitag reg., Tabasaran, near Bashli, Djavan Dag Mt., *Alexeenko s.n.* (LE); Makhachala, Tarku-Tau Mt., *Bagdanovski-Geenev s.n.* (LE); Derbent reg., *Becker s.n.* (LE, P); near Makhachala, *Klásková 311* (LE); Chutsni, *Zacharieva s.n.* (IIPGR).

UKRAINE: Odessa, *s.coll.*, *s.n.* (LE). CRIMEA: Simferopol, Salgir, *Andrejev 107* (LE); distr. Lenino, Kazantip, *Belianina & Kisseleva 211* (BC, C, ERE, LE, MO, RNG); Katchikalin Mts., *Busch s.n.* (LE); Kutchuk-Uzen to Djemerdzhi, *Busch s.n.* (LE); Sudak, *Callier 368* (FI, LD, P, PRC, Z); Sudak, Karakatch, *Callier 107* (B, JE, LD, PRC, Z); Malakoff, *Callier s.n.* (G); Nikita, *Davis 33101* (E, K, W); Alushta and Kosmodemjan, *Fedtschenko s.n.* (LE); Aydanil, *Fedtschenko s.n.* (LE); Mekenzi Mts., *Fedtschenko s.n.* (LE); Batiliman, *Fedtschenko s.n.* (LE); Balaclava, *Fedtschenko s.n.* (LE); Alupka, *Fedtschenko s.n.* (LE); Simeiz, *Ganemin 76* (LE); Partonit, *Golde s.n.* (LE); Jalta, *Golde 394* (C, G, K, LY, PRC, SOM); Gurzuv, *Gusev s.n.* (LE); Tarchankut penins., *Kipchak-Dzenslitovskja s.n.* (LE); Kara Dag, *Kirpichnikov & Fedorov s.n.* (LE); Perikop sta., Sivash, *Kotov s.n.* (LE); Alushta river, Ay-Ceres, *Kotov s.n.* (LE); Simferopol, Tuatai, *Kryshtofowicz s.n.* (LE); Baydar steppe, *Kryshtofowicz s.n.* (LE); Aitador, *Kryshtofowicz s.n.* (LE); Kekenjesh, *Kryshtofowicz s.n.* (LE); Martjan penins., *Kyprianu 1486* (LE); Magaratch, *Paczoski s.n.* (LE); Karadak, *Sarandinski s.n.* (LE); Massandra, *Smirnov s.n.* (LE); Tuak, Rydbatsche, *Smirnov 2* (ERE, G, L, LE, W); Misgor, *Sprygin 210a* (LE); Feodosia, *Sredinsky 111* (LE); S beach, near Nikitin Bot. Gard., *Stankov s.n.* (LE); Nikitin, *Stankov s.n.* (LE); Martin, *Stankov s.n.* (LE); river Kuru-Uzen, *Stankov & Regova s.n.* (LE); Chorgun, Tcherneya, *Tranzschel s.n.* (LE); Koktebil, *Tranzschel s.n.* (LE); Sebastopol, *Tzvelev 11, 18, 71, 72, 150, 858* (LE); S beach, Ayodak Mt., *Tzvelev 28* (LE); S beach, Frunzenskaya vill., *Tzvelev 130* (LE); Lukul penins., *Tzvelev & al. 813* (LE); 15 km to Sotchi, Orlovka, *Tzvelev & al. 838, 845* (LE); Sudak reg., Ujutnoje, *Tzvelev s.n.* (LE); Kerch, near Mitridad Mt., *Vlasov 5* (WIR); (LE); Kotur-Karagurt, *Zevanovski s.n.* (LE).

YUGOSLAVIA, MONTENEGRO: Donja Zeta, *Rohlena s.n.* (BM); Podgorica, *Rohlena s.n.* (BM, PRC). SERBIA: Vranja, Vitogoš, *Bornmüller s.n.* (B); S Serbia, Vranja, near Sobina, *Ilič s.n.* (Exsicc. Kneucker 410a) (BR, G, L, LD, LE, PR, SO, US) Gorica, near Nissam, *Ilič s.n.* (PR, PRC); Sveti Hijo to Donja Jajna, *Ilič s.n.* (L, LD); Leskovac, *Ilič s.n.* (B, L, LD); E Serbia, Meksinač, *Pančić s.n.* (FI); Bertiscus, Pec (Ipek), *Rechinger 91, s.n.* (BM); N Niš, *Runemark & Snogerup 21854* (LD); Topcivez, near Belgrade, *Sanciy s.n.* (LE); Povlorica, near Baijamón, *von Eggers s.n.* (LY).

ADVENTIVE: ASIA: TURKMENISTAN: Kushtang, Aul, Chodja-Pil, *Chepanov s.n.* (ASH). EUROPE: GERMANY: Hamburg, Waldsbeck, near Dampfmühle, *Haussknecht s.n.* (JE). SWITZERLAND: Laguis – Genève, *Ayasse s.n.* (Z). U.K., SCOTLAND: Midlothian, near Musselburgh, *Fraser s.n.* (E, RNG).

Germplasm collections examined:

AFRICA: TUNISIA: NW Sbeitla to Skiba, *van Slageren & al. MSMTNK-90013* (ESAK, ICARDA, INAT).

ASIA: JORDAN: Salt, Er Rumeimin to Um El-Amad, *van Slageren & al. MSBHAJ-88187* (ICARDA, JUST); W Salt to Jordan valley, *van Slageren & al. MSBHAJ-88202* (ICARDA, JUST); Irbid, Ishtafeina, NW Ajlun, *van Slageren & Jaradat MSAJ-88083* (ICARDA, JUST); Jarash, Kufr Kha, off road Irbid – Jarash, *van Slageren & Jaradat MSAJ-88043* (ICARDA, JUST).

SYRIA: Aleppo, Atareb to Qalat Sam'an, *Bourgois & Witcombe SY-20180* (ICARDA); Aleppo, Sarmada to Harem, *Bourgois & Witcombe SY-20159* (ICARDA); in Aleppo, Shahba area, *Bourgois & Witcombe SY-20188* (ICARDA); Aleppo, near Azaz, *Bourgois SY-20192* (ICARDA); Aleppo to Sfirah, near Al-Jabboul lake, *Bourgois SY-20139* (ICARDA); Aleppo, Euphratus valley, Manbij to Jarablus, *Bourgois SY-20148* (ICARDA); Idlib, Kafr Harim to Harem, *Bourgois SY-20175, SY-20176* (ICARDA); 50 km N Damascus to Homs, *Bourgois SY-20206* (ICARDA); Lattakia, Kabr el Abid, *Elings & al. ID-368* (ICARDA, SARD); Idlib, S Jisr-esh-Shughur, *Elings & al. ID-360-a* (ICARDA, SARD); E Homs to Palmyra, Fairuza, *Humeid & al. BMW-17-9* (ICARDA, SARD); E Homs, Ain Khadra, *Humeid & al. BMW-16-5* (ICARDA, SARD); Damascus, Zabadani, Barada fountain to Rawda, *Rifaie & Witcombe SY-20134* (ICARDA); Damascus, Zabadani, Surghaya to Lebanese border, *Rifaie & Witcombe SY-20136* (ICARDA); Tartous, Deir Shmeil to Safita, *Valkoun & al. VDFKO-70* (ICARDA, SARD, VIR); Tartous, Souda to Warida, *Valkoun & al. VDFKO-83* (ICARDA, SARD, VIR); Qamishly, W Amouda, *Valkoun & al. DFKO-25* (ICARDA, SARD, VIR); Suweida, Ma'ada, *van Slageren & al. MSGMNR-88093* (ICARDA, SARD); Damascus, Ma'lula to Yabroud, *van Slageren & Mir-Ali MSGM-88105* (ICARDA, SARD); Lattakia, Krerah, near Gobeh, *van Slageren & al. MSWRKA-88254* (ICARDA, SARD); Lattakia, Slenfeh to Ghab valley, *van Slageren & al. MSWRKA-88236* (ICARDA, SARD); Tartous, W Mishtel El-Hilo, *van Slageren & Obari MSKO-89131* (ICARDA, SARD); 35 km NE Homs to Salamie, *van Slageren & Obari MSKO-89123* (ICARDA, SARD); Hassake, just N Jebl Abd-el-Aziz, *van Slageren & Sweid MSFS-91027* (ICARDA).

TURKEY: Konya, 35 km SE Sarayönü, *Güzel & al. SNM-060889-0103* (ICARDA, PGRRI); Konya, 35 km SE Sarayönü, *Güzel & al. SNM-060889-0103* (ICARDA, PGRRI); Ankara, Ayas-Polatli junction, *Güzel & al. SNM-030889-0402* (ICARDA, PGRRI); Kayseri, 22 km S Felâhiye, *Güzel & al. SNM-090889-0103* (ICARDA, PGRRI); Ankara, 22 km N Celebi, *Güzel & al. SNM-040889-0603* (ICARDA, PGRRI); Afyon, SE Çay, *Güzel & al. SNM-140889-0103* (ICARDA, PGRRI); Ankara, 32 km Haymana to Polatli, *Güzel & al. SNM-030889-0503* (ICARDA, PGRRI); Aydin, N Kusadasi, *Metzger & Jana 79TK138-747b* (USDA); Malatya, S Darende, *Metzger & Jana 79TK012-056* (USDA); Elâziğ, E Arapkir-Elâziğ-Malatya, *Metzger & Jana 84TK443-002* (USDA); Izmir, near Menemen, *Metzger & Jana 84TK372-007-06* (USDA); Manisa, S Sarigol, *Metzger & Jana 84TK162-057* (USDA); Denizli, S Buldan, *Metzger & Jana 84TK158-033* (USDA); Bitlis, 45 km E Tatvan, *Metzger & Jana 84TK486-002* (USDA); W Malatya, *Metzger & Jana 84TK435-002* (USDA); Malatya, S border with Sivas, *Metzger & Jana 84TK430-003* (USDA); S Ankara, *Metzger & Jana 84TK331-002* (USDA); Balikesir, SE Balya, *Metzger & Kanbertay 84TK223-009* (USDA); Çanakkale, 24 km E Ayvacik, *Tüten & al. CNM-190689-0303* (ICARDA, PGRRI); Balikesir, E Altinoluk, near Edremit, *Tüten & al. CNM-190689-0203* (ICARDA, PGRRI); NE Ezine to Çanakkale, *Tüten & al. CNM-190689-0401* (ICARDA, PGRRI); Kirklareli, NW Vize, *Tüten & al. CNM-270689-0702* (ICARDA, PGRRI); Edirne, S Sarayakpinar, *Tüten & al. CNM-290689-0203* (ICARDA, PGRRI); NE Kirklareli to Dereköy, *Tüten & al. CNM-280689-0103* (ICARDA, PGRRI); E Bursa to Iznik junction, *Tüten & al. CNM-240689-0301* (ICARDA, PGRRI); Istanbul, NW Silivri-Cerkezköy junction, *Tüten & al. CNM-270689-0205* (ICARDA, PGRRI); E Bursa, *Tüten & al. CNM-230689-0103* (ICARDA, PGRRI); Balikesir, S Balya, *Tüten & al. CNM-210689-0904* (ICARDA, PGRRI); Bursa, SE Mudanya, *Tüten & al. CNM-230689-0601* (ICARDA, PGRRI); Balikesir, NW Manyas junction, *Tüten & al. CNM-220689-0601* (ICARDA, PGRRI); S Balya towards Balikesir, *Tüten & al. CNM-210689-0803* (ICARDA, PGRRI); Edirne, N Kesan, *Tüten & al. CNM-290689-0602* (ICARDA, PGRRI).

EUROPE: ARMENIA: Ararat reg., Urtzazor, *Gandilyan s.n.* (AAI); Urtzazor to Shorap, *van Slageren & Gandilyan MSPG-92065* (ICARDA).

AZERBAIJZAN: NAKHICHEVAN: Babek reg., Aznabgurt, *Gandilyan s.n.* (AAI).

BULGARIA: Varna, Albena, *van Slageren & al. MSRIMZ-89209* (ICARDA, IHAR, IIPGR); Svilengrad to Turkish border, *van Slageren & Zacharieva MSMZ-90232* (ICARDA, IIPGR); Svilengrad, Siva Reka, E Malko Gradiste, *van Slageren & Zacharieva MSMZ-90224* (ICARDA, IIPGR); Sofia reg., Kaprivlen to Paril, *van Slageren & al. MSMZNN-90266* (ICARDA, IIPGR, VIR); Sofia reg., W Blageovgrad, *van Slageren & al. MSMZNN-90283* (ICARDA, IIPGR, VIR); Sofia reg., N Kjustendil to Dragovistica, *van Slageren & al. MSMZNN-90287* (ICARDA, IIPGR, VIR); Sofia reg., in Pernik, *van Slageren & al. MSMZNN-90292* (ICARDA, IIPGR, VIR); Sofia reg., NW Mihajlovgrad to Vidin, *van Slageren & al. MSMZNN-90299* (ICARDA, IIPGR, VIR); near Kaprivlen, S Goce Delcev, *van Slageren & al. MSMZNN-90263* (ICARDA, IIPGR, WIR).

CYPRUS: E Kyrenia, Klepini, *van Slageren & Guarino MSLG-89082* (IPGRI, ICARDA); Famagusta, S Patriki to Yialousa, *van Slageren & Guarino MSLG-89079* (IPGRI, ICARDA); E Kykkos to Troodos, *van Slageren & al. MSLGAD-89119* (ARI, IPGRI, ICARDA).

RUSSIA: Daghestan: NE Izberbash, *van Slageren & Boguslavski MSRB-90179* (ICARDA, VIR); Dzhalgan vill., *van Slageren & Boguslavski MSRB-90190* (ICARDA, VIR).

Notes: 1. That the illustration with analysis from de Visiani could serve as a correct typification under the ICBN rules was first realized by Gandilyan (1980: 190), and was later given wider recognition by Mattatia & Feinbrun-Dothan (1986: 53). This typification of *Ae. biuncialis* was also indicated by Davis (1985: 243).

2. The name *Triticum biunciale* (Vis.) K.Richt. is a later homonym because of the older, same name by Villars, published in 1787 for what is now a *Vulpia* species. For the correct name in *Triticum* of *Ae. biuncialis* the correct name is the next available one: the equally old *T. macrochaetum* (Shuttlew. & A.Huet ex Duval-Jouve) K.Richt., also publised by Richter in his *Plantae europeae*.

3. Von Hayek's (1932: 224-225) posthumously published *Prodromus* uses only symbols for any subdivision of a species. Their connecting ranks are explained by him (1924: VI) in the preface of the first volume of the *Prodromus*: 'I **Subspecies**; A. Varietates; **a)** Subvarietates, and α) formae', thus with use of **bold** and capital typeface, and of Greek and Roman lettering. For example, in *Triticum ovatum*: *T. ovatum* 'E' *biunciale* (Vis.) Hayek (l.c., 225) has the 'E' taxon as a variety, and 'β' *hirsutum* (Eig) Hayek (l.c., 224) is regarded as a forma of the (otherwise not specified) autonymous or 'typical' subspecies *ovatum* (see at 10.8, *Ae. geniculata*).

10.3 **Aegilops caudata** L. **Figs. 21-23**

[For pre-Linnaean description and literature, see Chapter 3.1 at 3.1.1.]

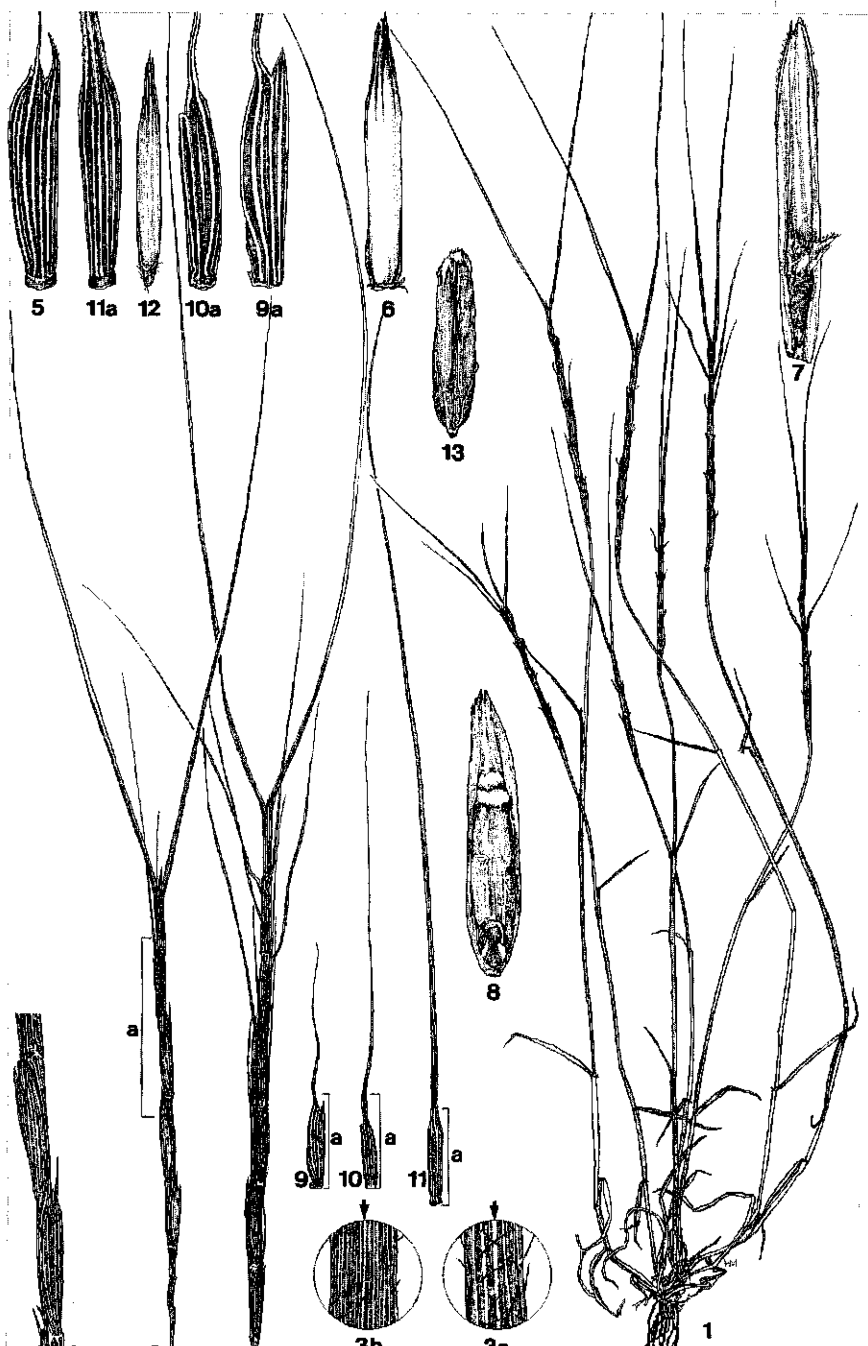
Aegilops caudata L., Sp. pl. (ed. 1) 2: 1051 (1753), (ed. 2) 2: 1489 (1763); Persoon, Syn. pl. 1: 107 (1805); von Willdenow, Sp. pl. (ed. 4) 4(2): 944 (1806); Roemer & Schultes, Syst. veg. 2: 770 (1817); Chaubart & Bory de Saint-Vincent in Bory de Saint-Vincent, Exp. sci. Morée, Bot. 3(2): 46 (1832, including phrase-named forms β and γ); Kunth, Enum. pl. 1: 458 (1833); Richter, Codex bot. linn. 998 (1835-39); Mutel, Fl. franç. 4: 155 (1837), Atlas, Tab. 92, fig. 649 (1837); Grisebach, Spic. fl. rumel. 2: 425 (1846); Cosson, Notes pl. crit. 1(2b): 66 (1850); Jaubert & Spach, Ill. pl. orient. 4: 15 (1850), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14 (1851b); Walpers, Ann. bot. syst. 3: 790 (1852); Grenier, Fl. massil. adv., Mém. Soc. Émul. Doubs 3(2): 434 (1858); Tchichatscheff, Asie Min., Bot. 2: 582 (1860); Nyman, Consp. fl. eur. 4: 839 (1882); Boissier, Fl. orient. 5(2): 675 (1884) *pro parte*; Gandoger, Fl. Eur. 25: 7 (1892); Fiori & Paoletti, Fl. Italia 1: 108 (1896); Haussknecht, Symb. fl. graec., Mitt. Thür. Bot. Ver., Neue Folge 13: 61 (1899); von Halácsy, Consp. fl. graec. 3: 432 (1904); Fiori, Nuov. Fl. Italia 1: 160 (1923, with var. ('α') *typica*); Zhukovsky, Bull. Appl. Bot. Gen. & Pl. Breeding 18(1): 451, 509 (1928); Eig, Feddes Repert., Beih. 55: 105 (1929a, with var. *typica* Eig 'non Fiori' on p. 106); Post, Fl. Syria (ed. 2) 2: 786 (1933); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 767 (1943); Gismondi, Pros. fl. ligust. 153 (1950); Thiébaut, Fl. lib.-Syr. 3: 316 (1953); Chennaveeraiah, Acta Horti Gotoburg. 23: 166 (1960); Mouterde, Nouv. Fl. Liban, Syrie 1: 150 (1966); Stojanov et al., Fl. Bulg. (ed. 4) 1: 148 (1966); Bor, Fl. Iraq 9: 178 (1968);, Fl. Iranica 70/30: 197 (1970); Osorio-Tafall & Seraphim, List Vasc. Pl. Cyprus 10 (1973); Pignatti, Fl. italia 3: 543 (1982).

Neotype: (Greece, Crete) Gramen spicatum, creticum, gracili, in duas aristas longissimas et asperas abeunte, *de Tournefort 4940* (P-TRF; isoneotype: LE ('Herb. Fischer, e (ex?) hb. Tournef.')). Designated by Scholz & van Slageren (1994). See note 1 and Fig. 23.

Homotypic synonyms:

Triticum caudatum (L.) Godr. & Gren. in Grenier & Godron, Fl. France 3: 603 (1856); de Cesati, Passerini & Gibelli, Comp. fl. ital. 1(4): 86 (1869); Richter, Pl. eur. 1: 128 (1890); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 708, 709 (1902, as A *eu-caudatum*); Thellung, Fl. adv. Montpellier 146 (1912); von Hayek, Prod. fl. pen. Balcan. 3: 227 (1932); Stojanov & Stefanoff, Fl. Bulg. (ed.

Fig. 21. *Aegilops caudata*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlarged part of spike, showing spikelets in situ (x 2); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 3a (x 5); 4, spike with long awns on lateral glumes (compare with 2) (x 1); 5-7, lower floret of spikelet in centre of spike: 5, glume (x 3), 6, lemma (x 3), 7, palea with immature seed (x 5); 8, palea and mature seed of upper floret of spikelet in centre of spike (x 5); 9-10: spike with long lateral glume awns: 9, glume in central part of spike (x 1); 9a, enlargement of basal part of 9 (x 3), 10, subapical glume (x 1), 10a, enlargement of basal part of 10 (x 3); 11-12: apical floret: 11, glume with long awn (x 1), 11a, enlargement of basal part of 11 (x 3), 12, lemma (x 3); 13, ventral surface of mature seed (x 5). (1-2, 13. *Tüten & al. CNM-280689-0601H*; 3, 5-8, 11-12. *Tüten & al. CNM-210689-0901H*; 4, 9-10. *Tüten & al. CNM-270689-0206H*.)


5
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3) 174 (1948), *nom. illeg.* (Art. 64.1), non *T. caudatum* Pers., Syn. pl. 1: 110 (1805), q.e. *Dasypyrum villosum* (L.) Cand.

Ae. caudata ssp. *dichasians* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 512 (1928), *nom. inval.* – Note: invalid because of Art. 26.1 as the autonym has to be used for the 'Forma typica' (l.c., 1928: 512). Zhukovsky's lectotypification in WIR ('Asie Mineure. Lydia, Efes valley, near Ayaslug, on sandy places, VI.1927, *Zhukovsky s.n.*' on sheet WIR 542) is therefore superseded. See note 1.

Triticum dichasians Bowden, Can. J. Bot. 37: 667 (1959), Can. J. Gen. Cyt. 8: 133 (1966, here and in 1959 with author as '(Zhuk.) Bowden'); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 36 (1987). See note 1.

Ae. dichasians (Bowden) Humphries, Bot. J. Linn. Soc. 78: 236 (1979, with authors '(Zhuk.) Humphries'); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980, with authors '(Zhuk.) Humphries'); Damanakis, Kat. Agrosz. Ellad. 11 (1983); Dakov, Red book Bulg., distr. threatened pl., anim. 1: 50 (1984), *nom. illeg.* (Art. 63.1: superfluous after the neotypified *Ae. caudata* L.).

Orrhopygium caudatum (L.) Á.Löve, Biol. Zentralbl. 101: 206 (1982), Feddes Repert. 95: 492 (1984).

Heterotypic synonyms:

Ae. caudata L. var. *paucispiculigera* O.Schwarz, Feddes Repert. 36: 68 (1934), **syn. nov.** – Type: (Turkey) Smyrna, Burnova, in collibus calcareis, Mai 1933, *Schwarz 581* (holo: B).

Triticum markgrafii Greuter in Greuter & Rechinger, Chloris Kythereia, Boissiera 13: 172 (1967); Greuter & al., Willdenowia 13: 73 (1983); Barclay, Englera 6: 119 (1986); Turland et al., Fl. Cretan Area 176 (1993). – Basionym: *Ae. cylindrica* Sm. in Sibth. & Sm., Fl. Graec. prodr. 72 (1806), Fl. graeca 1: 75 (1808); Link, Hort. Berol. 2: 173 (1833), Symb. fl. graec., Linnaea 9: 131 (1834); Bertoloni, Fl. ital. 1: 792 (1834); Tausch, Flora 20: 107 (1837); von Steudel, Syn. pl. glumac. 1: 355 (1854), *nom. illeg.* (Art. 64.1), non Host, Icon. descr. gram. austriac. 2: 6 (1802). – Lectotype: (Greece) in insula Creta, *Sibthorp s.n.* (OXF-252). Designated by Davis (1985: 237). – Homotypic synonym: *Ae. markgrafii* (Greuter) Hammer, Feddes Report. 91: 232 (1980b); Davis, Fl. Turkey 9: 236 (1985); Carlström, Survey Fl. Phytogeogr. Rhodos: 128 (1987); Baytop, Istanbul Univ. Ecz. Fak. Herb. Türk. Bitk. 2, Monocot. 29 (1988); Andreev et al., Opred. Visš. Rast. Bălgarija 581 (1992). See note 1.

Ae. caudata L. var. ('β') *polyathera* Boiss., Fl. orient. 5(2): 675 (1984); Haussknecht, Symb. fl. graec., Mitt. Thür. Bot. Ver., Neue Folge 13: 61 (1899); von Halácsy, Consp. fl. graec. 3: 432 (1904); Eig, Feddes Repert., Beih. 55: 106 (1929a); Post, Fl. Syria (ed. 1) 900 (1896), (ed. 2) 2: 786 (1933); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 767 (1943); Thiébaut, Fl. Lib.-Syr. 3: 316 (1953); Mouterde, Nouv. Fl. Liban, Syrie 1: 151 (1966), **syn. nov.** – Syntypes (fide Boissier, 1884): (Turkey, Phrygia) forêt de quercus *Aegilops* située entre Tatar-Keuï ed Boulgas-Keuï (Phrygia), VI.1857, *Balansa s.n.* (G-BOIS, L); (Turkey) Lycia, in collibus, Elmalu, 3.VI.1860, *Bourgeau 277* (A, C, E, G, G-BOIS, K, LY, LY-Jordan, P, US; see note 2); (Turkey, 'Iter Syriaco-Armenianum') Tauro Cataonicus, in agris ad Surug, V.1865, *Haussknecht s.n.* (G-BOIS). – Notes: 1. Excluded syntype: Turkey, Cappadocia, ad Caecaream, *Balansa s.n.* (42) (G-BOIS) = *Ae. cylindrica* Host. 2. The collection *Bourgeau 277* in JE, LY, LY-Gandoger, MPU, W = *Ae. cylindrica.* Note that the general herbarium in LY has both species with this number and collector. – Homotypic synonyms: *Ae. caudata* L. ssp. *polyathera* (Boiss.) Zhuk., Bull. Appl. Bot. Gen. & Pl. Breeding 18(1): 511 (1928). *Triticum caudatum* (L.) Godr. & Gren. var. ('B.') *polyatherum* (Boiss.) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 709 (1902, '*polyathera*'); Hayek. Prod. fl. pen. Balcan. 3: 227 (1932; as a *comb. nov.* although not stated as such; to be interpreted as an isonym). – Note: the 'B.' of Ascherson & Graebner is probably a mistaken 'I' as the other form under A. *eu-caudatum* is identified as 'II.'. *Ae. markgrafii* (Greuter) Hammer var. *polyathera* (Boiss.) Hammer, Feddes Repert. 91: 232 (1980b).

Diagnostic characters: tufted, many tillered annuals, 25-45 cm tall excluding spikes; spike narrowly cylindrical, 3-10 cm long excluding awns, with (2-)3-7 fertile and 1-3 rudimentary spikelets; glumes with one tooth and one short (2-3 mm) to long (2.5-6.5 cm) awn; apical glume protruding into 4.5-12 cm long, diverging awn, longer than the entire spike; caryopsis adherent.

Description (Fig. 21): tufted *annuals* (*Fig. 21-1*) with few to (usually) many slender tillers. *Culms* semi-prostrate at base, then ascending, 25-45 cm tall excluding spikes; foliage ± evenly distributed but more dense at base of culm. *Leaf* blades linear-acuminate, 3-10 cm long, 0.3-0.4 cm wide; margins of sheaths hyaline, often ciliate. *Inflorescence* (*Fig. 21-2*) a narrowly cylindrical spike, slightly tapering towards the apex, greatly varying in length: 3-10 cm excluding awns, only around 3 mm wide; disarticulating at maturity as one unit with the rudimentary spikelets remaining attached to the culm; with (2-)3-7 spikelets and 1-3 rudimentary spikelets, the latter ones sometimes absent. *Spikelets* sessile, ovoid-cylindrical, 9-12 mm long excluding teeth and awns, 2-3 mm wide; spikelet length roughly equalling that of the supporting rachis internode; with 2-3 florets of which only the lowest one fertile. *Glumes* 2, coriaceous (but with hyaline lateral margins), elliptic-oblong, 7-10 mm long, green to purplish-green, the surface scabrid; veins unequally wide, sunk into the surface, ± parallel, usually yellowish and lighter in colour than the glume surface, occasionally purplish-green, surface scabrid or setulose; apex of lateral glumes (*Fig. 21-5*) adaxially ending in a setulose awn, widely varying in length: from 2-3 mm only up to 2.5-5(-6.5) cm in specimens with well-developed and diverging awns (*Fig. 21-9, 10*), abaxially in a sharp, 1-2 mm long tooth; glumes of the apical spikelet (*Fig. 21-11*) elliptic-rectangular, flattened, the apex protruding into a long, diverging, setulose awn, 4.5-12 cm long (thus longer than the entire spike), 1-2 mm wide at the flat base, without lateral teeth. *Lemmas* (*Fig. 21-6*) of fertile florets slightly exserting the glumes, 10-12 mm long, narrowly ovate-elliptical, boat-shaped and almost conduplicate in the apical part; apex with one central tooth that often develops into a short (up to 5 mm), setulose awn, and 2 sharp, lateral teeth; lemmas of apical spikelet more flat, the lateral teeth at the apex more reduced and the central, short awn comparatively more prominent. *Paleas* (*Fig. 21-7*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 21-8, 13*) 5-8 mm long, adherent to lemma and palea.

Variation: in spike length: 3-10 cm; number of spikelets: (2-)3-7, and in the development of the awns at the lateral glume apex: from 2-3 mm only up to 2.5-5(-6.5) cm when well developed. The variety *polyathera* was based on the presence of these well-developed glume awns (compare Figs. 21-2 and 4).

Distribution (Fig. 22): a Mediterranean element occurring mainly in the Aegaeis and western Turkey where growth can be abundant. Less common in inland Turkey and along most of the Fertile Crescent arc where the presence is more sporadic.

Introduced and adventive in the Genoa region (Gismondi, 1950: 153) and on Sardinia (Fiori, 1923: 160) in Italy; also found near Marseille, France (Grenier, 1858: 434), and in Scotland.

Ecology: a species of fallow, roadsides, grassland (including steppe), edges of and within fields of cultivation (such as wheat), various forest types (e.g., of *Juniperus excelsa*), and, more rarely, of silty and even maritime locations. Often on dry, rocky slopes of limestone, more rarely on shales, schist, sandstone or granite. Soil texture predominantly clay- and sandy loams. *Aegilops caudata* can form dense stands, often together with other *Aegilops* species. Collated annual rainfall data are in the range 300-700 mm.

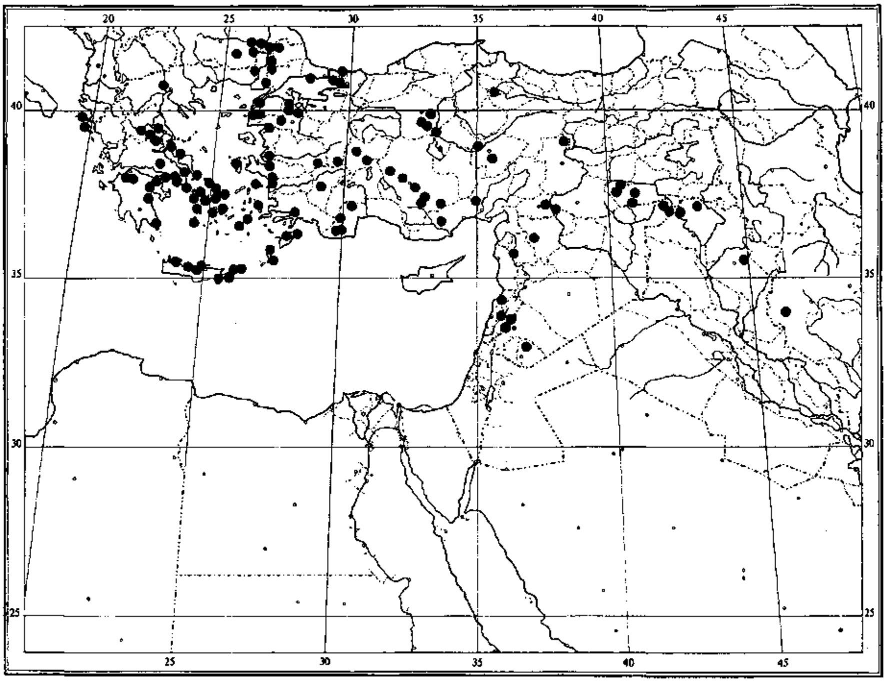

Fig. 22. Distribution of *Aegilops caudata* in the Mediterranean and the Near East. Location in Istria, Croatia, as well as adventive locations in Europe not shown.

Altitude: from sea level up to 1850 m. *Aegilops caudata* is, however, predominantly a lowland species. Hodgkin et al. (1992: 158) present a bar diagram with 200-m intervals and state that more than 60% of the altitudinal data in the worldwide germplasm collection of *Ae. caudata* are from below 400 m. Herbarium data confirm this.

Flowering and fruiting time: May – August. May – June in Italy (Fiori, 1923: 160).

Genome: C with 2x = 2n = 14 (Chennaveeraiah, 1960: 89; Waines & Barnhart, 1992: Table 1).

Vernacular names:

English: Cretan Hard-grass (Aiton, 1813: 433).

French: Froment à queue [= wheat (with a) tail] (Acloque, 1904: 718, 'probably introduced').

German: geschwänzter Walch [schwanze = with a tail / in the form of a tail] (von Willdenow, 1806: 944).

Italian: Grano selvatico cornuto [= wild, horned wheat] (Bertoloni, 1834: 792, sub *Ae. cylindrica*, but his description clearly refers to *Aegilops caudata*). This vernacular is applied both to *Ae. caudata* and *cylindrica* (see at 10.7).

Turkish: Kuyruklu buğday otu [kuyruklu = tailed]; Kara ot [kara = black; ot = grass] (Sabanci, 1984: 1).

Etymology: the final epithet is derived from the Latin 'caudatus' [= tail-pointed], and refers to the spike outline with its long apical glume awns.

Most of the 460 herbarium specimens examined:

ASIA: IRAN: 25 km N Ilam, *Zohary s.n.* (UCR); Astrabad, *s.coll., s.n.* (P).

IRAQ: Sersang, 30 km WSW Amadiyah to Dahuk, *Bot. Exp. Univ. Kyoto BMUK 6-16-7-H* (K), *6-16-7-J, 6-16-7-K* (US); Ispindari, Suara Tuka, *Chapman 26344* (K); Jarmo, Adobe ruin, *Helbaek 1199* (C, K, P), *1210A* (K); Jarmo, *Helbaek 1769* (C, K); Sirsank (Sersang?), 142 km W Mosul, *Knowles K1244* (UCR); Mosul, near Sharanish, E Zakho to Jebl Khantur, *Rechinger 10769* (B); Chemchemal, Jarmo, *Wheeler Haines W328* (E, K).

LEBANON: Tripoli, *Blanche s.n.* (US); Deir-el-Ahmar to Aineta, *Bornmüller 13040* (B, BM, C, E, G, JE, K, LD, LE, P, PR, US, W, Z).

SYRIA: Ain Diwar, near Tigris river, *Pabot s.n. (358)* (Min.Agr.Syr.); Sweida, Jebl Druze, El 'Anaat village, Tall abu Shanattir, *Sanadiki s.n.* (ACSAD); Damascus to Zabadani, before Maddaya, *van Slageren & al. MSGMKO-88112H* (ICARDA).

TURKEY: Akşehir, Sultan Daglari, Engilli yaylasi, *Akman 13869* (ANK); Izmir, Kemalpaşa, *Alava & Regel 50505* (E); Görpnik, near Buziar, *Ayasligil s.n.* (B); Istanbul, near Soghanlik, *Aznavour s.n.* (A, BEI, BM, FI, G, LY, MPU, W, Z); Kartal – Yacadjik, *Aznavour s.n.* (BM, G); Kayseri, plain of Kayseri, *Balansa s.n.* (BM); Phrygia, Tatar-Keuï and Boulgas-Keuï (Bulgas-Kevi), *Balansa s.n.* (G-BOIS, L, type of *Aegilops caudata* var. *polyathera*); Izmir, *Balansa 12* (BM, C, E, G, G-BOIS, JE, K, L, LE, LY-Gandoger, LY-Jordan, MPU, P, US, W); Konuklar, Nadastan, *Birand & Zohary 2445* (ANK); Amasya, *Bornmüller 471* (BM), Galatia, Angora, *Bornmüller 3199* (B); Elmalu, *Bourgeau 277* (A, C, E, G, G-BOIS, K, LY, LY-Jordan, P, US, type of *Aegilops caudata* var. *polyathera*); Dardanelles, *Calvert s.n.* (E, K. OXF); Uşak, Susak to Sivasli, *Coode & Jones 2442* (A, E); Mardin, 11 km Gerçüş to Hasankeyf, *Davis 43044* (E, ERE, K, SOM); Çinar – Diyarbakir, S of the Tigris, *Davis & Hedge 28671* (ANK, BM, E, K, LE); Mardin to Nusaybin, *Davis & Hedge 28481* (BM); Konya, Balcikhasar to Yayla, *de Wit 54* (WAG); Konya, Ermenek to Kayaönü, *Doğan 203* (E); Ankara, Beytepe, Maslak Kadisi, *Erik 1463* (HUB); Denizli to Honaz, *Fitz & Spitzenberger 682a* (W); near Ahiboz, 40 km S Ankara, *Godfrey & Taysi SH-16* (US); Manyas, Eregli, *Harlan 10286* (K); Ezine, Çanakkale, *Harlan 10291* (K), Bireçik ('Bir') to Urfa ('Orfa'), *Hausskneckt s.n.* (JE, W); 'Tauro Cataonicus', Surug, *Hausskneckt s.n.* (G-BOIS, type of *Aegilops caudata* var. *polyathera*), Kücük Köy, SE Konya, *Helbaek 2606, 2622* (C, K); 25 mi. W Gaziantep, *Johnson & Hall s.n.* (UCR); 33 km N Malatya, *Johnson & Hall s.n.* (UCR); NW Antalya, Nebiler, *Kehl 10/III-b, T-6/III-4* (B); Lycia, Elmalu, Mt. Alidagh, *Pichler 692* (G, G-BOIS, P, W); Ankara, Etymešut, *Pilát 2333* (PRC); Eğin (Kemaliye), *Sintenis 3580* (JE, LD); Smyrna, Burnova, *Schwarz 581* (B, type of *Aegilops caudata* var. *paucispiculigera*); 25 km S Çanakkale, *Tüten & al. CNM-200689-0203* (ICARDA, IZ); Balikesir, S Balya, *Tüten & al. CNM-210689-0901* (ICARDA, IZ); Balikesir to Bandirma, at Manyas junction, *Tüten & al. CNM-220689-0501* (ICARDA, IZ); Istanbul, N Silivri – Cerkezköy junction, *Tüten & al. CNM-270689-0204* (ICARDA, IZ); Edirne, NE Lalapaşa at Suleci, *Tüten & al. CNM-280689-0601* (ICARDA, IZ); Edirne, S Üzünköprü, *Tüten & al. CNM-290689-0401* (ICARDA, IZ, WAG); Içel, Mut – Sertavul, *Vural 1593* (ANK); Taurus, 30 km S Denizli, *Zohary s.n.* (US cult.); E Gaziantep, *Zohary s.n.* (US cult.); Lydia, Ayaslug, *Zhukovsky s.n.* (WIR 542, 620); Izmir to Manisa, Burnova, *Wall 285B* (LD); Antalya, Korkuteli, *Wängsjö 2729* (LD).

EUROPE: BULGARIA: Sladun, near Khaskovo, *Delipavlov s.n.* (SOA); Levka to Kostur, *Jordanov s.n.* (SO); Levka, near Svilengrad, *Stojanov s.n.* (SO); Khaskovo, Sakar-Planina, *Stojanov s.n.* (ERE).

CROATIA, DALMATIA: Rijeka, *Boott s.n.* (A).

GREECE, ATTICA: near Athens, Hagia Glykéria, *Chaboisseau 1214* (BM); Nomos Attiki, Ep. Kìthira, W Kapsàli, *Greuter 6536* (LD), *6537* (G, LD); Sunion, *Hausskneckt s.n.* (JE); Turko Wani, *Hausskneckt s.n.* (JE, LE, W); Anavryta, Pentelikon Mt., Amariti to Kephissia, *Leutwein de Fellenberg s.n.* (Z); near Athens, *Leutwein de Fellenberg s.n.* (MPU); Eleusis, *Linton s.n.* (BM); Hymethus (Imittós) Mts., *Rainer von und zu Haarbach s.n.* (PI); Megara, *Saint Lager s.n.* (A); Menidi, *von Heldreich 605* (BM, C, G, G-BOIS, FI, JE, K, L, LE, LY-Gandoger, LY-Jordan, MPU, P, PI, W), *s.n.* (C); Phaleron, *von Heldreich 605b* (BM, F, G, GE, JE, K, LD, MPU, OXF, P, PR, PRC, W, Z); Parnethis Mt., near Khasia, *von Heldreich 606* (BR); Kifisiá, *von Heldreich s.n.* (G); near Athens, *von Heldreich 2551 p.p.* (G-BOIS). ELLAS: S Thebe, *Zohary s.n.* (UCR, US cult.). MACEDONIA: Nomos Thessaloniki, Asbestochorio to Kuri forest, *Akeroyd 475* (RNG). PELEPONNESUS: Achaia, Patras, Castelli

Mt., *Bornmüller 1708* (Z); 'Moreé', Tenarium, *Despreaux s.n.* (G); Methana, *Haussknecht s.n.* (BM, JE, LE, W); Achaia, Mt. Kyllenes, near Pellene, *von Heldreich s.n.* (G, P); Nauplion, Argolides, *von Spruner s.n.* (A, G, G-BOIS, LD, LE, LY, TUB); 20 km N Argos, *Zohary s.n.* (UCR). STEREA: Fokís prov., SW Itéa, *Runemark & al. 44404* (LD). THESSALIA: Thessalia plain, Orman Magula, *Haussknecht s.n.* (JE): Aïvali, Pheras to Pharsalum, *von Heldreich s.n.* (G, LD, W). THRACE: near Bouloustra, *Tedd 1578* (K). ISLANDS: ANDROS: S Aipatha, *Snogerup 9128* (LD); S Pitrofos, *Snogerup 9249* (LD); Gaidharos, S Gavrion, *Snogerup & von Bothmer 31298* (LD); ESE Akra Apothikes, *Snogerup & von Bothmer 32633* (LD); Mt. Rakhi, *Snogerup & von Bothmer 3457* (LD); E Agios Marina, NE Agios Petros, *Snogerup & von Bothmer 32580* (LD); SSW Opiso Meria, *Snogerup & von Bothmer 32061* (LD); S Akra Gria, *Snogerup & von Bothmer 33107* (LD). ASTIPALEA: NW Skala, Livadia, *Burri & Krendl s.n.* (W); Caminacia, *Runemark & Nordenstam 14026* (LD); Maltesana to Vriseu Punda, *Runemark & Nordenstam 13458, 13459, 13622* (LD). CHIOS: s.loc., *Paulli 541* (JE). CORFU: S Kripero, *Bicknell s.n.* (BM, GE, OXF); N. Benitses, *Snogerup 23536* (LD). CRETE: Chanistra, Acrotiri, *Baldacci 50* (BM, BR, FI, G, P, W); s.loc., *de Tournefort 4940* (LE, P-TRF, type of *Aegilops caudata*); Ep. Apokorono, Georgioupolis, *Gradstein & Smittenberg 315* (U); Chania, Therissa, *Gandoger 4483* (MO); Cape Sitia, *Gandoger 297* (MO); Rethymnon, Platania, *Gandoger 12834* (G), *s.n.* (K); Rethymnon, Asomatoï, *Gandoger 5359* (FI, MO); Sitia, Epano Zakro to Kato Zakros, *Greuter 4505* (G, LD, Z); Hierapetra, Kavouci region, *Patten K98* (A); Kissamos, *Reverchon 181* (FI, G, K, LD, MPU, P, PR, SO, W, Z); Chania, *Reverchon 181* (BM, BR, FI, G, JE, K, LD, LE, LY, MPU, P, PRC, W); Gavdhos island, SW Kastri, *Runemark & Snogerup 47725* (LD); S Sitia, *Runemark & al. 17965* (LD); S Turloti, *Runemark & al. 17313* (LD); s.loc., *Sibthorp s.n.* (OXF-252, type of *Aegilops cylindrica* auct.); Cap Maleca (Akr. Maléa?), *Sieber s.n.* (A, BM, BR, G, JE, K, L, LE, LY-Gandoger, MO, PI, PR, W); W Moni Kapsa, 25 km E Ierapetra, *Snogerup 2385* (LD); Menara plain, *von Heldreich s.n.* (G, LE, OXF, P, TO, W); Iraklion, *Wängsjö 3100* (LD). DILOS: Mt. Kynthos, *Townsend 63/115* (K). EUBOEA: Aghmet Aga, Prokopion, *Rechinger 17175* (G, K, LD, MO); N Agios Dimitrios, *Runemark & Snogerup 11815* (LD); N Euboea, *Thompson & al. s.n.* (K). IRAKLIA: s.loc., *Runemark 4242* (LD). KARPATHOS: Mt. Lasto, *Barbey s.n.* (K); Amoppi, *Burri & Krendl s.n.* (W); Volada, SE slope of Lastos, *Burri & Krendl s.n.* (W); Agios Georgios of Meshori, *Burton R109* RNG); Pigadhia to Vrondi, *Greuter 5120* (Z); Mt. Lasto, *Pichler 691* (FI, G, P, W, Z). KITHNOS: N Loutra, *Runemark & Engstrand 37814* (LD); Ormos Flampourion, *Runemark & Engstrand 37998* (LD); Ormos Agios Dimitrio, *Runemark & Engstrand 38071* (LD). LEROS: s.loc., *Durville 142* (P). MILOS: S Akr. Romma, *Runemark & Bentzer 29660* (LD); MNE Profites Elias, *Runemark & Bentzer 29878* (LD). MIKONOS: Rinia, *Runemark & Engstrand 35993* (LD). NAXOS: SW Kato Potamia, *Runemark 2548* (LD); Fanoromeni, *Runemark 3305* (LD); SE Akr. Axapsis, *Runemark 3150, 3150b* (LD); Metri, N Moni, *Runemark 3199* (LD); Apollona to Komiaki, *Runemark 4019* (LD); SSE Axapsis, *Runemark 3894* (LD); ENE Moni, W slope Fanari Oros, *Runemark 3603* (LD); SE Agios Theodoros, *Runemark & Snogerup 8950* (LD); NNW Liona, *Runemark & Snogerup 9042* (LD); W Ormos Agiasou, *Runemark & Snogerup 10123a* (LD); Ammomaxis Oros, *Runemark & Snogerup 9917* (LD); SSE Sangri, *Snogerup 20190* (LD). OFIDHÓUSA: s.loc., *Runemark & Snogerup 13752* (LD). PAROS: S Naoussa, *Runemark & Bentzer 29279* (LD). RHODES: near Bastida, *Bourgeau 159* (A, BM, BR, E, FI, G, G-BOIS, K, LD, LY-Gandoger, MPU, NY, P, PR, PRC, W, Z); Salakos, *Carlström 70, 95, 209* (LD); SW Malona, Makkaris, *Carlström 640* (LD); W Apolakia, *Carlström 6606* (LD); Skiadi monastery, *Carlström 6642* (LD); NNE Agios Isidoros, *Carlström 6024* (LD); Embona, *Rechinger 7294* (BM, G, K, LD, W). SAMOS: Vathi, *Jakobsen 4* (C); Mt. Kerki, *Runemark & al. 19643* (LD). SIRNA (Saria?): top of the Mt., *Runemark & Snogerup 7794* (LD). SIROS: N Kini, *Snogerup & von Bothmer 33717* (LD). THIRA (SYRA): s.loc., *Gandoger s.n.* (G). TINOS: S Tinos town, *Runemark & Engstrand 36470* (LD); N Isternia, *Runermark & Engstrand 37234* (LD).

ADVENTIVE: EUROPE: FRANCE, BOUCHES DU RHÔNE: Marseille, *Balansa s.n.* (L). HÉRAULT: Port Juvénale, *Touchy 1045* (MPU). VAR: La Sainte Baume, near Toulon, *Ayasse s.n.* (G). U.K., SCOTLAND: Edinburgh, Leith Docks, *Fraser s.n.* (W).

Germplasm collections examined:

ASIA: SYRIA: Aleppo, Shahba area, *Bourgois & Witcombe SY-20189* (IPGRI, ICARDA); Damascus, Maddaya to Zabadani, *van Slageren & al. MSGMKO-88112* (ICARDA, SARD); Idlib, Mhambel, road Jisr-esh-Shughur – Ariha, *van Slageren & al. MSWRKA-88263* (ICARDA, SARD).

TURKEY: Ankara, NW Keskin, *Güzel & al. SMN-040889-0402* (ICARDA, PGRRI); Konya, W Eregli to Karaman, *Güzel & al. SMN-050889-0201* (ICARDA, PGRRI); Kayseri, 25 km SE Himmetdede, *Güzel & al. SMN-070889-0302* (ICARDA, PGRRI); Afyon, SE Çay, *Güzel & al. SMN-140889-0102* (ICARDA, PGRRI); 25 km S Çanakkale, *Tüten & al. CNM-200689-0203* (ICARDA, PGRRI); Edirne, N Kesan, *Tüten & al. CNM-290689-0601* (ICARDA, PGRRI); Edirne, S Üzünköprü, *Tüten & al. CNM-290689-0401* (ICARDA, PGRRI); Balikesir, SW Burhaniye, *Tüten & al. CNM-190689-0103* (ICARDA, PGRRI); Edirne, NE Lalapaşa at Suleci, *Tüten & al. CNM-280689-0601* (ICARDA, PGRRI); Balikesir, SW Süsürlük, *Tüten & al. CNM-220689-0201* (ICARDA, PGRRI); Balikesir, W Manyas junction, *Tüten & al. CNM-220689-0501* (ICARDA, PGRRI).

EUROPE: BULGARIA: Svilengrad, NE Raikova Mogila, *van Slageren & Zacharieva MSMZ-90238* (ICARDA, IIPGR); Svilengrad to Turkish border, *van Slageren & Zacharieva MSMZ-90230* (ICARDA, IIPGR).

Notes: 1. The typification and hence the correct name of *Ae. caudata* has been a matter of controversy, caused by the fact that the three sheets in LINN with the name *caudata* (nos. 1218.5-7) do not correspond with Linnaeus' description in the *Species plantarum* (ed. 1) 1051 (1753). A neotypification has recently been proposed separately (Scholz & van Slageren, 1994) in order to maintain the usage of the well-known name *Aegilops caudata*. The above treatment of the nomenclature of the species reflects this conservation proposal.

Dr Ch. Jarvis (BM) informed me that of the sheets in LINN pertaining to *Ae. caudata*, 1218.6 and 1218.7 are later additions to the herbarium (that is: after *Species plantarum* publication) and cannot be regarded as original material in the sense of Art. 7.5 of the *Code*. Hence when wanting to lectotypify the name only sheet 1218.5 is eligible. Material on this sheet represents, however, *Ae. ventricosa* (see Table 6 in Chapter 3.2), and is in conflict with the protologue of the *Species plantarum*. The main conclusions of the nomenclatural tangle connected with the name *Ae. caudata* are as follows:

a. Greuter (in Greuter & Rechinger, 1967: 172) stated that 'Number 1218.5 of Savage's Catalogue, must in the meantime be accepted as type of the species'. As he considered both specimens of sheet 1218.5 the same taxon, *Ae. squarrosa* L., he effectively made the name *Ae. caudata* a synonym of the simultaneously published *Ae. squarrosa*.
b. Bowden (1959: 667-668) considered indirectly the left-hand specimen of sheet 1218.5 the type of the name *Aegilops caudata* when he recombined its epithet under *Triticum*. As the combination *T. caudatum* Pers. (1805) already existed he used the subspecies epithet *dichasians* from Zhukovsky (1928: 512) to create *T. dichasians* (Zhuk.) Bowden. The basionym of this combination, *Ae. caudata* subsp. *dichasians*, is, however, not validly published (see above), but Bowden's name is legitimate in the genus *Triticum* as a *nom. nov.* for *Ae. caudata* L. (Greuter in Greuter & Rechinger, 1967) and is to be cited as *T. dichasians* Bowden.
c. Facing constant use of the name *Aegilops caudata* in a sense that excludes what he considered to be its type, Greuter (in Greuter & Rechinger, 1967: 172) created a new name, *Triticum markgrafii* Greuter, for the species known as *Ae. caudata*. The base for this name is *Ae. cylindrica* Sm. (Smith in Sibthorp & Smith, 1806: 72) – a later homonym of *Ae. cylindrica* Host (1802) – which, in turn, is

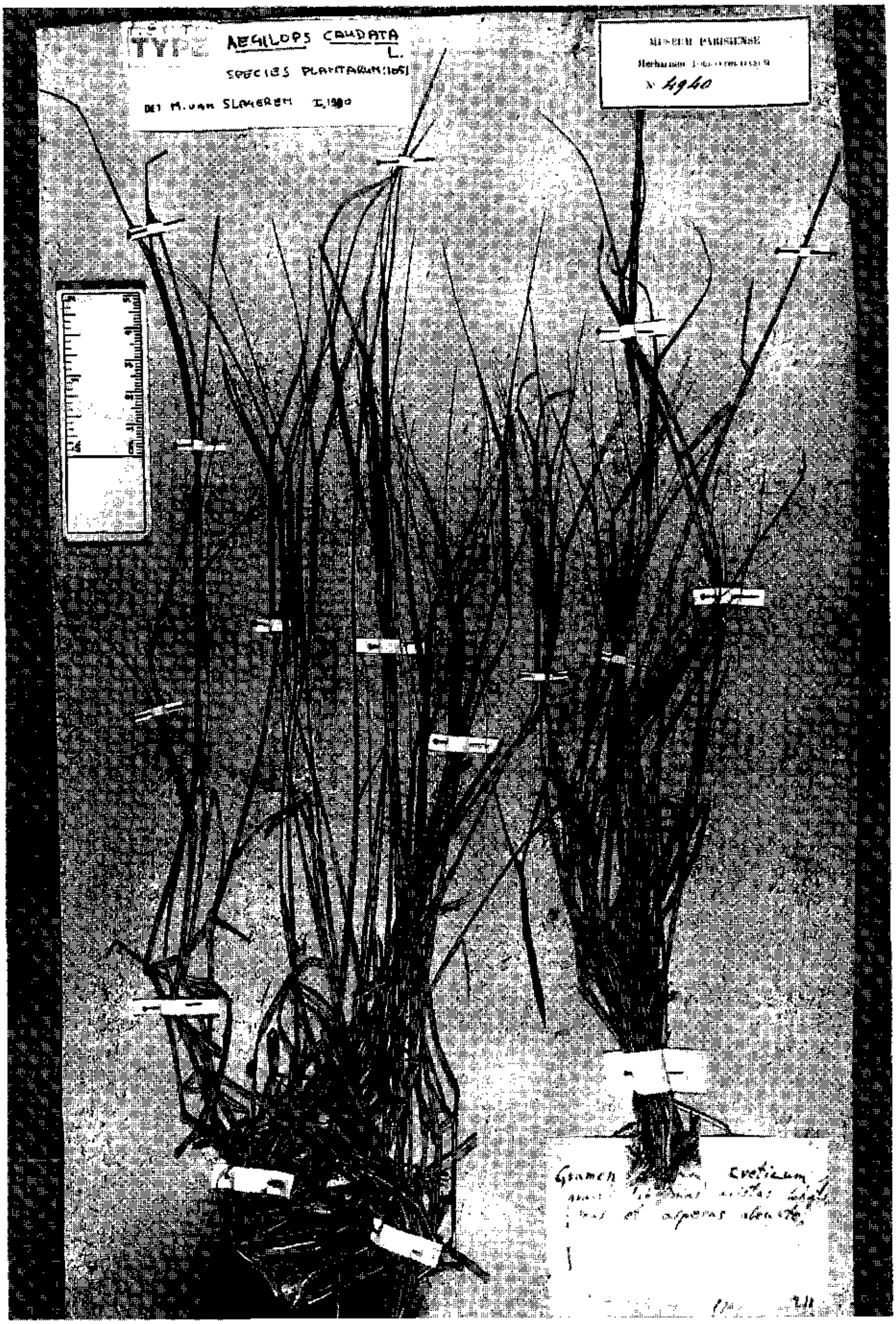

Fig. 23. The neotype of *Aegilops caudata* L., collection *de Tournefort 4940* from Greece in the de Tournefort herbarium in Paris (P-TRF). The annotation slip erroneously indicates 'lectotype' instead of 'neotype'.

based on the pre-Linnaean phrase-name of de Tournefort that, in Smith's (in Sibthorp & Smith, 1808: 76) opinion, Linnaeus erroneously cited in his *Species plantarum*. As lectotype of the basionym, Davis (1985: 237) chose a collection from Sibthorp ('In insula Creta'; holo: OXF). Greuter's arguments for superseding the name *Ae. caudata*, (1) rejection of all available herbarium specimens in LINN would make the name a *nomen dubium*, and (2) a typification in the sense of the de Tournefort synonym cannot be made due to Smith's remark about *Ae. caudata* in the *Flora graeca*, can be disputed. Even when rejecting the LINN specimens, a neotype can be chosen to maintain usage of the name, and Smith's remark is not relevant as he did not lectotypify *Ae. caudata* to replace his rejection of the de Tournefort synonym.

d. In my opinion *Aegilops markgrafii* (Greuter) Hammer has not completely superseded *Ae. caudata*. To end the confusion Scholz & van Slageren (1994) proposed, after dismissal of all material in LINN and for the sake of nomenclatural stability, to conserve the name *Ae. caudata* with a conserved type: the specimen *de Tournefort 4940* in P-TRF (Fig. 23), of which an isoneotype exists in LE. The label of this specimen, in de Tournefort's handwriting, equates literally the text that appeared as the only synonym under *Ae. caudata* by Linnaeus in the *Species plantarum*.

2. A key, separating *Ae. caudata* from the sometimes similar appearing *Ae. cylindrica* is presented with the latter species (see at 10.7).

10.4 **Aegilops columnaris** Zhuk. — **Figs. 24-25**

Aegilops columnaris Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 448, 489 (1928); Eig, Feddes Repert., Beih. 55: 214 (1929a, with var. *typica*); Post, Fl. Syria (ed. 2) 2: 784 (1933); Troitski, Trans. Armenian Br. Acad. Sci. USSR, Biol. Ser. 2: 132, 136 (1937); Grossheim, Fl. Kavkaza (ed. 2) 1: 353 (1939), Opredelitel rastenich Kavkaza [Key to Caucasus plants] 719 (1949); Oppenheimer & Evenari, Florul. Cisiord. 171 (1941, including var. *typica*); Thiébaut, Fl. Lib.-Syr. 3: 318 (1953); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960); Mouterde, Nouv. Fl. Liban, Syrie 1: 147 (1966); Bor, Fl. Iraq 9: 178 (1968); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 483 (1969); Bor, Fl. Iranica 70/30: 200 91970); Takhtajan & Fedorov, Fl. erevana (ed. 2) 366 (1972); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 38 (1973), in Fedorov, Zlaki SSR: 159 (1976, Russian; with var. *columnaris*) / 288 (1984, English, with var. *columnaris*); Hammer, Feddes Repert. 91: 239 (1980b, with var. *columnaris*); Löve, Feddes Repert. 95: 504 (1984); Davis, Fl. Turkey 9: 243 (1985); Gandilyan in Kazarjan, Red data book Armenian SSR 248 (1990).

Lectotype (*nov.*): (Turkey, 'Asia Minor') Galatia, near foot of Dizgurt-Dagh, on dry places, *Zhukovsky s.n.* (WIR 635). See note 1.

Homotypic synonym:

Triticum columnare (Zhuk.) Morris & Sears in Quisenberry & Reitz, Wheat and Wheat Improvement 20 (1967); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 58 (1987), *comb. inval.* – Note: in all references invalid because of Art. 33.2. Although Morris & Sears refer indirectly to Zhukovsky's (1928) publication of the basionym in their reference list, the latter publication is only mentioned with its entire pagination ('417-609', l.c., 1967: 87) and not to the exact page (or plate) of the basionym as is explicitly required by the Article, this being contrary to the '...pagination of the whole publication unless it is coextensive with that of the protologue...' (l.c., p. 38 of the *Code* in the footnote, connected with Art. 33.2). Note that both on pages 448 and 489 of Zhukovsky's (1928) monograph there are descriptions presented under the heading '*Ae. columnaris* Zhuk'.

Heterotypic synonym:

Ae. columnaris Zhuk. var. *glabriuscula* Eig, Feddes Repert., Beih. 55: 214 (1929a); Oppenheimer & Evenari, Florul. Cisiord. 171 (1941); Tzvelev in Fedorov, Zlaki SSSR 159 (1976, Russian) / 228 (1984, English); Hammer, Feddes Repert. 91: 239 (1980b), **syn. nov.** – Syntypes (two collections cited by Eig, 1929a; inspected one listed): (Turkey) Aintab (= Gaziantep), *Post s.n.* (BEI).

Diagnostic characters: tufted, many tillered annuals, 15-30 cm tall excluding spikes; spikes narrowly ovoid to oblong, 2.5-4 cm long excluding awns, with 3-4(-6) fertile and 2-3 rudimentary spikelets; glumes with 2-3 awns, when 2 then markedly different in development: 1 strongly developed, broad at the base and often bifurcating above, 1 narrow and slender; lemmas with 2-3 awns, shorter than those of the glumes; caryopsis free.

Description (Fig. 24): tufted *annuals* (*Fig. 24-1*), usually with many tillers. *Culms* semi-erect, geniculate and prostrate at base, then ascending, 15-30 cm tall excluding spikes; foliage dense at base of culms, more sparse above. *Leaf* blades linear-acuminate, 2-7 cm long, 0.2-0.4 cm wide; upper part of sheath margins hyaline, ciliate in lower parts of culm only (*Fig. 24-4*). *Inflorescence* (*Fig. 24-2*) a narrowly ovoid to oblong spike, 2.5-4(-6) cm long, excluding awns, 0.3-0.5 cm wide, the lower part of the spike ovoid, the upper part more linear in outline; disarticulating as one unit at maturity with the rudimentary spikelets remaining attached to the culm; with 3-4(-6) spikelets of which the lower 2-3 are well developed and the upper ones more reduced, rudimentary spikelets 2-3. *Spikelets* sessile, the lower 2-3 well-developed, ellipsoid, 0.7-1.2 cm long excluding awns, 0.2-0.3 cm wide, the upper ones more slender and reduced, almost cylindrical, around 0.6 cm long and 0.1-0.2 cm wide; lower spikelets 0.8 times the length of the supporting rachis internode, reducing to 0.5 times with the apical spikelet; with 2-5 florets of which the lower 1-3 fertile. *Glumes* (*Fig. 24-5*) 2, coriaceous (but with the lateral margins hyaline), of the lower 2-3 spikelets elliptic-oblong, 7-11 mm long, of the upper spikelets (*Fig. 24-8, 9*) obtrapezoid, around 6 mm long; surface of the lower glumes adpressed-velutinous, becoming reduced to scabrous only with setulose venation in the upper glumes, green, often purplish-green in the upper parts; venation unequal in width, flattened, sunk into the surface, unequally spaced but this more regular in the upper spikelets, usually more yellowish and lighter in colour than the rest of the glume surface; the truncate apex extending into 2-3 setulose, 3-5.5 cm long, often purplish awns: when 3 awns these equally wide at the base (generally in more apical parts of the spike and at any rate with the apical spikelet glumes), when 2 awns then the abaxial one broad, strongly developed, 1.5-2.5 mm wide at the base, often bifurcating above, and the adaxial one very narrow, linear, 1 mm or less at the base, and not bifurcating; all awns diverging up to erecto-patent in posi-

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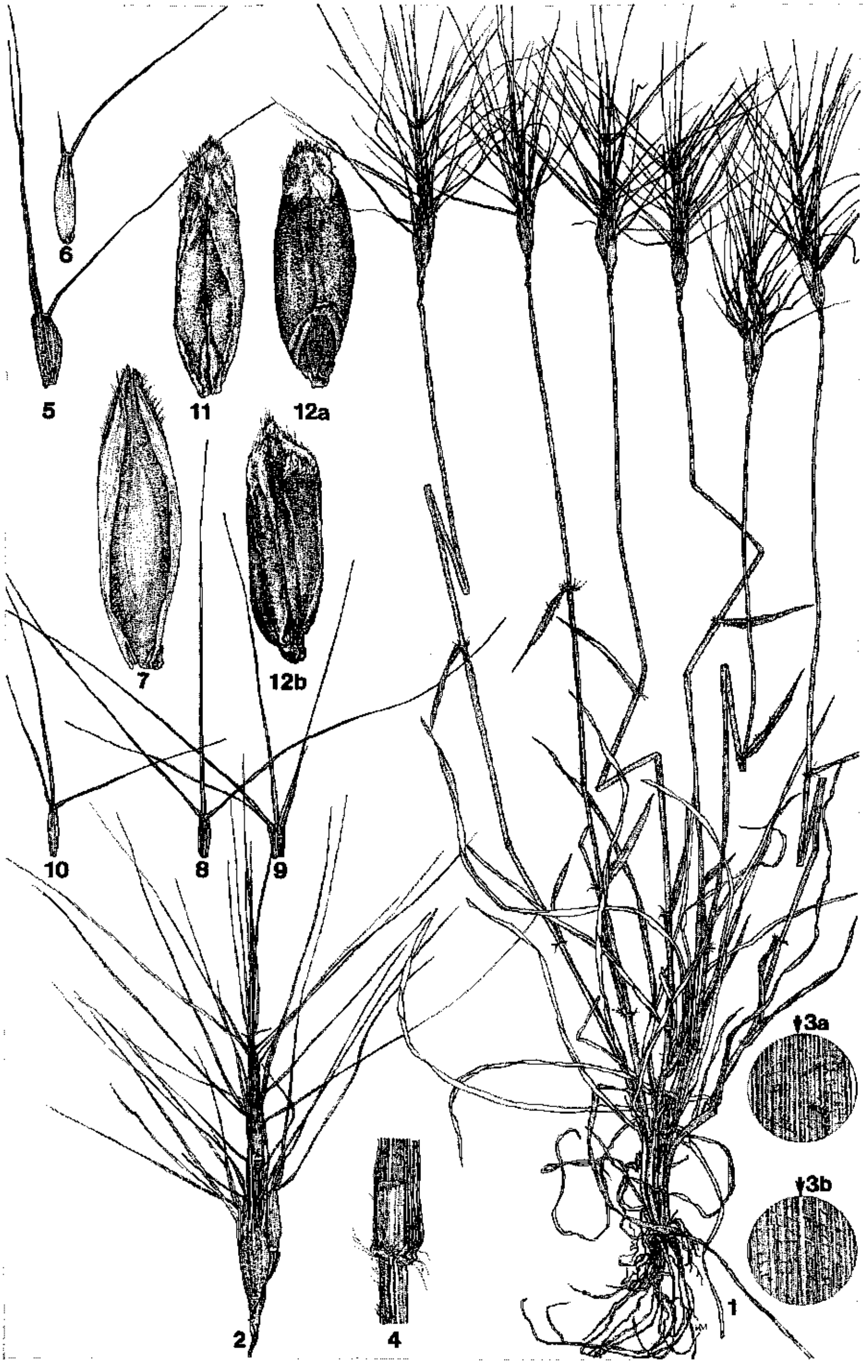
Fig. 24. *Aegilops columnaris*. 1, habitus (x 1/2); 2, spike (x 1); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 3a (x 5); 4, stem, leaf sheath, ears and blade (x 2); 5-7, lowest floret of lowest fertile spikelet: 5, glume (x 1), 6, lemma (x 1); 7, palea (x 4); 8-10, uppermost spikelet: 8, glume ventral (x 1), 9, glume dorsal (x 1), 10, lemma (x 1); 11, ventral surface of mature seed (x 5); 12a, dorsal surface of mature seed, (x 5); 12b, ventral surface of mature seed (x 5). (1-2, 8. *Gandilyan s.n. ('8')*; 3-7, 9-12. *van Slageren & Obari MSKO-89132*; both cultivated at ICARDA from germplasm accessions.)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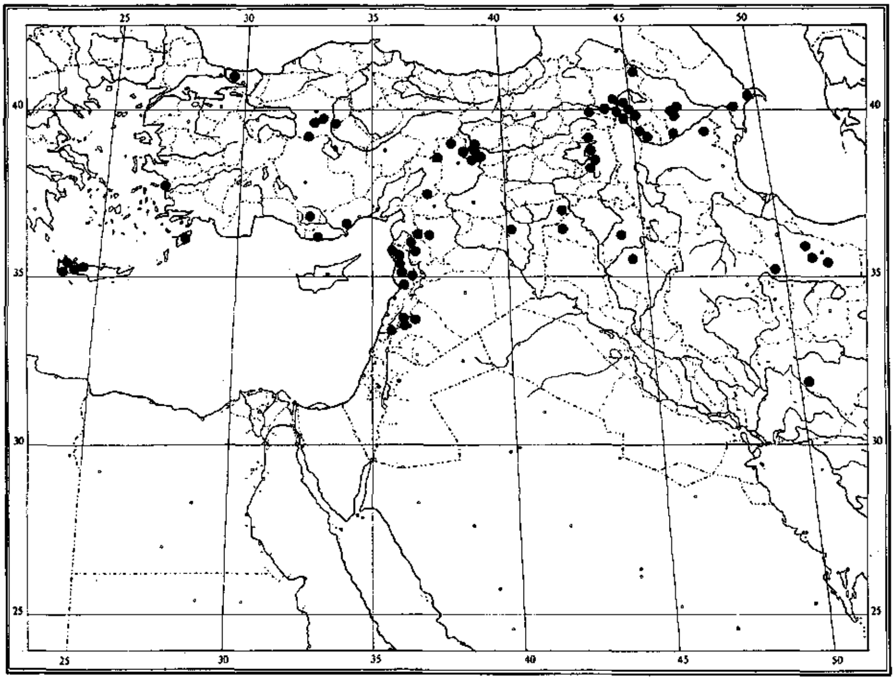


Fig. 25. Distribution of *Aegilops columnaris* in the eastern Mediterranean and western Asia. Adventive location in France not shown.

tion. *Lemmas* (*Fig. 24-6, 10*) of fertile florets 10-12 mm long, narrowly ovate-elliptical, boat-shaped; apex with 2-3 setulose awns, more slender and shorter than the glume awns, 0.3-3 cm long; apical part of outer surface often setose. *Paleas* (*Fig. 24-7*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 24-11, 12*) 5-8 mm, free from lemma and palea.

Distribution (Fig. 25): a Mediterranean / Western Asiatic element occurring mainly in Turkey and the western arc of the Fertile Crescent, but scattered in the eastern part of the arc as well. The area of distribution extends westwards to Crete, eastwards to Transcaucasia (Armenia, Azerbaijan). Rare in Iran. Uncommon throughout its range. Many new sites have recently become known because of germplasm collection activities. Found as an adventive near Marseille, France.

Ecology: in dry open fields, road- and hillsides, more rarely in forests of, e.g., *Pinus halepensis*. Mainly found on limestone, less frequently on basalt. Soil textures are predominantly stony, with additional clay, (clay)loam, and occasionally sand. Often found together with other *Aegilops* species. The range of annual rainfall data, 450-1250 mm, indicates that *Ae. columnaris* prefers a generally wetter environment than most *Aegilops* species.

Altitude: (0-)450-1990 m. Only occasionally lower than 450 m, but found at sea level.

Flowering and fruiting time: June – August.

Genome: UM (female parent 'U' x male parent 'M') with 2x = 2n = 28 (Chennaveeraiah, 1960: 91; Waines & Barnhart, 1992: Table 2).

Vernacular name:

Armenian: Aytzagn sugnazor / Karachod sugnazor [sugn = pillar] (Gandilyan in Kazarjan, 1990: 248). The name 'sugn' may refer to the strongly developed awn on the glumes of the lower, fertile spikelets.

Etymology: the final epithet is the Latin 'columnaris' [= columnar, column-shaped]. Where this refers to is unclear (but see the Armenian vernacular above).

Most of the 110 herbarium specimens examined:

ASIA: IRAN: Mazanderan, Tehran, S Elburz Mts., above Darakeh, *Alava 10550* (E); Agkeuth, *Bélanger 272/36* (P); Tehran, near Emirabad, *Bruhns s.n.* (US); N Sanadaj, *Furse 2101c* (K); Tehran, Imama Zader Gafyn, *Kotschy s.n.* (BM); Semiran to Sohana, *Kuckuck 176* (K); Hamadan to Tehran, *Kuckuck 499a* (B); Azerbaijan, Moghan, *Masef 9082e* (K); near Karaj, *Rechinger 227* (B).

IRAQ: Kirkuk, *Al-Effendi 3858A* (K); Balah, W Taweba, *Al-Rawi 21871A* (K); Jebl Sinjar, above Sinjar, *Handel-Mazetti 1467* (W).

LEBANON: Rayak, *Edgecombe A-428* (BEI); Ras Baalbek road, *Edgecombe B-902* (BEI); Kfarrine, *Mouterde 6040* (G); Rachaya, *Mouterde 3146* (G).

SYRIA: Jebl Abd-el-Aziz, Jezire, *Mouterde 350* (G); S of Deirik, Jezire, *Pabot s.n.(349)* (Min.Agr.Syr.); Damascus, NE Zabadani to Surghaya, *van Slageren & al. MSGMKO-88117H* (ICARDA, WAG); before Tukkaya on road Zabadani – Damascus, *van Slageren & al. MSGMKO-88125H* (ICARDA, WAG).

TURKEY: Içel, Silifke, *Alava 6651* (E); Kourdkeny, *Aznavour s.n.* (G); Maraş, *Balls 1121b* (ANK, K); Ankara ('Angora'), in valle Kawakli-Dere, *Bornmüller 14743* (A, B, G, LD, W, Z); Tunceli, Pertek – Tunceli, 25 mi. from Elâziğ, *Davis & Hedge 29108* (ANK, BM, E, K); 20 km Timar (Canik) to Van, *Davis 44223* (E); Tunceli, Pertek – Hozat, *Davis & Hedge 31071* (K); Van to Ercek, *Davis 44250* (E, K, SOM, US); Konya, Ermenek, *Doğan 113* (E); Elâziğ, Haropludagi, *Eren 113* (ANK); 137 km E Adana, *Johnson & Hall s.n.* (UCR); 90 km E Urfa, *Johnson & Hall s.n.* (UCR); Cilicia, near Anamur, *Péronin 105* (LD, LY-Gandoger, MPU, P, PRC); Aintab (= Gaziantep), *Post s.n.* (BEI, type of *Aegilops columnaris* var. *glabriuscula*); Mardin, Senar, *Sintenis 1639* (LD); Eğin (Kemaliye), Szanduk, *Sintenis 2646* (BR, LD, PR); Konya, Ermenek, Kazanci Kenerbasi civari, *Sümbül 2976* (HUB); Galatia, foot of Dizgurt-Dagh, *Zhukovsky s.n.* (WIR 635, type of *Aegilops columnaris*); Galatia, foot of Elma-Dagh, *Zhukovsky s.n.* (WIR 2718); 30 km SW Malatya, *Zohary s.n.* (UCR).

EUROPE: ARMENIA: Erevan reg., Dhzervesh, *Araratian s.n.* (ERE); Shorbulak, *Fedorov s.n.* (ERE); Gorovan, Vedi reg., *Gabrieljan s.n.* (ERE); Artachats reg., Zorachen, Mt. Yeranoz, *Gabrieljan s.n.* (ERE); Abovyan reg., Erebuni reserve, *Arutyunyan s.n.* (ERE, YAI); Vedi reg., Karaghlar, *Mulkidjanian s.n.* (ERE); Vedi reg., Tchiman (= Urtzazor), *Mulkidjanian & Nazarova s.n.* (ERE); Artachats, S Erevan, Chablu to Djzindzerlu, *Mulkidjanian & Gandilyan 236* (LE); Vedi reg., Karabachlar, *Mulidjanian & al. s.n.* (ERE); Aragats reg., Ashtarak, *Shukin 9446* (ERE); Yekhegnadzor reg., Daralagjaz, Mikoian, *Takhtajan s.n.* (ERE); Erevan, Zangozor, *Takhtajan s.n.* (ERE); Avdalar to Shorpulagh, *Tamamschjan & Maleev s.n.* (ERE); near Erevan, Rasdan river, *Tranzschel s.n.* (LE); Yekhegnadzor reg., Ortakent, *Tzvelev & Chepanov 798* (LE). NAGORNO-KARABACH: Gadrut reg., Domme, *Smolinjernova s.n.* (LE); Machmutli vill., *Vassiljev s.n.* (LE); Wesalu vill., *Vassiljev s.n.* (LE).

AZERBAIJAN: near Baku, *Bornmüller 8460* (B); Gibreel reg., Gamzalu and Gibreel, *Grossheim & al. s.n.* (LE); Zangelan reg., Perchevan and Akera, *Grossheim & al. s.n.* (LE); Kazach reg., Gancha prov., near Karasachkal, *Kolakovsky s.n.* (LE); Pais, *Takhtajan s.n.* (ERE). NAKHICHEVAN: Norachen reg., Achora, *Grossheim & al. s.n.* (LE); Aznaburt, Karaouch, *Takhtajan & al. s.n.* (ERE); Ordubat, *Yegerova & al. 488a* (LE).

GREECE, CRETE: Panormo to Rethymnon, *Damanakis 968* (K); Armeni to Rethymnon, *Damanakis 1098* (K); Ep. Kidonia, Chania to Perivolia, *Greuter 4580* (G, LD, Z); E Myrtos, *Röthlisberger s.n.* (G). RHODES: Salakos, *Carlström 69* (LD).

ADVENTIVE: EUROPE: FRANCE, BOUCHES DU RHÔNE: Montredon, near Marseille, *Ayasse s.n.* (G).

Germplasm collections examined:

ASIA: LEBANON: Terbol region, *Rubeiz A-14* (ICARDA); Beka'a valley, Sanin reg., *Rubeiz B-4, 6, 9, 11, 15, 19* (ICARDA); Antilebanon Mts., Irsal reg., *Rubeiz C-6, 16, 21, 25, 41* (ICARDA).

SYRIA: Idlib, after Sarmada, *Bourgois & Witcombe SY-20162* (IPGRI, ICARDA); Aleppo, Atareb to Qalat Semaan, *Bourgois & Witcombe SY-20179* (IPGRI, ICARDA); Damascus, Sednaya, *Holly & al. LR-152* (SARD, ICARDA); Lattakia, near Kasab, *Humeid & al. BMW-50-10* (SARD, ICARDA); Lattakia, W Qurdaha, *Humeid & al. BMW-42-3* (SARD, ICARDA); 28 km N Lattakia at Hrajiye, *Humeid & al. BMW-48-7* (SARD, ICARDA); Tartous, Mishtel el Hilo, *van Slageren & Obari MSKO-89132* (SARD, ICARDA); Aleppo, E Harem, *van Slageren & Obari MSKO-89142* (SARD, ICARDA); Lattakia, Saraya to Rabiah, *van Slageren & al. MSWRKA-88246* (SARD, ICARDA); Lattakia to Jisr-esh-Shughur, near Kensabeh, *van Slageren & al. MSWRKA-88256* (SARD, ICARDA); Lattakia, Kalet Banekthan to Shumboten, *van Slageren & al. MSWRKA-88268* (SARD, ICARDA); Tartous, Mosiaf to Shebbatr, *Valkoun & al. VDFKO-86* (SARD, ICARDA, VIR).

TURKEY: Van, 42 km SE Erciş – Karayollari Bakimevi, *Metzger & Jana 79TK075-406* (USDA); Mersin, 24 km SW Erdemli, Akkem, *Metzger & Jana 84TK047-121* (USDA); SE Van to Gurpinar, *Metzger & Jana 84TK502-003* (USDA); 29 km N Van, *Metzger & Jana 84TK571-002* (USDA); Aydin, N Kusadasi, *Metzger & Jana 79TK138-744C* (USDA); Kars, 35 km W Tuzluca, *Metzger & Jana 79TK091-458* (USDA); S Sivas on Malatya border, *Metzger & Jana 84TK430-001* (USDA); Ankara, NW Keskin, *Güzel & al. SNM-040889-0404* (ICARDA, PGRRI); NW Elâziğ, *Güzel & al. SNM-110889-0404* (ICARDA, PGRRI); Elâziğ, NW Keban, *Güzel & al. SNM-110889-0308* (ICARDA, PGRRI).

EUROPE: ARMENIA: outskirts of Erevan, *van Slageren & Gandilyan MSPG-92041* (ICARDA); hills Dzhervesh to Gegadir and Muchavan, *van Slageren & al. MSPGNG-92046* (ICARDA); Ashtarak reg., vill. Shorap, *van Slageren & Gandilyan MSPG-92074* (ICARDA).

AZERBAIJAN, NAKHICHEVAN: Dzhulfa reg., N to Abrakunis, *Megushova s.n.* (ICARDA, VIR).

Notes: 1. The collection, designated (but not published) in his herbarium by Zhukovsky as the type of *Ae. columnaris* (Turkey, Galatia, Dizgurt-Dagh and Elma-Dagh mountains, *Zhukovsky s.n.*, WIR 634), proved to be *Ae. neglecta*. A lectotype has been chosen from among four specimens, present in the typefold in WIR, only two of which proved to be *Ae. columnaris* (both others are *neglecta*). The choice between the two was made because the location of this specimen was cited by Zhukovsky (1928: 489), the other one was not.

2. *Aegilops columnaris* can be confused with the sympatric species *neglecta*. Differences are keyed out as follows:

Glumes of lower 2-3 spikelets elliptic-oblong, the apex usually with 2 awns: one large, 1.5-2.5 mm wide at the base and often bifurcating above, and one very small and linear, 1 mm or less at the base; – spike ovoid in the lower part, more linear in the upper part, with 3-4(-6) spikelets, all fertile .... **columnaris**

Glumes of lower, fertile spikelets obovate-elliptical, the apex usually with 3 awns of equal length and width at the base; – spike ovoid-ellipsoid and inflated in the lower part, then abruptly constricted and almost linear, with 3-6 spikelets of which the upper 1-3 sterile (however, these may be fertile under well-developed conditions) .... **neglecta**

10.5 **Aegilops comosa** Sm. in Sibth. & Sm. **Figs. 26-30**

Aegilops comosa Sm. in Sibth. & Sm., Fl. Graec. prodr. 1: 72 (1806), Fl. graec. 1: 75, Tab. 94 (1808); Roemer & Schultes, Syst. veg. 2: 772 (1817); Chaubart & Bory de Saint-Vincent in Bory de Saint-Vincent, Exp. sci. Morée, Bot. 3(2); 45 (1832); Kunth, Enum. pl. 1: 458 (1833, under 'Species dubiae'); von Steudel, Syn. pl. glumac. 1: 356 (1854); Tchichatscheff, Asie min., Bot. 2: 583 (1860; includes both varieties, see note 1); Boissier, Fl. orient. 5(2): 676 (1884); Post, Fl. Syria (ed. 1) 899 (1896, see note 2), (ed. 2) 2: 787 (1933, see note 2); Haussknecht, Symb. fl. graec., Mitt. Thür. Bot. Ver., Neue Folge 13: 62 (1899); von Halácsy, Consp. fl. graec. 3: 433 (1904); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 452, 512 (1928); Eig, Feddes Repert., Beih. 55: 107 (1929a, with ssp. *eu-comosa* var. *typica* on p. 108); Jansen & Wachter, Nederl. Kruidk. Arch. 138 (1931); Emberger & Maire, Cat. pl. Maroc 4: 947 (1941, see at Distribution); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 767 (1943); Jansen, Fl. neerl. I(2): 123 (1951); Maire & Weiller, Fl. Afrique nord 3: 356 (1955, with ssp. *eu-comosa* var. *typica* on p. 357); Chennaveeraiah, Acta Horti Gotoburg. 23: 165 (1960, with ssp. *comosa*), Proc. summer school bot., Darjeeling 46 (1962, with ssp. *comosa*); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980, with ssp. *comosa*); Hammer, Feddes Repert. 91: 235 (1980b, with ssp. *comosa* var. *comosa*); Davis, Fl. Turkey 9: 239 (1985, with ssp. *comosa*).

Type: (Greece) 'In insulis Græciæ frequens', *Sibthorp s.n.* (holo: OXF, not seen).

Homotypic synonyms:

Triticum comosum (Sm. in Sibth. & Sm.) K.Richt., Pl. eur. 1: 128 (1890); von Hayek, Prod. fl. pen. Balcan. 3: 226 (1932); Diapulis, Syn. fl. graec. 168 (1939, author as 'Richt.'); Bowden, Can. J. Bot. 37: 666 (1959), Can. J. Gen. Cyt. 8: 133 (1966); Morris & Sears in Quisenberry & Reitz, Wheat and Wheat Improvement 20 (1967, includes both vars. as '*Ae. comosa* S. & S. + *Ae. heldreichii* Holzm.'); Greuter in Greuter & Rechinger, Chloris Kythereia, Boissiera 13: 171 (1967); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 38 (1987).

Comopyrum comosum (Sm. in Sibth. & Sm.) Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 493 (1984, with ssp. *comosum*).

Heterotypic synonyms:

Ae. ambigua Hausskn., Symb. fl. graec. Mitt. Thür. Bot. Ver., Neue Folge 13: 62 (1899); von Halácsy, Consp. fl. graec. 3: 434 (1904), **syn. nov.** See note 3. – Type: (Greece, Attica, Lávrion, Kamárizos) distr. Laurion, prope Kamariza, 1885, *Haussknecht s.n.* (holo: JE, not found; iso: B (now †) *fide* Eig, 1929a: 109). – Homotypic synonyms: *Ae. comosa* Sm. in Sibth. & Sm. var. *ambigua* (Hausskn.) Eig, Feddes Repert., Beih. 55: 109 (1929a); Hammer, Feddes Repert. 91: 235 (1980b). *Triticum comosum* (Sm. in Sibth. & Sm.) K.Richt. forma ('γ') *ambiguum* (Hausskn.) Hayek, Prod. fl. pen. Balcan. 3: 226 (1932).

Ae. comosa Sm. in Sibth. & Sm. var. ('a)') *major* Hausskn., Symb. fl. graec., Mitt. Thür. Bot. Ver., Neue Folge 13: 62 (1899); Eig, Feddes Repert., Beih. 55: 108 (1929a, as 'var. *typica* ex parte'). – Syntypes: (Greece, 'præcipue in Pentilico, Phalero, Thessalia') Pentelikon, *Haussknecht s.n.* (BR, JE (not found), LE, PRC). For the Phaleron and Thessalia colls., see under *Ae. comosa* var. *thessalica*. – Note: various collections may refer to this variety, but the name *major* was not found connected with any of them. Considered *pro parte* as representing the typical variety, *pro parte* as the var. *thessalica* by Eig (1929a: 108), whose interpretation of the rank is now sustained by Art. 35.2, Ex. 2 of the *Code*.

Ae. comosa Sm. in Sibth. & Sm. var. *thessalica* Eig, Feddes Repert., Beih. 55: 109, Tab. VII, figs. e-k (1929a); Hammer, Feddes Repert. 91: 235 (1980b), **syn. nov.** – Syntypes: (Greece) Thessalia, Aïvali, 1888, *Haussknecht s.n.* (B †, JE (not seen)); (Greece) Attica, Phaleron, 1885, *Haussknecht s.n.* (B †). – Note: no type material was seen, but Eig's plate shows some variation in the typical variety of *Ae. comosa*. – Homotypic synonym: *Triticum comosum* (Sm. in Sibth. & Sm.) K.Richt. forma ('β') *thessalicum* (Eig) Hayek, Prod. fl. pen. Balcan. 3: 226 (1932).

For literature, typification and synonyms referring specifically to the varieties, see under there.

Key to the varieties:

Spike narrowly cylindrical, not inflated, with 3-4(-5) spikelets; – apical glumes with 1 strongly developed, diverging, 4-11 cm long central awn, and 2 lateral, more slender, 3-7.5(-10) cm long awns .... var. **comosa**

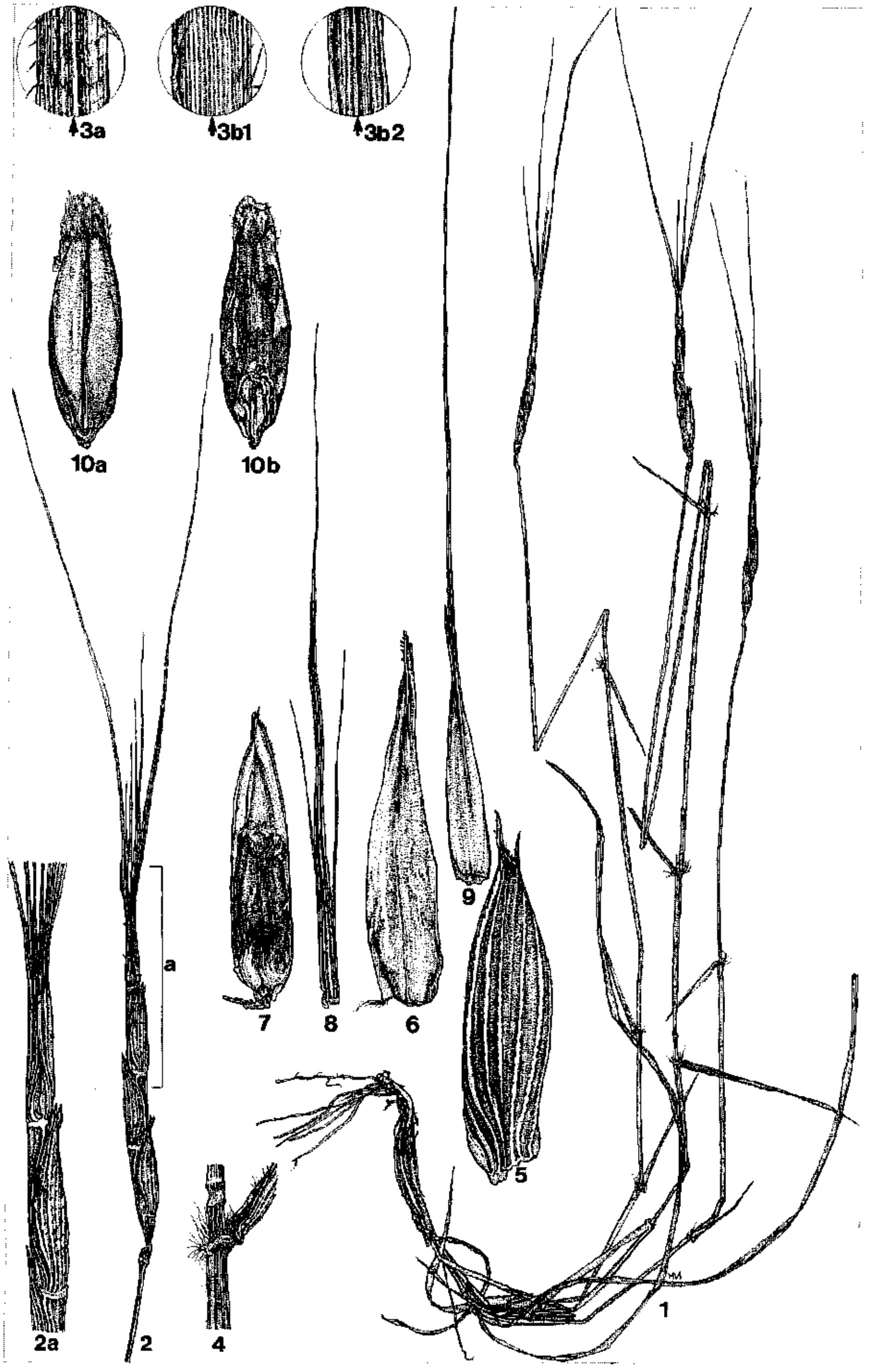
Spike moniliform, with 1-2(-3) urceolate spikelets; – apical glumes with 1 strongly developed, diverging, 3-5.5 cm long central awn, and 2 lateral, more slender, 2-2.5 cm long awns that are frequently reduced to teeth or absent .... var. **subventricosa**

10.5a **Aegilops comosa** Sm. in Sibth. & Sm. var. **comosa** **Figs. 26-27**

Diagnostic characters: tufted, many-tillered annuals, 10-35 cm tall excluding spikes; culms geniculate at base, then ascending; spikes narrowly cylindrical, tapering towards apex, 1.5-5 cm long excluding awns, with 3-4(-5) fertile and (0-)1(-2) rudimentary spikelets; glumes of lateral spikelets with 1 tooth and 1 short awn, of apical spikelet with 3 well developed awns, the central one 4-11 cm long and more diverging than the more slender, 3-10 cm lateral ones; apical lemmas with 1 awn of 3.5-4.5 cm and 2 lateral teeth that may develop into short awns; caryopsis free.

Description (Fig. 26): tufted *annuals*, usually with many tillers. *Culms* (*Fig. 26-1*) semi-erect, geniculate at base, then ascending, (10-)15-35 cm tall excluding spikes; foliage ± evenly distributed but more dense at base of culms. *Leaf* blades linear-acuminate, 4-7 cm long, 0.2-0.4 cm wide; sheath margins hyaline, ciliate. *Inflorescence* (*Fig. 26-2*) a narrowly cylindrical spike, tapering towards the apex, 1.5-4(-5) cm long excluding awns, 0.2-0.3 cm wide; disarticulating as one unit at maturity with the rudimentary spikelet(s) remaining attached to the culm; with 3-4(-5) fertile spikelets, rudimentary spikelets 1(-2), occasionally absent. *Spikelets* (*Fig. 26-2a*) sessile, ovoid-cylindrical, 1-1.2 cm long excluding teeth and/or awns, 0.2-0.3 cm wide, 0.8-1 times the length of the supporting rachis internode; with 4-5 florets of which the lower 2-4 are fertile. *Glumes* (*Fig. 26-5*) 2, coriaceous, the lateral ones ovate-lanceolate, 9-11 mm long, the apical one obovate to rectangular, 5-7 mm long; the surface scabrid, green, sometimes purplish-green, venation unequal in width, flattered, sunk into the surface, setulose, unequally spaced, usually more yellowish and lighter in colour than the rest of the glume surface; the apex of lateral glumes ending abaxially in a triangular tooth of 1-2 mm, adaxially in a short, setulose awn of 1.5-4 mm; apex of the apical glume (*Fig. 26-8*) extending into 3 setulose awns: a large, diverging central awn of 4-11 cm long, 1-2 mm wide at the

Fig. 26. *Aegilops comosa* var. *comosa*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlarged part of spike, showing spikelets in situ (x 2); 3a, abaxial leaf surface, midway (x 5); 3b1, adaxial surface of 3a (x 5); 3b2, adaxial leaf surface higher up the stem (x 5); 4, stem, leaf sheath, ears and blade (x 2); 5-7, lowest floret in centre of spike: 5, glume, 6, lemma, 7, palea and seed (5-7 all x 4); 8-9, apical spikelet: 8, glume (x 1), 9, lemma of upper floret (x 3); 10a ventral surface of mature seed (x 5); 10b, dorsal surface of mature seed (x 5). (1-10. *van Slageren & Guarino MSLG-89073*; cultivated at ICARDA from germplasm accession.)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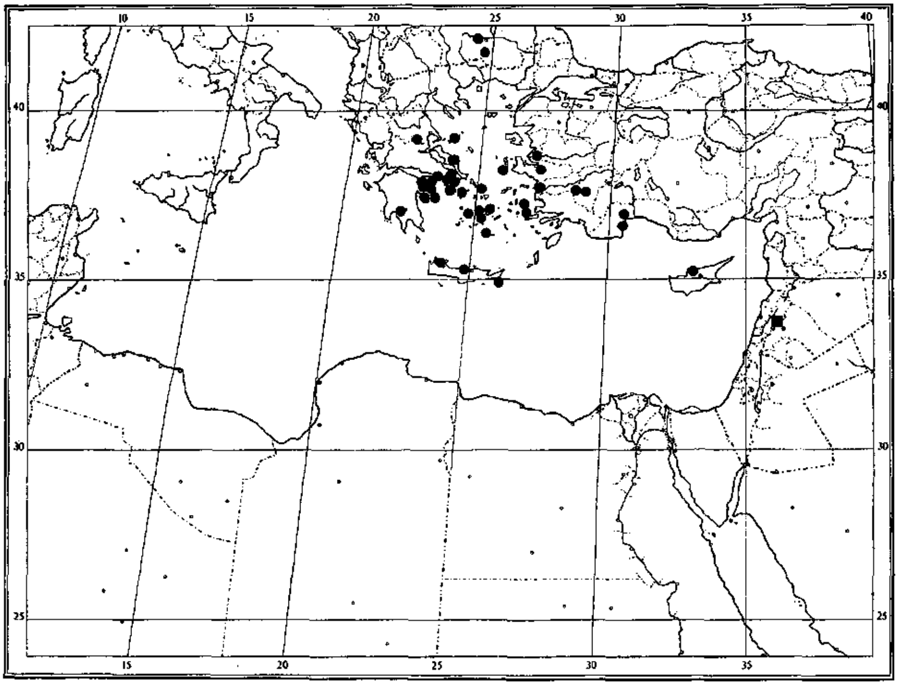


Fig. 27. Distribution of *Aegilops comosa* var. *comosa* in the eastern Mediterranean. ● = locations; ■ = locations, reported from the literature.

base, flanked by 2 lateral, shorter and more slender awns, 3-7.5(-10) cm long, sometimes reduced to 0.5-3 cm only, clearly less diverging than the central one, often remaining ± upright. *Lemmas* (*Fig. 26-6*) of lateral fertile florets 8-14 mm long, narrowly ovate-acuminate, boat-shaped, conduplicate and velutinous in the apical part; the apex with 1 short awn which is the extension of the central vein, and 1 small tooth (apex thus rather similar to the glume apex but less pronounced); apex of apical spikelet (*Fig. 26-9*) extending into 1 setulose awn, 3.5-4.5 cm long, with 2 lateral teeth that may develop into short awns; lemma awns slightly diverging. *Paleas* (*Fig. 26-7*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 26-10*) 5-7 mm long, free from lemma and palea.

Distribution (Fig. 27): a Mediterranean element occurring in coastal Yugoslavia, Albania, and coastal and inland Greece (its main area of distribution). For the first time reported here from (northern) Cyprus, while it was found for the first time in 1992 in southern Bulgaria by Dimitrov and Zacharieva (IIPGR) (pers. comm.): N Peruchtitza, Plovdiv reg., *Dimitrov & Zacharieva 9211, 9212* (IIPGR, not seen); near Simitovo, reg. Pazarchik, *Dimitrov & Zacharieva 9213* (IIPGR, not seen). Additional scattered distribution throughout Turkey, but most locations historical. Except for Greece, uncommon to rare throughout its range. Found as an adventive in Morocco and reported by Emberger & Maire (1941: 947, 'spontanéité') and Maire & Weiller (1955: 357, 'très rare'), as well as in the Netherlands (Jansen,

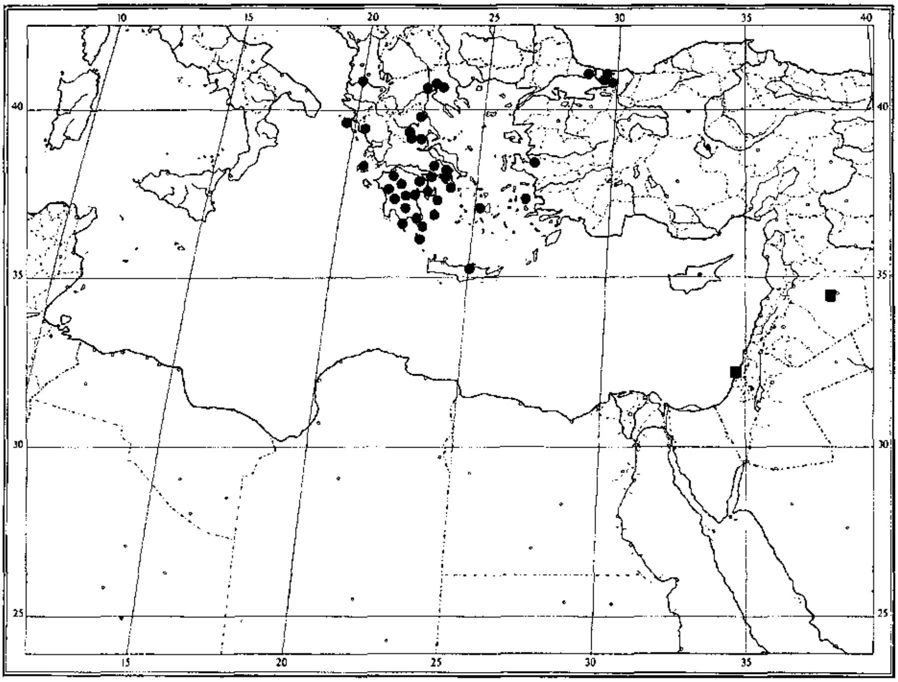


Fig. 28. Distribution of *Aegilops comosa* var. *subventricosa* in the eastern Mediterranean. ● = locations; ■ = locations, reported from the literature.

1951: 123; at IJselmonde – not seen).

Ecology: on roadsides, grasslands and hillsides, in garrigue, and sometimes in cultivated fields. Mainly on limestone with a clayloam soil texture. Rarely on saline soils (e.g., Corfu, Greece). Data on ecology and soil type are, however, scarce.

Altitude: from sea level up to 500 mm, rarely to 800 m.

Flowering and fruiting time: May – July.

Genome: M with 2x = 2n = 14 (Chennaveeraiah, 1960: 89, sub *A. comosa* and *A. heldreichii*; Waines & Barnhart, 1992: Table 1, sub *Ae. comosa*).

Etymology: to final epithet is derived from the Latin 'comosus' [= bearing a tuft of hairs or leaves, cf., Stearn, 1978: 404]. Most likely referring to the many, long apical glume and lemma awns.

Most of the 140 herbarium specimens examined:

ASIA: TURKEY: Izmir, *Balansa 13* (BM, C, E, G, G-BOIS, JE, LY, LY-Gandoger, LY-Jordan, MPU, P, US, W); ibid., *Fleischer 282* (B, BR, E, G-BOIS, LE, MO, P, PR, PRC, TUB); Antalya, Lydia, Tahtali Dag Mts., Pinarbaşi, *Bornmüller 10211* (B, BM, E, JE, K, LY, P, PR, PRC, US, W); 6 km W Denizli, *Zohary s.n.* (UCR).

EUROPE: CYPRUS: W Kyrenia, *van Slageren & Guarino MSLG-89073H* (ICARDA, ARI).

GREECE, ATTICA: Mt. Parnethis, *Guiol 160* (FI), *1670* (BM); Athens, Pentelikon, *Haussknecht s.n.* (BR, LE, PRC, type of *Aegilops comosa* var. *major*); Laurion, *Haussknecht s.n.* (GE, K, LD); Turko Wuni, *Haussknecht s.n.* (BM, W); Hymethus (Imittós) Mts., *Rainer von und zu Haarbach s.n.* (PI); W Agios Nikolaos, *Snogerup 20320* (LD); Lycabettos, *von Spruner s.n.* (G-BOIS, JE, LD, TUB); olive forest near Athens, *von Spruner s.n.* (G-BOIS); Megara, *Saint Lager s.n.* (G, K, NY); Phaleron, *von*

Heldreich 606b (BM, F, G, GE, JE, K, LD, LY, OXF, P, PR, PRC, W, Z); Menidi, near Athens, *von Heldreich 106b* (FI); near Athens, *von Heldreich s.n.* (FI, G, K, LY-Gandoger, W), *2551 p.p.* (FI, G-BOIS, K, P, W); Pharmacusarum, Mt. Lero, *von Heldreich s.n.* (G-BOIS). PELEPONNESUS: Gaenius Methana, *Hassknecht s.n.* (JE); Kalamáki, isthmus of Corinthe, *Lacaita s.n.* (BM, K); Argolis penins., Koilas, *Runemark & Svensson 48787* (LD); Argolis penins., above Loukaiton, NW Iliokastron, *Runemark & Svensson 48768* (LD); Corinthe, *Saint Lager s.n.* (A, G, K, NY); Epidauros, *Zohary s.n.* (UCR); S Corinthe, *Zohary s.n.* (UCR). THESSALIA: Thessalia plain, Orman Magula, *Haussknecht s.n.* (JE); Pertuli, *Johnson s.n.* (UCR). ISLANDS: ANTIPAROS: s.loc., *Runemark & Bentzer 28776* (LD). CHIOS: SW Agios Georgios Sykousis, *Snogerup 7661* (LD). CRETE: Chania, *Reverchon 181* (K). EUBOEA: s.loc., *Amshoff s.n.* (WAG). IRAKLIA: harbour to Spitea Cove, *Runemark & Nordenstam 13300, 13286* (LD). KÉA: top Mt. Agios Theodoros, N old Karthea, *Snogerup & von Bothmer 34429-e* (LD); SW islet Spanopoula, *Snogerup & von Bothmer 34278* (LD); S Kastriani, *Snogerup & von Bothmer 34333* (LD). KOUFONISIA: s.loc., *Runemark & Nordenstam 15853* (LD). LEROS: Drima, *Runemark & Nordestam 15760* (LD); peak of the mountain, *Runemark & Snogerup 10875* (LD). NAXOS: ENE Skado, *Runemark 3734* (LD); Panormou canyon, *Runemark & Snogerup 10779* (LD); W Ormos Agiasou, *Runemark & Snogerup 10123* (LD). PAROS: S Venetia, *Runemark & al. 41436* (LD); S Naoussa, *Runemark & Bentzer 29280* (LD). SIFNOS: Ormos Kouda, *Runemark & Snogerup 8409, 8449* (LD): W Agios Elias, *Runemark & Snogerup 8648* (LD). THIRA (SYRA): s.loc., *Gandoger s.n.* (K). TINOS: N Istemia, *Runemark & Engstrand 37189* (LD); Panormos, *Runemark & Engstrand 36877* (LD); Siamnidia to Panormos, *Runemark & Engstrand 37463* (LD). YIOURA: cape Angistri, *Phitos 19706* (LD).

ADVENTIVE: AFRICA: MOROCCO: 2 km from Taza, *Weiller s.n.* (MPU).

Germplasm collections examined:

ASIA: TURKEY: Aydin, N. Kusadasi, *Metzger & Jana 79TK138-750* (USDA); near Denizli – Asagisamli junction, *Metzger & Jana 84TK157-008* (USDA); W Denizli, *s.coll., s.n.* (ICARDA, UCR G-1290); N Mememen, *s.coll., s.n.* (ICARDA, UCR G-5032). EUROPE: GREECE: Peleponnesus, S Corinth, *s.coll., s.n.* (ICARDA, UCR G-1288, G-1289); Thessalia, Pestuli, *s.coll., s.n.* (ICARDA, UCR G-1515).

Notes: 1. Tchichatscheff (1860: 583) refers to Sibthorp & Smith (1808, Tab. 94) for *Aegilops comosa*, which then applies to the typical variety. However, he also lists 'Herb. gr. norm. No. 606', which refers to von Heldreich's *Herbarium graecum normale, series I*. This collection was later used for the description of the variety *β subventricosa* of *Aegilops comosa* by Boissier.

2. Post (1896; 1933) describes *Ae. comosa* (var. *comosa*) from El Masna'ah in the Antilebanon mountains on the Lebanese-Syrian border. This (adventive) locality could not be confirmed with any herbarium specimen in Post's herbarium in BEI.

3. The name *Aegilops ambigua* Hausskn. was published as representing a hybrid of *Aegilops caudata* x *Ae. comosa* (Haussknecht, 1899: 62). Eig (1929a: 109) made it a variety of *Aegilops comosa* (ssp. *eu-comosa*), characterized by only one apical glume awn with, in addition, a tooth or short awn at the base (this on at least one of the apical glumes). Although he cites incompletely what may very well represent Haussknecht's original material ('...Athen, leg Haussknecht 1885 (Herb, Hausskn.! Herb. Bot. Gart. Dahlem!...', l.c., 109; the location Kamariza (SE Athens) is omitted), neither of the two herbaria involved (JE and B, respectively in the citation) has yielded it. The B specimen is now most likely destroyed. Eig's Tab. VII, figs. c-d, referring to the var. *ambigua*, corresponds with the description of his variety. *If* any of these two figures refers to the original Haussknecht type, I agree with Eig that a location with *Ae. comosa* (under the typical var. *comosa*) is the most acceptable, the 2-3 spikelets shown (usually 4-7 in *caudata*) being typical for this species. It would represent forms with less well-developed apical awns than is usual in *Aegilops comosa*. However, as Haussknecht (1899: 62) correctly remarks, both *Ae. comosa* and *caudata* are common in Attica and natural hybrids may occur.

10.5b **Aegilops comosa** Sm. in Sibt, & Sm, var ('β') **subventricosa** Boiss.

Figs. 28-30

Aegilops comosa Sm. in Sibt. & Sm. var. ('β') *subventricosa* Boiss., Fl. orient. 5(2): 676 (1884); Haussknecht, Symb. fl. graec., Mitt. Thür. Bot. Ver., Neue Folge 13: 62 (1899); Post, Fl. Syria (ed. 1) 900 (1896; see note 6); Eig, Feddes Repert., Beih. 55: 110 (1929a); Hammer, Feddes Repert. 91: 236 (1980b, as var. of ssp. *heldreichii*). See note 1.

Lectotype (*nov.*): (Greece) in collibus aridis Atticae ad radices montis Parnethis prope Khasia, 6.VI.1857, *von Heldreich 606* (G-BOIS; isolectotypes: A, C, G, FI, JE, K, L, LE, LY, LY-Gandoger, LY-Jordan, MPU, P, PI, W). See note 2.

Homotypic synonyms:

Ae. subventricosa Jaub. & Spach ex Bornm., Beitr. Kenntnis Fl. Syrien, Palästina, Verh. k.k. zool.-bot. Ges. Wien 48: 651 (1898, '*subventrica*'), *nom. inval.* See note 3.

Triticum heldreichii (Holzm. ex Boiss.) K.Richt. forma ('α') *subventricosum* (Boiss.) Hayek, Prod. fl. pen. Balcan. 3: 227 (1932).

Sub nom. *Ae. comosa* auct. non Sm. in Sibth. & Sm. *pro parte*: Jaubert & Spach, Ill. pl. orient. 4: 19, Tab. 314 (1851a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 357 (1851b); Walpers, Ann. bot. syst. 3: 790 (1852); Nyman, Consp. fl. eur. 4: 839 (1882, refers mainly to colls. of this variety, especially *von Heldreich 606*).

Heterotypic synonyms:

Ae. caudata L. var. ('γ') *heldreichii* Holzm. ex Boiss., Fl. orient. 5(2): 675 (1884), **syn. nov.** See notes 1 and 4. – Type: (Greece, Attica) in montis Parnethis prope Dekeleiam (Tatoï hodie), VI.1881, *Holzmann s.n.* (holo: G-BOIS; iso: LE). – Homotypic synonyms: *Ae. heldreichii* (Holzm. ex Boiss.) Nyman, Consp. fl. eur., Suppl. 2: 342 (1890, '*Heldreichii*'); Bornmüller, Beitr. Kenntnis Fl. Syrien, Palästina, Verh. k.k. zool.-bot. Ges. Wien 48: 651 (1898, '*Heldreichi*'); von Halácsy, Consp. fl. graec. 3: 433 (1904); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 452, 515 (1928, on p. 452 with authors '(Holzm.) Halácsy', on p. 515 with author 'Holzm.'). *Triticum heldreichii* (Holzm. ex Boiss.) K.Richt., Pl. eur. 1: 128 (1890); Dörfler, Herbarium normale, Schedae ad Centuriam 39: 323 (1899, publication of Exsicc. 3898); von Hayek, Prod. fl. pen. Balcan. 3: 227 (1932); Diapulis, Syn. fl. graec. 168 (1939, author as 'Richt.'). *Triticum caudatum* (L.) Gren. & Godr. var. ('II.') *heldreichii* (Holzm. ex Boiss.) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 710 (1902). *Ae. comosa* Sm. in Sibth. & Sm. ssp. *heldreichii* (Holzm. ex Boiss.) Eig, Feddes Repert., Beih. 55: 109 (1929a, '*Heldreichii* (Holz.) Eig'); Post, Fl. Syria (ed. 2) 2: 787 (1933; see note 6); Chennaveeraiah, Acta Horti Gotoburg. 23: 166 (1960), Proc. summer school bot., Darjeeling 46 (1962); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980); Hammer, Feddes Repert. 91: 235 (1980b); Davis, Fl. Turkey 9: 239 (1985). *Triticum comosum* (Sm. in Sibth. & Sm.) K.Richt. ssp. *heldreichii* (Holzm. ex Boiss.) Greuter in Greuter & Rechinger, Chloris Kythereia, Boissiera 13: 171 (1967). *Comopyrum comosum* (Sm. in Sibth. & Sm.) Á.Löve ssp. *heldreichii* (Holzm. ex Boiss.) Á.Löve, Feddes Repert. 95: 494 (1984).

Ae. turcica Azn., Bull. Soc. bot. France 44: 177 (1897); Haussknecht, Symb. fl. graec., Mitt. Thür. Bot. Ver., Neue Folge 13: 62 (1899). – Lectotype (*nov.*): (Turkey) Constantinople, lieux herbeux des collines près de Kartal, 27.VI.1897, *Aznavour s.n.* (G; isolectotypes: B, BM, G, JE, LD, LY, LY-Gandoger, MPU, P, US, W). See Fig. 30 and note 5.

Ae. comosa Sm. in Sibth. & Sm. var. ('b)') *minor* Hausskn., Symb. fl. graec., Mitt. Thür. Bot. Ver., Neue Folge 13: 62 (1899), **syn. nov.** – Type: (Greece, Attica) 'In collibus aridis Att.', *Haussknecht s.n.* (holo: JE, not found). – Note: considered by Haussknecht (l.c., 62: '...huc pertinet *Ae. heldreichii* Holzm. in Heldr. hb. norm no. 986...') very close to the collection *von Heldreich 986* from Achaia, which is var. *subventricosa*. Various collections from Attica in JE may refer to this variety, but none was found connected with this varietal name. Interpretation of the rank as variety follows Eig (1929a: 108-109) for 'a)' *major*, and thus Art. 35.2, Ex. 2 of the *Code*.

Ae. comosa Sm. in Sibth. & Sm. var. *achaica* Eig, Feddes Repert., Beih. 55: 110 (1929a); Hammer, Feddes Repert. 91: 236 (1980b), **syn. nov.** – Type: (Greece) Achaia, Mt. Kyllenes, near Pellene, 1887, *von Heldreich 986* (holo: B †; iso: BC, BM, C, FI, G, GE, JE, K, LD, LE, LY, LY-Gandoger, MPU, P, PR, SO, TO, W, Z). – Homotypic synonym: *Triticum heldreichii* (Holzm. ex Boiss.) K.Richt. forma ('β') *achaicum* (Boiss.) Hayek, Prod. fl. pen. Balcan. 3: 227 (1932).

Ae. comosa Sm. in Sibth. & Sm. var. *biaristata* Eig, Feddes Repert., Beih. 55: 110 (1929a); Hammer, Feddes Repert. 91: 236 (1980b), **syn. nov.** – Syntypes: (Greece) Morea (= Peleponnesus), *Chaubart s.n.* (G); (Greece) Sparta, 1844, *Lenormand s.n.* (G-BOIS). – Homotypic synonyms: *Triticum heldreichii* (Holzm. ex Boiss.) K.Richt. forma ('γ') *biaristatum* (Eig) Hayek, Prod. fl. pen. Balcan. 3: 227 (1932). *Triticum comosum* (Sm. in Sibth. & Sm.) K.Richt. var. *biaristatum* (Eig) Greuter in Greuter & Rechinger, Chloris Kythereia, Boissiera 13: 172 (1967).

Uncertain status:

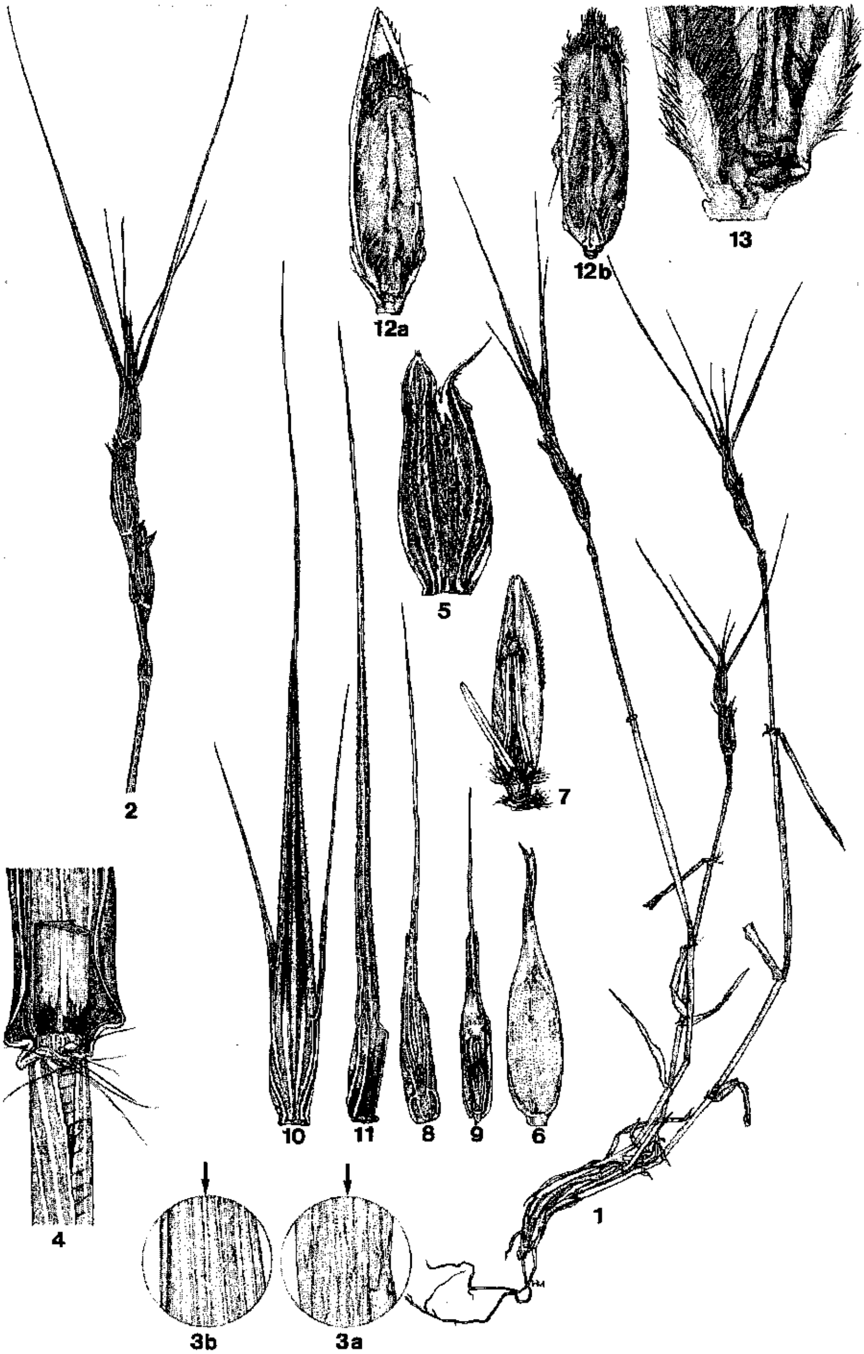
Ae. comosa Sm. in Sibth. & Sm. var. ('d)') *polyathera* Hausskn., Symb. fl. graec., Mitt. Thür. Bot. Ver., Neue Folge 13: 62 (1899); von Halácsy, Consp. fl. graec. 3: 434 (1904); Eig, Feddes Repert., Beih. 55: 111 (1929a); Hammer, Feddes Repert. 91: 236 (1980b, as var. of *Ae. comosa* ssp. *heldreichii*). – Type: not indicated (a few Greek locations mentioned only: Phaleron, Orman Magula, Aïvali). – Homotypic synonyms: *Ae. comosa* Sm. in Sibth. & Sm. ssp. ('β') *pluriaristata* Halácsy, Consp. fl. graec. 3: 434 (1904); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 514 (1928, designates it subspecies status); Eig, Feddes Repert., Beih. 55: 111 (1929a). *Triticum comosum* (Sm. in Sibth. & Sm.) K.Richt. var. ('B') *pluriaristatum* (Halácsy) Hayek, Prod. fl. pen. Balcan. 3: 226 (1932), although a different epithet for the same taxon not a *nom. illeg.* See note 7.

Ae. comosa Sm. in Sibth. & Sm. var. *confusa* Eig, Feddes Repert., Beih. 55: 116 (1929a), *nom. inval.* (probably; if so then because of Art. 34.1 *(b)*: provisional name) – Type: not indicated. See note 8.

Diagnostic characters: shorter, more stout inflorescence than var. *comosa*, with 1-2(-3) fertile spikelets, the lateral ones urceolate, the apical one obconical; glume apex with 1 triangular tooth and 1 awn.

Description (Fig. 29): *inflorescence* (*Fig. 29-2*) a moniliform spike, shorter and more stout than of var. *comosa*, not or hardly tapering towards the apex, 2-3.5 cm long excluding awns, 0.3 cm wide; with 1 rudimentary and 1-2(-3) fertile spikelets. Lateral *spikelets* urceolate, the apical one obconical. *Glumes* (*Fig. 29-5*) 2, coriaceous, ovate; the apex of lateral glumes with a broadly triangular tooth, around 2 mm long on the abaxial side, and a short, 2-4 mm awn on the adaxial side, tooth and awn curved outwardly and distinctly pointing in opposite directions; apex of apical glume (*Fig. 29-10*) extending into 3 setulose awns, generally shorter than those of var. *comosa*, 3-5.5 cm long, the more slender, lateral awns also generally shorter, 2-2.5 cm long, often one or both reduced to teeth or even absent (*Fig. 29-*

Fig. 29. *Aegilops comosa* var. *subventricosa*. 1, habitus (x 1/2); 2, spike (x 1); 3a, abaxial leaf surface, midway (x 6); 3b, adaxial surface of 3a (x 6); 4, stem, leaf sheath, ears and blade (x 5); 5-7, lowest florest of lowest fertile spikelet of a spike: 5, glume, 6, lemma, 7, palea and anthers (5-7 all x 3); 8, lemma of lower floret of apical spikelet, abaxial view (x 2); 9, lemma of upper floret of apical spike, adaxial view (x 2); 10, glume of lower floret of apical spikelet, abaxial view (x 2); 11, glume of upper floret of apical spikelet, adaxial view (x 2); 12a, palea and dorsal surface of mature seed (x 5); 12b, ventral surface of mature seed (x 5); 13, enlargement of 12a, showing lodicules in situ (x 15). (1-13. *Metzger & Jana 84TK154-046*, cultivated at ICARDA from germplasm accession, received from PGRRI; material originally from Croatia or Greece.)



2
12a
12b
13
5
7
4
10
11
8
9
6
1
3b
3a

11). *Lemmas* (*Fig. 29-6*) of fertile florets in the apical region flat and not conduplicate, the apex of the apical spikelet lemmas (*Fig. 29-9*) with a central awn, 1.5-2.5 cm long and thus shorter than the one of var. *comosa*, with 2 lateral teeth, not developing into short awns.

Otherwise as var. *comosa*.

Variation: in the lateral awns of the apical glumes: from 2-2,5 cm long to reduced to teeth to even absent. The reduction can be found in one or both lateral awns.

Distribution (Fig. 28): sympatric with var. *comosa*; also known from Albania but not from Cyprus and Bulgaria. Most locations in Turkey are probably historic. Rare throughout its range but possibly more common in Greece.

Ecology, altitude, flowering and fruiting time, genome type: similar to var. *comosa*.

Etymology: the final epithet is derived from the Latin 'ventricosus'[= swollen, especially on one side, cf., Stearn, 1978: 543], and refers to the spikelet outline.

Most of the 185 herbarium specimens examined:

ASIA: TURKEY: Ochranli, Qidinli-dere, *Aznavour s.n.* (G); Kartal to Yacadjik, *Aznavour s.n.* (G); Yacadjik to Dolaïba, *Aznavour s.n.* (G); Kartal to Soganli-Yacadjik, *Aznavour s.n.* (G); Pendik – Dolaïba, *Aznavour s.n.* (G); valley of Qidinli, near bridge Pendik – Yougla, *Aznavour s.n.* (BM, G); Constantinopel (= Istanbul), near Kartal, *Aznavour s.n.* (B, BM, G, JE, LD, LY, LY-Gandoger, MPU, P, US, W, type of *Aegilops turcica*); ibid., *Aznavour s.n.* (Exsicc. Dörfler 3898) (B, BM, FI, GE, JE, LD, LY, MPU, OXF, PR, PRC, SO, Z); 65 km W Izmit to Istanbul, *Bot. Exp. Univ. Kyoto BMUK 5804, 5805* (UCR); Istanbul, Domuzdere, Belgrade forest, *B. Post A2(1)* (E); 21 km S Çanakkale towards Izmir, *Tüten & al. CNM-200689-0103* (IZ); Gebze to Istanbul, *Zohary s.n.* (UCR).

EUROPE: ALBANIA: Antibaria(?), *Baldacci s.n.* (BM).

GREECE, ATTICA: Ep. Kithara, W Kapsàli, *Greuter 6539* (G); Mt. Parnethis, near Prophitis Hilias, *Guiol 1669* (BM); Athens, Pentelikon, *Haussknecht s.n.* (BM, JE); Launion, *Haussknecht s.n.* (JE, P); Phaleron, *Haussknecht s.n.* (JE); Mt. Parnethis, near Dekeleiam, *Holzmann s.n.* (G-BOIS, LE, type of *Aegilops caudata* var. *heldreichii*); near Kifisia, *Leutwein de Fellenberg s.n.* (MPU); Mt. Parnethis near Khasia, *von Heldreich 606* (A, C, G, G-BOIS, FI, JE, K, L, LE, LY, LY-Gandoger, LY-Jordan, MPU, P, PI, W, type of *Aegilops comosa* var. *subventricosa*); near Athens, *von Heldreich s.n.* (BM, BR); Phaleron, *von Heldreich s.n.* (LD); Mt. Parnethis, near Dekeliam, *von Heldreich s.n.* (G, LD). MACEDONIA: Thessaloniki, *Nadji s.n.* (LD); N Saloniki, *Zohary s.n.* (UCR, US cult.); 80 km N Saloniki, *Zohary s.n.* (UCR). PELEPONNESUS: near Nauplion, *Berger 182* (MO); Achaia, Patras, *Bornmüller 1710* (BC, BM, G, JE, K, LD, PR, Z); Achaia, near Kalavryta, *Bornmüller 1711* (BC, BM, JE, K, LD, PR, Z), *1712* (G, LD, Z); Olympia ruins, Droura hill, *Bot. Exp. Univ. Kyoto BMUK 5807, 5808, 5810, 5812, 5813* (UCR); s.loc. ('Moreé'), *Chaubart s.n.* (G, type of *Aegilops comosa* var. *biaristata*); 'Moreé', Elaphanis, *Despreaux s.n.* (G); 'Moreé', Magne, *Despreaux s.n.* (G); Acro-Corinthe, *Disprenne s.n.* (JE); near Sparta, *Lenormand s.n.* (G-BOIS, type of *Aegilops comosa* var. *biaristata*); Lakonia penins., Limin Jerakos, *Runemark & Svensson 48254* (LD); Lakonia penins., Mani, S Velanidia, *Runemark & Svensson 48081* (LD); Argolis, E Adami, *Runemark & Svensson 48704* (LD); Argolis, N Palea Epidhavros, *Runemark & Svensson 48634* (LD); near Nauplion, Argolides, *von Heldreich s.n.* (G); Achaia, Mt. Kyllenes near Pellene, *von Heldreich 986* (BC, BM, C, FI, G, GE, JE, K, LD, LE, LY, LY-Gandoger, MPU, P, PR, SO, TO, W, Z, type of *Aegilops comosa* var. *achaica*); Nauplion, *Zuccarini s.n.* (NY). PIROS: Igoumenitsa, *Helli s.n.* (UCR); Paramythia, *Helli s.n.* (UCR). STEREA: Fokís prov., SW Itéa, *Runemark & al. 44404* (LD). THESSALIA: Thessalia plain, Orman Magula and Aïvali Pharsalitis, *Haussknecht s.n.* (JE); ibid., Aïvali, *Haussknecht s.n.* (A, BM, BR, FI, G, K, LD, LE, P, PRC, W); near Aïvali, *von Heldreich 898* (A, BEI, BM, FI, G, GE, JE, K, LD, LE, LY-Jordan, MPU, NY, P, PR, SO, TO, W). ISLANDS: ARKOI: s.loc., *Runemark & von Bothmer 46548* (LD). CORFU: near Potamos river, NW Corfu town, *Hansen 1286* (GAT). CRETE: Chania to Souda, *Bot. Exp. Univ. Kyoto BMUK 5814, 5816* (UCR); Iraklion, Spilea Cove, *Runemark & Nordenstam 13209* (LD). KE-

FALLINIA; E Sami, *Snogerup 23642* (LD); NW Poros, *Snogerup 23824* (LD). KYTHERA: Kapsàli, *Greuter 24992* (G). LIPSOI: SE Lipsói town, *Runemark & von Bothmer 46598* (LD). PARAPOLA: s.loc., *Runemark & von Bothmer 47069* (LD). TRIKERI: Spetsai-Idhra, *Runemark & von Bothmer 47188* (LD).

Germplasm collections examined:

ASIA: TURKEY: Yebze – Istanbul road, *s.coll., s.n.* (ICARDA, UCR G-602); 40 km W Izmit to Istanbul, *s.coll., s.n.* (ICARDA, UCR G-1428).

EUROPE: GREECE: NE Saloniki, *s.coll., s.n.* (ICARDA, UCR G-603 & G-1291); Epiros (Paramythia), *s.coll., s.n.* (ICARDA, UCR G-1517); S Thebe, *s.coll., s.n.* (ICARDA, UCR G-5037).

Notes: 1. Boissier (1884: 675-676) simultaneously published *Aegilops caudata* L. var. ('γ') *heldreichii* Holzm. ex Boiss. (l.c., p. 675) and *Ae. comosa* Sm. in Sibth. & Sm. var. ('β') *subventricosa* Boiss. (l.c., p. 676). Both epithets are thus of the same date. The combination of *heldreichii* at variety level under *Ae. comosa* appears not to have been made thus far (see the nomenclature above) as Eig's (1929a: 109) combination is at subspecies level. Likewise, the combination of *subventricosa* at subspecies level has also not been made thus far either. When classified at variety level the final epithet therefore must be *subventricosa* Boiss., when seen at subspecies level the epithet must be *heldreichii* (Holzm. ex Boiss.) Eig.

No ranks were indicated by Boissier at his infraspecific taxa, but they are varieties following Art. 35.3 of the *Code*.

2. Boissier (l.c.) cited two collections with his variety *subventricosa*, *von Heldreich 606* and *Bory* (s.n.), both from Greece. Inspection of G-BOIS revealed, however, *Lenormand s.n.* rather than Bory as the collector of material from the Sparta region. In view of this, and because the von Heldreich collection is well distributed and better documented, the von Heldreich collection is chosen as the lectotype. The Lenormand collection was later taken up in the syntypes of var. *biaristata* by Eig (1929a). No Bory material has been available in G-BOIS. With his *caudata* var. *heldreichii*, Boissier (1884: 675) cited in detail the Greek location from Attica, but abbreviated the collector as '*Heldr!*'. However, his herbarium shows *Holzmann* instead on the type-sheet.

3. The name *Ae. subventricosa* Jaub. & Spach ex Bornm. is invalid because of Art. 34.1*(a)* as it is not accepted by Bornmüller. His reference to a varietal status of the epithet with Jaubert & Spach ('...*Ae. subventricosa* Jaub. & Spach (pro var.)...', Bornmüller, 1898: 651) is erroneous as neither rank nor epithet are mentioned with the latter authors. He suggests elevation of β *subventricosa* to species rank as he disagrees with Boissier's diagnosis of *heldreichii*. At the same time, however, all his comments are under the main header of *Aegilops heldreichii*, rather than *Ae. subventricosa*!.

4. It must be noted that the name *heldreichii* from Holzmann is older than 1884. It appeared on the printed label of 'De Heldreich plantae exsicc. Florae Hellenicae', von Heldreich's exsiccatae series of the Greek flora, in 1881 (and is as such quoted by Zhukovsky (1928: 515) at '*Ae. heldreichii* Holzm.'). The label (of this holotype in G-BOIS) furthermore presents the type location with date ('Jul. 1881') and the notation '*Aegilops Heldreichii* Holzmann – Aeg. caudatae var?'. Although this constitutes effective publication in the sense of Art. 29, it is invalid because of

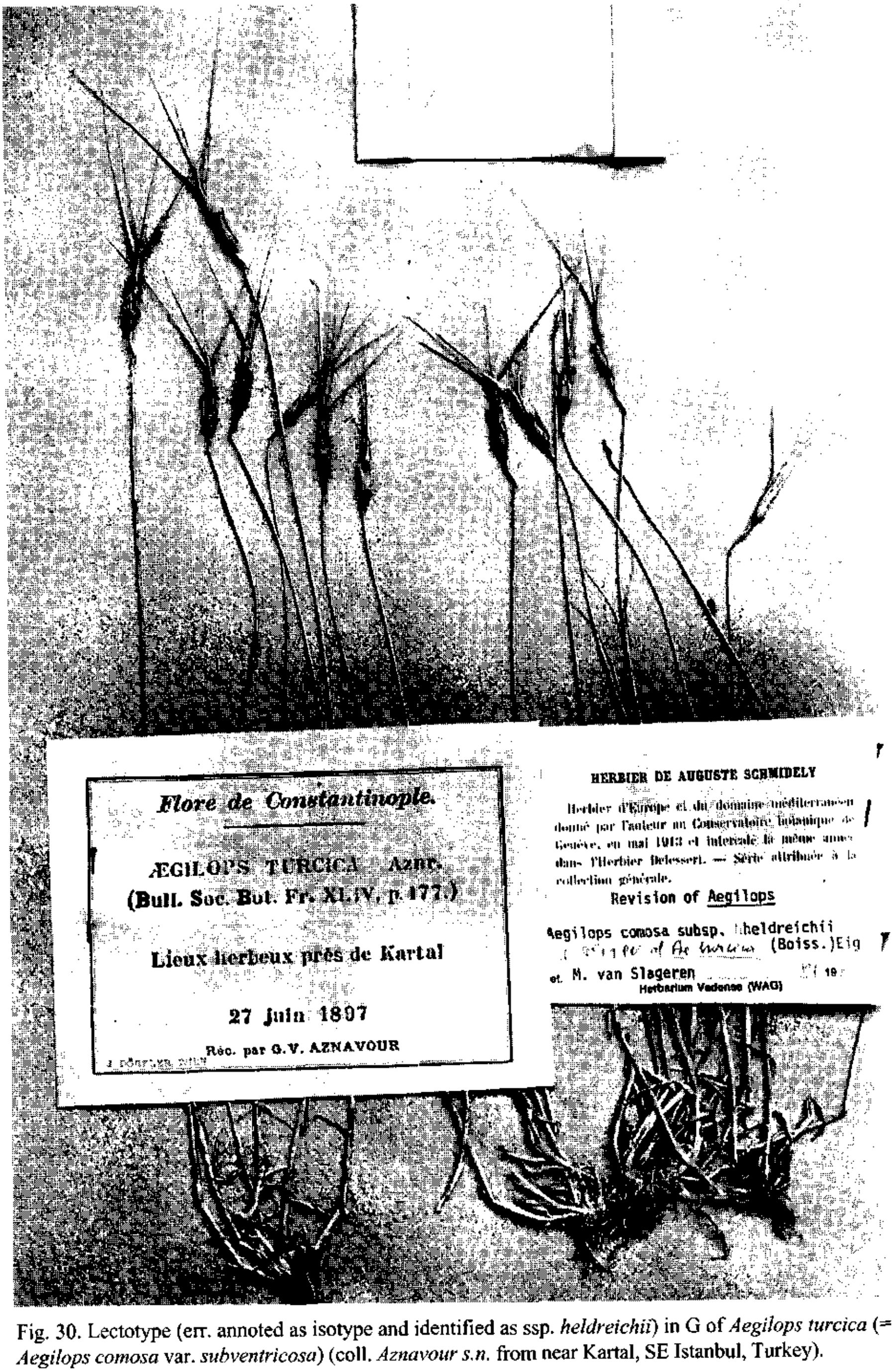


Fig. 30. Lectotype (err. annoted as isotype and identified as ssp. *heldreichii*) in G of *Aegilops turcica* (= *Aegilops comosa* var. *subventricosa*) (coll. *Aznavour s.n.* from near Kartal, SE Istanbul, Turkey).

Art. 32.1*(c)*: no description or diagnosis or reference to an earlier one is provided. The name was later validated by Boissier in his *Flora orientalis*.

5. Many specimens with similar location and collector to the type of *Aegilops turcica* Aznavour were distributed as Exsiccatum no. 3898 by Dörfler in Vienna. However, they are not considered isotypes as several herbaria (BM, JE, LD, LY, MPU) have specimens of both collections with consistently only one of them annotated as isotype. Aznavour's herbarium was located at Robert College (RH), Rumeli Hisar, Turkey, and, according to Stafleu & Mennega (1992: 219), later moved to E. RH no longer exists (that is, no longer listed in the *Index Herbariorum* ed. 8). From correspondence it has appeared that E only borrowed material from G for a prolonged period of time due to the 'Flora of Turkey' project at E. In view of this the collection in G is now chosen as the lectotype (Fig. 30).

6. Post (1896; 1933) briefly describes and illustrates *Ae. comosa* var. *subventricosa* from the Palmyra (Tadmor) oasis in central Syria (first edition of 1896) and from Jaffa, Palestine (in the second edition of 1933, sub nom. ssp. *heldreichii*). These would be adventive localities of the variety *subventricosa*, but I have been unable to confirm them with any specimens in Post's herbarium in BEI.

7. The rank of this otherwise validly published name, 'd)', was interpreted for the first time by von Halácsy (1904: 434) as a variety (later the same by Eig, 1929a: 111). In view of Art. 35.2 of the *Code* I adhere to this rank (a similar case to Ex. 2 of this Article). According to Eig (l.c.) taxonomically maybe '...einer nicht typischen Form von *Ae. triuncialis*...', has been involved in a comment on the only specimen in Haussknecht's herbarium (JE), which he inspected, that carried the name *polyathera*. Eig, however, was unsure of the identity and wrote that the material needed to be inspected again (l.c., 111).

Material carrying the name *Aegilops comosa* ssp. *pluriaristata* was not found, and Haussknecht collections from Phaleron and Orman Magula are known from both varieties of *Ae. comosa*; from Aïvali, however, only the var. *subventricosa* is known. Eig discussed 'var.' *pluriaristata* after his varieties in the subspecies *heldreichii*, and this may be the reason that Hammer (1980b: 236) treated it as a variety under the same subspecies. Eig's designation of rank is, however, later than the subspecies status that Zhukovsky (1928: 514) assigned, and, even if he intended a different rank, did not propose it as a new combination. Although published to replace the epithet *polyathera* from Haussknecht, the name *Ae. comosa* ssp. *pluriaristata* is not illegitimate because of Art. 63.1 as it is of different rank. The taxonomic identity is, however, unclear, but in view of Eig's discussion I list both names under the var. *subventricosa*.

8. Eig (1929a: 116) is remarkably unclear about the status of this variety, aptly named *confusa*. First he subdivided his ssp. *heldreichii* on the basis of the number of awns of the glumes of the terminal spikelet as follows (l.c., 110): a 3-awned variety (var. *achaica* Eig), one apical glume 3-awned and the other one 1-awned (var. *subventricosa* Boiss.), and 1-awned with sometimes a second long or short awn added (var. *biaristata* Eig, but note that his Latin diagnosis only mentions 'uniaristatae', l.c., 110, footnote 4). Further on, however, in the discussion of *Ae. uniaristata*, Eig points at the similarity in the awns of this species with his var. *biaristata* of

Ae. comosa: extreme forms of the latter variety with only one awn developed on all glumes are likely to be confused with the former species (l.c., 1929a: 115-116). Such a form of *Ae. comosa* is, according to Eig, depicted by Jaubert & Spach in Tab. 314 of their *Illustrationes*, Vol. 4 (1851a), 'third spike from the left', and for which the name var. *confusa* is 'probably' adequate (l.c., 1929a: 116). Eig then enumerates differences between his new variety and *Ae. uniaristata*, but overemphasizes the glume awn characters: triangular in cross section with *uniaristata*, 'appearing as flat' [orig. German: '...flach zu sein scheinen...'] in var. *confusa*. He concludes that this variety is only known from the Jaubert & Spach illustration, where it is 'not clear enough'. Eig thus describes a variety but not under the appropriate next higher taxon, and bases it on an insufficiently clear illustration not showing an analysis in the sense of Arts. 42.2 (*Note 2*) and 44. His varietal name may therefore at best be characterized as provisional in the sense of Art. 34.1*(b)*, making it invalid.

9. This variety may be confused with the sympatric species *Aegilops uniaristata*. Differences are keyed out as follows:

Rudimentary spikelets 1 (or 2), fertile spikelets 1-2(-3) (*Fig. 29-2*); lateral glume apex with a broad, triangular tooth and a short, 2-4 mm long, awn (*Fig. 29-5*); apical spikelet glumes with 1 broad, well-developed, 3-5.5 cm long, awn and 2 lateral, more slender, sometimes reduced awns (*Fig. 29-10, 11*) .... **comosa** var. **subventricosa**

Rudimentary spikelets (2 or) 3, fertile spikelets 3-5 (*Fig. 87-2*); lateral glume apex with a broad, triangular tooth and an increasingly, 7-40 mm long, awn (*Fig. 87-5, 8-9*); apical spikelet glumes extending into a flat, 3-5 cm long, awn without lateral awns (*Fig. 87-10*) .... **uniaristata**

10.6 **Aegilops crassa** Boiss. **Figs. 31-33, 38**

Aegilops crassa Boiss, Diagn. pl. orient., Sér. 1(7): 129 (1846), Fl. orient. 5: 677 (1884); von Steudel, Syn. pl. glumac. 1: 355 (1854); Post, Fl. Syria (ed. 1) 900 (1896), (ed. 2) 2: 787 (1933); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 456, 550 (1928); Eig, Feddes Repert., Beih. 55: 91 (1929a, with var. *typica*); Nevski in Komarov, Fl. URSS 2: 671 (1934, Russian) / 535 (1963, English); Parsa, Fl. Iran 5: 825 (1952); Thiébaut, Fl. Lib.-Syr. 3: 316 (1953); Ovczinnikov, Fl. Tadschikistan SSR 1: 338 (1957); Chennaveeraiah, Acta Horti Gotoburg. 23: 167 (1960); Bor, Grasses Burma, Ceylon, India, Pakistan 654 (1960); Bor in Rechinger, Fl. Lowland Iraq 111 (1964); Bor, Fl. Iranica 70/30: 194 (1970, with var. *crassa*); Mouterde, Nouv. Fl. Liban, Syrie 1: 151 (1966); Bor, Fl. Iraq 9: 180 (1968, with var. *crassa*); Goloskokov, Ill. key to Kazakhstan pl. 1: 124 (1969); Takhtajan & Fedorov, Fl. erevana (ed. 2) 366 (1972); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973), in Fedorov, Zlaki SSSR: 158 (1976, Russian) / 226 (1984, English); Hammer, Feddes Repert. 91: 234 (1980b, with ssp. *crassa* var. *crassa* forma *crassa*); Migushova & Chakimova, Bull. WIR 119: 76 (1982); Davis, Fl. Turkey 9: 238 (1985, with ssp. *crassa*); Nikitin & Geldykhanov, Opredelitel rastenich Turkmenistana [Key to Turkmenistan plants] 46 (1988); Gandilyan in Kazarjan, Red data book Armenian SSR 193, 248 (1990; on p. 248 err. ssp. *vavilovii* for hexaploid forms of *crassa*).

Type: (Iran) ad canales in planitie prope ruinas urbis Persepolis, 16.IV.1842, *Kotschy 248* (holo: G-BOIS; iso: BM, C, FI, G, K, L, LE, MO, OXF, P, PI, PRC, TUB, W).

Homotypic synonyms:

Triticum crassum (Boiss.) Aitch. & Hemsl. in Aitchison, Trans. Linn. Soc., Ser. 2(3): 127 (1888); Thellung, Fl. adv. Montpellier 150 (1912); Fedtschenko & Fedtschenko, Consp. fl. Turkest. Kirgh. 1, Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 38(1): 149 (1924); Bowden, Can. J. Bot. 37: 676 (1959), Can. J. Gen. Cyt. 8: 135 (1966); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 72 (1987).

Ae. crassa Boiss. ssp. *trivialis* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 554 (1928); Hammer, Feddes Repert. 91: 234 (1980b; considers this ssp. a synonym of the typical ssp.). – Synonyms: *Ae. trivialis* (Zhuk.) Migush. & Chakim., Bull. WIR 119: 76 (1982); Hammer, Kulturpflanze 33: 129 (1985), *nom. inval.* (Arts. 26.1 and 32.1*(b)*). *Ae. vavilovii* auct. non Chennav., quoted by Migushova & Chakimova, Bull. WIR 119: 76 (1982). – Notes: 1. The epithet *trivialis* is invalid as the phrase 'Forma typica' is used at its description by Zhukovsky, and the name *crassa* should have been adopted (Art. 26.1. of the *Code*). 2. When '*trivialis*' is separated from the 'typical' *crassa* then this epithet is linked with the existence of hexaploid forms within the species. See at 'Genome'.

Gastropyrum crassum (Boiss.) Á.Löve, Feddes Repert. 95: 501 (1984).

Heterotypic synonyms:

Ae. platyathera Jaub. & Spach, Ill. pl. orient. 4: 17, Tab. 313 (1851a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 356 (1851b); Walpers, Ann. bot. syst. 3: 790 (1852); von Steudel, Syn. pl. glumac. 1: 355 (1854); Cosson, App. fl. juv. alt., Bull. Soc. bot. France 11: 164 (1864; see note 1); Chase & Niles, Index Grass Species 1: 8, 10 (1962; see note 1). – Type: (Turkey / Syria / Iraq; but probably Iraq as BM, FI, G-BOIS labels give 'Mossul') 'Mesopotamia', inter Mardin et Mosul, *Aucher-Éloy 2913* (holo: P; iso: BM, FI, G, G-BOIS, K, MPU, OXF). – Homotypic synonyms: *Ae. crassa* Boiss. var. ('β') *macrathera* Boiss., Fl. orient. 5(2): 677 (1884); Post, Fl. Syria, (ed. 1) 901(1896), (ed. 2) 2: 787 (1933); Bornmüller, Beih. Bot. Centralbl. 26: 438 (1910); Handel-Mazetti, Pteridoph. Anthoph. Mesopot. 4, Ann. k.k. naturhist. Hofmus. Wien 28: 32 (1913); Eig, Feddes Repert., Beih. 55: 93 (1929a); Parsa, Fl. Iran 5: 826 (1952); Thiébaut, Fl. Lib.-Syr. 3: 316 (1953); Mouterde, Nouv. Fl. Liban, Syrie 1: 151 (1966); Bor, Fl. Iraq 9: 182 (1968), Fl. Iranica 70/30: 195 (1970); Tzvelev in Fedorov, Zlaki SSSR: 158 (1976, Russian) / 226 (1984, English); Hammer, Feddes Repert. 91: 234 (1980b). *Triticum crassum* (Boiss.) Aitch. & Hemsl. var. *macratherum* (Boiss.) Thell., Fl. adv. Montpellier 150 (1912). *Ae. crassa* Boiss. ssp. *macrathera* (Boiss.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 553 (1928), **syn. nov.** See note 1.

Ae. crassa Boiss. var. *flavescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923); Hammer, Feddes Repert. 91: 234 (1980b; considers this variety a synonym of the typical forma). – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3.

Ae. crassa Boiss. var. *fuliginosa* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923), **syn. nov.** – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3. – Hometypic synonym: *Ae. crassa* Boiss. forma *fuliginosa* (Pop.) Hammer, Feddes Repert. 91: 234 (1980b).

Ae. crassa Boiss. var. *rubiginosa* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923), **syn. nov.** – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3. – Homotypic synonym: *Ae. crassa* Boiss. forma *rubiginosa* (Pop.) Hammer, Feddes Repert. 91: 234 (1980b).

Ae. crassa Boiss. var. *glumiaristata* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 328 (1928a), Feddes Repert, Beih. 55: 92 (1929a); Parsa, Fl. Iran 5: 826 (1952); Hammer, Feddes Repert. 91: 234 (1980b), **syn. nov.** – Type: (Turkmenistan / Uzbekistan) Amu-Darja, 30.IV.1915, *Popov s.n.* (holo: LE, not found). – Note: the collector is cited as *Popova* by Eig (1929a), who also added the following collections: Afghanistan, Badghis, *Aitchison 461* (A, BM, K, LE), and (Iran, Hamadan) in agro Echatanensi (media), inter Danbedabad et Tschitschian, 1882, *Pichler s.n.* (G (not G-BOIS as cited in Eig), K, LE). Although well documented and in various herbaria, they are *not* to be considered as (syn-)types. – Homotypic synonym: *Gastropyrum glumiaristatum* (Eig) Á.Löve & McGuire, Feddes Repert. 95: 502 (1984).

Uncertain status:

Ae. crassa Boiss. var. *brunnea* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923); Hammer, Feddes Repert. 91: 234 (1980b). – Type: (Turkmenistan / Uzbekistan) 'Turkomania', *Vavilov s.n.* (holo: WIR?, not found).

Ae. crassa Boiss. var. *lutescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923); Hammer, Feddes Repert. 91: 234 (1980b). – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found).

Note: both varieties are described with 'spicis glabris', indicating for Hammer (1980b: 234) that they must belong to another species. This is difficult to say in the absence of type materials. Popova does not indicate that her varieties are based on, e.g., local mutations of introgressions from cultivated wheats, which may explain the reported spike character. The varieties are not *nomina nuda* or otherwise invalidly published (reasons to ignore them), and probably belong to *Aegilops*. For the time being they are maintained here under *Aegilops crassa*.

Diagnostic characters: robust, loosely tufted annuals, (10-)30-40 cm tall excluding spikes; spikes moniliform, (4.5-)6-10(-13) cm long excluding awns, with (4-)6-9(-12) spikelets, rudimentary spikelets absent, rarely 1-2; glumes adpressed-velutinous, the truncate apex with 1 broad and 1 sharp tooth, the latter sometimes developing into a short awn; lemmas coriaceous in upper-lateral part, with 1 sharp apical tooth, which develops towards apex of spike into a flat, up to 8.5 cm long awn; apex of palea keels somewhat obtuse; caryopsis free.

Description (Figs. 31, 33): robust, loosely tufted *annuals* (*Fig. 31-1*) with few to many tillers. *Culms* erect, slightly geniculate at base, (10-)20-40 cm tall excluding spikes; foliage evenly distributed, somewhat more dense at base of culm. *Leaf* blades linear-acuminate, 8-25 cm long, 0.3-0.4 cm wide; margins of sheaths ciliate in the upper 1/2-3/4. *Inflorescence* (*Fig. 31-2*) a moniliform spike, (4.5-)6-10(-13) cm long excluding awns, 0.5-0.7 cm wide; disarticulating barrel-type at maturity (*Fig. 33*) into individual spikelets with usually the lowest spikelet remaining attached to the culm; with (4-)6-9(-12) fertile spikelets, rudimentary spikelets usually absent but rarely 1-2 developed. *Spikelets* (*Fig. 31-2a*) sessile, urceolate, 7-10 mm long excluding teeth and/or awns, 4-6 mm wide; the apical spikelet cylindrical-obconical and more slender, around 3 mm wide; spikelet length 0.7-0.8 times the length of the supporting rachis internode; with 4-7 florets, the upper 2 sterile. *Glumes* (*Fig. 31-5, 8*) 2, coriaceous, of lateral spikelets broadly ovate-truncate, 7-10 mm long, the surface closely adpressed-velutinous; veins unequally wide, sunk into the surface, more or less parallel, usually somewhat lighter in colour than the glume surface; apex of lateral glumes truncate with one broad, sometimes indistinct, abaxial tooth and a sharp, adaxial tooth that may develop into a short to longer awn, 1-4 mm long at base of spike, up to 15 mm in the subapical spikelet glumes; apical glumes (*Fig. 31-14, 16*) ovate, around 8 mm long, the apex truncate with 1 sharply acute, central tooth, often developing into a setulose awn that is up

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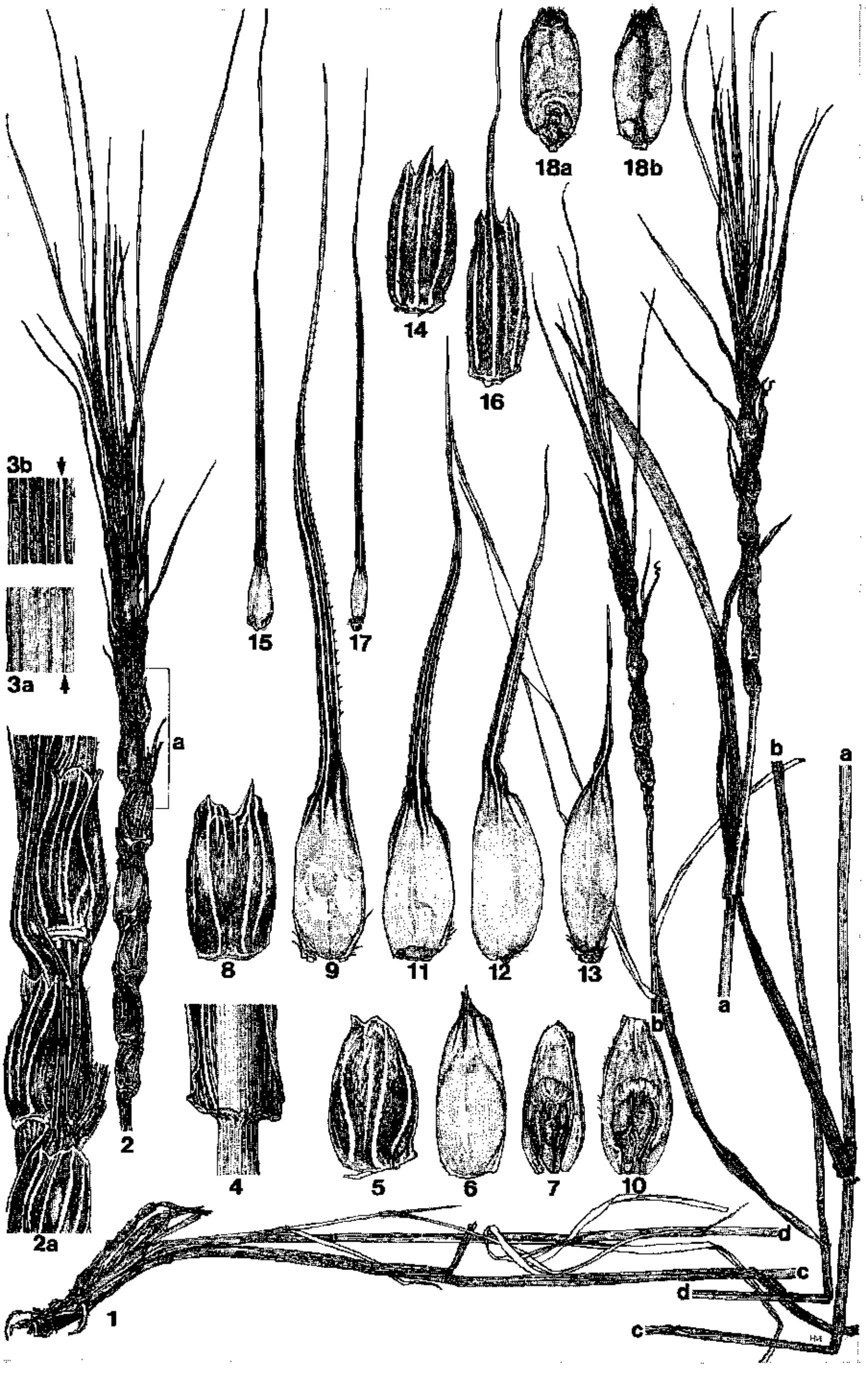
Fig. 31. *Aegilops crassa*. 1, habitus (x 1/2); 2, spike (x 3/4); 2a, enlarged part of spike, showing spikelets in situ (x 21/2); 3a, abaxial leaf surface, midway (x 2); 3b, adaxial surface of 3a (x 2); 4, stem, leaf sheath, ears and leaf blade (x 2); 5-7, lowest floret of lowest fertile spikelet in a spike: 5, glume, 6, lemma, 7, palea with immature seed (5-7 all x 21/2); 8-13, lowest floret of spikelet in centre of spike: 8, glume, 9, lemma, 10, palea with immature seed, 11, lemma of upper glume of same spikelet, 12, lemma of third fertile floret, 13, lemma of fourth fertile floret (8-13 all x 21/2); 14-17, apical spikelet: 14, glume of lower floret (x 21/2), 15, lemma of lower floret (x 1), 16, glume of upper floret (x 21/2), 17, lemma of upper floret (x 1); 18a, dorsal surface of mature seed (x 21/2); 18b, ventral surface of mature seed (x 21/2). (1-18. *Humeid & al. BMW-6-6*; cultivated at ICARDA from germplasm accession.)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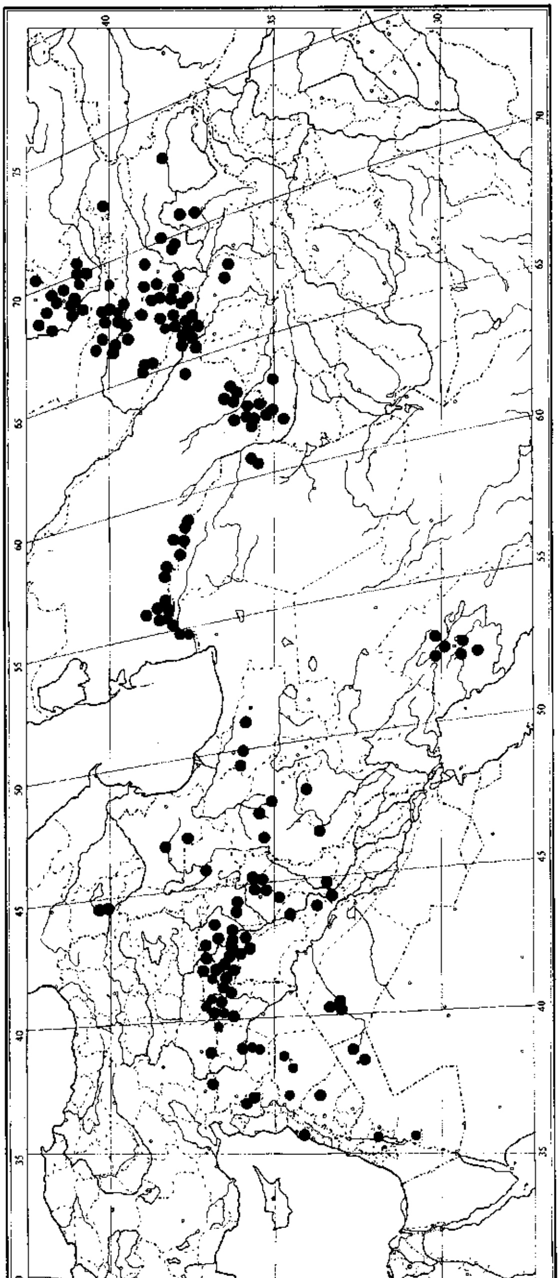


Fig. 32. Distribution of *Aegilops crassa* in western and central Asia. For adventive distribution in the U.S.A., see Fig. 38.

to 6 mm long, flanked by 2 lateral, sometimes indistinct teeth. *Lemmas* (*Fig. 31-6, 9, 11-13*) of fertile florets slightly exserting the glumes, 8-10 mm long, ovate, boat-shaped, hyaline in the central and basal parts only, the apical and upper-lateral parts coriaceous; the apical part flat when protruding into a shorter to longer awn, otherwise folded to conduplicate, inner surface velutinous, the outer surface with ornamentation as of the glumes; apex truncate with 1 sharp tooth only in basal part of spike, or the tooth developing in a long, flat awn, increasing in length towards the apex of the spike, up to 8.5 cm long, stronger developed in the basal florets of a spikelet and there with the base up to 2 mm wide, with a prominent central vein (a single, well-developed spikelet in the upper half of the spike may thus have up to 5 flat awns developed, next to the 2 slender glume awns), awn margins setulose; lemmas of the apical spikelet (*Fig. 31-15, 17*) with well-developed, flat awns, 3-8.5 cm long, usually diverging. *Paleas* (*Fig. 31-7, 10*) elliptical, with 2 sharp, setose keels ending in a somewhat obtuse apex; apex of palea thus appearing emarginate. *Caryopsis* (*Fig. 31-18*) around 7 mm long, free from lemma and palea.

Variation: in length of the spike: 4.5-13 cm; number of spikelets: 4-12; development of glume awn: a tooth only in most cases, but an awn of up to 15 mm in the upper parts of the spike is observed. The most conspicuous variation, however, is in the development of the lemma awns of the fertile florets: from small and indistinct in basal parts of spike up to large, 8.5 cm long, in upper and apical parts of the spike, dominating the aspect of the spikes.

Distribution (Figs. 32, 38): a Western Asiatic element occurring in central, western and northwestern Iran, extending southwards to Shiraz province, in central and northern Iraq, northern Afghanistan, southernmost parts of Kazakhstan, western Kyrgyzstan, southern Turkmenistan and Uzbekistan, northern Tajikistan, as well as in northern and northeastern Syria and adjacent southern Turkey. First records for Jordan [Tafila, Jordan river valley, germplasm collections from *Humeid & al.* (ICARDA, NCARTT)]; rarely also present in Lebanon. Comparatively well represented in Central Asia and on the northern part of the Fertile Crescent with these two regions appearing almost disjunct. Uncommon throughout its range and only occasionally found in the steppe region of Syria, Iraq and Jordan.

Adventive presence reported from France and Germany (not shown on maps), and in the U.S.A. (one site in the New York area, see Fig. 38).

Ecology (Fig. 33): a drought-tolerant species that grows under (100-)150-350 mm annual rainfall in steppe, fallow, arid grasslands (Fig. 33), along roadsides, within as well as in margins of cultivation (e.g., of bread wheat with which it occasionally hybridizes, see Chapter 4.2), and on rocky slopes. Mainly found on a limestone bedrock, more rarely on basalt. Soil textures including clay- and sandy loam, and sand.

Altitude: from -260 m (Jordan valley region: germplasm coll. *Humeid & al. 91-JOR-28*) up to 1650 m.

Flowering and fruiting time: May – July.

Genomes: DM (female parent 'D' x male parent 'M') with 2x = 4n = 28 (Chennaveeraiah, 1960: 92, sub *A. crassa* ssp. *crassa*; Waines & Barnhart, 1992: Table 2, sub *Ae. crassa* '(4x)'), and DDM (female parent 'D' x male parent 'DM') with 2x

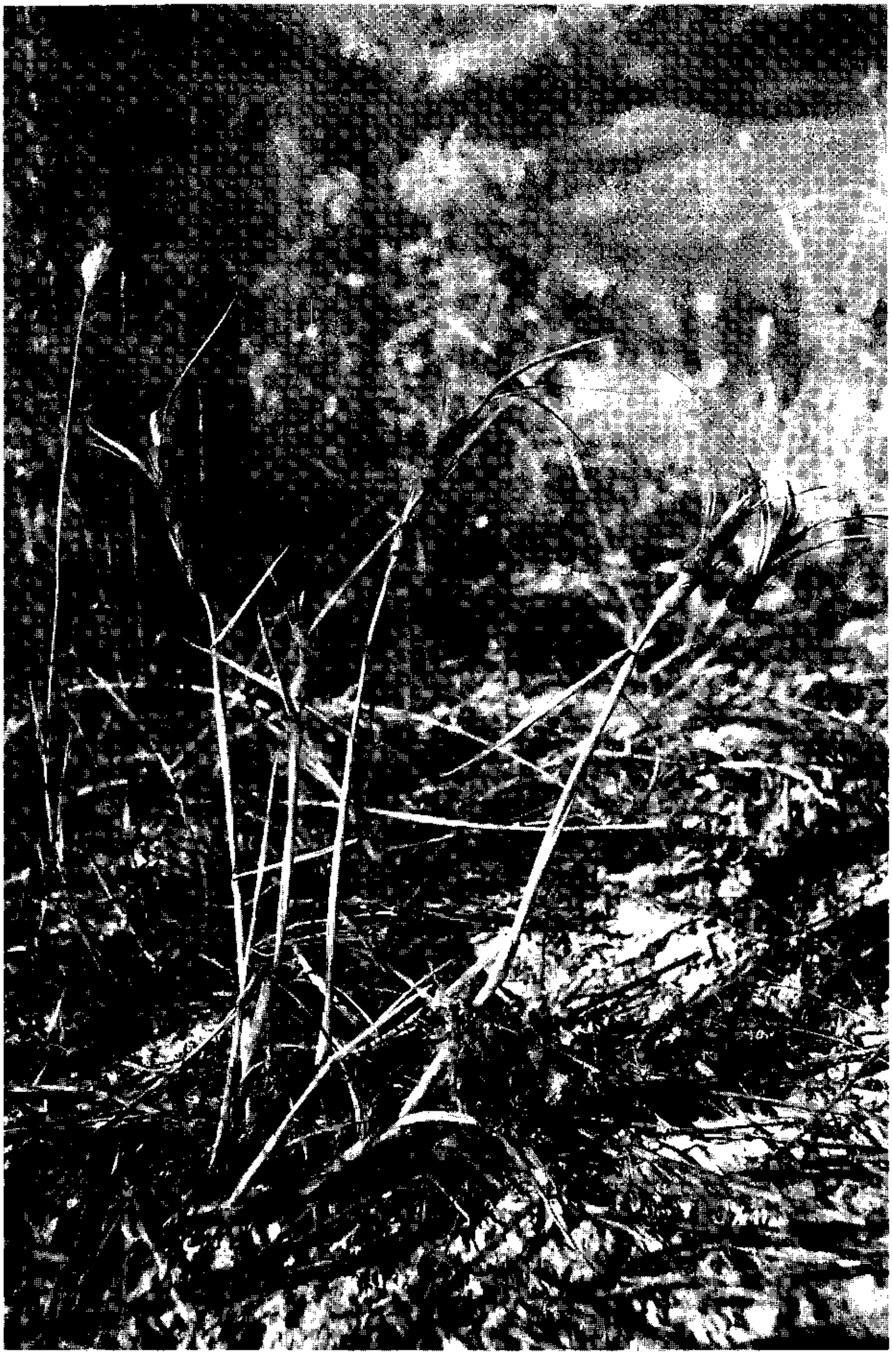


Fig. 33. Partially shattered *Aegilops crassa* in a grassland between Sharlauk and Kara-Kala, Turkmenistan (germplasm collection *van Slageren & al. MSPGZK-91114*, ICARDA).

= 6n = 42 (Waines & Barnhart, 1992: Table 2, sub *Ae. crassa* '(6x)'). – Note: the hexaploid forms of *Ae. crassa* have been reported and published as *Aegilops trivialis* by Migushova & Chakimova (1982: 76) with genome type 'DDM' (as '$DDD^2D^2M^{er}M^{er}$'). They equate this type with *Ae. vavilovii* 'auct. non Chennav.', suggesting that hexaploid *crassa* may have been mistaken for *Ae. vavilovii* (although not citing examples of this), and list *Ae. vavilovii* Chennav. separately with its genome type as '$DDM^{er}M^{er}S^pS^p$' (l.c., 1982: 76). The genome symbol of hexaploid *crassa* in short notation would then be 'DD^2M^{er}', and the superscript additions indicate modification from one original D and from the M genome. Waines & Barnhart (1992) suggest, however, that only the M-genome is modified and notate DD$\underline{\text{M}}$, while Kimber & Tsunewaki (1988: 1210) considered all genomes modified and notated '$\underline{\text{DDM}}$'. None of the three involved genomes of *Ae. vavilovii* are considered modified by Waines & Barnhart, who thus code 'DMS' for this species (see at 10.21), whereas Kimber & Tsunewaki (1988: 1210) again considered all genomes modified and notated '$\underline{\text{DMS}}$'.

Vernacular names:

Armenian: Aytzagn hastlig [hastlig = medium thick] (Gandilyan et al., 1975: 86).

Kurdish: several unconfirmed names are quoted by Bor (1968: 180) that are note on various collections in K: Qaidiq (from Sinur, Jezira, Iraq, *Guest 13551*); Jaganma [= wild wheat / grass (like) wheat; possibly related to 'Gîyā ganim' or 'wheat grass'. Bor, l.c.] (from Arbil, Iraq, *Gillett 8007*); Chadwar hanta [= friend of wheat] (from Kirkuk, *Gillett & Al-Rawi 7465*); Kharken keina [= (literally) hanging ass (sic) / donkey choke] (from Qaraghan, Iraq, *Gillett & Al-Rawi 7367*).

Russian: *Aegilops* tolsti [tolsti = thick] (Kovalevskaja, 1968: 184).

Turkmenian: Jorin bogdayli-tchair [jorin = thick] (Nikitin & Kerbabajev, 1962: 141).

Uzbek: Khasmaldokh (Kovalevskaja, 1968: 184). Also used for *Ae. triuncialis* (see 10.18a).

Uses: in spite of the local name Kharken keina (see above), it is also reported as a forage plant in the same steppe districts in Iraq (Sinjar, Kirkuk, Arbil) from where this name originates (Bor, 1968: 180).

Etymology: the final epithet is derived from the Latin 'crassus' [= thick], and may refer to the stout spike outline or the thick, leathery glumes of this species.

A geographical selection of ca 360 herbarium specimens examined:

ASIA: AFGHANISTAN: Badghis, *Aitchison 461* (A, BM, K, LE); Badakshan prov., Darrah-e-Mashad valley, E Kangurchi, *Anders 6684* (G); Samangan prov., S side Tangi Taschkurgan Mt., *Ekberg W9099* (E); Paropamisus Mts., Sabzac pass, *Furse 7720* (K, LE); Katagham prov., Aliabad, *Furse 6057* (K); Badghis, Darrah-i-Bum, *Hedge & al. W8197* (E); Badakshan prov., Keshem valley, near Kangurchi, *Podlech 21487* (G); Kunduz to Mazar-e-Sharif, *Smith 475* (K); Kandahar, Arghandab dam, *Smith s.n.* (UCR cult.); Kandahar, upper Tarnak valley, *Smith 101, 184* (UCR cult.).

IRAN: Karaj, *Gauba 40* (B); Badgka, NE Shiraz, *Gentry 14948* (UCR cult.); Takht-e Jamshid, *Gentry 14953* (UCR cult.); Dastana, S Shahr-Kord, *Gentry 15210* (UCR cult.); Khorasan, Sarakhs, Shorlogh, 23 km from Mozduran, *Ghorasi-al-Hosseini 210* (RNG); Bajgah, N Shiraz, *Grant 17561* (MO); Tabriz prov., near Sofian, *Grossheim s.n.* (B, LE); 30 km from Mianeh, *Jacquemart 77/13* (BR); lake Rezaiyeh, *Jacobs 6883* (E, K, L); E Bujnuro, *Johnson s.n.* (UCR); Lorestan, Durud, *Koelz 15814* (US); Fars, Jahrum, *Koelz 14557* (US); near Persepolis, *Kotschy 248* (BM, C, FI, G, G-BOIS, K, L, MO, OXF, P, PI, PRC, TUB, W, type of *Aegilops crassa*); Sultanabad, near Qasvin, *Lindsay 231* (BM); Khorasan, near Chakhuder, W of Sarakhs, *Merton 3892* (K); Fars, Lar Guarach, *Mirzayan 9050E* (K); Hamadan, Echatanensi, Danbedabad to Tschitschian, *Pichler s.n.* (G, K, LE); Hamadan prov., Dolidabad, *Pichler s.n.* (G); ruins Persepolis, *Schmid 5248* (G); Fars, near Mián Jangal, *Soják 5263, 5309, 5319, 5320* (PR); W Iran, Sungur, Kuh-i-Emrallah, *Strauss s.n.* (B, JE, US, W); Gulpaigan, *Strauss s.n.* (JE); W Iran, near Dsihekal, Sultanabad to Kasihan, *Strauss s.n.* (B); Bisitun, *Strauss s.n.* (B, JE); 80 km E Kermanshah to Hamadan, *Zohary s.n.* (UCR, US cult.).

IRAQ: 20 km S Tall 'Afar, *Al-Ani & Hadi 9805* (K); Al Masad, S Rutbah, *Alizzi 35184* (K); Hatra to Bagdad, *Al-Kaisi & Wedad 51938* (K); Al Bayder, 78 km S Sinjar, *Al-Rawi & al. 32097* (K); near Rutbah, *Al-Rawi 21210* (K); Kirkuk – Sulaymaniyah, *Al-Rawi 21501* (K); Air Tallawi, near Mosul, *Al-Rawi 5783* (K); Udaim, Ghurfa, *Al-Shehbaz & Al-Monawi s.n.* (A); N Sinjar, *Barkley 7980* (US); Rutbah, Trefawi station, *Battcha s.n.* (ACSAD 1178); Assyria, Djebel Hamrin, *Bornmüller 1905* (B, G, JE); E Kirkuk to Sulaymaniyah, *Bot. Staff. Nat. Herb. Iraq 42983* (K); Mosul to Dahuk, *El-Batanouny s.n.* (CAI); Meer Khassim, Balad Sinjar to Tell 'Afar, *Field & Lazar 552* (W); Muwasul Tiaton, Mukruk Nawar, *Field & Lazar 450* (F, US); Balad Sinjar to Tall 'Afar, Khasim lake, *Field & Lazar 552* (A, F, US); W wadi Thirtar, *Gillett & Al-Rawi 7131* (K); N Qaraghan, *Gillett & Al-Rawi 7367* (K); Kirkuk, *Gillett & Al-Rawi 7465* (K); Arbil, *Gillett 8007* (K), Kursi, Jebl Sinjar, *Gillett 10904* (K); E Chemchemal, *Gillett & Al-Rawi 11603* (US); Wadi Shremiye, near Tikrit, *Handel-Mazzetti 1108* (W); Assyria, Qalat Shergat to Al Hadr (Hutra), Wadi Sefa, *Handel-Mazetti 1109* (LE, W); Khabur and Sinjar rivers, *Haussknecht 1062* (G-BOIS); desert of Khabur, *Haussknecht s.n.* (JE, LE, W); Jarmo, Adobe ruins near camp, *Helbaek 1254* (C, K); Chemchemal, *Johnson s.n.* (UCR); Kirkuk, Qara Anjir, *Rechinger 10021* (BM), *10023* (K), *15885* (G); Arbil, *Thorpe s.n.* (UCR, US cult.); Kharagin, *Wheeler Haines s.n.* (E).

IRAQ/SYRIA/TURKEY: Mardin to Mosul, *Aucher-Éloy 2913* (BM, FI, G, G-BOIS, K, MPU, OXF, P, type of *Aegilops platyathera*).

JORDAN: El Hamad area, El Khoudairy, *Ismail il-Chaikh s.n.* (ACSAD 766); El Hamad, Shubeika, *Ismail il-Chaikh s.n.* (ACSAD 767); Emghayir el Serhan, *Khudair 10205* (K); near Es Sahab, *Samuelsson 896* (B).

KAZAKHSTAN: Ulkun-Burun Mt., near Dzhambul, *Kamelin 1348* (LE); Chimkent, Syr-Darya, *Knorring 139* (LE); Chimkent, Bun-Bulan, *Knorring 1452* (LE); Chimkent, Slanski, *Knorring 43* (LE); Alim-Tau Mts., *Markova & Medvedeva s.n.* (LE, NY); Syr-Darya, Chimkent, Chodzja-Darbaza to Mantai-Tash, Chadma-Barbaza, *Mokieva 193* (TASH); Chimkent reg., NE Chali-Babak, *Mokieva 172* (TASH); Sari-Agaz to Derbaza, Zlanovski reg., *Neyostroyeva & al. s.n.* (LE); Al-Kakul sands, *Nitrov 1* (LE); Chimkent reg., Dau-Babje, *Sovietkina 118* (TASH).

KYRGYZSTAN: Osch, *Knorring 305a* (LE).

LEBANON: 17 km SW Tripoli, *Ahmad Chaikh 35* (ACSAD).

SYRIA: Aleppo, *Fre. Louis* (hb. Gombault 6298) (P); Redde, banks Euphrates, near Meshkin, *Mouterde 5053* (G); Guir Cafeh to Deirik, Qaratchok Dag, *Mouterde 11405* (G); 40 km W Tell Kotchek, *Nemarian 10783* (US); SE Ras-el-Ain, Jezire, *Pabot s.n.* (361) (Min.Agr.Syr.); E lake Khatouniye, E of Hassake, *Pabot s.n.(360, 363)* (G, Min.Agr.Syr.); 20 and 40 km SE Tell Aalo, *Pabot s.n.* (G); Jebl Abd-el-Aziz, *Pabot s.n.* (G); S Qaratchok Dag to Tell Roumila, *Pabot s.n.* (G); SE Tell Aalo, Jezire, *Pabot s.n.(362)* (Min.Agr.Syr.); El Hass, *Post s.n.* (BEI); El Hamad area, E of Sabba Bear (Sab Biyar), *Sanadiki s.n.* (ACSAD 768); Breda, next to ICARDA exp. fields, *van Slageren & Sweid MSFS-91001H, 91002H, 91004H* (ICARDA); Boueidar, next to ICARDA exp. fields, *van Slageren & Sweid MSFS-91006H* (ICARDA); Hassake, E Qantari, Al Misherfe to Tall Tamr, *van Slageren & Sweid MSFS-91024H* (ICARDA); E Hassake, 30 km W Al Khatouniye, *van Slageren & Sweid MSFS-91032H* (ICARDA).

TAJIKISTAN: Koiki-Tau Mts., near Hochadi, *Botschantzev & Yegorova 157* (LE); Hadzak-Kazian Mt., near Lailjakaei, *Botschantzev & Yegorova 274* (LE); Pamir-Alai, Gissar, *Gnezdillo 68, 76, 83, 90, 114* (TASH); Bukhara reg.(!), Sar-Salik Mts., Wash river, *Gontscharov & al. 141* (LE); Pamir-Alai, Kashka-Dari, E Yakabak, *Grannitov 451* (TASH); Kujki-Tau Mts., near Lublikar, *Nepli s.n.* (LE); Hadzja-Kazlan Mts., near Laylakul, *Nepli s.n.* (LE); Kujki-Tau Mts., near Chodzha-Ikol, *Nikitin 165* (LE); Dagana-Kee, Obi-Keek, *Ovczinnikov 107* (LE); Alim-Tau Mts., towards Kulap-Dongar, *Pachomova s.n.* (LE); Gazi-Maijlik, near Chazar, *Popov 207* (LE); Pamir-Alaj, Kul-Keriz, near river Chilkovo, *Popov & Vvedensky 540* (B, BC, BR, C, E, G, K, LE, NY, TASH, W); near Gordani-Uztzi, *Varivczeva & Nepli 933* (LE); Gardani-Usti Mts., *Varivczeva & Nepli 805* (LE); Gazi-Mailik, Washuk and Kufirnagan rivers, *von Regel 42* (LE); Gissar distr., Tashbulak, *von Regel s.n.* (LE); Baba-Dag Mts., *Yudzin & Bodisko s.n.* (LE).

TURKEY: Ceylânpinar – Ekufiska, Akcakaleye dagh, *Birand 69* (ANK); Urfa – Akçakale, *Davis & Hedge 28145* (ANK, BM, C, E, K); Urfa to Viranşehir, *Davis 42283* (ERE); desert of Surug, *Haussknecht s.n.* (BM, JE, P, W).

TURKMENISTAN: Mukresh-Takiri Mt., Gauldan, *Ashgirova & al. s.n.* (TASH); Caspian sea reg., Alexevski pass, *Androssov s.n.* (ASH); Kalukski reg., in the Kugitangh, Chodzja-Karaol, *Androssov s.n.* (ASH); Chardzhou, *Annalijev s.n.* (ASH); Kugitangh, pass of Kuytan, *Berdyev & Gutkova s.n.* (ASH); Karabil, Chodzja-Gurdek, *Berdyev s.n.* (ASH); Badghis, Akar-Tchechma, *Botschantzev 651* (LE); Badghis, Benchan-Techma, *Botschantzev 607* (LE); Badghis, near Kardon-Kipila, *Botschantzev 738* (LE); Badghis, Mt. Kazghadik, *Botschantzev 863* (LE); Cachta Karatscha, *Capus 1415* (P); Karabil, Tek-Tek, *Chepanov s.n.* (ASH); Mt. Stalova, *Chepanov s.n.* (ASH); Kachkinski reg., Deicha, *Chepanov s.n.* (ASH); Kugitangh Mt., Chodzja-Pil pass, *Chepanov s.n.* (ASH); Tachta-Bazar, Murgaba river, *Chepanov s.n.* (ASH); Kachkinski reg., Charlik valley, *Chepanov s.n.* (ASH); Badghis, Pinchan-Cheshme spring, *Chepanov s.n.* (ASH); Tachta-Bazar reg., Kushka, Kara-Chop, *Chepanov & Ataeva s.n.* (ASH); Zanin and Zanzar rivers, near Biz-Yuz-Kuduk, *Emme 533* (LE); Kara-Kala, W Komsomol, near Kizyl-Gin, *Geldikhanov s.n.* (ASH); Goroda-Zamina to Besh-Kubu, *Karotkina & Vassilkovskaja 42* (TASH); C Kopet Dag, Chamli, *Komachina s.n.* (ASH); Pul-i-Khazum, *Korshinsky 5580, 5810* (LE); Badghis, Kushka, Marunovsk, Dar-Char, *Linczevski & Seifulin 534* (LE, TASH); Chamagori, near Badghis, *Michelson s.n.* (ASH); Kushka, Kala-i-Mor, *Michelson 463* (LE); near Kushka, *Michelson 421* (LE); Kara-Kala reg., Podgorna Mt., *Micherjakov s.n.* (ASH); Pamir-Alai, Mt. Kugitangh, *Nevski 516* (ASH, NY); Gaudan reg., *Nikitin s.n.* (ASH); Ashkhabad reg., Chodzja-Dere, *Nikitin s.n.* (ASH); Serach reg., Akar-Cheshme, *Orazmuchommedov & Timochenko s.n.* (ASH); near Kizyl-Arvat, *Rodin & al. 1943* (LE); Badghis, Cerachi reg., Mt. Gjaz-Gjadik, *Seifulin s.n.* (ASH); Badghis, Rachnatur, near Gjaz-Gjadik Mt., *Seifulin & al. s.n.* (ASH); E Kopet Dag, Dali-Bulagi Mt., *Timochenko s.n.* (ASH); Ashkhabad reg., Tchuly, near Firyuza, *van Slageren & al. MSPGZK-91075H* (ICARDA); 30 km NE Sharlauk, valley of Sumbar river, *van Slageren & al. MSPGZK-91106H* (ICARDA); Kara-Kala reg., near Seiwan, *van Slageren & al. MSPGZK-91133H* (ICARDA); Childuchtora reg., *Yildushin s.n.* (ASH).

UZBEKISTAN: Krasnopechansk reg., *Abolin 7606* (TASH); Mukrin-Takiri, Gauldak to Chacht, *Acherov s.n.* (TASH); Fergana plain, Choli vill., *Arifkhanova & Gringov 621* (TASH); Katita-Kurgin, *Alexandrova s.n.* (TASH); Tashkent, Sid-Choa sta., *Berezovski s.n.* (LE); Kugitangh Mts., E Bazar-Tjube, *Bogdanovitch s.n.* (TASH); Baysun to Dennau, near Tash-Kaka, *Botschantzev & Vvedensky s.n.* (TASH); Pamir-Alai, Babatak Mts., Bedlend, *Bukasov 21* (TASH); Chanak, near Tashkent, *Butkov s.n.* (TASH); Angren river, *Butkov & al. 443* (TASH); Nuratinsk Mt., Urus-Kuduk, *Chaidarov 1321* (TASH); Gallya-Aral reg., *Chaporova & Shishlov 342* (TASH); Zeravchan steppe, Kattakurgan to Ulus, *Fedtschenko s.n.* (LE); Tcheshma-Miron, Guzar river, *Fedtschenko 1871* (LE); Namangan, *Galkina & Nikerov s.n.* (TASH); Malgusar Mts., N Chasangaba, *Gomolitski & Dolgech s.n.* (TASH); Koitash Mts., NE Berechen, *Gomolitski & al. 49* (TASH); Kashka-Darya, Gissar Mt., river Kichkik-Uru-Darya, *Grannitov 617* (TASH); Darabas to Dzhizak, Ghadit Mt., *Gromakov s.n.* (TASH); Angren, Urazajevka, *Kashonikova 153* (TASH); Dzhizak, Kol-Tali, *Kasimov s.n.* (TASH); Toi-Tash to Balikti-Tau Mts., *Kobrachova 409* (TASH); Dzhizak, *Kochornikova 111* (TASH); Kashka-Darya river, Zeravchan Mts., *Kudrjaschev & Sumnevicz 190, 331, 333, 338, 339, 359* (TASH), *311* (LE, TASH); Chobdou-Tau to Karacha-Tau Mts., Kurupatkin, *Kudrjaschev s.n.* (TASH); Tchatkal Mts., Kaypar, *Kudrjaschev 61* (TASH); N Gissar Mts., Kashka-Darya river, *Kudrjaschev 483* (TASH); N Guzara, *Kudrjaschev 34* (TASH); Bukhara reg., Bishkent Mt., *Kultiasow 504* (TASH); near Bishkent, *Kultiasow 521, 645* (LE); Bishkent, Talvik, *Kultiasow 645* (LE); E Baysun, *Lepeschkin s.n.* (TASH); Dalversin steppe, Tututalik, *Lepeschkin s.n.* (TASH); Kashka-Darya, Uria-Darya plain, NE Chaitan-Guzar, *Li & Niazov 430* (TASH); Kashka-Darya, Arab-Bati, Tchirakin, *Li & Niazov 153* (TASH); Kuratan plain, NE Nurata, *Miliakin 408* (TASH); Nuratinsk reg., Nura-Tau Mt., *Michajlova s.n.* (TASH); Alim-Tau Mt., *Minkwitz 347* (LE); Kashka-Darya, NE Arab-Chana, *Niazov 153* (TASH); Chawastsk reg., S Usatievsk, Chekand Mt., *Pasich 86* (TASH); Kashka vill., Ak-Cheva, *Pjataeva s.n.* (TASH); Bukhara reg., Amu-Darya basin, Sherabad, Shakarlik-Astan spring, *Popov 212* (LE, TASH); Bukhara, reg., Baysun, Kata-Kashish, *Popov 398b* (LE, TASH); Bukhara, Kugitangh Mts., Kizyl-Alma, *Popov 462* (TASH);

Samarkand, Kupanata, *Popov 228* (TASH); Kattakurgan, Zeravchan, *Popov 471* (TASH); Bukhara reg., Kutchitangh Mts., Tchuba, *Popov 342* (LE); Kurgitangh Mts., near Kimper-Tjube, *Popov 342a* (LE); Samarkand, Mogal-Tau, *Popov & Vvedensky 337* (TASH); Tashkent reg., near Sari-Alyk, *Pripad 210* (LE); reg. Tashkent, near Kaplanbek, *Radkewicz s.n.* (PR); Gallya-Aral, Kara-Kudu, *Ribakov s.n.* (TASH); Bukhara, Tiroka, *Rozhevitz 697* (LD); Samarkand, Dargom, *Salichbajeva s.n.* (TASH); Samarkand, Kuratinski Mts., Tala-Sai, *Saprochetova 119* (LE); Dzhizak, Galodna steppe, *Spiridonov s.n.* (LE); W Tian Shan, Kurman Mts., *Vassiljevskaja 36* (TASH); Angren river, Kalkan-Ata Mt., Dzhar-Bulak vill., *Vernik & al. 94* (LE, TASH); Dzhizak, Yang-Kurgan, *von Regel s.n.* (LE); NE Kara-Tepe to Koi-Tap, *Zakirov 854* (TASH); plain of Nuratin Mt., *Zakirov 520* (TASH).

UZBEKISTAN/TAJIKISTAN: valley Zeravchan, Ulus to Djam, *Fedtschenko s.n.* (K, LE).

EUROPE: ARMENIA: Erevan, canyon of Rasdan river, *Gabrieljan s.n.* (ERE).

ADVENTIVE: AMERICA: U.S.A., NEW YORK: Yonkers, Yonkers woodmill, *Bicknell s.n.* (NY). EUROPE: FRANCE, BOUCHES DU RHÔNE: Lavairs à Laine, Marseille, *Blaisse & Roux 66* (P). HÉRAULT: Port Juvénale, *Touchy s.n.* (K, L, MPU). GERMANY: Leipzig, Wallkammerei, *Duty s.n.* (LD).

Germplasm collections examined:

ASIA: IRAN: W Azerbaijan, Mahabad to Miandoab, *van Slageren & al. MSMNNL-93179* (ICARDA, SPII); W Azerbaijan, in Mahabad, *van Slageren & al. MSMNNL-93183* (ICARDA, SPII); W Azerbaijan, Naqadeh to Hayder Abad, close to lake Urumia, *van Slageren & al. MSMNNL-93197* (ICARDA, SPII); W Azerbaijan, shore of lake Urumia, near Hayder Abad, *van Slageren & al. MSMNNL-93202* (ICARDA, SPII).

JORDAN: SE Tafila, Um Al Sarab, *Humeid & al. 91-JOR-151-A* (ICARDA, NCARTT); Salt, Twal Al Janoubi to Deir Alla, near Jordan river, *Humeid & al. 91-JOR-28* (ICARDA, NCARTT).

SYRIA: Raqqa, Rasafa, *Elings & al. ID-302-a* (ICARDA, SARD); Homs, 30 km SE Sarjaneh, *Elings & al. ID-331* (ICARDA, SARD); Palmyra, S Kum, *Elings & al. ID-315* (ICARDA, SARD); Homs reg., N Tadmor (Palmyra) on Tadmor – Deir-ez-Zor road, *Humeid & al. BMW-6-6* (ICARDA, SARD); 57 km from Qamishly to Hassake, *Rifaie & al. SY-20063* (IPGRI, ICARDA); Hassake, E Qantari, El Misherfe to Tall Tamr, *van Slageren & Sweid MSFS-91024* (ICARDA); Hassake, W Ras el Ain to Tell Abiad, *van Slageren & Sweid MSFS-91063* (ICARDA); Hassake, Derbasiye, E Ras el Ain, *van Slageren & Sweid MSFS-91062* (ICARDA); Hassake, Qara Chok Dag, Jawady to Malkiye, *van Slageren & Sweid MSFS-91044* (ICARDA).

TAJIKISTAN: NE Ura-Tjube to Begova, *van Slageren & al. MSPGAP-91186* (ICARDA, VIR).

TURKENISTAN: Kizyl-Ilgin, NE Sharlauk, *van Slageren & al. MSPGZK-91108* (ICARDA, VIR); near Kara-Kala, *van Slageren & al. MSPGZK-91101* (ICARDA, VIR); Tchuly, near Firyuza, *van Slageren & al. MSPGZK-91075* (ICARDA, VIR).

UZBEKISTAN: Kashkadar reg., Kamashi, *Udachin s.n.* (VIR); Dzhizak to Gallya-Aral, *van Slageren & al. MSPGAP-91156* (ICARDA, VIR); Angren to Sarydala, *van Slageren & al. MSPGAP-91210* (ICARDA, VIR).

Notes: 1. Boissier (1884: 677) replaced the epithet of the species name *Ae. platyathera* of Jaubert & Spach (1851a: 17) by *macrathera* and made it a variety of *Ae. crassa*. He directly referred to Jaubert & Spach's *Illustrationes*, even citing the (type) specimen on which the latter had based their species. Boissier's name at the variety level is valid because of Art. 60.1, although the original epithet could have been retained following Recommendation 61A.3 of the *Code*. The variety β *macrathera* now becomes a new heterotypic synonym of the species.

Chase & Niles (1962: 8) cite Cosson's (1864: 164) 'platyathera' as '*Aegilops mutica* Boiss. var. *platyathera* (Jaub. & Spach) Coss.', a similar case to '*Ae. mutica* var. *ligustica* (Savign.) Coss.' (see at 10.16b, note 3). No rank was indicated by Cosson, but this is a variety following Art. 35.3 of the *Code*. However, I think that Cosson did not intended to locate *platyathera* under *Ae. mutica* and that unclear typography is the cause of this confusion.

2. Hexaploid forms of *Ae. crassa* have been reported (Kihara et al., 1965: 41-52) and I studied a few cultivated samples from UCR, that were received by them from the Kyoto institute (no. '21-1, no. 1'; UCR G-965, from an unknown location, and therefore not listed here). The spikes are more slender and tapering towards the apex than in the (presumably hexaploid) forms of *Ae. crassa*. Most conspicuous are the much more reduced lemma awns, only up to 1.5-2 cm at the apical spikelets but longer towards the base of the spike. However, this is cultivated material and no other, similar forms have been observed by me in herbaria or in the field. The 6n *crassa* closely resembled the artificially created amphiploid '4n *crassa* x *Ae. tauschii*', and it is suggested by Kihara et al. (l.c., 52) that the hexaploid forms have locally arisen similar to this cross, being found in Afghanistan among the putative parents.

Most of the 6n samples of Kihara et al. originate from Pul-i-Khumri and Maimana regions in Afghanistan (l.c., 1965: Tab. 27 and Fig. 21) from which area I have unfortunately not seen material. No separate taxonomic status has been given to these introgressed forms, although they are, as described, somewhat different from the typical tetraploid *crassa*.

3. Type material of Popova's varieties was not found at LE, TASH or WIR, the most likely places of deposit, and is probably no longer extant. This is similar to material, related to her varieties of *Ae. cylindrica* (see at 10.7), *Ae. juvenalis* (10.9), *Ae. tauschii* (10.17), and *Ae. triuncialis* (10.18).

10.7 **Aegilops cylindrica** Host **Figs. 34-39**

Aegilops cylindrica Host, Icon. descr. gram. austriac. 2: 6, Tab. 7 (1802), Fl. austriac. 1: 175 (1827); von Willdenow, Sp. pl. (ed. 4) 4(2): 943 (1806); Marschall von Bieberstein, Fl. taur.-caucas. 1: 434 (1808); Reichenbach, Fl. germ. excurs. 1(1): 17 (1830); Bluff, Nees von Esenbeck & Schauer, Comp. fl. German. (ed. 2) 1(1): 209 (1836); Parlatore, Fl. ital. 1: 513 (1850); Cosson, Notes pl. crit. 1(2b): 67 (1850); Jaubert & Spach, Ill. pl. orient. 4: 14, Tab. 311 (1850), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 354 (1851b); Walpers, Ann. bot. syst. 3: 789 (1852); Godron, Fl. juvenalis (ed. 1, Latin) 48 (1853) / Mém. Acad. Montp., Sect. Méd. 1: 455 (1853), (ed. 2, French) 115 (1854) / Mém. Acad. Stan. (Nancy) 435 (1853); Grenier, Fl. mass. adv., Mém. Soc. Emul. Doubs 3(2): 434 (1858); Tchichatscheff, Asie min., Bot. 2: 582 (1860); Nyman, Consp. fl. eur. 4: 839 (1882); Boissier, Fl. orient. 5(2): 675 (1884); Gandoger, Fl. Eur. 25: 8 (1892); Velenovský, Fl. bulg. 627 (1891); Fiori & Paoletti, Fl. Italia 1: 108 (1896); de Marchesetti, Fl. Trieste 656 (1897); von Halácsy, Consp. fl. graec. 3: 433 (1904); Coste, Fl. descr. France 3: 658 (1906); Koch, Syn. deut. schweiz. Fl. (ed. 3) 3: 2799 (1907); Jávorka, Magyar fl. 1: 114 (1924), Magyar fl. kis határozója 39 (1926); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 450, 505 (1928); Eig, Feddes Repert., Beih. 55: 102 (1929a, with var. *typica*); Jansen & Wachter, Nederl. Kruidk. Arch. 132 (1931); Douin in Bonnier, Fl. ill. France 12: 63 (1934); Nevski in Komarov, Fl. URSS 2: 671 (1934, Russian) / 534 (1963, English); Hegi, Ill. Fl. Mitt.-Eur. (ed. 2) 1: 500 (1936); Hitchcock, Man. Grasses U.S., USDA Misc. Publ. 200: 245 (1935), (ed. 2, rev. Chase) 245 (1951), Gen. grasses U.S. (ed. 2), USDA Bull. 772: 91 (1936); Fournier, Quatre fl. France 88 (1935); Kolakovski, Fl. Abkhazia 1: 182 (1938); Grossheim, Fl. Kavkaza (ed. 2) 1: 352 (1939), Opredelitel rastenich Kavkaza [Key to Caucasus plants] 719 (1949); Booth, Fl. Montana 1: 72 (1950); Gismondi, Pros. fl. ligust. 153 (1950); Karjagin, Fl. Azerbaijana 1: 335 (1950); Jansen, Fl. neerl. 1(2): 122 (1951); Soó von Bere, Magyar Növényv. Kézik. [Handb. Hung. fl.] 2: 939 (1951), Syst. geobot. handb. Hung. fl. 5: 354 (1973); Parsa, Fl. Iran 5: 822 (1952); Thiébaut, Fl. Lib.-Syr. 3: 316 (1953); Geideman, Opredelitel rastenich

Moldavskoi CCP [Key to pl. Moldavian SSR]: 424 (1954); Maevski, Fl. centr. belt europ. USSR (ed. 8): 817 (1954); Ovczinnikov, Fl. Tajikistan SSR 1: 336 (1957); Chennaveeraiah, Acta Horti Gotoburg. 23: 166 (1960, with ssp. *cylindrica*); Kearney & Peebles, Arizona Fl. (ed. 2) 1040 (1960); Kucera, Grasses Missouri 69 (1961); Steyermark, Fl. Missouri 126 (1963); Mouterde, Nouv. Fl. Liban, Syrie 1: 150 (1966); Stojanov et al., Fl. Bulg. (ed. 4) 1: 148 (1966, with var. '*cylindricum*'); Weber, Rocky Mount. Fl. 366 (1967); Hess et al., Fl. Schweiz 1: 383 (1967); Domac, Eksk. fl. Hrvatske [Croatia] 516 (1967); Bor, Fl. Iraq 9: 182 (1968); Munz & Keck, California Fl. and Suppl. 1507 (1968); Hitchcock et al., Vasc. Pl. Pacific NW 1: 447 (1969); Goloskokov, Ill. key to Kazakhstan pl. 1: 124 (1969); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 482 (1969); Bor, Fl. Iranica 70/30: 196 (1970); Rubtsova, Opredelitel vysschich rastenich Kryma [Key to higher pl. Crimea] 68 (1972); Takhtajan & Fedorov, Fl. erevana (ed. 2) 366 (1972); Anghel & Beldie in Savulescu, Fl. Rep. Soc. Romania 12: 559 (1972); McDougall, Seed Pl. N Arizona 16 (1973); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973), in Fedorov, Fl. part. Eur. URSS 1: 155 (1974), Zlaki SSSR 157 (1976, Russian) / 224 (1984, English); Josifovič, Fl. rep. soc. serbie 8: 443 (1976, with var. *cylindrica*); Dorn, Man. Vasc. Pl. Wyoming 1: 708 (1977); Cronquist et al., Interm. fl., Vasc. Pl. Interm. West U.S.A. 6: 332 (1977); Sljusarenko in Prokudin et al., Zlaki Ukrainy 92 (1977); Guinochet & Vilmorin, Fl. France 3: 967 (1978); Swink & Wilhelm, Fl. Chicago region 9 (1979); Zangheri, Fl. ital. 1: 980 (1979); Correll & Johnston, Man. Vasc. Pl. Texas 139 (1979); Martin & Hutchins, Fl. New Mexico 1: 255 (1980); Hammer, Feddes Repert. 91: 232 (1980b, with var. *cylindrica* and forma *cylindrica*); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980); Pignatti, Fl. italia 3: 543 (1982); Cope in Nasir & Ali, Fl. Pakistan 143: 595 (1982); Barnard & Potter, New Mexico Grasses 50 (1984); Davis, Fl. Turkey 9: 237 (1985); Barkley, Fl. Great Plains 1122 (1986); Welsh et al., Utah Fl. 692 (1987); Nikitin & Geldhykanov, Opredelitel rastenich Turkmenistana [Key to Turkmenistan plants] 46 (1988); Dostál, New fl. Czechoslovak SSR 2: 1366 (1989); Gandilyan in Kazarjan, Red data book Armenian SSR 248 (1990).

Lectotype (*nov.*): (Hungary) Buda Pesthini [= Budapest], in Cttu [= Comitatu = County] Békésiensi, *Kitaibel 226* (BP, photocopy of sheet seen; isolectotype: B-W 18878-1). See note 1.

Homotypic synonyms:

Triticum cylindricum (Host) Ces., Pass. & Gibelli, Comp. fl. ital. 1(4): 86 (1869); Richter, Pl. eur. 1: 128 (1890); Schmahlhausen, Fl. ssredn. jushn. Rossii [Fl. central and southern Russia] 2: 661 (1897); Zimmermann, Adv. Ruderalfl. Mannheim 72 (1907); Fedtschenko & Flyorov, Fl. Eur. Russia 148 (1910); Thellung, Fl. adv. Montpellier 146 (1912); Fedtschenko & Fedtschenko, Consp. fl. Turkest. Kirgh., Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 38(1): 149 (1924); Stojanov & Stefanoff, Fl. Bulg. (ed. 1) 1: 168 (1924), (ed. 3) 174 (1948); von Hayek, Prod., fl. pen. Balcan. 3: 227 (1932); Diapulis, Syn. fl. graec. 168 (1939, authors as 'Ces. Pass. Gib.'); Bowden, Can. J. Bot. 37: 675 (1959), Can. J. Gen. Cyt. 8: 135 (1966); Mohlenbrock, Ill. Fl. Illinois, Grasses 244 (1972); Gould, Grasses Texas 175 (1975); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 68 (1987).

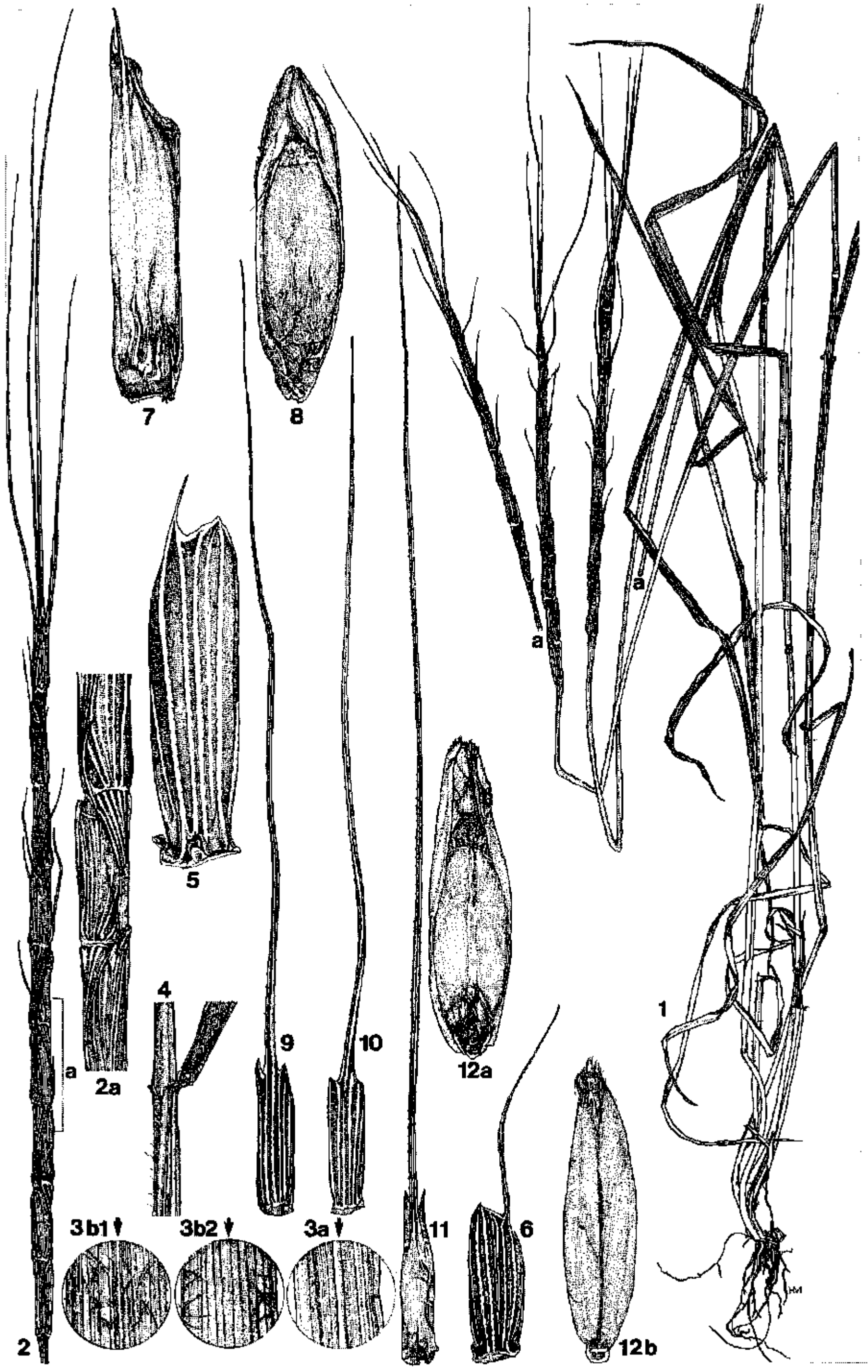
Triticum caudatum (L.) Godr. & Gren. ssp. ('B.') *T. cylindricum* (Host) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 710 (1902). – Note: on the rank of the 'B', see note 1 at *Ae. speltoides* var. *ligustica* (10.16b).

Ae. caudata L. ssp. *cylindrica* (Host) Hegi, Ill. Fl. Mitt.-Eur. (ed. 1) 1: 390 (1908).

Ae. caudata L. var. ('β') *cylindrica* (Host) Fiori, Nuov. Fl. Italia 1: 160 (1923). – Note: on the rank of the 'β', see note 1 at *Ae. speltoides* var. *ligustica* (10.16b).

Ae. cylindracea Kit. (ex Jáv) ex Soó, Syst. geobot. handb. Hung. fl. 5: 354 (1973), *nom. inval.* (Art. 34.1*(c)*). See note 2.

Fig. 34. *Aegilops cylindrica*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlarged part of spike, showing spikelets in situ (x 3); 3a, abaxial leaf surface, midway (x 5); 3b1, adaxial leaf surface at basal part of stem, midway (x 5); 3b2, abaxial leaf surface (of 3a), midway (x 5); 4, stem, leaf sheath, ears and leaf blade (x 2); 5, glume of lowest floret of lowest spikelet in a spike (x 5); 6-8, lowest floret of spikelet in centre of spike: 6, glume (x 21/2), 7, lemma (x 5), 8, palea and immature seed (x 5); 9-10, glumes of apical spikelet (both x 21/2); 11, lemma of 9 (x 21/2); 12a, palea and dorsal surface of mature seed (x 5); 12b, ventral surface of mature seed (x 5). (1-12. *van Slageren & al. MSMZNN-90248H.*)



7
8
a
a
5
4
2a
a
9
10
12a
1
3b1
3b2
3a
11
6
12b
2

Cylindropyrum cylindricum (Host) Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 500 (1984, with ssp. *cylindricum*).

Sub nom. *Ae. caudata* auct. non Linnaeus (1753): Roemer & Schultes, Syst. veg. 2: 770 (1817); Kunth, Enum. pl., Suppl. tomi primi 372 (1835); Tenore, Fl. napol. 5: 288 (1835); Tausch, Flora 20: 106 (1837); Grisebach in von Ledebour, Fl. ross. 4: 326 (1852); von Steudel, Syn. pl. glumac. 1: 355 (1854); Schlosser von Klekovski & Vukotinovič, Fl. croat. 1293 (1869); von Lindemann, Fl. cherson. 2: 317 (1882); von Regel, Descriptiones plantarum novarum 8, Trudy Imp. St-Peterburgsk. Bot. Sada [= Acta Horti petro.] 7: 577 (1881); Kuntze, Pl. Orient.-Ross., Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 20: 256 (1887, sub. nom. *Tr. caudatum*); Post, Fl. Syria (ed. 1) 899 (1896).

Heterotypic synonyms:

Ae. cylindrica Host var. *rumelica* Velen., Fl. bulg. 627 (1891); Stojanov et al., Fl. Bulg. (ed. 4) 1: 148 (1966, '*rumelicum*'), **syn. nov.** – Type: (Bulgaria) in colle arido Džemdem Tepe ad Philippopolin [= Plovdiv], VI.1890, *Keck & Pichler s.n.* (holo: PRC; iso: BR, G, K, LD, LE, W). – Homotypic synonyms: *Triticum cylindricum* (Host) Ces., Pass. & Gibelli var. *rumelicum* (Velen.) Stoj. & Stef., Fl. Bulg. (ed. 1) 1: 169 (1924), (ed. 3) 174 (1948). *Triticum cylindricum* (Host) Ces., Pass. & Gibelli forma ('β') *rumelicum* (Velen.) Hayek, Prod. fl. pen. Balcan. 3: 228 (1932). – Note: on the rank of the 'β' in this and other von Hayek combinations, see note 1 at *Ae. biuncialis* (10.2).

Ae. caudata L. [ssp. *cylindrica* (Host) Hegi] var. *hirsuta* (Binz) Hegi, Ill. Fl. Mitt.-Eur. (ed. 1) 1: 390 (1908), **syn. nov.** – Type: not indicated. – Synonym: *Ae. cylindrica* Host var. *hirsuta* (Binz) Hegi, Ill. Fl. Mitt.-Eur. (ed. 2) 1: 500 (1936). – Note: Hegi (1908: 390) apparently took the epithet from Binz, but I have been unable to find any publication from Binz relating to it.

Ae. cylindrica Host var. *pubescens* (Kloos) Jansen, Ned. Kruidk, Arch. 66 (1914, as '*Aegilops cylindrica pubescens* Kloos'), Fl. neerl. 1(2): 122 (1951), **syn. nov.** – Lectotype (*nov.*): (the Netherlands) Wormerveer, bij de meelfabriek Mercurius, 27.VI.1914, *Kloos s.n.* (holo: L 953.200-231, photocopy seen). – Note: the varietal status was given by Jansen, and this name and citation follows Art. 35.2 and its Ex. 2 of the *Code*.

Ae. cylindrica Host var. *albescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923); Hammer, Feddes Repert. 91: 232 (1980b; considers this var. the typical form of *cylindrica*). – Type: (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*.

Ae. cylindrica Host var. *brunnea* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonym: *Ae. cylindrica* Host forma *brunnea* (Pop.) Hammer, Feddes Repert. 91: 233 (1980b).

Ae. cylindrica Host var. *ferruginea* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Syntypes: (Russia) Saratov, *Vilenski s.n.* (LE/TASH/WIR?, not found); (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonym: *Ae. cylindrica* Host forma *ferruginea* (Pop.) Hammer, Feddes Repert. 91: 232 (1980b).

Ae. cylindrica Host var. *flavescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Type: (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonym: *Ae. cylindrica* Host forma *flavescens* (Pop.) Hammer, Feddes Repert. 91: 233 (1980b).

Ae. cylindrica Host var. *fuliginosa* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Type: (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonyms: *Ae. cylindrica* Host forma ('f.') *fuliginosa* (Pop.) Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 482 (1969), *comb. inval.* (Art. 33.2). *Ae. cylindrica* Host forma *fuliginosa* (Pop.) Hammer, Feddes Repert. 91: 233 (1980b).

Ae. cylindrica Host var. *rubiginosa* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Type: (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonym: *Ae. cylindrica* Host forma *rubiginosa* (Pop.) Hammer, Feddes Repert. 91: 233 (1980b).

Ae. cylindrica Host ssp. *aristulata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 507 (1928), **syn.**

nov. – Syntypes (fide Zhukovsky, 1928): (Azerbaijan) Nakhichevan, *Kuleschov s.n.*; (Russia) Daghestan, prope Derbent, *Zherdeva s.n.*; Afghanistan, Chadjatchit-Chazar, *Bukinitch s.n.* (all WIR?, not found). – Homotypic synonym: *Ae. cylindrica* Host var. *aristulata* (Zhuk.) Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973), in Fedorov, Zlaki SSSR: 157 (1976, Russian) / 225 (1984, English); Hammer, Feddes Repert. 91: 233 (1980b).

Ae. cylindrica Host var. *pauciaristata* Eig, Feddes Repert., Beih. 55: 103 (1929a); Jansen, Fl. neerl. 1(2): 122 (1951); Tzvelev in Fedorov, Fl. part. Eur. URSS 1: 155 (1974), Zlaki SSSR: 157 (1976, Russian) / 225 (1984, English); Josifovič, Fl. rep. soc. serbie 8: 443 (1976); Hammer, Feddes Repert. 91: 233 (1980b), **syn. nov.** – Syntypes (five collections cited by Eig, 1929a; inspected ones listed): Turkey, Cappadocia, Caesarea ('Caesareebene'), 1886, *Balansa 42* (G-BOIS, L, P); Bulgaria, near Sliven, Mt. Baramuk, 1907, *Schneider 1426* (B, not seen, probably †, BM, G, K, MO, PH, W); Ukraine, Cherson, near Limane, *Rehmann 174* (B, not seen, probably †, NY). – Homotypic synonyms: *Triticum cylindricum* (Host) Ces., Pass. & Gibelli forma ('γ') *pauciaristatum* (Eig) Hayek, Prod. fl. pen. Balcan. 3: 228 (1932). *Ae. cylindrica* Host. ssp. *pauciaristata* (Eig) Chennav., Acta Horti Gotoburg. 23: 166 (1960). *Cylindropyrum cylindricum* (Host) Á.Löve ssp. *pauciaristatum* (Eig) Á.Löve, Feddes Repert. 95: 500 (1984).

Ae. cylindrica Host var. *multiaristata* Jansen & Wacht., Nederl. Kruidk. Arch. 138 (descr.), 135 (illustr. Fig. 5c) (1931); Henrard in van den Bosch, Prodr. fl. bat. (ed. 2) 1(4): 2410 (1916; sub *Ae. caudata β polyathera*, referred to by Jansen & Wachter); Jansen, Fl. neerl. 1(2): 122 (1951), **syn. nov.** – Type: (the Netherlands) Gorinchem, VII.1912, *Henrard s.n.* (holo: L-Jansen & Wachter 7084).

Ae. cylindrica Host var. *prokhanovii* Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973), in Fedorov, Zlaki SSSR 157 (1976, Russian) / 225 (1984, English); Hammer, Feddes Repert. 91: 233 (1980b), **syn. nov.** – Type: (Russia) Daghestan, distr. Machacz-Kala, jugum Narat-Tjube, Alti-Bujukski pass, 22.VI.1955, *Prokhanov 280* (holo: LE).

Ae. cylindrica Host var. *kastorianum* Karataglis, Pl. Syst. Evol. 163: 19 (1989), **syn. nov.** – Type: (Greece) Kastoria, *Karataglis 9* (holo: TAU, not seen). See note 3.

Diagnostic characters: tufted, many tillered annuals, 20-40(-80) cm tall excluding spikes; spikes narrowly cylindrical 5-8(-12) cm long excluding awns, with (4-) 6-8(-12) spikelets, rudimentary spikelets 1-2; glumes with 1 blunt, triangular tooth and 1 short (2-5 mm, base of spike) to long (up to 35 mm, subapically) awn, apical glume with 3-6 cm awn with 2 teeth at the base (sometimes not developed); lemmas with small apical tooth, those of apical spikelets with long, 4-8 cm awn with 2 teeth at the base; caryopsis adherent. Apical glume and lemma awns always shorter than length of entire spike.

Description (Fig. 34): tufted *annuals* (*Fig. 34-1*) with few to (usually) many slender tillers. *Culms* semi-prostrate at base, then ascending, 20-40(-80) cm tall excluding spikes; foliage ± evenly distributed, sparse, more dense at base of culm. *Leaf* blades linear-acuminate, 3-10(-15) cm long, 0.2-0.5 cm wide; margins of sheaths hyaline, sometimes ciliate (*Fig. 34-4*). *Inflorescence* (*Fig. 34-2*) a narrowly cylindrical spike, slightly tapering towards the apex, 5-8(-12) cm long excluding awns, around 0.3 cm wide; disarticulating at maturity as one unit with the rudimentary spikelets remaining attached to the culm, in second instance breaking up barrel-type; with (4-)6-8(-12) fertile and 1-2 rudimentary spikelets, the latter ones sometimes absent. *Spikelets* (*Fig. 34-2a*) sessile, cylindrical, 9-10 mm long excluding awn, around 3 mm wide, spikelet length roughly equalling that of the supporting rachis internode; apical spikelet obconical, shorter and more slender, ± 7 mm long, 2 mm wide; with 3-5 florets of which the lower (1-)2-3 are fertile. *Glumes* (*Fig. 34-5*) 2, coriaceous (but lateral, especially in the lower parts, hyaline), ovate-

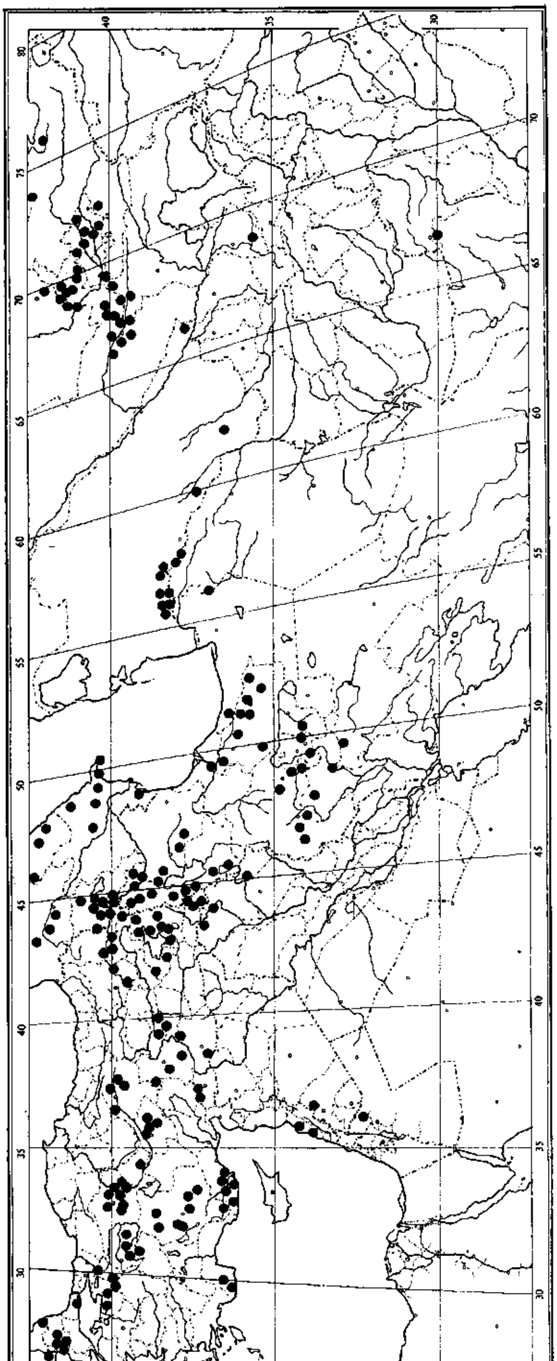


Fig. 35. Distribution of *Aegilops cylindrica* in Asia.

oblong, 7-9 mm long, green to purplish-green, surface scabrid; veins unequally wide, sunk into the surface, more or less parallel, usually yellowish and lighter in colour than the glume surface, occasionally purplish-green, surface scabrid or setulose; apex of lateral glumes adaxially ending in a sharp tooth, extending into a setulose awn, increasing in length from 2-5 mm at base of spike up to 35 mm subapically, apex abaxially with a broadly triangular tooth; glumes of apical spikelets (*Fig. 34-9, 10*) narrowly elliptic-rectangular, the truncate apex with 1 setulose, 3-6 cm long awn, flanked by 2 acute lateral teeth, but sometimes only shouldered and teeth indistinct, awns with a prominent central vein and diverging at maturity of spikes. *Lemmas* (*Fig. 34-7*) of fertile florets slightly exserting the glumes, 9-10 mm long, narrowly elliptical, boat-shaped, folded to conduplicate in the apical part, inner surface of apical part velutinous; apex with 1 setulose, central tooth, usually developing into a short awn, and 1-2 blunt, lateral teeth; lemmas of apical spikelet (*Fig. 34-11*) with a prominent central awn, 4-8 cm long, with 2 sharp teeth at the

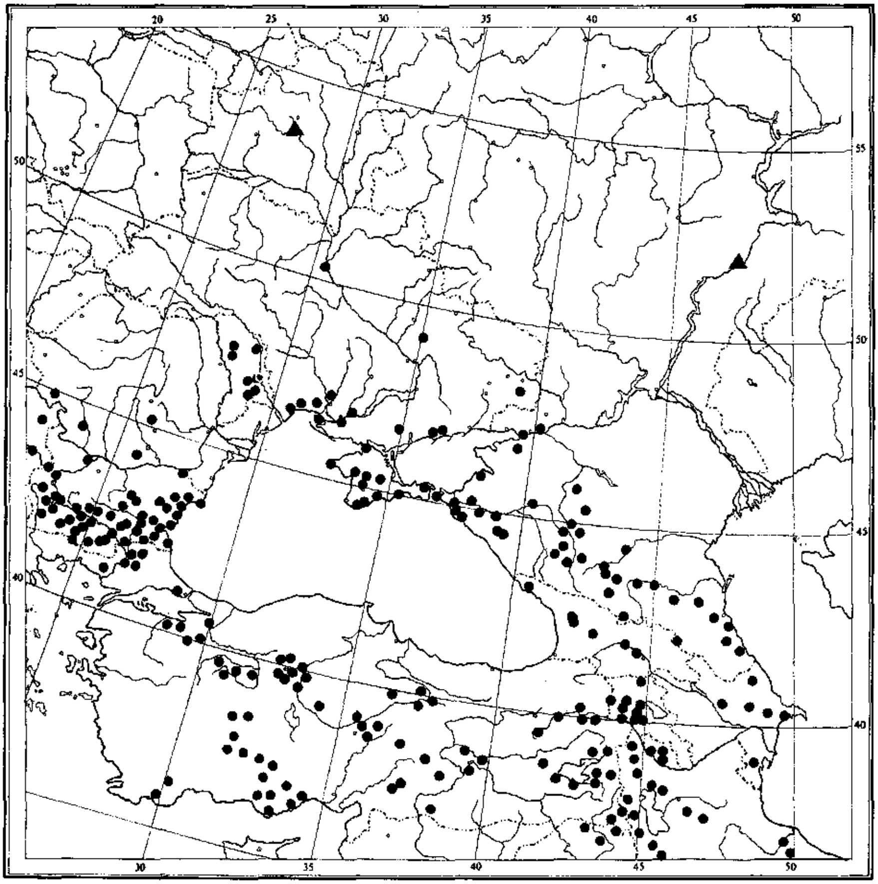


Fig. 36. Distribution of *Aegilops cylindrica* in the Black Sea region. ● = locations; ▲ = adventive locations.

base, less divergent at maturity than glume awns, lemma awns of sterile apical florets much reduced. *Paleas* (*Fig. 34-8, 12a*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 34-12b*) 6-7 mm long, adherent to lemma and palea.

Variation: in length of culms: 20-40 cm, but up to 80 cm is recorded; in length of spike, 5-8(-12) cm and number of spikelets: (4-)6-8(-12), and in development of the lateral glume awn: 2-5 mm at base of spike, up to 35 mm subapically.

Distribution (Figs. 35-38): a widespread Mediterranean / Western Asiatic, and even circumboreal element occurring mainly at the higher latitudes in the distribution area of the genus: westwards from Asia Minor into Bulgaria, Romania, Yugoslavia and up along the Danube into Hungary (from where it was first described; see also note 5 of Chapter 6.1.1 on the distribution in the Balkans); northwards into the Caucasus region and along the Black Sea coast (Fig. 36; see also note 4 of Chapter 6.1.1), and eastwards up into Central Asia (in the sense as explained in Chapter 6.1.1: the Asian republics of the CIS; Fig. 35). Rather inexplicably this species is almost absent in Greece, while only a few sites are known from Afghanistan, and one from Pakistan (see below). In the Fertile Crescent mainly present in the northern (central) part, with a few sites known from the western arc: Lebanon, as well as the first records for Jordan [Zarqa, germplasm coll. *Humeid & al. 91-JOR-148* (ICARDA, NCARTT)], and Syria [Damascus to Nabk, germplasm coll. *Rifaie & Witcombe SY-20315* (ICARDA, IPGRI)]. A weedy species, common throughout its range (except in the western part of the Crescent where it is rare).

Cope (1982: 596) cites a specimen from Pakistan's North Western Frontier Province, [Hazara distr., Changla Gali, *Ali 711* (KUH)], but I have been unable to see the specimen involved and thus unable to confirm this location. In Afghanistan and Pakistan *Ae. cylindrica* is known from a few sites only, but the distribution is probably more extensive than can be shown at present due to insufficient collecting and the inaccessibility of the countryside.

Recently (probably at the end of the 19th century; oldest specimen seen is from 1918) introduced in the U.S.A. (Hitchcock, 1935: 246) and present in many states from the east to the west coasts (Fig. 38), although most abundantly in the western and northwestern states and the plains of the midwest (Barkley, 1986: 1122).

Earlier introduced and classified as an adventive in Italy (Genoa region, cf., Gismondi, 1950: 153; Trieste, Aosta, Genoa, Langhe and Puglia regions, cf., Fiori & Paoletti, 1896: 108; Pignatti, 1982: 543), France (Montpellier region, cf., Grenier, 1858: 434), Germany (harbour of Mannheim, cf., Zimmermann, 1907: 72); Switzerland (Hess et al. (1967: 383). The varieties *hirsuta*, *pubescens* and *multiaristata* were described on the basis of adventive findings: the first one from near Basel, Switzerland, by Hegi (1908: 390), the latter two from the Netherlands (Wormerveer and Gorinchem) by Jansen (1951: 122-123) and Jansen & Wachter (1931: 138), respectively. Also found adventive in many other countries of central, northwestern, northern, and eastern Europe (Fig. 37).

Ecology (Fig. 39): a species from ruderal and disturbed sties, wastelands, road- and railwaysides (Fig. 39), dry hill- and mountain slopes, grasslands, and close by or within cultivation: orchards, vineyards, wheat fields. Near wheat fields, *Ae.*

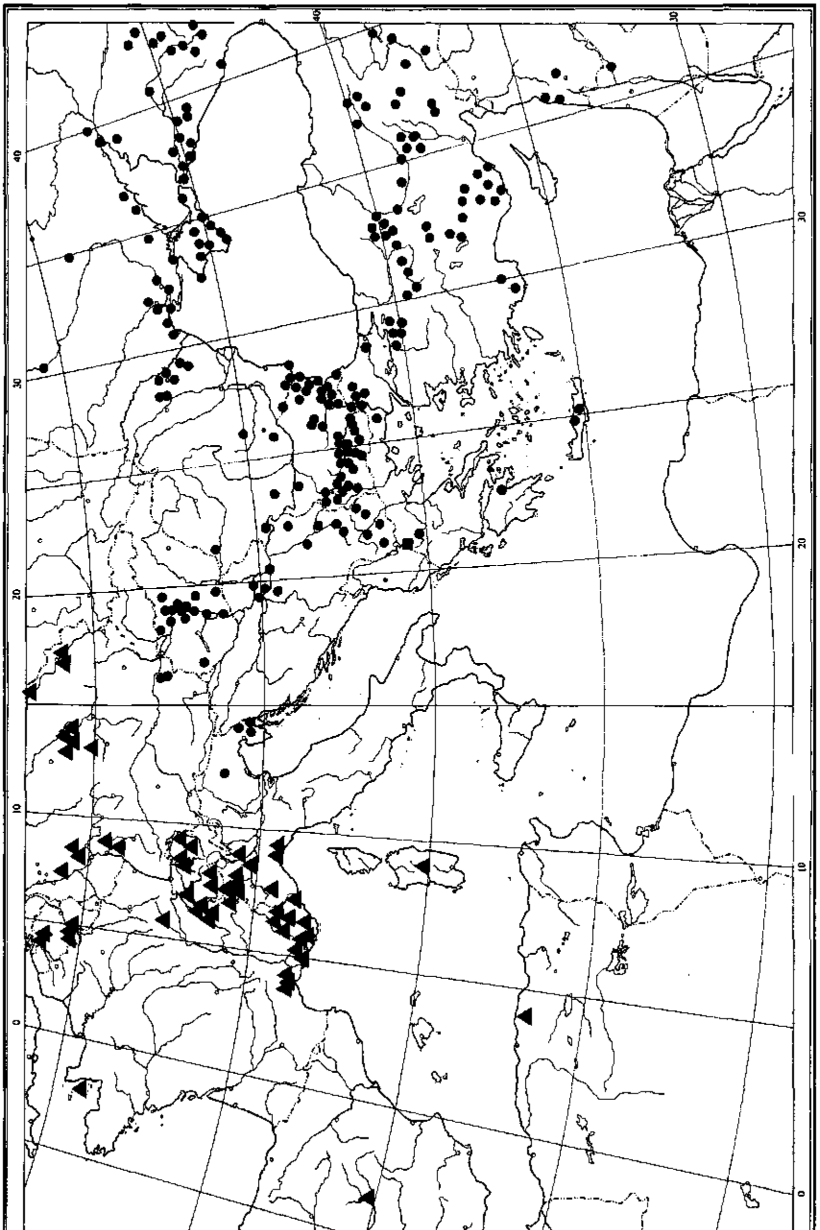


Fig. 37. Distribution of *Aegilops cylindrica* in Europe, western Asia (partially) and the Black Sea region (partially). ● = locations; ▲ = adventive locations (those in the Netherlands, Sweden and the U.K. not shown).

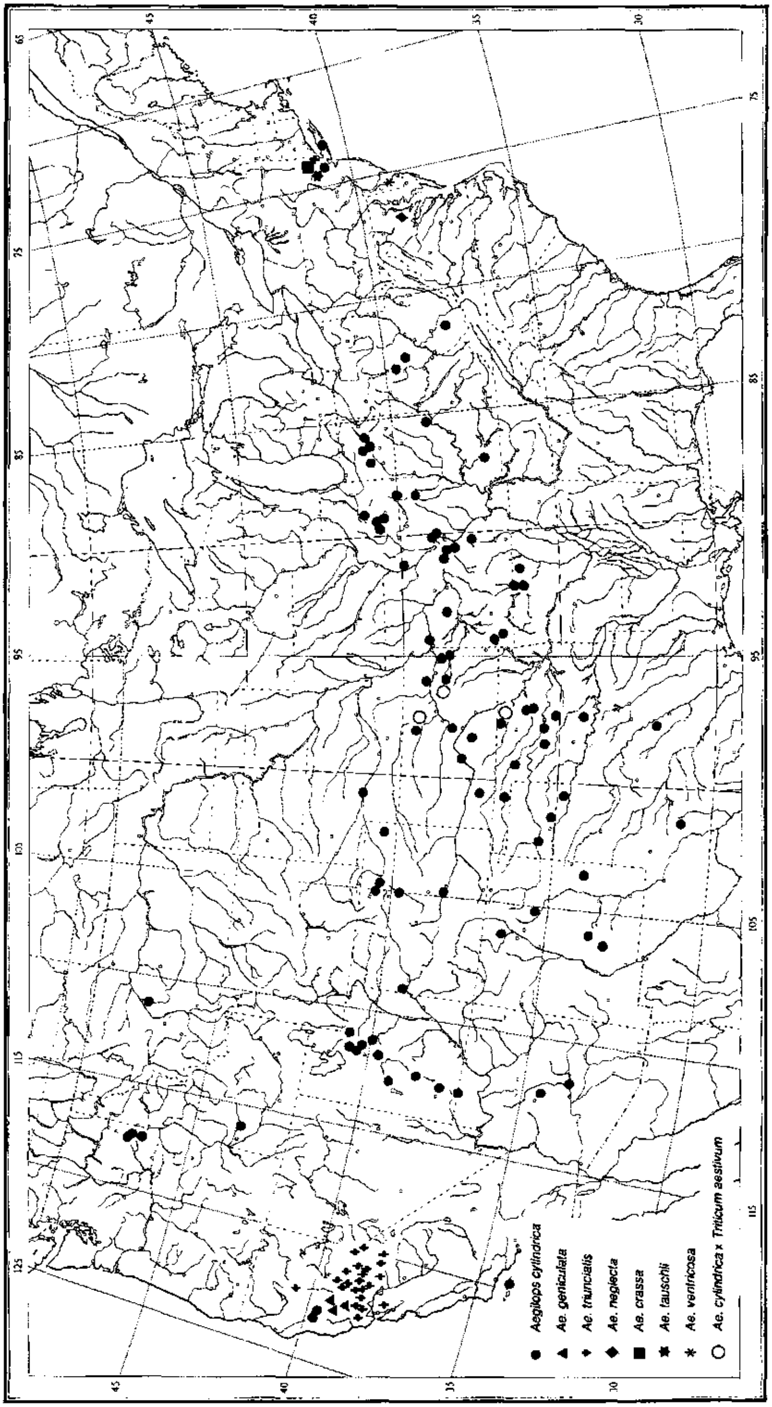


Fig. 38. Distribution of introduced *Aegilops* species and of the natural hybrid x *Aegilotriticum sancti-andreae* in the U.S.A. ● = *Ae. cylindrica*; ■ = *Ae. crassa*; ◆ = *Ae. neglecta*; ▲ = *Ae. geniculata*; ✱ = *Ae. tauschii*; ✚ = *Ae. triuncialis* var. *triuncialis*; * = *Ae. ventricosa*; ○ = x *Aegilotriticum sancti-andreae*.

cylindrica can easily form natural hybrids (see Chapter 4.2 at 4.2.2.5. and Fig. 5). Soil bedrock is mainly calcareous and basaltic, less frequently on sands. Soil textures include clay, clayloam and sandy loams, but sometimes found on more pure sands. Annual rainfall data vary from 450 to 800 mm, indicating a preference for more humid environments than most *Aegilops* species. An exception to this is the germplasm collection *Humeid & al. 91-JOR-148* from Jordan, which is found in an area with only 50 mm annual rain. However, this site is a wadi (river bed) where rainfall accumulates, together with water from a nearby salt marsh. Thus the actual water presence may be very different from what the rainfall figures suggest.

Probably at the end of the 19th century this species was introduced in the U.S.A. where it has now developed locally into 'a serious pest in (winter) wheat and alfalfa fields' (coll. *Geier s.n.* (US) from Oklahoma). Many records, especially from the northwestern states, indicate that the species was found for several years in that particular location and that it was becoming more and more common over the years. It is reported from wastelands, road- and railwaysides, grasslands, sagebush, oak and cedar glades, grasslands and grass / shrub communities with, among others, *Juniperus* or *Yucca*, and edges of and within wheat and oat fields. Reported as a pest for wheat growers because it shatters easily when mature. Soil types include sands, dry gravel, sandy clay and clayloams.

Aegilops cylindrica more than most species of the genus shows weedy behaviour, occupying large stands after recent disturbances. [More notes on its weediness in Chapter 6.1.1.].

Altitude: from -28 m (Caspian Sea region) up to 2000 m. In the U.S.A. found at 50-2500 m.

Flowering and fruiting time: May – August. May – June in the Genoa region, Italy (Gismondi, 1950: 153). In the U.S.A. May – June (Martin & Hutchins, 1980: 255).

Genome: DC (female parent 'D' x male parent 'C') with 2x = 4n = 28 (Chennaveeraiah, 1960: 91; Waines & Barnhart, 1992: Table 2).

Vernacular names:

Armenian: Aytzagn klanatzev [klan = cylinder, pipe; tzev = shape] (Gandilyan et al., 1975: 87); Karachod klanatzev (Gandilyan in Kazarjan, 1990: 248).

Azeri: Istvanevi bugdayiot (Karjagin, 1950: 335).

Czech: Mnohoštět válcovitý [válcovitý = cylindrical] (Dostál, 1989: 1366).

Dutch: Eennaald-geitenoog [= one-awned goat's eye] (Heimans et al., 1909: 278).

English: Cylindrical Hard-grass (Aiton, 1813: 433); Jointed Goatgrass (Hitchcock, 1935: 245).

French: Égilope à queue [= *Aegilops* with a tail] (Tenore, 1835: 288); Égilope cylindrique (Douin in Bonnier, 1934: 63).

German: walzenförmiger Walch [walze = cylinder (shaped), barrel, roll] (von Willdenow, 1806: 943); Zylinder Walch [= cylindrical Walch] (Anghel & Beldie, 1972: 559); cylindrischer Walch (Koch, 1907: 2799); zylindrischer Walch (Hess et al., 1967: 383).

Hungarian: Kecskezsem [kecske = goat; zsem = eye] (Anghel & Beldie, 1972:

Fig. 39. Mixed growth of *Aegilops cylindrica* and *Ae. triuncialis* on a roadside between Kara-Kala and Yarti-Kala in the Kopet Dag Mts., Turkmenistan.

559). Mainly used at generic level, but connected by Anghel & Beldie with *Ae. cylindrica*.

Italian: Egilope coduta [= *Aegilops* (with a) tail] (Tenore, 1835: 288). The description by Tenore is under *Ae. caudata*, from which this vernacular name appears to be derived. His description, however, refers to *Ae. cylindrica*. Grano selvatico cornuto [= wild, horned wheat] (de Marchesetti, 1896: 656). This name also appears in Bertoloni (1834: 792) under *Ae. cylindrica*, but his description clearly refers to *Aegilops caudata*. Thus this vernacular is applied to two species. Cerere cilindrica (Pignatti, 1982: 543).

Kazach: Kiltik chop (Kovalevskaja, 1968: 184).

Kurdish: Karkhankina [= Kharkan keina (at *Ae. crassa*) = donkey choke]. On a collection from Khalana, Iraq: *Al-Rawi 13809* (K), cited by Bor (1968: 182).

Romanian: Ciucure [= plume] (Anghel & Beldie, 1972: 559).

Russian: Ovodnik (von Lindemann, 1882: 317, sub *Ae caudata*).

Turkish: Yuvarlak buğday otu [yuvarlak = spherical]; Kirpikli ot [kirpikli = ciliated; ot = otu = grass] (both from Sabanci, 1984: 1).

Turkmenian: Cylinderli bogdayli-tchair (Nikitin & Kerbabajev, 1962: 141).

Uzbek: Jetteburun [jette = seven; burun = separate parts] (Kovalevskaja, 1968: 184). Referring to a common number of spikelets in this species.

Uses: in spite of the Kurdish vernacular name 'donkey choke', it is nevertheless recognized locally as a forage plant in Iraq (Bor, 1968: 182).

Etymology: the final epithet is derived from the Latin 'cylindricus' [= cylinder-shaped], a reference to the spike outline.

A geographical selection of ca 1470 herbarium specimens examined:

AFRICA: ALGERIA: Djardjara, *Courzaille s.n.* (BC).

ASIA: AFGHANISTAN: Baghlan prov., Darrah-i-Kayan, W Doshti, near Shahhasan, *Podlech 18327* (G); 20 mi. SW Maimana, *Smith 545, 549* (K).

IRAN: Azerbaijan, 33 km Shahpur to Khvoy, *Assadi & Mozaffarian 30512* (E); 60 km Rezayeh to Oshnavieh, *Babakhanloo 23787* (K); W Iran, Sungur, Kuh-i-Emrallah, *Bornmüller s.n.* (B, US); Ghazvian to Abdolahabad, *Foroughian 10013* (K); Azerbaijan, Bazargan, *Furse & Synge 799/19* (K); 30 mi. N Sanandaj, *Gentry 15340* (UCR); Tabriz prov., near Marand, *Grossheim s.n.* (LE); Azerbaijan, Goya Bel, N Ahar, *Jardine 602* (E); Lorestan, Chamchid, *Koelz 16017* (US); Khoramabad, *Köie 1044* (LE); Khvoy to Makul, *Kuckuck 56/2318* (K), *229c, 231a* (B); Jam, 111 km Tabriz to Marand, *Kuckuck 223h* (B); Sofian, 86 km Tabriz to Marand, *Kuckuck 218d* (B); 152 km Mianeh to Tabriz, *Kuckuck 213f2* (B); Qasvin to Tehran, *Kuckuck 197a1, 197a2* (B); 106 km Chalus to Karaj, *Kuckuck 276c* (B); 55 km Quchau to Bojnurd, *Kukcuck 327f* (B); 34 km Tehran to Firuzkuh, *Kuckuck 388e* (B); 57 km Ali Cüdarz to Borujerd, *Kuckuck 452d* (B); 48 km Khorramabad to Keshvar, *Kuckuck 468b* (B); 138 km Khorramabad to Kermanshah, *Kuckuck 479c* (B); Behbehan, Aghajary to Khalalabad, *Kuckuck 102* (B); Tehran, Astra, 44 km from Karaj, *Kuckuck 40b* (B); 43 km from Arak, *Kuckuck 94a5, 95a10, 95a11, 94a12, 9411* (B); Tehran, Shemiran, Kontche Parvin, *Kuckuck 104m1* (B); Kermanshah, Shahan, near Kahavand, *Kuckuck 142a* (B); near Malayer, *Kuckuck 150b1* (B); Bahlodabad, *Kuckuck 236e* (B); Shahpur to Rezaiyeh, *Kuckuck 241c* (B); 62 km from Shahpur to Rezaiyeh, *Kuckuck 244f* (B); 79 km Rezaiyeh to Mahabad, *Kuckuck 247c* (B); Mahabad to Barum, *Kuckuck 250d* (B); Soma, Tabriz to Mianeh, *Kuckuck 259c* (B); 24 km Qasvin to Rasht, *Kuckuck 265e* (B); 88 km Chalus to Karaj, *Kuckuck 273d* (B); Hamadan, Aghbalagh, *Pahal 10091B* (K); Kermanshah to Hamadan, *Wright & Bent 528-101* (K); Hamadan, *Zohary s.n.* (UCR, US cult).

IRAQ: Kani Mam Shevin, *Agnew & al. W2002* (K, W); Khalana, *Al-Rawi 13712, 13809* (K); 112 km N Mosul, *Knowles K1236* (UCR); Gopala, near Taynal, Sulaymaniyah to Kirkuk, *Thorpe 33166* (K).

LEBANON: Tripoli, *Blanche s.n.* (LY-Gandoger); Fnaidé to Marj Hin, *Mouterde 8586* (G).

KAZAKHSTAN: reg. Chimkent, *Minkwitz s.n.* (BM); Chimkent, Sasyk-Sai, *Minkwitz 327* (LE); near Kaplanbek, *Pasich s.n.* (TASH).

KYRGYSTAN: Osh reg., Ala-Bukha distr., near Chekafter, *Bukeeva s.n.* (LE); Ala-Tau, Neldi river, *Kudrjaschev 1198* (TASH); Tian Shan, Kirgizki Mts., NE Frunze, near Chop-Aryk, *Vašák s.n.* (BR, G).

PAKISTAN: Baluchistan, Quetta, near Kath Urrak, *Dar & Sher Mohad 499* (A).

TAJIKISTAN: Ayni to Shakhristan, *van Slageren & al. MSPGAP-91179H* (ICARDA).

TURKEY: Guedes-Tchaï, *Balansa s.n.* (L); Cappadocia, Caecarea, *Balansa 42* (G-BOIS, L, P, type of *Aegilops cylindrica* var. *pauciaristata*); Kocas, Yol Kenarlazi, *Birand & Zohary 2605* (ANK); Ankara, 68 km Güneyde, *Birand & Zohary 2055, 3077* (ANK); Anatolia, Amasya, Logman Mt., Pontus Galaticus, *Bornmüller 471* (B, BR, G, JE, K, LD, LE, OXF, SO, W), *1803* (B, JE, LE, LY-Gandoger, MPU, NY, US, W), *2152* (BM, G, JE, LD, PR), *2652* (B, BEI, BR, FI, G, K, L, LE, OXF, P, PRC, SO, W, Z), *s.n.* (B, BM, L, LE, MPU, NY, OXF, P); Lycia, Elmalu, *Bourgeau 277* (JE, LY, LY-Gandoger, MPU, W); 20 mi. from Ankara to Polatli, *Coode & Jones 2229* (A, E); Maraş, Göksun, Yalak, *Davis & al. 20165* (ANK, BM, C, E, K); Van, Timar to Bendimaki, 50 km from Erciş, *Davis 44201* (E, ERE, K); S Hakkari, Zap gorge, *Davis 45452* (E, K, US); Ankara, Beytepe, Maslak Vadizi, *Erik 1463* (HUB); Karakilise to Guyuk Sun, *Grass 138* (BEI); Horasen, Pasinler, *Harlan 7241* (K); Moden, Bayburt, *Harlan 7177* (K); Baskoi, *Harlan 7492* (K); Taurus Cataonicus, Surug, *Haussknecht s.n.* (G-BOIS); Kücük, Köy, SE Konya, *Helbaek 2605* (C, K); Konya, Merkez, Ala Cati, *Hillman 2803* (RNG); 230 km NE Diyarbakir, *Johnson & Hall s.n.* (UCR, US cult.); E Agri, *Johnson & Hall s.n.* (UCR, US cult.); SW Bitlis, *Johnson & Hall s.n.* (UCR, US cult.); 31 km N Doğubayazit, *Johnson & Hall s.n.* (UCR, US cult.); 120 km NW Kirşehir, *Johnson & Hall s.n.* (UCR); Ankara, Polatli yolu, Kargaloğlari, *Kasapligil 416* (ANK, K); Istanbul, *Noë s.n.* (L); Içel, Ermenek, *Péronin 210* (BM, L, LY, MPU, W); Pursak river, nera Sazova, *Scheibe 1303* (B); Eskişehir, Kaymaz, *Scheibe 1071* (JE), *1303* (B); Trabzon, *Schischkin s.n.* (ERE); Makemudi Dobrudicha, near Reibudžuk, *Sintenis 780* (LD, LE); Malatya, Hekimhan, *Stainton & Henderson 5401* (E, K, US); W Karacabey on road Bandirma – Bursa, *Tüten & al. CNM-220689-0801* (ICARDA, IZ); Bursa, NW Inegöl, *Tüten & al. CNM 230689-0202* (ICARDA, IZ); Kirklareli, SW Dereköy, *Tüten & al. CNM-280689-0201* (ICARDA, IZ, WAG); Edirne, S Sarayakpinar, *Tüten & al. CNM-290689-0402* (ICARDA, IZ); Taurus Mts., Iacus Sasyk, *Vašák s.n.* (W); Sögüt Gölü, *Woldring E16* (L); Maraş, Göksun, Kinikkok, *Yildiz 2856, 2868* (HUB); SW Tunceli, *Zohary s.n.* (UCR, US cult.).

TURKMENISTAN: Bacharden reg., Karaol, *Belolov & Berdyev s.n.* (ASH); Bacharden reg., Kapakli, *Berdyev & Belolov s.n.* (ASH); Iolotan reg., *Chaparliev s.n.* (ASH); Kopet Dag, Gaudan, *Chepanov s.n.* (ASH); Duchak Mt., Echek-Medan, *Chepanov s.n.* (ASH); Kugitangh, Chodzja-Pil, *Chepanov s.n.* (ASH); C Kopet Dag, Tokariov pass, *Chepanov s.n.* (ASH); Bacharden reg., Arvaz pass, *Chepanov s.n.* (ASH); Charchangin reg., Chatap pass, *Nichajeva & Silajeva s.n.* (ASH); Ashkabad reg., Tchuly, near Firyuza, *van Slageren & al. MSPGZK-91074H* (ICARDA); SE Kara-Kala to Sakar, *van Slageren & al. MSPGZK-91116H* (ICARDA); Kara-Kala reg., Seiwan farm, near Sakar, *van Slageren & al. MSPGZK-91125H, 91128H* (ICARDA).

UZBEKISTAN: Kuraminsk Mts., Dulana river, *Arifkhanova 137* (TASH); Andizhan, Karabek, *Arifkhanova 318* (TASH); Fergana, Baybiche to Kara-Chura, *Arifkhanova 508* (TASH); Fergana, Patsk reg., Khanabada, *Bandarenko 54* (TASH); W Tian Shan, Boroldai Mt., *Chasanov 17* (TASH); Cherabad, *Chepanov s.n.* (ASH); Dzharkatan, Papsk reg., *Chevrenidi 364* (TASH); W Alai Mts., Chachimardan, *Chonazarov 524* (TASH); Parkent, *Korotkina & Titov 101* (TASH); Angren river, near Sarchoilak, *Kudrjaschev 132* (ERE, TASH); Achangara reg., Chatkalsk Mts., Koshnar, *Kudrjaschev 69* (TASH); Kashka-Dari to Zeravchan, *Kudrjaschev & Sumnevicz 36* (TASH); Kashka-Darya, *Kudrjaschev & Sumnevicz 384* (TASH); Shakhrizyabskogo reg., Gissar Mt., Kashka-Darya, naer Ak-Su river, *Kudriashev 611* (TASH, US); Samarkand, *Mergulov s.n.* (TASH); Kadiri reg., *Michajlova 281* (TASH); Tashkent reg., Bostanlik, Chutisan vill., *Nabejev & al. s.n.* (TASH); Kashka-Darya, Aichon, *Pjataeva & Chonazarov 59* (TASH); Tashkent, Bostanlin reg., Ugan river, *Prachov 797* (TASH); W Talash-Alatau, Keltemmachat, *Putchkova 30* (TASH); Kaplanbek, near Tashkent, *Radkewicz s.n.* (G, PR, Z); Bukhara reg., Baba-Tak Mts., *Roshevitz 686* (LE); Fergana, Sari-Kurgana, Saka river, *Sochopidinov & Li 626* (TASH); Tashkent, road to Abdula Tukayera, *Townsend 69/221* (K); Angren river, Urnate, *Tuchiev 140* (TASH); N Pungan, S side of Kuraminsky Mts., *van Slageren & al. MSPGAP-91202H* (ICARDA); Samarkand, near village Langi Aryk, *Vašák n.* (W); E Tashkent, near Durmen, *Vašák s.n.* (BR); Tian Shan, Chatalski Mts., E Gazalkent, *Vašák s.n.* (B, G); Angren plain, Kakan-Ata, NW Kul-Ata, *Vernik &*

al. 45 (TASH); Boroldai Mt., *von Regel s.n.* (G); Pekem river, *Ziazirtunova s.n.* (TASH).

EUROPE: ARMENIA: Yekhegnadzor reg., Morzov to Areni, *Arutyunyan s.n.* (ERE); Ararat reg., Lusachog, *Arutyunyan s.n.* (ERE); Ararat reg., Landzhar, *Arutyunyan s.n.* (ERE); Daralagjaz reg., Arizbekov to Sisian, *Arutyunyan s.n.* (ERE); Arizbekov (= Vaikski) reg., Dzermuk, *Arutyunyan s.n.* (ERE); Armavir reg., Maisian, *Arutyunyan s.n.* (ERE, YAI); Vaiksi reg., Saravan, *Arutyunyan s.n.* (ERE); Megri reg., Tuchkut canyon, *Arutyunyan s.n.* (ERE, YAI); Arthik reg. (= Leninakan), *Arutyunyan s.n.* (YAI); Yekhegnadzor reg., Noravank, *Arutyunyan s.n.* (ERE); Ararat reg., Dashtakar, *Arutyunyan s.n.* (ERE, YAI); near Spitak, *Arutyunyan s.n.* (ERE, YAI); Artik reg., *Arutyunyan s.n.* (ERE); Abovyan reg., Garni, *Arutyunyan s.n.* (ERE); Abovyan reg., Gerard, *Arutyunyan s.n.* (ERE); Talin reg., Zaringdzha, *Arutyunyan s.n.* (ERE); Sevan, Varten reg., Norakert, *Arutyunyan s.n.* (ERE); Etchmiazin reg., Voskeat, *Arutyunyan s.n.* (ERE, YAI); Abovyan reg., Dzhervesh to Shorbulak, *Arutyunyan s.n.* (ERE); Ararat reg., Zorachen, *Arutyunyan s.n.* (ERE); Megri reg., Legvaz, *Arutyunyan s.n.* (ERE); Sisian reg., Charab, *Arutyunyan s.n.* (ERE); in Erevan, *Arutyunyan s.n.* (ERE, YAI); Erevan, Ash-Dak Mt., to Artachatz, *Aslanian s.n.* (ERE); Garni reg., Kochavank, *Aslanian s.n.* (ERE); Artachatz reg., Dvin, *Avetissjan & al. s.n.* (ERE); Abovyan reg., Atsavan, *Avetissjan & Gandilyan s.n.* (ERE); Vokhchabert to Shorpulagh, *Avetissjan & al. s.n.* (ERE); Yekhegnadzor reg., Sovetachen, *Avetissjan & al. s.n.* (ERE); Erevan, plateau Cicernakaberd, *Buhl 11325* (GAT); Rasdan, near Covagjuch and Sevan lake, *Čuba s.n.* (E); Erevan, Nork, *Gabrieljan & Avetissjan s.n.* (ERE); Armavir reg., Arevik, *Gabrieljan s.n.* (ERE); Abovyan, Norgjuch to Yelkovan, *Gandilyan s.n.* (ERE); Vaik reg., Karaglug, *Gandilyan s.n.* (ERE); Etchmiadzin, *Grossheim 274* (ERE, LE); Artachatz reg., Dzhindzerlu to Birali, *Manakian s.n.* (ERE), Daralagjaz reg., Ortakent, *Movssesjan s.n.* (ERE); Vedi reg., Azizkent to Dainak, *Mukidjanian s.n.* (ERE); Vedi reg., Sharablu to Dzjindzerlu, *Mukidjanian & Gandilyan s.n.* (ERE); Ashtarak reg., before Talin and Ashtarak, *Narinian s.n.* (LE); Armavir reg., Sardarapad, *Nazarova s.n.* (ERE); Erevan to Dzjplegch, *Schmiedeknecht 858* (GAT); Paravakar, Gurnaja steppe, *Takhtajan s.n.* (ERE, LE); Ashtarak reg., Agarak, *Takhtajan & al. s.n.* (ERE); Etchmiazin reg., near Zvardnotz, *Tamamschjan s.n.* (ERE); Agin reg., Ani and Bagravan, *Tzvelev & Chepanov 818* (LE); Terzhola reg., Chishura vill. *Vašák s.n.* (G); distr. Abovyan, Gegamski Mts., near Zar village, *Vašák s.n.* (B, BR, G, W); Megri, near Vardanaouzor, *Yegorova & al. 1500* (LE).

AZERBAIJAN: Baku reg., Geokczai, Mäsüsli, *Alexeenko 1618* (LE); Kuba reg., Ata-Chai, *Alexeenko s.n.* (LE); Achsu, Hindarch, *Beideman s.n.* (LE), Baku, Achmedlu, *Holmberg 925* (LD); Baku, Sultan Sikh, *Homberg 953* (LD); near Elisabethpol (= Kirovabad), *Kolenati 1449* (P); Kuba, *Lagowski s.n.* (LE); Baku reg., Diman, *Levandovski s.n.* (LE); Lenkoran reg., Chodze-Doi, *Mateeva 630* (LE); Maraza, *Zacharieva s.n.* (IIPGR). NAKHICHEVAN: Ordubad reg., Tivi, *Arutyunyan s.n.* (ERE); Ordubad reg., Paraga, *Arutyunyan s.n.* (ERE); Norachen reg., Danzik, *Grossheim & al. s.n.* (LE); Norachen reg., near Danzuk, *Grossheim & al. s.n.* (L, US); Aznaburt, *Takhtajan & al. s.n.* (ERE, LE); near Nakhichevan, *Tzvelev & Chepanov 428, 679* (LE).

BULGARIA: Stara Zagora, *Achtarov s.n.* (SOM); near Sliven, *Baramuk s.n.* (G); Trnovo, Blumenberg, *Bisse & Schneider 41* (JE); near Capitan Andreevo, *Cedmakova s.n.* (IIPGR); Sabla, *Cedmakova s.n.* (IIPGR); Sumen, *Davidov s.n.* (SOM); Zachari Stojanov, *Delipavlov s.n.* (SOA); Dolno Botevo, near Khaskovo, *Delipavlov s.n.* (SOA); near Ajtos, *Delipavlov s.n.* (SOA); near Jambol, *Delipavlov s.n.* (SOA); Akhtopol, *Delipavlov s.n.* (SOA); Lakatnik, Stara Planina Mts., *Evstatieva s.n.* (SO); Ljulin Mt., near Sofia, *Gančev s.n.* (SOM); near Dragoman, *Georgiev s.n.* (SO); Tekira, near Pazardjik, *Georgiev s.n.* (SO); Black Sea, Auchialvo, *Hruby 63* (LD); Razgrad, *Javaceff s.n.* (SOM); Sakar Mt., SW Topolovgrad, *Jordanov & Janev s.n.* (SO); Novy Pasar to Omurtak, *Jordanov s.n.* (SO); near Bojcinovici, *Jordanov & Volev s.n.* (SO); Drjanovec, near Lom, *Jordanov & Volev s.n.* (SO); Kazanlik, S Gabrovo, *Jurkovski s.n.* (SO); Tchienden Tepe Mt., *Keck & Pichler s.n.* (BR, G, K, LD, LE, PRC, W, type of *Aegilops cylindrica* var. *rumelica*); Silistra, near Strazimir, *Kožuharov 19109, 19110* (SOM); Asenovgrad, *Kožuharov 22640* (SOM); Dzebel, *Kožuharov 21137* (SOM); Palevo, near Khaskovo, *Kožuharov 213118* (SOM); Varna, Slatni, Pjasâci and Ekrene, *Král 1589* (PRC); Krushari, near Tolbuhin, *Penev s.n.* (SO); Lodjene, *Popov s.n.* (SO); Sliven, Mt. Baramuk, *Schneider 1426* (BM, G, K, MO, PH, W, type of *Aegilops cylindrica* var. *pauciaristata*); Burgas, near Kara Tepa, *Stiefelhagen s.n.* (W); Malevo to Kralevo, *Stojanov s.n.* (SO); Ardino to Kardzali, *Stojanov & al. s.n.* (SOM); Struma valley, Kucerinovo, *Stojanov s.n.* (SO); above Plovdiv, *Stříbrný s.n.* (SO); near Balcik, *Tagamlitzky 126* (BR, C, G, GAT, K, SO, W); Lovec, *Urumoff s.n.* (SOM); Ihtiman, *Urumoff s.n.* (SOM); Tarnovo, *Urumoff s.n.* (G, SOM); E Zelenikovo, *van Slageren & al. MSRIMZ-89151H* (ICARDA, IIPGR, WAG); near Jakorunda, *van Slageren & al. MSMZNN-90248H* (ICARDA, IIPGR); Caribrod, *Velenovský s.n.* (PRC); Kharmanli, valley of the Oludere, *Vihodcevsky s.n.* (SO); Mladovo, *Zacharieva s.n.* (IIPGR).

CROATIA, DALMATIA: Rijeka, *Boott s.n.* (A); near Rijeka, *de Visiani s.n.* (G); coast, *Vukotinović s.n.* (B).

GEORGIA: Tblisi, *Homberg 1024, 1210* (LD), *1278* (LD, W); Tblisi, Naftlug, *Grossheim s.n.* (ERE); Vera, near Tblisi, *Homberg 1327* (LD); Kartli, *Lagowski s.n.* (LE); W Caucasus, distr. Terzhola, near Chishura, *Vašák s.n.* (W); Tsebilda, Abchazia reg., *Woronow s.n.* (LE).

GREECE, PELEPONNESUS: near Nauplion, *Berger s.n.* (L). THESSALIA: Grevená, Ziakas, *Podlech 37752* (G). THRACE: near Karagatch, Adrianopolis, *Müllenhof s.n.* (B); Adrianopol – Karasareli, *Nejceff s.n.* (SOM). ISLANDS: CRETE: s.loc., *Fuckel s.n.* (G); Menara, *von Heldreich s.n.* (BM). RHODES: Bastida, *Bourgeau s.n.* (F).

HUNGARY: Sashegy, near Budapest, *Bartha s.n.* (B, GAT); Lágymányos, *Bartha s.n.* (FI); Köhegij, Pomaz, *Baschant s.n.* (B); near Budapest, *Bayer s.n.* (A, B, BC, C, G, GAT, JE, K, L, LD, P, PI-GUAD, PR, US, W); ibid., *Steinitz 1487* (A, B, BC, BM, C, FI, G, K, L, LD, LE, LY, MO, OXF, P, PR, SO, US, W, Z); Comit. Pest, Szentendre, *Bisse s.n.* (JE); Esztergom, Szenthamásheggen, *Feichtinger s.n.* (W, Z); Gran in the Danube, *Feichtinger s.n.* (JE, LE, LY-Gandoger); Budalok, near Budapest, *Filarszky 1389* (BP, LE); Budapest, Szemlöhegy Mt., *Flatt von Alföld 97* (A, BM, JE, K, LE, LY, US, W); near Herulesbad, *Golopencza 1323* (B, BM, K, MO, PH, W); Kövefo, Gran, *Grundl s.n.* (BR, LY-Gandoger, W); Heleniba, near Gran, *Grundl s.n.* (B, FI); Dorogh, *Grundl s.n.* (LY-Gandoger); Tegyverneth, *Gustav s.n.* (NY, MO); desert near Abovy, *Janka von Bulcs s.n.* (LE); Comit. Heves, Gyöngyös, *Janka von Bulcs s.n.* (BM, C, FI, G, GAT, JE, K, LD, LY, MPU, NY, P, US); Csepel island in Danube, *Kerner von Marilaun s.n.* (G); Budapest, Békésiensi, *Kitaibel 226* (B-W 18878-1, type of *Aegilops cylindrica*); Szeged, *Lányi s.n.* (BM); Budapest, Lágymányos, *Pénzes s.n.* (LD, MPU, US); Budapest, Fereoàros, *Pénzes s.n.* (K); Budapest, Màtyàstregos, *Pénzes s.n.* (MPU); Titler plateau, *Renfs s.n.* (FI); Budapest, Peters Mt., *Richter s.n.* (Exsicc. Kneucker 59) (A, B, BM, C, CAI, G, GE, JE, L, LD, LE, LY, MO, PR, SO, US W, Z); Budapest, Wolsthal, *Steinitz s.n.* (B, GE, JE, LD, MPU, Z); Portobaszy, near Budapest, *Steinitz s.n.* (SO); Budapest, Blocks Mt., *Steinitz s.n.* (B, BM, F, FI, G, JE, LD, LE, LY-Gandoger, NY, PR, W, US, Z); Budapest, Gerardi Mt., *Tauscher s.n.* (Exsicc. Schultz 182) (B, BC, C, FI, G, GE, L, LD, LE, LY, LY-Gandoger, MPU, OXF, P, PI, PR, PRC, TO, W, Z), *14755* (P); Budapest, Adler Mt., *Tauscher s.n.* (FI, JE, L, LD, U); Budapest, Gellerthegy Mt., *Tuzson 294* (A, B, BM, BR, C, F, FI, G, K, L, LD, LE, MO, PR, SOM, US, W, Z); Gran in the Danube, *Veselsky s.n.* (PR); Comit. Pest, at Szentendre, *von Degen s.n.* (G, W); Knitvölgy, near Budapest, *von Degen s.n.* (FI); Comit. Pest, to Ráleos, *von Degen s.n.* (F); Deliblát, Kincstári homokpuszta, *Wagner s.n.* (B, PR); Ezüst Mt., near Pomáz, *Walger 3849* (LD); Vac, near Danube river, N Budapest, *Zündorf 3499* (JE).

MACEDONIA: Huedova, Doman, *Bornmüller 5282b* (B, JE); Skopje (Üsküb), Mt. Vodno, *Bornmüller 5287* (B, JE); Demir-Kapu, above river Wardas, *Bornmüller 5282* (B, JE, NY); Trojatsi, near Prilep, *Nikolov s.n.* (SO).

MOLDOVA: Strachen reg., Retcha, *Ananeva s.n.* (LE); Kornjesti reg., Girevaja, *Andrejev s.n.* (LE); Pereval, Kornechtchki reg., *Andrejev s.n.* (ERE); Kichinev reg., Korzuchnja, *Arvat s.n.* (LE); Kalarash reg., Paolesti, *Borissova s.n.* (LE); Bender reg., Kopanka, *Brizgailova s.n.* (ERE); Kalarash reg., Bachmut, *Godzhun s.n.* (LE); Moldavia infer., *Guebhard 171* (G, P, W), *469* (G, P); Benderi, *Konchin s.n.* (LE); Budaki, *Lipsky s.n.* (LE); Tjeraspol, *Paczoski s.n.* (LE); Benderi, Kopanski, *Sheluch s.n.* (LE); Kichinev, *von Lindemann s.n.* (LE, LY-Gandoger).

ROMANIA: Caraş-Severin distr., Banatus, Orsova vill., *Bujorean 518* (A, BM, BOLO, BR, C, G, K, MO, P, PR, SO, W, Z); Dobrogea, Constanta, near Techirghiol, Glarea, Kitila, *Grecescu s.n.* (LD); 'Rumelia', *Kitaibel s.n.* (G-BOIS); Oltenia, Craiova, Popoveni, *Maloş & al. 83* (BM, BR, G, L, NY, OXF, RAB, SO); Dobrogea, near Eforie-Sud, *Morariu s.n.* (LD); Ploesti, Mizil, Clondiru to Sahateni, *Todor & Molea s.n.* (BM, JE, LE, SOM); Bucuresti distr., Comana, *Toma s.n.* (BM); 'Banatus', Sitter, *von Reuss s.n.* (W); 'Banatus', Ulina, *Wierzbicki s.n.* (W); Dobrogea, Valul, Traiau, *Zahariadi s.n.* (LD).

RUSSIA, 'CAUCASUS': Stavropol reg., river Kalaousi, *Akinfiev s.n.* (LE); Ossetia, Kotlarevskaja sta., *Akinfiev s.n.* (LE); Rostov reg., Salski, *Bondareva s.n.* (LE); Carthalinia, Achalziek to Abas, *A. & V. Brotherus 55* (W); Terek river, Pjatigorsk, *Gordjaghin 773* (LE); Terek river, Muchuk Mt., near Proval, *Gordjaghin 768* (LE); Mineralnewodjne, near Zmjeinaja, *Gordjaghin 810* (LE); Novotcherkassk, near Rostov, *Jakuschevskii 96* (BM, C, GAT, SO); Praskoveja, river Kuma, *Krasnov* *s.n.* (LE); Cherkass reg., *Laupmann s.n.* (LY-Gandoger); Stavropol reg., Mineralnewodjne, *Lipsky s.n.* (LE); Krasnodar, Maykop, *Lipsky s.n.* (LE); Kuban river, Nevinomiskaja vill., *Lipsky s.n.* (LE); Anapa, *Lipsky s.n.* (LE); near Novorossysk and Gelendzhik, *Litvinov 5333c* (A, BM, C, E, ERE, G, K, LE, NY, SOM, US, W); Rostov reg., Constantinovsk, *Litwinov s.n.* (LE); near Alexandriska, Kuma river, *Marakujev 327* (LE); Krasnodar reg., Abinskaja sta., Armavir, *Marusjak 45* (LE); Albrau-Durso, Guzov Mt., Black sea reg., *Palibin & Vorobiev 265* (LE); Kuban reg., Ternovskaja Padina, Jasinskaja, *Schiffers & Solokova 584* (LE); Azov sea reg., Kaminchevadsky to Jasinskoi, *Schiffers & Solokova 511* (LE); Stavropol, Derbentovskaja, *Turkevicz 741* (LE); Medvezhenski reg., Djemina, Privolnogo, *Turkevicz 1009* (LE); near Elista, *Vysotskij s.n.* (LE); Mariopol, *Vysotskij s.n.* (LE). DAGHESTAN: Temir-Cha-Shura, *Alexeenko 1289* (LE); Temin-Cha-Chura, near Manas, *Alexeenko 46* (LE); Kataigh-Tabassaran, *Alexeenko & Woronow 1589* (LE); Derbent, *Becker 2, 139* (LE); Groznyy, *Lipsky s.n.* (LE); Terski, W Makhachkala, *Magulaev s.n.* (LE); Makhachkala, Narat-Tjube, Alti-Bujukski pass, *Prokhanov 280* (LE, type of *Aegilops cylindrica* var. *prokhanovii*); Checheno-Ingushetia, Groznyy to Makhachkala, Akcay river, *s. coll., s.n.* (LE).

SLOVAKIA: Stúrovo, near Chlaba, *Cernoch 12215* (LD, SO); Nové Zamky, Sturova, on bank of Danube, *Smejkal & Vicherek 1594* (A, B, BC, BR, C, G, JE, K, L, LD, LE, MO, P, U, US, W).

SLOVENIA: Triester Karst, Borst, *Cufodontis s.n.* (W).

UKRAINE: Odessa, *Aucher-Éloy 2967* (BM, FI, G, K, MPU, OXF, P); Bolshaja, Svenucha, Berdjansk, *Boiko s.n.* (LE); Lugan reg., Crivorozia, *Deripova s.n.* (LE); Kiev, *Mosakin s.n.* (LE); Kiev to Tavarni, *Mosakin s.n.* (LE); distr. Melitopol, Ascania Nova, *Oksner s.n.* (C, LE, NY); Ferstjerovka, *Paczoski s.n.* (LE); Belozjorka, near Cherson, *Paczoski s.n.* (LE); Dnjeprovski reg., Golaja Pristan, *Paczoski s.n.* (LE); Seraspol to Krasnograd, *Paczoski s.n.* (LE); Cherson reg., Dnjepr river, *Paczoski s.n.* (LE); Nikolajev, *Puring s.n.* (LE); Cherson reg., near Limane, *Rehmann 174* (NY, type of *Aegilops cylindrica* var. *pauciaristata*); Bessarabia, Odessa to Nikolajev, *von Meyer s.n.* (LE). CRIMEA: Bujarka-Su river, *Antipova & Tsirina s.n.* (LE); Simferopol reg., Changraf, *Ariemovitski s.n.* (LE); Tauria, Karagatch, near Sudak, *Callier 268* (FI, G, JE, K, LD, P, PR, PRC, W, Z); Chanchik, *Doig s.n.* (LE); Inkerman, *Fedtschenko s.n.* (LE); Toile and Katchikalin, *Fedtschenko s.n.* (LE); Tiberti, *Fedtschenko s.n.* (LE); Biuk Onlar, *Fedtschenko s.n.* (LE); near Jalta, *Finn 77* (C, G, LE, LY, W); near Jalta, *Golde 5333b* (A, BM, C, ERE, G, K, LE, NY, SOM, US, W), *s.n.* (LY-Gandoger, SOM); Oreanda, *Golde s.n.* (LE); Kertch penins., *Janata s.n.* (US); Yevpatorea, *Janata s.n.* (LE); Sorokino, *Kaplunovsky 6* (LE); Tarchankut penins., *Kipchak-Dzenslitovskaja s.n.* (LE); Perikop, Taganash, *Kotov s.n.* (LE); Baidar, *Krylov s.n.* (LE); Primorski reg., Andrejevka, *Novoceltseva & Krylova s.n.* (LE); Simferopol, Kizyl-Choba, *Plitchinsky s.n.* (LE); Alushta, *Poplavskaja s.n.* (LE); near Feodosia, *Sredinsky 5333a* (A, BM, C, ERE, G, K, LE, NY, SOM, US, W); Mt. Ajudak, *Tzvelev 10* (LE).

YUGOSLAVIA, SERBIA: Belgrade, *Bornmüller s.n.* (B); Paraĉin, *Hansen s.n.* (C); Niš, *Isailovits s.n.* (G); N Serbia, Topĉi, *Panĉić s.n.* (FI); Vismer, *Panĉić s.n.* (LY-Gandoger); near Vranja, *Panĉić s.n.* (W); Semlinum in Syrmia (= Sremska Mitrovica), *Panĉić s.n.* (B); Syrmia (= Sremska Mitrovica), near Petrovgrad, *von Portenschlag-Ledermayer s.n.* (W).

ADVENTIVE:

AMERICA: U.S.A., ARIZONA: Apache Co., *Gandhi 268* (MO); Yavapai Co., Prescott, *Keil 6397* (NY). ARKANSAS: Izard Co., S of Sage, *Robinson 1814* (A, NY); Randolph Co., *Robinson 1901* (A, NY); Lawrence Co., S Imboden, *Robinson 1891* (NY); Baxter Co., Mt. Howe to Ellis, *Robinson 1935* (NY); Boone Co., *Robinson 1907* (NY); Izard Co., Salem plateau, E Franklin, *Robinson 1851* (NY); Sharp Co., S Ash Flat, *Thomas 8229* (NY). CALIFORNIA: Siskiyou Co., Montague, *Fuller 1611* (DAV, UCR); Santa Barbara Co., Santa Cruz island, *Clarke & al. s.n.* (NY). COLORADO: N Denver, *Bailey 4004* (C); Wray, *Lute s.n.* (US); Pueblo Co., N Exit 67 at rest area, *Ricketson 475* (MO); Boulder Co., Baseline lake, E Boulder, *Smith s.n.* (C); E Boulder, *Watkins 32* (A); Mesa Co., Loma, *Young 176* (COLO, UCR). IDAHO: Ada Co., NE Boise to Cottonwood Creek, *Ertter 4089* (NY); Ada Co., Dry Creek, *Heidenreich 106* (NY). ILLINOIS: Champaign country, Urbana, *Ahles 7378* (B, BC, BR, C, L, NY, W); Edgar Co., Kansas, *Ahles & al. 6260* (PH-PENN); E Peoria Heights, *Chase 8873* (B, F, K, NY, W); E Peoria, Taze Well Co., *Chase 10415* (F, K, NY); Adams Co., Quincy, *Evers 1393* (NY); Cook Co., Bensenville, Milwaukee road, *Thieret 2294* (F); St. Clair Co., North Dupo, *Thieret 1873* (F); Madison Co., N Granite City, *Thieret 1874* (F); Madison Co., Alton, *Thieret 3310* (F). INDIANA: Howard Co., Nickel plate, *Ek s.n.* (A, BM, NY); Howard Co., NE Kokomo, *Ek s.n.* (NY); Howard Co., NE part of Kokomo, Clover Leaf Trail, *Ek s.n.* (NY); Tippecanoe Co., Lafayette, *Ek s.n.* (NY); Howard Co., Kokomo, *Gunn I-13* (A, C); Charlestown, *Gunn 1404* (A, NY). KANSAS: Jewell Co., E Jewell, *Brooks 9989* (NY); Douglas Co., Lawrence, *Croat 167* (NY); Rice country, Raymond, *Gates 1528* (A, B, BM, BR, C, G, K, L, LE, P, PH, W); Riley Co., *Gates 14734* (BM, F, NY, MO); Harvey Co., E Newton, *Harms 1628* (NY); Miami Co., *Henderson 66-404* (BM); Miami Co., W Osawatomie, *Henderson 66-404* (MO); Meade Co., E Fowler, *Horr 3915* (A, NY); Lane Co., 15 mi. E Deighton, *Isle 542* (MO); Pawnee Co., *Salmon s.n.* (A, BM, MO); Barton Co., N Stafford, *Ungar 995* (A, K); Gave Co., *Weber s.n.* (NY). KENTUCKY: Campbell Co., Silver Grove, *Buddell 175* (NY); Robertson Co., Mt. Olivet, *Gunn K 27* (A); Warren Co., S Bowling Green, *McFarland 96* (A, NY, MO, PH). MISSOURI: s.loc., *Bush 12133* (G, Z), *12133A* (Z), *12133b* (G), *12137* (BM, G, MO, Z), *12137A* (LE, NY, Z), *12141* (G), *12141A* (MO), *12141B* (LE, NY, Z), *12148* (BM, G, LE, MO, NY, W, Z), *12150* (G, LE, MO, NY, W, Z), *12466* BM, MO), *12468* (BM, MO), *12468A* (Z), *13187* (NY); St. Louis Co., Glendale, *Comte 418* (MO); Jackson Co., Kansas city, *Henderson 65-222, 69-141* (MO); Jackson Co., Courtney, *Kellogg s.n.* (MO); St. Louis, *Muehlenbach 111, 2089, 2367, 2924, 3964* (MO); Jasper Co., Joplin, *Palmer 57782, 60028* (F); Barton Co., W Oscaloosa, *Palmer 59677* (F); Jasper Co., Carterville, *Palmer 50015* (F); Cole Co., Jefferson, *Raveill 2043* (MO); Jefferson Co., Rock Creek valley, lake Holiday, *Van Schaack 3496* (MO). MONTANA: Bell, *Booth s.n.* (US); Great Falls, *Fosse s.n.* (US); Chateau Co., *Warden s.n.* (US). NEBRASKA: Lincoln Co., Broadmoor, North Platte, *Bredemeier s.n.* (US). NEW MEXICO: Lincoln Co., E Capitan, *Adams 30* (UCR); San Miguel Co., W Galinas river, Las Vegas, *Hill & Cress 11566* (NY); Lincoln Co., Ruidoso, *Spellenberg 2077* (NY); Rio Arriba Co., W Espanola at Hernandez, *Spellenberg & Ussury 8181* (ID, NMC, NY); Curry Co., in Clovis town, *Worthington 16531* (NY, UCR, UTEP). NEW YORK: Long Island, Kings Co., Brooklyn, *Monachino 438* (NY); *448* (PH-PENN). OHIO: Jackson Co., W Jackson, *Bailey 2381* (NY); Pickaway Co., N Kingston, *Bartley & Pontius 823* (NY). OKLAHOMA: Murray Co., N Springer, *Brenckle 48277* (NY, US); Cleveland Co., Norman, *Demaree 12479* (A); Beaver Co., 11 mi. E Elmwood, *Goodman & Lawson 8429* (G); Wakita, *Johnston s.n.* (US); Makila, *Geyer s.n.* (Z); SE Woodward, *Goodman 5276* (A); S Watonga, *Goodman 4180* (A); Cadde Co., near Bridgeport, *Hill & Cress 11193* (NY); Stillwater, *Stratton s.n.* (US); W Nichols Hills, *Waterfall 1968* (A); Payne Co., S Stillwater, *Wooldridge 54* (NY). TEXAS: Sutton Country, 29 miles NE Sonora, *Cory 1527* (B, BM, BR, C, G, K, L, LE, NY, P, PH, W); Coryell Co., SE Gatesville, *Gould 11438* (K); Tom Green Co., near highway 87, *Hatch & Gandhi 5410* (NY); Childress Co., E Memphis, near Jonah & Salt Creek, *Higgins 7159* (NY); Randall Co., Palo Duro Creek, *Higgins 9317* (NY); Coryell Co., Fort Hood, *Wipff 229* (MO); Randall Co., E City Canyon, *Worthington 16570* (UCR, UTEP). UTAH: Kane Co., S side Kanab, *Anderson 781* (A, NY); Salt Lake Co., Red Butte Canyon, Wasatch range, E Salt Lake, *Arnow 2781* (MO); S Salt Lake City, *Arnow 461* (NY); Cottonwood Creek, near Salt Lake City, *Arnow 389* (G); San Juan Co., Navajo Twins, *Atwood & Thompson 11011* (NY); Utah Co., NE Provo, *Curtis 189* (NY); Utah Co., 31 mi. SE Provo, *Gould 13974* (MO, NY); Cache Co., S University, *Holmgren 10546* (NY); Millard Co., Snake Valley, *Peabody & al. 384* (NY); Sevier Co., Clear Creek Canyon, *Taye 3758* (NY); Cache Co., Cove Canyon, *Thorne 1332* (NY). VIRGINIA: Page & Campbell Co., *Massey s.n.* (A). WASHINGTON: Whitman Co., Pullman, *Bettle 5811* (PH); Pullman, *Cary s.n.* (G); Pullman, Rogers Field, *Wakabayashi s.n.* (US).

EUROPE: AUSTRIA: Vienna, Nordbahngelände, *Forstner s.n.* (W); Vienna, near Assenal, *Rechinger s.n.* (L, LD, W); Vienna, Laaerberg, *Zukrigl s.n.* (BC).

BELGIUM: Jamiouix, *Baily s.n.* (BR); La Louvrière, Haine St. Paul, *Duvigneaud s.n.* (BR); Houdeng-Goegnies, near La Louvrière, *Duvigneaud s.n.* (BR); Lambermont, *Halin s.n.* (LE, MPU); harbour of Antwerp, *Lefebvre s.n.* (BR); Mechelen, *Pelgrims s.n.* (BR); Antwerp, *van Meel s.n.* (BR); Maeseyck, *Verheggen s.n.* (BR).

BELORUSSIA: near Minsk, *Tretjakov 439* (LE).

CZECH REPUBLIC: Carlova (Karlovy Vary?), *Frivaldszky von Frivald s.n.* (NY).

FRANCE, ALPES MARITIMES: Nice, *Zavraz(?) s.n.* (G). ALSACE: Strassbourg, *Lehmann s.n.* (TUB). BOUCHES DU RHÔNE: St. Pont sur Gémenos, *Autheman s.n.* (FI); Lavoirs à Laine, Marseille, *Blaisse & Roux s.n.* (P); Marseille, *de Brébisson s.n.* (G); Gémenos to St. Pons, *Roux s.n.* (G, LY). HAUTES ALPES: Laragne-Montéglin, *Barrier & Boivin 420* (G); near Laragne-Montéglin, *Charpin & Greuter 8322* (BM, C, G, LD, NY, SOM, W); (Pont-le-)Chabestan, *Girod s.n.* (B, G, LE, LY, LY-Gandoger, MPU). HAUTE SAÔNE: Gray, *Maire s.n.* (Exsicc. Soc. Rochelaise 4187) (LY, MPU, MPU-Coste). HÉRAULT: Port Juvénale, *Godron s.n.* (P); ibid., *Touchy 288* (MPU), *1045* ('naturalisé') (P, Z), *s.n.* (G, LY, MPU). VAR: Ste. Baume, *Auzende s.n.* (LY); near Nice, *Favrat s.n.* (Z).

GERMANY: Altona (= Hamburg), *Christiansen s.n.* (B); Leipzig, *Duty s.n.* (JE); Schleswig-Holstein, Altona, Siebsteich, *Erichsen s.n.* (FI, G); Nordbaden, Mannheim, *Heine s.n.* (BM); Mecklenburg, Blankenburg, Güterbahnhof, *Henker s.n.* (B); Limburg, *Hermann s.n.* (GAT, US); Anhalt, Bernburg, *Hermann s.n.* (JE); Hessen, Giessen, *Hupke s.n.* (JE, SOM); Nürnberg, *Keßler s.n.* (JE, PRC); Olmitz, *Laus s.n.* (JE); Hamburg, Waldsbeck, near Dampfmühle ('eingeschleppt'), *Raap s.n.* (CAI, LY, W); Dresden, Kaditz, *Schöne s.n.* (B); Karlsruhe, *Schulz s.n.* (JE); Berlin, Cöpenik, Hof der Dampfmühle, *Suter s.n.* (Z); Rheinpreussen, Königswinter, *Torges s.n.* (JE); Flora Hercynica, Nordhauf, *Vork s.n.* (JE).

ITALY: LIGURIA: Genoa, Mt. Bartolomeo, *Savignone s.n.* (FI); Genoa, port of Montaldo, *Savignone s.n.* (FI, LY-Gandoger). PIEMONTE: Aosta, Mt. Muret, *Alioth s.n.* (G); Aosta, Tra Chambave e Nus, *Bavazzano & Ricceri s.n.* (FI); Aosta, Beauregard, *Beyer s.n.* (B); Aosta to St. Rémy, *Cornaz s.n.* (BM); Mt. Genis d'Aoste, *Garzon s.n.* (B, C); Casale Monferrato, *Negri s.n.* (BC, FI, LY-Gandoger, TO); St. Pierre to Villeneuve, *Santi s.n.* (TO); Valley of Aosta, *Thomas s.n.* (G, JE, K, LY-Gandoger, LY-Jordan); Aosta, Collignon, *Vaccari s.n.* (GE); Aosta, Chesallet, *Vaccari s.n.* (FI); Aosta, St. Pierre, *Vaccari s.n.* (FI); Castiglione to Falletto, near Cuneo, *Vignolo-Lutati 15995* (FI, TO). OTHER ITALY: Alasale, Piante del Casalese, *Negri s.n.* (TO); hills near Limana, *Rehmann 1711* (BM); Veglia, *Sadler s.n.* (W). ISLANDS: SARDINIA: s.loc., *Thomas s.n.* (K).

NETHERLANDS: Westzaan, Molenaar Flour Mill, *Akkerman s.n.* (BR, L); Kampen, molen van Reynders, *Boldingh s.n.* (U); Gorinchem, *Henrard s.n.* (hb. Jansen & Wachter 7084) (L, type of *Aegilops cylindrica* var. *multiaristata*); Rotterdam, Rozenburg, *Jansen & Wachter s.n.* (U): Amsterdam, at the 'Houthaven', *Koorneef 416b* (WAG).

RUSSIA: Pskov (near Estonia), Toropetz, *Bulavkina & al. s.n.* (LE); Petrograd (= St. Petersburg), Oilgino, *Ganeschin s.n.* (LE); near Saratov, *Tranzschel s.n.* (LE).

SPAIN: Madrid, *s.coll.*, *s.n.* (W).

SWEDEN: Skåne, Malmö, *Bågenholm s.n.* (C, US); Goteborg, Kvillebäckvägen, *Blom s.n.* (US); Skåne, *Sjöbeck s.n.* (C, K, MO).

SWITZERLAND: Basel, Badische Lagerhäuser, *Aellen s.n.* (LD, LE); Genève, La Voie-Creuze to Varembé ('adventive plant'), *Ayasse s.n.* (Exsicc. Soc. Dauphinoise 482) (B, BM, BR, FI, G, LY, MPU); Valais, Brig, *Koch 47/123* (LD, NY); Vaud, Orbe, *Moehrlen 8275* (G); Genève, Moulins de St. Jean, *Paiche s.n.* (FI, G, LY, W, Z); Solothurn, *Probst s.n.* (B, L, Z); St. Gallen, Appenzell, Sargans railway sta., *Seitter s.n.* (G); Aargau, Güterbahnhof, *Stauffer s.n.* (Z); in Zürich, *Thellung s.n.* (Z); Glarus, Gäsi, *Vischer s.n.* (Z); railway sta. of Chène-Bourg, *Weber s.n.* (G); Vidy lake near Lausanne, *Wilczek s.n.* (G, PI-GUAD, W).

U.K., ENGLAND: Tewkesbury, *Bannister s.n.* (K); Surrey, Mortlake, *Fraser s.n.* (K); Gloucestershire, Sharpness Docks, *McCallum-Webster 2346* (K); Cambridge, Seed Testing Station, *Quarterly s.n.* (K); Tewkesbury, *Townsend s.n.* (K). SCOTLAND: Leith Docks, *Fraser s.n.* (K, RNG). ISLANDS: JERSEY: s.loc, *Lester-Garland s.n.* (K).

S.LOC.: *Host 2284* (W, see note 1).

Germplasm collections examined:

ASIA: JORDAN: Zarqa, Al Azraq, Al Janoubi, *Humeid & al. 91-JOR-148* (ICARDA, NCARTT).

SYRIA: Nabk to Damascus, *Rifaie & Witcombe SY-20315* (ICARDA, IPGRI).

TAJIKISTAN: NE Ura-Tjube to Begova, *van Slageren & al. MSPGAP-91185* (ICARDA, VIR); at Ura-Tjube, *van Slageren & al. MSPGAP-91183* (ICARDA, VIR); at Urmefan, 100 km E Samarkand, *van Slageren & al. MSPGAP-91174* (ICARDA, VIR).

TURKEY: 22 km SE Konya to Karapinar, *Güzel & al. SMN-050889-0101* (ICARDA, PGRRI); Ankara, 22 km N Celebi, *Güzel & al. SMN-040889-0601* (ICARDA, PGRRI); Konya, W Eregli to Karaman, *Güzel & al. SMN-050889-0202* (ICARDA, PGRRI); Ankara, W Kirikkale, *Güzel & al. SMN-040889-0302* (ICARDA, PGRII); Konya, SW Çumra, *Güzel & al. SMN-050889-0401* (ICARDA, PGRRI); Konya, 35 km SE Sarayönü, *Güzel & al. SMN-060889-0101* (ICARDA, PGRRI); Ankara, NW Keskin, *Güzel & al. SMN-040889-0501* (ICARDA, PGRRI); Konya, E Kadinhani, *Güzel & al. SMN-060889-0201* (ICARDA, PGRRI); 24 km NW Maden to Elâziğ, *Güzel & al. SMN-120889-0302* (ICARDA, PGRRI); Kayseri, NE junction Pinarbaşi to Şarkişla, *Güzel & al. SMN-140889-0102* (ICARDA, PGRRI); Sivas, 21 km SW Şarkişla to Gemerek, *Güzel & al. SMN-090889-0202* (ICARDA, PGRRI); Kayseri, 22 km S Felâhiye, *Güzel & al. SMN-090889-0101* (ICARDA, PGRRI); Konya, 25 km S Yunak, *Güzel & al. SMN-060889-0301* (ICARDA, PGRRI); Sivas, SE Yildizeli, *Güzel & al.*

SMN-090889-0402 (ICARDA, PGRRI); NE Sivas, *Güzel & al. SMN-100889-0101* (ICARDA, PGRRI); Konya, 32 km E Yunak, *Güzel & al. SMN-060889-0401* (ICARDA, PGRRI); Sivas, SE Kangal, *Güzel & al. SMN-110889-0102* (ICARDA, PGRRI); Sivas, SE Zara – Imranli junction, *Güzel & al. SMN-100889-0301* (ICARDA, PGRRI); Hakkari, S Semdinli, *Metzger & Jana 79TK057-325* (USDA); Hakkari, S-SW Semdinli, *Metzger & Jana 79TK061-341* (USDA); Hakkari, 37 km NE Yüksekova, *Metzger & Jana 79TK064-325A* (USDA); Van, 42 km SE Ercis – Karayollari Bakimevi, *Metzger & Jana 79TK075-404* (USDA); Malatya, 41 km SE Darende, *Metzger & Jana 79TK014-062* (USDA); SE Van, *Metzger & Jana 79TK047-289* (USDA); Van, NE Gevas,, *Metzger & Jana 79TK046-1114* (USDA); Hazar lake, 35 km SE Elâzig˘, *Metzger & Jana 79TK018-079* (USDA); Kars, 35 km W Tuzluca, *Metzger & Jana 79TK091-457* (USDA); W Malatya, *Metzger & Jana 84TK435-004-01* (USDA); 42 km N Van, *Metzger & Jana 84TK572-001-01* (USDA); 19 km E Van, *Metzger & Jana 84TK069-386* (USDA); E Mus, on Bitlis border, *Metzger & Jana 84TK473-002-01* (USDA); Kars, SE Karakurt, *Metzger & Jana 79TK095-484B* (USDA); SW Kagizman – Igdir – Erzurum junction, *Metzger & Jana 79TK092-463* (USDA); W Elâzig˘ – Bingöl border, *Metzger & Jana 79TK075-404* (USDA); 24 km S Erzurum – Hinis, road junction, *Metzger & Jana 79TK119-619* (USDA); Agri, NE Dog˘ubayazit, slope Mt. Ararat, *Metzger & Jana 79TK085-441B* (USDA); Bitlis, 45 km SE Tatvan, *Metzger & Jana 84TK486-001* (USDA); Nevs,ehir, SE Múcur, *Metzger & Jana 84TK414-002-01* (USDA); Van, SW Ozalp, *Metzger & Jana 79TK071-390* (USDA); S Ankara, *Metzger & Jana 84TK331-003* (USDA); Bursa, NW Inegöl, *Tüten & al. CNM-230689-0202* (ICARDA, PGRRI); S Mudanya, NW Bursa, *Tüten & al. CNM-230689-0401* (ICARDA, PGRRI); Kirklareli to Edirne, *Tüten & al. CNM-280689-0301* (ICARDA, PGRRI); Balikesir, W Karacabey to Bursa, *Tüten & al. CNM-220689-0801* (ICARDA, PGRRI).

TURKMENISTAN: before Tchuly, near Firyuza, *van Slageren & al. MSPGZK-91074* (ICARDA, VIR); at Bezmein, *van Slageren & al. MSPGZK-91077* (ICARDA, VIR); Seiwan, 50 km SE Kara-Kala, *van Slageren & al. MSPGZK-91128* (ICARDA, VIR); near Sakar, SE Kara-Kala, *van Slageren & al. MSPGZK-91117* (ICARDA, VIR); SE Kara-Kala to Sakar, *van Slageren & al. MSPGZK-91116* (ICARDA, VIR).

UZBEKISTAN: W part Tashkent ringroad, *van Slageren & al. MSPGAP-91139* (ICARDA, VIR); Tashkent to Yangiyul, *van Slageren & al. MSPGAP-91141* (ICARDA, VIR); near Sarydala, Angren river, *van Slageren & al. MSPGAP-91207* (ICARDA, VIR); Angren to Sarydala, *van Slageren & al. MSPGAP-91208* (ICARDA, VIR); Dzhizak to Gallya-Aral, *van Slageren & al. MSPGAP-91155* (ICARDA, VIR); W Angren to Ablyk, *van Slageren & al. MSPGAP-91212* (ICARDA, VIR); near Il-lich, E Samarkand, *van Slageren & al. MSPGAP-91146* (ICARDA, VIR); Gallya-Aral to Tumchuk, *van Slageren & al. MSPGAP-91160* (ICARDA, VIR); N Pungan to Angren, *van Slageren & al. MSPGAP-91201* (ICARDA, VIR); E Pap, road Namangan to Angren, *van Slageren & al. MSPGAP-91196* (ICARDA, VIR).

EUROPE: BULGARIA: Burgas, N Ajtos, *van Slageren & al. MSRIMZ-89217* (ICARDA, IHAR, IIPGR); Varna, Balcik to Albena, *van Slageren & al. MSRIMZ-89207* (ICARDA, IHAR, IIPGR); Plovdiv, E Sadovo to Stara Zagora, *van Slageren & al. MSRIMZ-89220* (ICARDA, IHAR, IIPGR); Burgas, Venec, W Karnobat, *van Slageren & al. MSRIMZ-89218* (ICARDA, IHAR, IIPGR); Varna, Priespa, SW Dropla, *van Slageren & al. MSRIMZ-89205* (ICARDA, IHAR, IIPGR); Varna, Odrinki, SW Tolbuhin, *van Slageren & al. MSRIMZ-89211* (ICARDA, IHAR, IIPGR); Plovdiv, Pestera to Kricim, at Kozarsko, *van Slageren & al. MSRIMZ-89162* (ICARDA, IHAR, IIPGR); Plovdiv, E Zelenikovo, *van Slageren & al. MSRIMZ-89151* (ICARDA, IHAR, IIPGR); Khaskovo, E Gorski Ivor, *van Slageren & al. MSRIMZ-89167* (ICARDA, IHAR, IIPGR); Sofia, NE Jakoruda, *van Slageren & al. MSMZNN-90248* (ICARDA, IIPGR, VIR); Sofia, in Pernik, *van Slageren & al. MSMZNN-90293* (ICARDA, IIPGR, VIR); Sofia, E Slivnica, *van Slageren & al. MSMZNN-90298* (ICARDA, IIPGR, VIR); NE Svilengrad, *van Slageren & Zacharieva MSMZ-90234* (ICARDA, IIPGR).

RUSSIA: Daghestan, E slope Dzhalgan Mt., *van Slageren & Boguslavski MSRB-90183* (ICARDA, VIR).

Notes: 1. Host (1802: 6) lists various locations from Hungary and from what is now Romania ('Banatu', see Stearn, 1978: 216) at his description of *Aegilops cylindrica*. From his lay-out it appears that four collections, all from Waldstein & Kitaibel, are involved (presented here in literal citation from Host's *Icones*), viz.

(1) 'In apricis, ad-vias, vinearum & agrorum margines agri peshinensis, budensis; (2) in prædio szilidensi versus Coloscam; (3) infra *Szarvas* in Comitatu bekesiensi; (4) & in Banatu inter vineas versetzenses'. Davis (1985: 237) cites them literally, but assumes that all are from Romania and that they are all deposited in PR. *Taxonomic Literature* (ed. 2) gives at Waldstein (Stafleu & Cowan, 1988: 30) that many of the Waldstein & Kitaibel types are indeed in PR, but inspection of PR did not yield any of the four involved here. Other Kitaibel types are in BP (Stafleu & Cowan, 1979: 555). To choose a lectotype I have found only two collections from Kitaibel, both from BP, one of which is also found in B and (probably) LE, but with different texts on the labels.

All type materials inspected represent *Ae. cylindrica* as here understood. One collection is from the 'Herbar. Kitaibel (no.) 9585', with '*Aegilops cylindracea*' on it, but no collector's number or locality. The other is from the 'Herbar. Kitaibel (no.) 9705', but with the text: '*Aegilops cylindracea* n.sp. Budae Pesthini, in Cttu Békésiensi. Ist auch nach Willdenow neu und von der *caudata* verschieden.', and has the collector's number *226* ('Cttu' is an abbreviation of Comitatu, or County). The first sheet of no. 18878 of the von Willdenow herbarium in B carries the label with the same species name and number, as well as '(Kitaibel)' and the text: 'In agrorum marginibus, ad vias inter agros et vineas.'. Finally, in LE a sheet carries '*Aegilops cylindracea* Kitaib. ♂', which I also consider to belong to the original Kitaibel collections, now considered as the syntypes. The sheets with '226' are now designated the lectotype, being better documented and relating to Host's publication. LE is excluded, even though it is probably a separatum of the original BP material (but not per se of collection 226).

An indication as the type specimen in W on the collection 's.loc., *Host 2284*' is erroneous.

2. The presence of '*cylindracea*' on Kitaibel's collections in BP may have been the reason that Soó von Bere (1973: 354) published this name with authors 'Kit. ex Jáv. 1926'. He probably assumed that Jávorka used the name and description from Kitaibel for his *A magyar flóra kis határozója* from 1926. The name *cylindracea* is, however, not published there, nor in any other edition of Jávorka's Hungarian flora. Soó von Bere's publication of the name is invalid for only citing it only in synonymy of *Ae. cylindrica* (Art. 34.1*(c)*).

3. This variety was distinguished by Karataglis (1989: 17) on the basis of its geographical isolation, and morphological and chromosomal characteristics, while the protein electrophoresis patterns were strikingly similar to other *cylindrica* accessions, even from distant countries such as e.g., Afghanistan. The three spikes, presented by Karataglis (1989: 15, Fig. 2A-C), however, show variation that is entirely covered by the species *Ae. cylindrica* as it is here understood, with his var. *kastorianum* only having longer lateral lemma awns than usual. In this it looks somewhat like the (former) var. *polyathera* of *Aegilops caudata*. The latter variety, however, has the well-developed apical glume awns that are longer than the entire spike, together with the only toothed apical lemmas, which are characteristic of *Ae. caudata* (see Fig. 20-4). That *Ae. cylindrica* is so rare in Greece, as Karataglis also concedes, is indeed difficult to explain. Maybe its preference for generally cooler climates accounts for it, and also explains the occurrence on the Anatolian highlands.

4. *Aegilops cylindrica* may be confused with forms of the sympatric *Ae. caudata*, especially specimens with well-developed lateral glume awns (formerly known as var. *polyathera*). Differences are keyed out as follows:

Apex of glumes of apical spikelets with a well-developed, 3-6 cm long, awn with (1-)2 lateral teeth at the base (*Fig. 34-9, 10*); awns of lemmas of apical spikelets 4-8 cm long, thus longer than those of the glumes; all apical spikelet awns *shorter* than the entire length of the spike (*Fig. 34-2*); – apex of glumes of lateral spikelets with a broad, almost inconspicuous tooth and a short awn that is usually somewhat longer towards the apex of the spike (*Fig. 34-5, 6*) .... **cylindrica**

Apex of glumes of apical spikelets with a 4.5-12 cm long awn, which is *longer* than the entire spike (*Fig. 21-1, 2, 4*), lateral teeth at the base absent; lemmas of apical spikelets mucronate to subulate only; – apex of glumes of lateral spikelets with a sharp tooth and a short awn that, sometimes, may be well developed, especially towards the apex of the spike (*Fig. 21-9, 10*) .... **caudata**

10.8 **Aegilops geniculata** Roth — **Figs. 38, 40-44**

[For pre-Linnaean descriptions and literature, see Chapter 3.1 at 3.1.2.]

Aegilops geniculata Roth, Bot. Abh. Beobacht. 45 (1787), in Usteri, Ann. Bot. 2(4): 41 (1793), Catal. bot. 1: 121 (1797); Persoon, Syn. pl. 1: 107 (1805); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 38 (1973), in Fedorov, Fl. part. Eur. URSS 1: 156 (1974), Zlaki SSSR 160 (1976, Russian) / 229 (1984, English); Scholz, Liste Gräs. Libyens, Willdenowia 7: 435 (1974); Zangheri, Fl. ital. 1: 979 (1976, with ssp. *geniculata*); Kerguelen, Bull. Soc. Bot. France 123: 318 (1976); Sljusarenko in Prokudin et al., Zlaki Ukrainy 97 (1977); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980); Hammer, Feddes Repert. 91: 240 (1980b, with ssp. *geniculata* and var. *geniculata*); Demiri, Fl. ekskur. shqip. (Albania) 80 (1981); Pignatti, Fl. italia 3: 542 (1982, with ssp. *geniculata*); Löve, Feddes Repert. 95: 503 (1984, with ssp. *geniculata*); Davis, Fl. Turkey 9: 245 (1985); Thiébaud & Deschatres in Jeanmonod et al., Not. Fl. Corse, Candollea 41: 55 (1986); Feinbrun-Dothan, Fl. Pal. 4: 176 (1986); Talavera in Valdés et al., Fl. Vasc. Andal. Occ. 3: 376 (1987); Sagredo, Fl. Almeria 49 (1987); Sherif & Siddiqi in El-Gadi, Fl. Libya 145: 105 (1988); Dostál, New fl. Chechoslovak SSR 2: 1368 (1989).

[**Homotypic synonym:** the combination of the epithet '*geniculata*' with *Triticum* has been made twice, but it cannot and has not been made with *Ae. geniculata* as the basionym. See note 1.]

Type: 'Germany', *Roth s.n.* (holo: B-W, not seen; iso: BM, LE, TUB).

Sub nom. *Ae. ovata* L. (1753) *pro parte* (the part *not* typified by Greuter in Greuter & Rechinger (1967: 171); see note 2 at 10.12, *Ae. neglecta*): Linnaeus, Sp. pl. (ed. 1) 2: 1050 (1753), (ed. 2) 2: 1489 (1763) *pro parte*; Gouan, Fl. monsp. 132 (1765); Allioni, Fl. pedem. 2: 262 (1785); Villars, Hist. pl. Dauphiné 2: 179 (1787); Honckeny, Syn. pl. Germ. 1: 484 (1792, '*Aegylops ovata*'); Desfontaines, Fl. atlant. 2: 383 (1799); Host, Icon. descr. gram. austriac. 2: 5, Tab. 5 (1802), Fl. austriac. 1: 174 (1827); Persoon, Syn. pl. 1: 107 (1805); de Lamarck & de Candolle, Fl. franç. (ed. 3) 3: 79 (1805, reissue 1815); von Willdenow, Sp. pl. (ed. 4) 4(2): 942 (1806); Smith in Sibthorp & Smith, Fl. Graec. prodr. 1: 71 (1806), Fl. graec. 1: 74, Tab. 93 (1808); Marschall von Bieberstein, Fl. taur.-caucas. 1: 432 (1808); Roemer & Schultes, Syst. veg. 2: 771 (1817); Duby, Bot. gall. (ed. 2) 1: 528 (1828); Reichenbach, Fl. germ. excurs. 1(1): 17 (1830); Chaubart & Bory de Saint-Vincent in Bory de Saint-Vincent, Exp. sci. Morée, Bot. 3(2): 45 (1832); Kunth, Enum. pl. 1: 458 (1833), Suppl. tomi primi 371 (1835); Tenore, Fl. napol. 5: 287 (1835); Richter, Codex bot. linn. 998 (1835-39); Bluff, Nees von Esenbeck & Schauer, Comp. fl. German. (ed. 2) 1(1): 209 (1836); Mutel, Fl. franç. 4: 153 (1837), Atlas, Tab. 92, fig. 645 (1837); Gussone, Fl. sicul. syn. 1: 53 (1843); Boissier, Voy. bot. Espagne 2: 682 (1844a), Fl. orient. 5(2): 673 (1884); Parlatore, Fl. palerm. 1: 237 (1845), Fl. ital. 1: 510 (1850); Webb & Berthelot, Hist. nat. Iles Canaries 3: 421 (1849); Grisebach in von Ledebour, Fl. ross. 4: 327 (1852); Cosson & Durieu de Maisonneuve, Expl. sci. Algérie 210 (1855, with var. α *vulgaris* Coss. & Durieu; see note 2); Lange, Pug. pl. hispan. 1: 56 (1860); Tchichatscheff, Asie min., Bot. 2: 581 (1860); Willkomm & Lange, Prod. fl. hispan. 1: 107 (1861); Schlosser von Klekovski & Vukotinovič, Fl. croat. 1295 (1869); Loret & Barrandon, Fl. Montpellier (ed. 1) 2: 770 (1876), (ed. 2) 577 (1886); Schlechtendal et al., Fl. Deutschl. ed. 5, vol. 8: 219 (1881); Nyman, Consp. fl. eur. 4: 838 (1882), Suppl. 2: 342 (1890); Battandier & Trabut, Fl. Alger 107 (1884), Fl. Algérie 1(2): 241 (1895); Stapf, Beitr. Fl. Lycien 1: 5 (1885); Velenovský, Fl. bulg. 627 (1891); Post, Fl. Syria (ed. 1) 899 (1896), (ed. 2) 2: 783 (1933); Fiori & Paoletti, Fl. Italia 1: 109 (1896); de Marchesetti, Fl. Trieste 655 (1897); von Halácsy, Consp. fl. graec. 3: 430 (1904); Battandier & Trabut, Fl. Algérie Tunisie 393 (1905); Coste, Fl. descr. France 3: 657 (1906); Lázaro é Ibiza, Comp. fl. Españ. (ed. 2) 1: 657 (1906), (ed. 3) 2: 72 (1920); Koch, Syn. deut. schweiz. Fl. (ed. 3) 3: 2798 (1907); Albert & Jahandiez, Cat. pl. vasc. Var 561 (1908); Hegi, Ill. Fl. Mitt.-Eur. (ed. 1) 1: 390 (1908), (ed. 2) 1: 499 (1936); Lojacono, Fl. sicul. 3: 369 (1908-09); Pitard & Proust, Iles Canaries 399 (1909); Durand & Barratte, Fl. libyc. prodr. 275 (1910); Rouy, Fl. France 14: 331 (1913); Jávorka, Magyar fl. 1: 114 (1924); Borg, Descr. fl. Malt. isl. 790 (1927); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 447, 471 (1928); Eig, Feddes Repert., Beih. 55: 141 (1929a, with var. *vulgaris* Eig (p. 144), 'non var. *vulgaris* Coss. & Durieu'; see note 2); Pampanini, Prodr. fl. ciren. 135 (1930); Oppenheimer, Florul Transiord. 151 (1931); Jansen & Wachter, Nederl. Kruidk. Arch. 139 (1931); Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931); Lindberg, Itin. medit. 8 (1932); Nevski in Komarov, Fl. URSS 2: 674 (1934, Russian) / 537 (1963, English); Douin in Bonnier, Fl. ill. France 12: 63 (1934); Fournier, Quatre fl. France 88 (1935); Hitchcock, Man. Grasses U.S. (ed. 1) 246 (1935), (ed. 2, rev. Chase) 246 (1951); Cadevall y Diars, Fl. Catalunya 6: 273 (1936); Täckholm et al., Fl. Egypt 1: 270 (1941); Oppenheimer & Evenari, Florul Cisiord. 171 (1941); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 766 (1943); Gismondi, Pros. fl. ligust. 154 (1950); Jansen, Fl. neerl. 1(2): 124 (1951); Parsa, Fl. Iran 5: 818 (1952); Thiébaut, Fl. Lib.-Syr. 3: 317 (1953); Cuénod et al., Fl. Tunisie 156 (1954); Maire & Weiller, Fl. Afrique nord 3: 365 (1955); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960); Nègre, Petit fl. rég. arides Maroc occ. 1: 91 (1961); Quézel & Santa, Nouv. fl. Algérie rég. dés. merid. 1: 158 (1962; with ssp. *eu-ovata* but erroneously as a ssp. of *Ae. triuncialis*, see entry of Quézel & Santa (1962) at *Ae. triuncialis* var. *triuncialis*, and note 4 at 10.18a); Mouterde, Nouv. Fl. Liban, Syrie 1: 146 (1966); Stojanov et al., Fl. Bulg. (ed. 4) 1: 147 (1966, '*ovatum*'); Domac, Eksk. fl. Hrvatske [Croatia] 516 (1967); Hess et al., Fl. Schweiz 1: 381 (1967); Munz & Keck, California Fl. and Suppl. 1507 (1968, introduced); Bor, Fl. Iraq 9: 186 (1968), Fl. Iranica 70/30: 202 (1970); Rubtsova, Opredelitel vysschich rastenich Kryma [Key to higher pl. Crimea] 68 (1972); Anghel & Beldie in Savulescu, Fl. Rep. Soc. Romania 12: 560 (1972); Guinochet & Vilmorin, Fl. France 3: 966 (1972); Osorio-Tafall & Seraphim, List Vasc. Pl. Cyprus 10 (1973); Täckholm, Students' Fl. Egypt (ed. 2) 702 (1974); Tzvelev in Fedorov, Fl. part. Eur. URSS 1: 155 (1974); Guinea Lopez & Ceballos Jiménez, Elenco Fl. Vasc. Españ. 357 (1974); Josifovič, Fl. rep. soc. serbie 8: 444 (1976); Haslam, Sell & Wolseley, Fl. Maltese isl. 457 (1977); Bonafé, Fl. Mallorca 1: 219 (1977). See note 2 at 10.12, *Ae. neglecta*.

Synonyms of *Ae. ovata* L. *pro parte*:

Ae. altera Cam. ex Roth, Bot. Abh. Beobacht. 45 (1787); Desfontaines, Fl. atlant. 2: 383 (1799); Smith in Sibthorp & Smith, Fl. graec. 1: 74 (1808); Bertoloni, Fl. ital. 1: 786 (1834); Richter, Codex bot. linn. 998 (1835-39); Petermann, Cod. linn. index. 4 (1840), *nom. inval.* (Art. 34.1*(a)* and *(c)*). – Note: based on well-known pre-Linnaean (1586) name from Camerarius' *De Plantis Epitome*. Cited as a binomial by all authors listed (Roth being the oldest one I could find), but only in synonymy. See Chapter 3.1.

Ae. peregrina Tabern. ex Honck., Syn. pl. Germ. 1: 485 (1792), *nom. inval.* (Art. 34.1*(c)*). – Notes: 1. This name is based on the pre-Linnaean name '*Ægylops peregrina* V' of Tabernæmontanum (1588 and other eds.) and cited only in synonymy, thus invalid. See Chapter 3.1. 2. This name precedes the accepted species name from Maire & Weiller but, as it is invalid, does not threaten the validity of the latter. See the nomenclature at 10.13.

Ae. narbonensis Lobel ex Honck., Syn. pl. Germ. 1: 485 (1792); Juel, Burser hort. sicc. 15 (1936, '*Aegylops Narbonensis* Lob.'), *nom. inval.* (Art. 34.1*(c)*). – Note: based on pre-Linnaean (1576/1581) name of de Lobel and cited only in synonymy by Honckeny and Juel, thus invalid. Chabrey ('*app.* 621 f. 1', referring to J. Bauhin, Hist. pl. 2: 621, fig. 1 of 1651) is erroneously cited by Honckeny as the author of the name *narbonensis*. Chabrey's illustration 1 on p. 621 shows the *Hyascinthus* from Dodoens (1644). See Chapter 3.1.

Ae. veterum J. Bauhin ex Honck., Syn. pl. Germ. 1: 485 (1792), *nom. inval.* (Art. 34.1*(c)*). – Note: based on pre-Linnaean (1651) name of J. Bauhin and cited only in synonymy, thus invalid. See Chapter 3.1.

Festuca italica J.Gerard ex Honck., Syn. pl. Germ. 1: 485 (1792). *nom. inval.* (Art. 34.1*(c)*) – Note: based on pre-Linnaean (1597) name of J. Gerard and cited only in synonymy, thus invalid. See Chapter 3.1.

Triticum ovatum auct. non Rasp. *pro parte* (based on the part of *Ae. ovata* that is *not* typified by Greuter & Rechinger): Raspail, Ann. Sci. Nat., Sér. 1(5): 435 (1825); Grenier & Godron, Fl. France 3: 601 (1856); de Cesati, Passerini & Gibelli, Comp. fl. ital. 1(4): 86 (1869); Durand & Schinz, Consp. fl. afric. 5: 938 (1894); Schmahlhausen, Fl. ssredn. jushn. Rossii [Fl. central and southern Russia] 2: 662 (1897); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 704-705 (1901-02, with ssp. ('A.') *eu-ovatum*); Zimmermann, Adv. Ruderalfl. Mannheim 72 (1907); Fedtschenko & Flyorov, Fl. Eur. Russia 147 (1910); Briquet, Prodr. fl. Corse 1: 190 (1910, with var. α *vulgare* Briq.); Knoche, Fl. baléar. 1: 334 (1921); Stojanov & Stefanoff, Fl. Bulg. (ed. 1) 1: 168 (1924), (ed. 3) 173 (1948); von Hayek, Prod. fl. pen. Balcan. 3: 224 (1932, author as '(L.) Gren. & Godr.'); Coutinho, Fl. Portugal (ed. 2) 117 (1939); Diapulis, Syn. fl. graec. 167 (1939, authors as 'Gren. Godr.'); Bowden, Can. J. Bot. 37: 675 (1959), Can. J. Gen. Cyt. 8: 133 (1966); Webb, Fl. Eur. Turkey, Proc. Roy. Irish Acad., Sect. B, 65: 79 (1966); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 50 (1987).

Ae. ovata L. var. α *genuina* Griseb., Spic. fl. rumel. 2: 425 (1846); Tchichatscheff, Asie min., Bot. 2: 581 (1860); Maire & Weiller, Fl. Afrique nord 3: 367 (1955), *nom. inval.* (Art. 24.3).

Triticum sylvestre Cesalpino ex Bubani, Fl. pyren. 4: 395 (1901-02). – Note: based on the pre-Linnaean (1583) name of Cesalpino; see Chapter 3.1. Earlier published as a binomial by Bertoloni, Fl. ital. 1: 785 (1834), but in synonymy of *Ae. ovata* only, thus invalid because of Art. 34.1*(c)*.

Other heterotypic synonyms of *Ae. geniculata*:

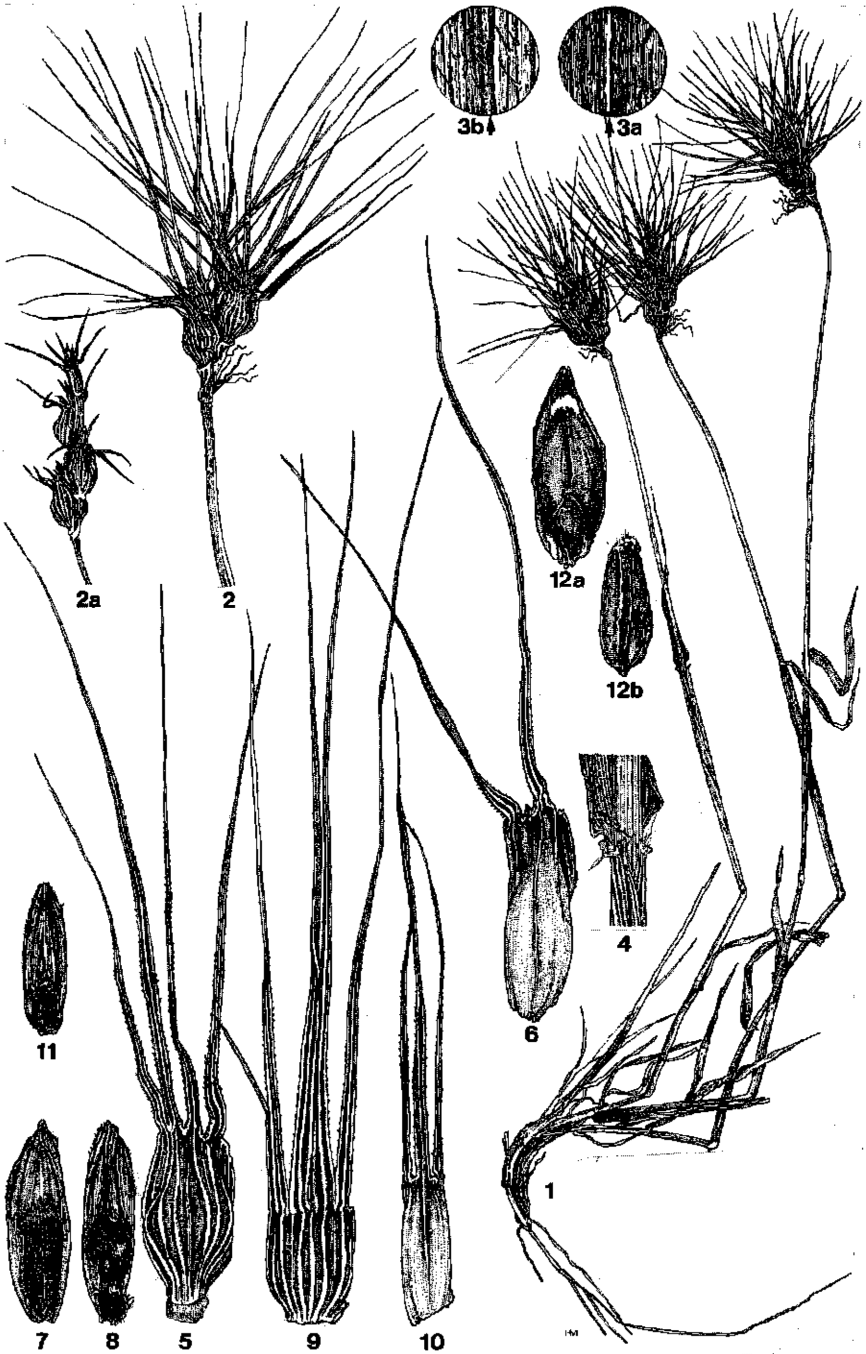
Phleum aegylops Scop., Fl. carniol. (ed. 2) 1: 55 (1771/1772); Honckeny, Syn. pl. Germ. 1: 485 (1792). – Type: (Italy) circa Tergestum (= Trieste), *Scopoli s.n.* (probably) (holo: ?). – Note: for this species relevant Scopoli material may be in C, LINN, MPU, UPS, and PAV (Stafleu & Cowan, 1985: 453), but I have been unable to retrace any (iso-)type of *P. aegilops* if still existing.

Ae. echinus Godr., Fl. juvenalis (ed. 1, Latin) 48 (1853) / Mém. Acad. Montp., sect. Méd. 1: 456 (1853), (ed. 2, French) Mém. Acad. Stan. (Nancy): 435 (1853, separately publ. 1854), **syn. nov.** – Type: (France, Hérault) Port Juvénale, 17.VII.1851, *Touchy 294* (holo: NCY, not seen; iso: K, MPU). – Homotypic synonyms: *Triticum ovatum* auct. non Rasp. var. *echinus* (Godr.) Thell., Fl. adv. Montpellier 145 (1912). *Ae. ovata* L. var. *echinus* (Godr.) Eig, Feddes Repert., Beih. 55: 145 (1929a). *Ae. geniculata* Roth var. *echinus* (Godr.) Hammer, Feddes Repert. 91: 241 (1980b).

Ae. divaricata Jord. & Fourr., Brev. pl. nov. 2: 129 (1868); Richter, Pl. eur. 1: 127 (1890), non Stapf, Beitr. Fl. Lycien 1: 5 (1885; see note 2 at 10.12, *Ae. neglecta*). – Neotype: (Italy, Sicily: 'In incultis Siciliæ') Palermo, cultivé à Lyon, fl. 4 juin 1869, *Jordan s.n.* (MPU-Coste; isoneotype: LY-Gandoger). – Note: not found in LY-Jordan. See note 3.

Ae. erigens Jord. & Fourr., Brev. pl. nov. 2: 131 (1868); Richter, Pl. eur. 1: 127 (1890). – Neotype:

Fig. 40. *Aegilops geniculata*. 1, habitus (x 1/2); 2, spike (x 1); 2a, depauperate spike with reduced awns, probably a natural hybrid with *Ae. peregrina* (x 1); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 3a (x 5); 4, stem, leaf sheath, ears and leaf blade (x 2); 5-8, lower floret in lowest fertile spikelet of a spike: 5, glume, 6, lemma, 7, palea and immature seed, 8, palea and anthers (5-8 all x 3); 9-11, apical spikelet: 9, glume, 10, lemma, 11, palea with immature seed (9-11 all x 3); 12a, palea with lodicules and mature seed (x 3); 12b, ventral surface of mature seed (x 3). (1-12. *Holly & al. DZA-3*; 2a. *van Slageren & Guarino MSLG-98085*; both cultivated at ICARDA from germplasm accessions.)


3b
3a
2a
2
12a
12b
4
6
11
1
7
8
5
9
10

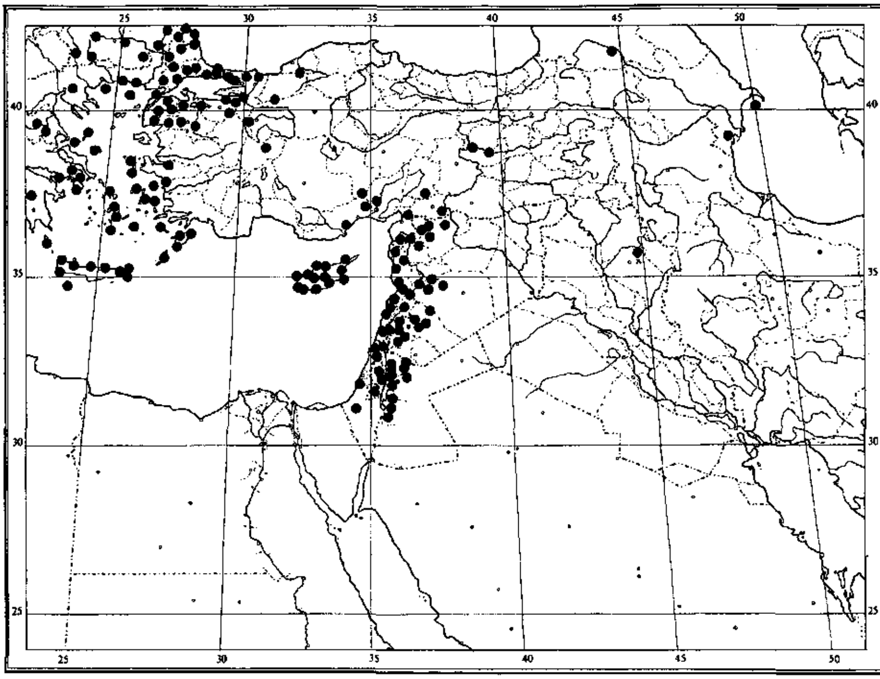


Fig. 41. Distribution of *Aegilops geniculata* in the eastern Mediterranean, southwest Asia and the Caucasus.

(France, Aude: 'In incultis Galliæ australis: Mas-Cabardès (Aude) etc.') Mas-Cabardès, cultivé à Lyon, fl. 28 mai 1869, *Jordan s.n.* (MPU-Coste; isoneotype: LY-Gandoger). – Note: not found in LY-Jordan. See note 3. – Homotypic synonym: *Ae. ovata* L. var. ζ *erigens* (Jord. & Fourr.) Rouy, Fl. France 14: 332 (1913).

Ae. erratica Jord. & Fourr., Brev. pl. nov. 2: 130 (1868); Richter, Pl. eur. 1: 127 (1890). – Neotype: (France, Vaucluse: 'In incultis Galliæ australis: Valrèas (Vaucluse) etc.') Valrèas, cultivé à Lyon, fl. 3 juin 1865, *Jordan s.n.* (LY-Jordan; isoneotype: K). See note 3. – Homotypic synonym: *Ae. ovata* L. var. ε *erratica* (Jord. & Fourr.) Rouy, Fl. France 14: 332 (1913).

Ae. parvula Jord. & Fourr., Brev. pl. nov. 2: 131 (1868); Richter, Pl. eur. 1: 127 (1890). – Neotype: (Italy: 'In Italia. Ex Horto botan. heidelbergensi olim acceptum') cultivé à Lyon, fl. 28 mai 1865, *Jordan s.n.* (LY-Jordan). See note 3. – Note: the label in LY-Jordan indicates that the original material came from the botanic garden in Palermo, Sicily.

Ae. procera Jord. & Fourr., Brev. pl. nov. 2: 129 (1868); Richter, Pl. eur. 1: 127 (1890). – Neotype: (France, Hérault: 'In incultis Galliæ australis: circa Monspelium, ex dom. E. Revelière') cultivé à Lyon, fl. 3 juin 1869, *Jordan s.n.* (MPU-Coste). See note 3. – Note: not found in LY-Jordan. Material supplied by Revelière, cultivated by Jordan. – Homotypic synonym: *Ae. ovata* L. var. β *procera* (Jord. & Fourr.) Rouy, Fl. France 14: 332 (1913); Keith, Checkl. Libyan Fl. 198 (1965).

Ae. pubiglumis Jord. & Fourr., Brev. pl. nov. 2: 131 (1868); Richter, Pl. eur. 1: 127 (1890). – Neotype: (France, Alpes-De-Haute-Provence: 'In incultis Galliæ australis: Digne (Basses-Alpes) etc.') cultivé à Lyon, fl. 16 juin 1865, *Jordan s.n.* (LY-Jordan; isoneotype: K). See note 3. – Homotypic synonyms: *Ae. ovata* L. var. δ *pubiglumis* (Jord. & Fourr.) Rouy, Fl. France 14: 332 (1913); Maire & Weiller, Fl. Afrique nord 3: 368 (1955, ampl. to include also var. *hirsuta*); Keith, Checkl. Libyan Fl. 198 (1965). *Ae. ovata* L. forma *pubiglumis* (Jord. & Fourr.) Maire & Weiller, Fl. Afrique nord 3: 368 (1955).

Ae. sicula Jord. & Fourr., Brev. pl. nov. 2: 129 (1868); Richter, Pl. eur. 1: 127 (1890). – Neotype: (Italy, Sicily: 'In incultis Siciliæ') cultivé à Lyon, fl. 4 juin 1869, *Jordan s.n.* (LY-Jordan; isoneotypes: LY-Gandoger, MPU-Coste). See note 3.

Ae. brachyathera Pomel, Nouv. mat. fl. atl. 389 (1874); Battandier & Trabut, Fl. Alger 208 (1884), Fl. Algérie 1(2): 241 (1895), Fl. Algérie Tunisie 393 (1905), **syn. nov.** – Type: (Algeria) friches du Sersou, Aïn Toucria, Bourbaki, 14.V.1860, *Pomel s.n.* (holo: AL, not seen; iso: MPU). – Homotypic synonyms: *Triticum ovatum* auct. non Rasp. var. *brachyatherum* (Pomel) Th.Durand & Schinz, Consp. fl. afric. 5: 938 (1894, with 'Hack. in litt.' instead of Pomel). *Ae. ovata* L. [ssp. *atlantica* Eig] var. *brachyathera* (Pomel) Eig, Feddes Repert., Beih. 55: 145 (1929a); Maire & Weiller, Fl. Afrique nord 3: 369 (1955). *Ae. ovata* L. var. *eigiana* Maire & Weiller, Fl. Afrique nord 3: 369 (1955, '*Eigiana*'), *nom. illeg.* (Art. 63.1). *Ae. ovata* L. ssp. *brachyathera* (Pomel) Chennav., Acta Horti Gotoburg. 23: 164 (1960). *Ae. geniculata* Roth var. *brachyathera* (Pomel) Hammer, Feddes Repert. 91: 241 (1980b).

Ae. triaristata Willd. forma *submutica* Battand. & Trab., Fl. Algérie 1(2): 241 (1895), Fl. Algérie Tunisie 393 (1905, as 'γ *submutica*'), **syn. nov.** – Type: (Algeria) Djebel Amour, Aïn Mansour, près d'Aflou, 10.V.1888, *Clary 236* (holo: MPU).

Ae. fonsii Sennen, Bull. Soc. bot. France 69: 91 (1922, '*Fonsii*'); Eig, Feddes Repert., Beih. 55: 142 (1929a, '*Ae. Fausii* Sennen in sched.'). – Based on: *Ae. fonsii* Sennen, Butl. Inst. Catal. Hist. Nat. 6: 122 (1920, '*E. Fonsii* Sennen = *AE. ovata* x...?'), Plantes d'Espagne no. 4220 ('1921', and '*fausii*' acc. Eig, 1929a: 142), *nom. nud.* – Type: (Spain) Barcelona, Rubí, chemin de S. Mus, 5.VI.1921, *Sennen (Plantes d'Espagne) 4220* (holo: BC; iso: BM, G, L, LE, MPU, MPU-Coste, P). – Notes: 1. Sennen (1922: 91) gives: '28.IV.1920, *J. Fons s.n.*' as the type collection. 2. The label of the holotype in BC indicates '*fonsii*' rather than the misspelled name '*fausii*' as it appeared in Eig (1929a, quoting Sennen's *Plantes d'Espagne 4220*). Sennen comments that the species was named in honour of Joaquin Fons.

Ae. ovata L. ssp. *gibberosa* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 471 (1928), **syn. nov.** – Syntypes: (France) Gallia australis, Toulon, *Vavilov s.n.* (WIR, not found); (Italy) Sardinia, *Vavilov s.n.* (WIR, not found). – Homotypic synonym: *Ae. geniculata* Roth ssp. *gibberosa* (Zhuk.) Hammer, Feddes Repert. 91: 241 (1980b). – Note: synonym relies on the description and the photograph of Zhukovsky (1928: 471-472, Fig. 12-a).

Ae. ovata L. ssp. *globulosa* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 473 (1928); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960), **syn. nov.** – Type: Tunisia, prope Maktar, 10.VIII.1926, *Vavilov s.n.* (holo: WIR 2723). – Homotypic synonym: *Ae. geniculata* Roth ssp. *globulosa* (Zhuk.) Á.Löve, Feddes Repert. 95: 503 (1984).

Ae. ovata L. ssp. *planiuscula* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 473 (1928); Jansen & Wachter, Nederl. Kruidk. Arch. 141 (1931), **syn. nov.** – Lectotype: Spain, Morede, near Granada, near barley fields, 23.VI.1927, *Vavilov 55130* (holo: WIR 938).

Ae. ovata L. var. *lanuginosa* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 474 (1928), **syn. nov.** – Syntypes: collections from Spain and Sicily from *Vavilov* (WIR, not found). – Homotypic synonym: *Ae. geniculata* Roth var. *lanuginosa* (Zhuk.) Hammer, Feddes Repert. 91: 241 (1980b). – Note: synonym relies on the description and the photograph of Zhukovsky (1928: 474, Fig. 13).

Ae. ovata L. ssp. *umbonata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 472 (1928), **syn. nov.** – Lectotype: Palestine, upper Galilea, 6.IX.1926, *Vavilov 29512* (holo: WIR 960).

Ae. ovata L. var. *puberulla* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 473 (1928), **syn. nov.** – Type: Algeria, s.loc., *Vavilov s.n.* (holo: WIR, not found). – Homotypic synonym: *Ae. geniculata* Roth var. *puberulla* (Zhuk.) Hammer, Feddes Repert. 91: 240 (1980b).

Ae. ovata L. var. *vernicosa* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 473 (1928), **syn. nov.** – Syntypes: (Algeria) Algiers, Frenda, *Vavilov 239* (WIR 2725); Tunisia, s.loc., *Vavilov s.n.* (WIR, not found).

Ae. ovata L. forma *nudiglumis* Nábělek, Iter turc.-pers. 5, Publ. Fac. Sci. Univ. Masaryk 111: 29 (1929); Parsa, Fl. Iran 5: 819 (1952), **syn. nov.** – Type: Palestine, Jericho, in declivibus aridis, 19.III.1909, *Nábělek 3166* (holo: BRA, not seen; iso: SAV) *pro parte*. – Note: the type specimen is a mixture of *Ae. geniculata* and *Ae. peregrina* var. *peregrina*.

Ae. ovata L. var. *africana* Eig, Feddes Repert., Beih. 55: 144 (1929a); Pampanini, Prodr. fl. ciren. 135 (1930); Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931); Maire & Weiller, Fl. Afrique nord 3: 368

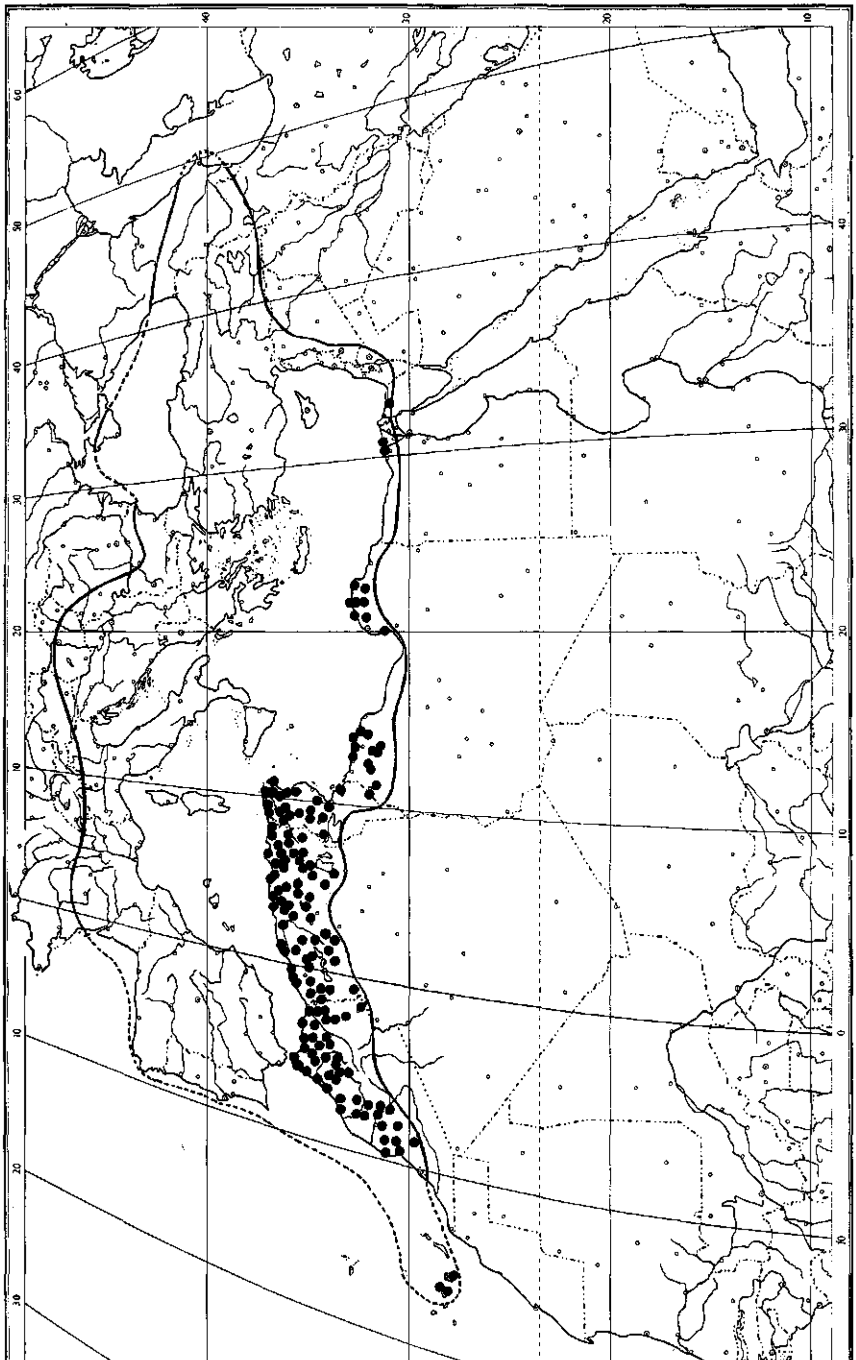


Fig. 42. Distribution of *Aegilops geniculata* in north Africa The continous line indicates the entire distribution area of the species.

(1955); Keith, Checkl. Libyan Fl. 198 (1965), **syn. nov.** – Syntypes (two collections cited by Eig, 1929a; inspected one listed): Libya, Cyrenaica, in lapidosus primae regionis morien Derra (Derna?) oppidi, 5.IV.1887, *Taubert 181* (G, JE, P). – Homotypic synonyms: *Ae. geniculata* Roth var. *africana* (Eig) Scholz, Liste Gräs. Libyens, Willdenowia 7: 420 (1974); Sherif & Siddiqi in El-Gadi, Fl. Libya 145: 105 (1988); Hammer, Feddes Repert. 91: 241 (1980b, as a *comb. nov.*, thus an isonym).

Ae. ovata L. ssp. *atlantica* Eig, Feddes Repert., Beih. 55: 144 (1929a); Jansen & Wachter, Nederl. Kruidk. Arch. 141 (1931); Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931); Jansen, Fl. neerl. 1(2): 124 (1951); Maire & Weiller, Fl. Afrique nord 3: 368 (1955); Quézel & Santa, Nouv. fl. Algérie rég. dés. merid. 1: 158 (1962; erroneously as a ssp. of *Ae. triuncialis*, see entry of Quézel & Santa (1962) at *Ae. triuncialis* var. *triuncialis*, and note 4 at 10.18a). – Type: not indicated.

Ae. ovata L. var. *eventricosa* Eig, Feddes Repert., Beih. 55: 144 (1929a); Jansen & Wachter, Nederl. Kruidk. Arch. 141 (1931); Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931); Post, Fl. Syria (ed. 2) 2: 783 (1933); Emberger & Maire, Cat. pl. Maroc 4: 947 (1941); Jansen, Fl. neerl. 1(2): 124 (1951); Maire & Weiller, Fl. Afrique nord 3: 367 (1955), **syn. nov.** – Syntypes (six collections cited by Eig, 1929a; inspected ones listed): Morocco, Bekrit, valley of Admerissen, 1925, *Jahandiez 607* (E, G, Z); Algeria, Cala Rana, méridional du Lalla Khelidja, Dept. d'Alger, 30.VI.1879, *Duhamel du Monceau s.n.* (G, G-BOIS (?, not found)). – Homotypic synonyms: *Triticum ovatum* auct. non Rasp. forma ('γ') *eventricosum* (Eig) Hayek, Prod. fl. pen. Balcan. 3: 224 (1932). *Ae. geniculata* Roth var. *eventricosa* (Eig) Hammer, Feddes Repert. 91: 241 (1980b).

Ae. ovata L. var. *hirsuta* Eig, Feddes Repert., Beih. 55: 144 (1929a); Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931); Post, Fl. Syria (ed. 2) 2: 783 (1933); Oppenheimer & Evenari, Florul. Cisiord. 172 (1941); Jansen, Fl. neerl. 1(2): 124 (1951), **syn. nov.**, *nom. illeg.* (Art. 64.1), non var. *hirsuta* Tchich., Asie Min., bot. (1860, see Chapter 12). – Type: not indicated; only countries of distribution mentioned. – Homotypic synonyms: *Triticum ovatum* auct. non Rasp. forma ('β') *hirsutum* (Eig) Hayek, Prod. fl. pen. Balcan. 3: 224 (1932). *Ae. geniculata* Roth var. *hirsuta* (Eig) Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 38 (1973), in Fedorov, Zlaki SSSR 160 (1976, Russian) / 229 (1984, English).

Ae. ovata L. forma *longispica* Oppenh. & Evenari, Florul Cisiord. 172 (1941), **syn. nov.**, *nom. inval.* (Art. 36.1). – Voucher: not indicated.

Diagnostic characters: tufted, many-tillered annuals, 10-30(-40) cm tall excluding spikes; spikes narrowly ovoid, 1.5-3 cm long excluding awns, with (2-)3-4 spikelets, the apical one sterile, and 1(-2) rudimentary spikelets; lower (1-)2-3 spikelets subventricose, urceolate, widest at or below the middle; glumes with (3-)4(-5) awns, decreasing in length towards the spike apex; lemmas with 2-3 awns of 1-2.5 cm only; caryopsis free.

Description (Fig. 40): tufted *annuals* (*Fig. 40-1*), usually with many tillers. *Culms* geniculate at base, then ascending, 10-30(-40) cm tall excluding spikes; foliage ± evenly distributed, dense at base of culms, more sparse above. *Leaf* blades linear-acuminate, 2-7.5 cm long, 0.2-0.5 cm wide; sheath margins hyaline, the upper part ciliate but only in lower parts of the culm. *Inflorescence* (*Fig. 40-2*) a narrowly ovoid spike, 1.5-3 cm long excluding awns, 0.4-0.7 cm wide; disarticulating as one unit at maturity with the rudimentary spikelet(s) remaining attached to the culm; with (2-)3-4 spikelets, the apical one sterile, and 1(-2) rudimentary spikelets. *Spikelets* sessile, the lower (1-)2-3 subventricose, urceolate, widest at or below the middle, 7-10 mm long excluding awns, 3-4 mm wide, gradually reducing to the slender, narrowly obovoid apical spikelet, 4-5 mm long excluding awns, and only 1-2 mm wide, 1-1.5 times the length of the supporting rachis internode; with 3-4 florets, the lower 1-2 fertile, the apical spikelet with 1, reduced, sterile floret.

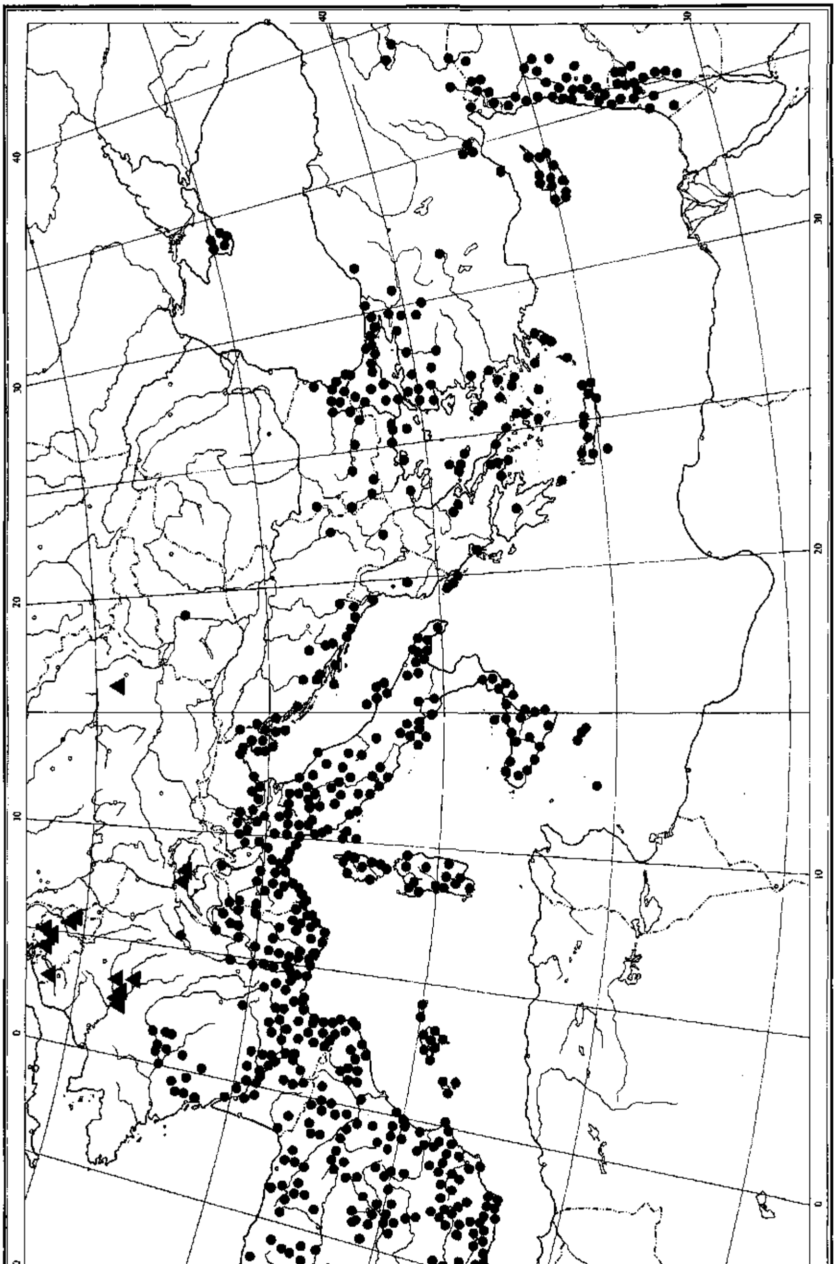


Fig. 43. Distribution of *Aegilops geniculata* in Europe ● = locations; ▲ = adventive locations (not shown for northern Germany, Sweden and the U.K.). For adventive distribution in the U.S.A., see Fig. 38.

Glumes (*Fig. 40-5*) 2, coriaceous, ovate, 6-8(-10) mm long, those of the apical spikelet (*Fig. 40-9*) obtrapezoid and around 3 mm long; the surface glabrous, scabrid or adpressed-velutinous, green to purplish-green; veins setulose or scabrous, unequal in width, flattened, sunk into the surface, unequally spaced, usually more yellowish and lighter in colour than the rest of the glume surface; the truncate apex extending into (3-)4(-5) setulose awns, ± equally wide at the base, rarely only 2 and then unequally wide at the base, the wide awn bifurcating above, 2-4.5 cm long, occasionally reduced to 0.4-0.5 cm, often purplish in colour, mostly erecto-patent in position, the 4 awns of the apical spikelet usually somewhat shorter, 1-3.5 cm only. *Lemmas* (*Fig. 40-6, 10*) of fertile florets 6-8 mm long, narrowly ovate, boat-shaped, the apex with 2-3 setulose awns, 1-2.5 cm long, thus shorter than the glume awns, and 1-2 teeth; awn position similar to the glume awns; inner surface of apical region often velutinous, outer surface setose. *Paleas* (*Fig. 40-7, 8, 11*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 40-12*) 4-6 mm long, free from lemma and palea.

Variation: forms with only two short and globose spikes and often only two short, 0.5-1 cm long, awns on the glumes of the lower, fertile spikelets are found from Morocco to Libya in north Africa. In this they resemble the type collection of the aptly named *Ae. echinus* from the Port Juvénale in the Hérault, southern France.

Distribution (Figs. 38, 41-43): a widespread Mediterranean / Western Asiatic / Circumboreal element occurring exclusively to the west and in the centre of origin of the genus. Common in southern Europe and the Aegaeis (Fig. 43), but relatively rare in Turkey where locations appear as somewhat disjunct between the northwest and central-south of the country (Fig. 41). Common in Africa north of the Sahara but less so in the eastern parts (Libya, Egypt; Fig. 42). Well represented in the western arc of the Fertile Crescent, but virtually absent in the central part and the eastern arc (Fig. 41). Rare in Transcaucasia; additional presence on the Crimea but exclusively south of the 45^0 latitude (in Europe also at higher latitudes, see Fig. 43). Common throughout its range.

Introduced in the Canary islands (see Chapter 6.1.1 at note 6), and the U.S.A. (Fig. 38: California – Mendacino County only – and Virginia (Hitchcock, 1935: 246). Collections from Virginia have not been confirmed, however). Adventive in parts of central and northwestern Europe, such as Germany, Switzerland, and the Netherlands (Zimmermann, 1907: 72; Hegi, 1908: 390; Jansen, 1951: 124 (with several varieties distinguished); Hess et al., 1967: 381), but of locations in central and eastern France and in Switzerland it is, in fact, difficult to determine whether these are natural or adventive (Fig. 43).

Ecology (Fig. 44): locally abundant in generally dry, somewhat disturbed habitats such as fallow, wastelands, roadsides, and dry rocky slopes of hills and mountains. In Malta also on corraline plateaux (Haslam et al., 1977). Also on edges of and within cultivation such as olive groves, vineyards, fruit tree plantations, and cereal crops such as barley and wheat (with which it may form natural hybrids, see Chapter 4.2 and at 4.2.2.7). Vegetation types include garrigue, maquis, grassland (frequently including other *Aegilops* species), shrub- and woodlands, forests and scrubs (e.g., of *Quercus*, *Pinus*, *Juniperus*, and *Pistacia*), steppe, and, more rarely,

Fig. 44. Extensive stand of *Aegilops geniculata* on a roadside near Om el Gersan, SE Yefren, Libya (germplasm collection *van Slageren & al. MSAJAS-91016*, ICARDA).

also humid pastures, dunes and even swamps. Bedrock is predominantly limestone but shales, pillow lava, silicate, Mediterranean terra rosa, karst, basalt and sandstone are also reported. Soil texture also varies widely: often on clay- and sandy loam, clay, and gravel; more rarely on pure sand and highly organic soil such as turf. *Ae. geniculata* can grow on very stony and rocky soils and has been found on old city walls. As a typical colonizer, the species can be found in massive stands, especially at regularly disturbed places such as roadsides (Fig. 44). Together with *Ae. triuncialis* this is the most widespread species of the genus and grows under a similarly wide annual rainfall amplitude, varying from less than 100 mm up to 1100 mm. Most data are, however, from the range of 200-700 mm.

In California, U.S.A., found in pastures on an unusual soil type: a silty clay, wet for the greater part of the year (coll. *Jones s.n.* (DAV) from Little Lake valley).

Altitude: from -300 m (Dead Sea region) to 1750 m, rarely up to 2100 m (coll. *Ball 2075* (E) from Lebanon).

Flowering and fruiting time: over a long period: March – August, but differing over the distribution area: March – May in Libya (Durand & Barratte, 1910: 275); April – May in Italy (Parlatore, 1845: 237); May in Istria and Croatia (Schlechtendal et al., 1881: 219); May – August in Spain (del Amo y Mora, 1871: 254; Cadevall y Diars, 1937: 273; Sagredo, 1987: 48); April – June on the Balearic islands (Knoche, 1921: 334) and in Portugal (Coutinho, 1939: 117); May – June in S France (dept. Var, cf., Albert & Jahandiez, 1908: 561). In mountainous Turkey as late as August (pers. observ.).

Genome: MU (female parent 'M' x male parent 'U') with 2x = 4n = 28 (Chennaveeraiah, 1960: 91; Waines & Barnhart, 1992: Table 2; both sub *Ae. ovata*).

Vernacular names:

Albanian: Halmuca vezake (Demiri, 1981: 80, sub *Aegilops geniculata*).

Arabic: Qamh el-hagal [= wheat of the partridge]; Sabal el-far [= spike of the mouse] (both from Täckholm, 1974; compare with Maghreb-Arabic names below). Dawsar baydi [baydi = egg-shaped; dawsar = *Aegilops*], Sha'ier iblies [sha'ier or scha'īr = satan or devil; iblies or iblīs = barley]; Dawsar [= *Aegilops*]; Zen (all from Al-Khatib, 1978: 11). Sebel iblīs [sebel = sableh = spike; iblīs = barley] (Dinsmore, 1911: 98). As with other languages the vernacular name of *Ae. geniculata* may be equal to the name for the genus *Aegilops* ('Dawsar'; see Chapter 7). Names from Al-Khatib are in Mashreq-Arabic, spoken in West Asia. Trabut (1935: 16) lists six names referring to both *Ae. ovata* (in the sense of *geniculata*) and *Ae. ventricosa* without distinction between the species. They are enumerated under both. The following names are in Maghreb-Arabic, spoken in North Africa: Oum el guemah [= mother of (durum) wheat]; Guemah el hadjela [= wheat of partridge]; Habbet el hadjela [= seed of partridge]; Hachechet el hadjela [= grass of partridge]; Bou stout [= father of 'stout(?)']; Sboulet el far [= spike of the mouse]. Note that Guemah (or Qamh) refers to both the genus *Triticum* and to *T. durum* (Trabut, 1935: 260, 261). Senboul-el-far [see above at Sboulet el far] (Nègre, 1961: 91). Bou el guemah [= father (not mother!) of (durum) wheat], guemah el hajra [hajra = hadjela = partridge; thus: wheat of the partridge] (both on herbarium colls. in MPU: *Long s.n.* from Aïn Draham, Tunisia).

Armenian: Aytzagn tzvatzev [tzva = oval, tzev = shape(d)] (Gandilyan et al., 1975: 86).

Basque: Herrikía / Herrok [= trigo del pais = wheat of the country], Grosaiña [= trigo extranjero = foreign wheat] (all from Guinea Lopez, 1949: 98). Herrikía is also used for x *Aegilotriticum triticoides* (as 'Herrokia', see Chapter 4.2 at 4.2.2.7).

Castilian (Spanish): Rompe sacos / Rompesacos (Cadevall y Diars, 1937: 273; Guinea Lopez, 1949: 98; Bonafé, 1977: 216). Basically the language of Castilia only, but nowadays the official language of Spain (see under Spanish).

Catalonian: Blat bord, Blat de perdiu [blat = wheat; perdiu = partridge] (both Cadevall y Diars, 1937: 273, with reference to *Ae. triuncialis*; see also 10.18a); Blad de camavermeya, Blad den menna (both Knoche, 1921: 334). All these names also used for *Ae. ventricosa* (Bonafé, 1977: 216).

Czech: Mnohoštetnik podlauhlý [podlauhlý = elongated] (Presl, 1820: 47; sub *Ae. ovata*); Mnohoštět vejčitý [vejčitý = egg-shaped] (Dostál, 1989: 1368).

English: Haver Grasse / Haver-grasse [= oat-grass; this vernacular is, in fact, in Dutch] (Gerard (1597: 68) and Bauhin (1658: 151), respectively); French Haver-grasse [= French oat-grass] (Parkinson, 1640: 1148); Oval-spiked Hard-grass (Aiton, 1813: 432); Goat-grass (Borg, 1927: 790, equivalent with the English common name for the genus); Ovate *Aegilops* (Haslam et al., 1977: 457).

French: Égilope ovoïde (de Lamarck & de Candolle, 1805 (reissue 1815): 79; Tenore, 1835: 287); Égilope ovale [= ovoid or egg-shaped *Aegilops*] (Mutel, 1837: 153; Cosson & Germain, 1861: 853; Douin in Bonnier, 1934: 63; Bouchard, 1977:

49); Froment ovoïde [= ovoid or egg-shaped wheat] (Acloque, 1904: 718); Bla dé couguou [bla = blé = wheat; couguou = ?] (Albert & Jahandiez, 1908: 561); *Aegilops* ovoïde (Cuénod et al., 1954: 156).

German: Fremdwalch [= strange Walch] (Bauhin, 1658: 151); Eyrunder Walch [= egg-round Walch], Geißauge [= goat's eye], Gerstenwalch [= barley Walch], fremder Walch [= strange (in the sense of 'from another region') Walch] (all from Honckeny, 1792: 484); Eirunder Walch [= egg-round Walch] (von Willdenow, 1806: 943 ('Eyrunder'); Schlechtendal et al., 1881: 219); Eiförmiger Walch [= egg-shaped Walch] (Hess et al., 1967: 381); Gemeiner Walch [= ordinary Walch] (Koch, 1907: 2798); Walch (Hegi, 1908: 390), which is also used at genus level (see Chapter 7).

Greek: Αιγιλωφ (Dioscorides, *De Materia Medica*, Lib. 4, Cap. 134). Although used at generic level in fact referring only to *Ae.* '*ovata*'. See also at Chapter 3.1 and at the etymology of the generic name *Aegilops* (Chapter 7).

Hungarian: Tojásdad kalászbojt [tojás = egg; dad = form (of)]. On label of *von Degen 94* (LE) from Rijeka, Croatia.

Italian: Orzo saluatico [= wild barley] (de Lobel, 1581: 43); Grano da formiche [= wheat of the ants] (Savi, 1798: 390), Grano delle formiche (Bertoloni, 1834: 786; Tenore, 1835: 287; Penzig, 1924: 10; Zangheri, 1976: 979), Gran da furmigh, Gran furmighèn (Penzig, 1924; both from Emilia-Romagna), Grano di formiche (Penzig, 1924; from Abruzzo); Cerere [a reference to the Roman god of agriculture, Ceres] (Bertoloni, 1834: 786), Cèrere (Penzig, 1924; from Toscana); Egilope secunda [= second *Aegilops*; referring to the old Mattioli name, see Chapter 3.1] (Bertoloni, 1834: 786); Fenice [= probably a reference to Phenice or Phoenicia, the country now more or less equivalent to Lebanon] (Bertoloni, 1834: 786), Fènice (Penzig, 1924; from Toscana); Forasacco [= (making) hole (in a) sack; compare the Spanish 'Rompesacos'] (Parlatore, 1845: 237); Orzo salvatico della mura [= wild barley of the wall] (Bertoloni, 1834: 786; Penzig, 1924, from Poggibonsi, Toscana); Gramigna da mescolo [Gramigna usually refers to *Cynodon dactylon* (L.) Pers., a weedy grass. A 'mescolo' is a wooden spoon. As 'mescolare' = 'turning around', this strange vernacular from Toscana (Penzig, 1924) may therefore refer to the mixing of grains (of cereals) with a wooden spoon in a cask or barrel, and where seeds of *Ae. ovata*, next to *Cynodon*, act as an unwanted weedy infestation (pers. comm. E. Porceddu).] (Bertoloni, 1834: 786); Gramigna stellata [= star-shaped weed (with 'weed' to be interpreted as *Cynodon dactylon*; thus a different kind of this plant, which, of course, is not *Cynodon*)] (Bertoloni, 1834: 786; de Marchesetti, 1897: 655); Grano salvatico [= wild wheat] (Bertoloni, 1834: 786; de Marchesetti, 1897: 655; Penzig, 1924, from Val di Chiana, Toscana); Frumento sarvaggiu o saraciniscu [= wild wheat of the Saracens] and Frumento saraciniscu (or Frumentu saracinescu, cf., Penzig, 1924) [= wheat (of the) Saracens] (both Parlatore, 1845: 237) are names from Sicily, referring to the Saracens, who were Arabs from the Near East, who at one time occupied Sicily (pers. comm. E. Porceddu); Frumentu sarvaggiu [= wild wheat] (Penzig, 1924); Frumminutuni [meaning unclear, but related to frumento = wheat] (Penzig, 1924; from Avola, Sicily); Furmintieddu di turchi [= wheat from the Turks] (Penzig, 1924; from Modica, Sicily); Furmeint dal diàvel [= wheat of the devil] (Penzig, 1924; from Bologna, Emilia-Romagna); Scannacavallo [scannare = to butcher; cavallo = horse] (Penzig, 1924; from Barletta, Puglia); Grano dei sorci [grano = wheat; sorcio = mice] (Penzig, 1924; from Lecce, Puglia). Note that in Italian 'grano' = 'frumento' = bread wheat (*Triticum aestivum*, cf., Zangheri, 1976: 979), and that thus several common names refer to a relation with this cereal. In addition some names refer to barley. There are also vernacular names for the natural hybrid of *Ae. geniculata* and *Triticum*, x *Aegilotriticum triticoides*, referring to wheat and barley (see Chapter 4.2). Old forms of present-day Italian 'silvatico' [= wild] are 'salvatico', 'selvatico', and 'sarvaggiu', with the last one from Sardinia and Sicily. Most of Bertoloni's names are also at Parlatore (1845: 237), and were later compiled and arranged by region by Penzig (1924: 10).

Portugese: Trigo de perdiz [trigo = wheat; perdiz = perdrix = partridge] (Coutinho, 1939: 117). Compare with Catalonian 'blat de perdiu'.

Spanish: Trigo de los Guanches [= wheat of the 'guanches' (or guanchos, the original inhabitants of the Canary islands)] (Webb & Berthelot, 1849: 421); also used for *Ae. neglecta* (see 10.12). Rompe sacos [= sack breaker = (making) hole (in a) sack; compare with the Italian 'Forasacco'] (Guinea Lopez, 1949: 98). This name is also used for *Ae. triuncialis* (see 10.18a) and x *Aegilotriticum triticoides* (see Chapter 4.2). Hierba del legañoso, Trigo bastardo pinchudo [= sharp, bastard(ized) wheat], Trigo montesino silvestre [= wild wheat (from the) mountain], Triguera [= wheat-like?] (all from Caballero, 1940: 613, sub *Triticum ovatum*). Ceballos-Jiménez (1986: 472) also lists Trigo montesino [= mountain wheat] and trigo silvestre [= wild wheat].

Turkish: Bodur buğday otu [bodur = dwarf], konbaş [= ?; note that 'kon' = to perch, to settle, to alight, and 'baş' = head] (both from Sabanci, 1984: 1).

Uses: mentioned among drugs by Dioscorides and Galenus as a resolvent, that is an agent capable of dispersing or absorbing inflammatory products. According to Oribasius it was a cure for alopecia (baldness). Täckholm et al. (1941: 271) mention a drug derived from *Ae. geniculata* in use in the Arab world under the name 'Dawsar' (see also under vernacular names). Arab sources for this were Abu Hanifa el Dinawari (AD 895) and Ibn El-Beitar. More supposed (but not established!) healing capacities (eye healing, desiccation, etc.), relating to *Ae. geniculata* are discussed in Chapter 3.1.

Etymology: the final epithet is derived from the Latin 'geniculatus' [= geniculate, bent abruptly like a knee, cf., Stearn, 1978: 434], a reference to the base of the culms.

A geographical selection of ca 2800 herbarium specimens examined:

AFRICA: ALGERIA: Oued Biskra, *Balansa s.n.* (L, LY-Gandoger, P); Batna, *Balansa 714* (BM, C, E, FI, G, K, L, LE, LY-Gandoger, LY-Jordan, P, WAG); Mnechoumès oasis near Biskra, *Balansa s.n.* (FI, G, L, LY-Gandoger, P); Sersou to Aïn-Sfa, *Battandier s.n.* (MPU); Ras-el-Niâ to l'Ouid Seba, *Baya 202* (P); Chellala, Jebl Chemeur, *Botschantzev 1851, 2181, 2183* (LE); Jebl Sidi Ahmar, Kradou, *Botschantzev 2033* (LE); Oran, *Bourgeau s.n.* (A, G, MPU, P); Constantine prov., Mansoura, *Bourjot Saint-Hilaire s.n.* (MPU); near Kouba, *Bové s.n.* (BR, G, L, LE, MO); near Aumale, Bous de l'Oud Bhaïr, *Charoy 253* (P); near Oued Lakhâl on road to El Khebetna, *Charoy 293* (P); Constantine, *Choulette 100* (G, P); Jebl Amour, Aïn Mansour, Aflou, *Clary 236* (MPU, type of *Aegilops triaristata* forma *submutica*); Algiers, Bon Ismaël, near Koléah, *Clauson 80a* (MPU, P); Le Oalu, *Clave 4670* (G); Ksour to El Kantara, *Cosson s.n.* (P); El Kantara, Batna to Biskra, *Cosson s.n.* (P); El Outaia, near Biskra, *Cosson s.n.* (P); Philippeville (= Skikda), *Cosson s.n.* (LY, P); Seniet-el-Haad, Algiers prov., *Cosson s.n.* (P); Mostagenem, *d'Alleizette s.n.* (P); Bône, *d'Alleizette s.n.* (P); Oran to Miserghin, *Davis 51675* (BM, E, RNG); SW Djelfa, *Davis 55317* (BM, E, RNG); Kherrata to Setif, *Davis 52737* (BM, E, RNG); Constantine to Setif, *Davis 52085* (BM, E); N Tlemcen, near Lalla Seti, *Davis 58902* (BM, E); Algiers, Reghaïa, *Debray s.n.* (MPU); Ain Aissa, *Domin s.n.* (PRC); Constantine prov., Massif de Tafrenit, Ouled Abd Emour, *Donat s.n.* (MPU); near Oran, Kristel, *Doumergue s.n.* (LY); Medeah, *Doumergue s.n.* (LY); Algiers, Chellala, Adaouras, near sidi Aïssa, *Dubuis s.n.* (MPU); Cala Rana, Lalla Khelidja, Algiers reg., *Duhamel du Monceau s.n.* (G, type of *Aegilops ovata* var. *eventricosa*); near Algiers, coast of Bimandres, *Durando s.n.* (E, MPU, RAB); Oran prov., Sig, *Durando s.n.* (G, L, MPU, PI); Oran, *Faure s.n.* (BM, CAI, E, FI, G, K); Oran, Gambetta, *Faure 387* (BC, G, LD, LY-Gandoger); massif of Aurès, *Faurel s.n.* (MPU); Grand Atlas Oriental, Sidi Youssef, *Faurel s.n.* (MPU); Algiers, near Trolard-Taza, *Faurel s.n.* (MPU); Telagh, *Faurel s.n.* (MPU); Mustapha hills near Algiers, *Gailleraud s.n.* (P); Constantine prov., Mchouinès, *Gandoger s.n.* (MO); near Kouba, *Gandoger 326* (BM, LE, LY, LY-Gandoger, P, PRC, W, Z); Constantine, *Girod s.n.* (G); S of Medeah at Jeca de l'Agouath, *Guillon s.n.* (W); Muley Abd El Kadr, *Havard s.n.* (BR); Oran, Ras Thergui, near Aïn Sefra, *Hochreutiner 213* (G, Z); Algiers, Bagari, *Joly s.n.* (MPU); Beni-Sid, Jebl Aziza, *Kralik 342* (LE, LY-Gandoger, LY-Jordan); Blidah, near Algiers, *Lefebvre s.n.* (BM); Sidi bel Abbes, *Lefranc s.n.* (LY); Constantine, Aïn Yagout, *le Tourneux de la Perraudière s.n.* (MPU); Bône, *Letourneux s.n.* (P); Sétif, *Marguès s.n.* (LY-Gandoger); dept. Médéa, SW Sidi Maklouf, on Djelfa – Laghouat road, *Marty 24* (Z); dept. Médéa, near Boughzoul, *Marty 17* (Z); Camp Monod, *Mouret 1076, 1119* (MPU); Jebl Bessam, near Kiss, *Muschler s.n.* (LY); Sidi Marouff, *Mussat 115* (LY); Voirol, near Algiers, *Neyraut 145* (LY, MPU); Batna to Arris, Aurès massif, Aïn Tinne, *Podlech 38669* (G); friches du Sersou, Aïn Toucria, Bourbaki, *Pomel s.n.* (MPU, type of *Aegilops brachyathera*); near Djelfa, *Reboud s.n. (499?)* (A, G, LY-Gandoger, MPU, P); Bou Taleb, *Reboud 996* (FI); Mustapha hills near Algiers, *Romain 1838* (BR, F, G, JE, K, LE, LY, LY-Gandoger, MO, MPU, NY, P, PI, Z); Constantine, *Romieux 1119* (G, MO); Oran, Jebl Amour, Gueltat, Sidi Saad, *Roux s.n.* (MPU); Dra-ben-Khedda, W Tizi-Ouzou, *Sutton 988* (RNG); Algiers, Bellefontaine, *Trabut 168* (W); Cherchell, *Trabut 169* (MPU, P, W); Berrouaghia, *Trabut 164* (MPU, W); Wilaya Tlemcen, com. de Sebdou, Tal Terni, *van Setten 437* (WAG); Algiers, Frenda, *Vavilov 239* (WIR 2725, type of *Aegilops ovata* var. *vernicosa*); Bône, *von Lorent s.n.* (TUB); Oran, Beni Saf, *Wilczek s.n.* (LD).

EGYPT: Ramleh, Diamantini, *Montarquet s.n.* (LE); Alexandria, *Muschler s.n.* (LY); Sinai, Ka'ak, *Muschler s.n.* (LY); Damiette, *Muschler s.n.* (G).

LIBYA: Gharian, 86 km S Tripoli, *Ahmad 1321* (ULT); Jadu, *Ali & Khalifa 380* (ULT); Jebl Nafusa, *Boulos 4507* (ULT); W Tripoli, on sea shore, *Boulos & al. 1596* (LD, ULT); Jebl Nafusa, Jefren – Giado, *Davis 49559* (E); Wadi El Kuf, E Benghazi, *El-Gadi & al. 1829-G* (ULT); Aboujiau, before Kleba, *El-Jaley 27* (ULT); El Awaniah, *Faris 450* (ULT); Jebl Ahdar, Shahat, *Faruqi 1734, 1793* (ULT); Abu Zaiyan, *Faruqi 758, 760* (ULT); El Bayda to Derna, *Faruqi 1386-S, 1386-M* (ULT); Sharshara, *Fathi 29* (ULT); Al-Ghareeba, Jebl Ahdar, *Ghafur 362* (ULT); Homs, *Guichard KG/LIB/158* (BM); El Zentane, *Issa 381* (ULT); near Barcem, *Maire & Weiller 1640* (MPU); Aïn Messa, *Maire & Weiller 1637* (MPU); Sharshara, *Nahiba 47* (ULT); Wadi El Kuf, E Benghazi, *Sanadiki s.n.* (ACSAD); El Baida to Shahhat road, *Siddiqi & Ramadan 2450-Z* (ULT); Derna, *Taubert 181* (JE, G, P, type of *Aegilops ovata* var. *africana*); Tripoli, Ghiran, *Taubert 76* (E, G, P).

MOROCCO: Talamerhait to Taza, *Alexander & Kupicha 247* (BM, E, MO); Ghaghaïa (Reraia), *Balansa s.n.* (G, L, P); Meknès, *Benoist 335* (P); Jebl Darziro, *Bertault 93* (RAB); Ametrasse, Bab-Taza, *Bocquet & al. 10111* (BM); Fez to Azrou, *Bocquet & al. 11510* (BM); Oued Mikès, *Cosson s.n.* (G); Aknoul to Boured, Aïn Hamra, *Dahlgren & al. M60-21* (LD); Taza to Aknoul, *Dahlgren & al. M55-06* (LD); Oued Grou, Rommani to Maaziz, *Davis 54349* (RNG); 70 km E Tiznit to Tafraoute, *Davis & King 68285* (E); 14 km to Ifrane from El-Hajeb, forest of Jaba, *de Wilde & Dorgelo 2408* (L, WAG); Jebl Bessam, near Kiss, *Faure s.n.* (MPU); Bouhouda, N Taounate, *Fennane s.n.* (RAB); above Bab-Taza, El Ajmas, *Font Quer 86* (BC, BM, G, MPU, Z); above Targuist, *Font Quer 94* (BC, BM, G, MPU); Tiflet to Oulmès, Maaziz Mts., *Galiano & al. 1816/69* (RNG); Jebl Bou Jahi, *Gandoger s.n.* (G, L, LE, MO); Jebl Iziren, *Gandoger s.n.* (G, L, LE, MO); Guerouan, *Gandoger s.n.* (LD, LE, MO, W); Dar Cheikh, Hattin des Aït Loudma, *Gatefossé s.n.* (RAB); Cuvette de Guenfouda, *Gerbinot & al. 374*

(RAB); Reraïa, *Jahandiez 633* (RAB); Moyen Atlas, Bekrit, valley of Admerissen, *Jahandiez 607* (E, G, Z, type of *Aegilops ovata* var. *eventricosa*); Khénifra, *Jahandiez 318* (BM, E, G, Z); SSW Taza to Bab-Bou-Idir, *Jury & al. 8580* (BM, RNG); Rabat, *Lewalle 9834* (BR); prov. Skhiret, Bouznike, *Lewalle 11476* (BM, BR); Anti Atlas, near Tifernit, *Maire 98* (MPU); Grand Atlas, Ourika, Anfegeïn, *Maire s.n.* (MPU); Boulamane, *Mathez 374* (RAB); Tiliounine, *Mathez 6902* (MPU); forest of Jaba, *Mathez 979* (MPU); Bir-Guettara, *Mathez 4787* (MPU); Daya Chiker, near Taza, *Maire s.n.* (RAB); valley of Oued Beth, *Maire s.n.* (BC, LD); Reraïa, *Matt s.n.* (P); Mounod, *Mouret 1329* (P); Marrakech, Aguedal, *Murbeck s.n.* (LD); El Hajeb to Azrou, *Pannero & al. 1907-69* (E); Argana, *Peltier 539* (RAB); Chaonia, Settat, Aïn Da, *Pitard 1261* (G, K, P); Meknès, Seba Aïoun, *Powell s.n.* (RAB); Oued Biskra, *Raunkiaer s.n.* (C); N Ouelma, off road Tamrhakht to Immouzer, *Reading Univ./BM Exp. 267* (BM, E, MO, RNG); Tangier, *Roffey s.n.* (BM); Zaïane, near El-Harche at Sidi Bu Kerrouche, *Sauvage 8382, 8382b* (RAB); Beni bu Jahi, Aguada du Tefio, *Sennen & Mauricio s.n.* (BM, RAB); E Tangier, *Simpson 361197* (BM); Oulad Ali, *Stanes 28105* (BM); S Ifrane, coming from Azrou, *van Slageren & Istar MSAI-90115H* (ICARDA); near Kerzoua, *van Steenis 192* (L); Taounate to Boued, *Vindt 3158* (RAB); Ifrane, Jebl Zerrouka, *Wängsjö 4200* (LD); Anti Atlas, Tafraoute, *Weiller s.n.* (MPU); near Taourirt, Tafrata plain, foot of Jebl Boaksim, *Wilczek & al. 631* (A, G); Taourirt, Marguechoum Mts., near Beni Koulal, *Wilczek & al. 748* (G, MO).

TUNISIA: Bordj-Eoum, *Barratte s.n.* (P); Sousse, *Boitel s.n.* (MPU); Oued Bou Noukahl, *Cosson & al. s.n.* (P); Tunis, *Cuénod s.n.* (G); Ain Sebaa to Jebbara beach, E Tabarka, *Davis & Lamond 57704* (BM, E, RNG); La Haouaria to Kelibia, *Davis & Lamond 56867* (BM, E, RNG); Sidi Bou Said, *Davis 69834* (E); Jebl Aziza, *Gandoger s.n.* (MO); Achichina, near Graïba, *Humbert s.n.* (MPU); 20 km N Ghardimaou, *Jansen 351* (WAG); Beni Dzid, foot of Jebl Aziza, *Kralik 342* (E, G, MPU, P); Gabes, *Kralik s.n.* (PI); Chebika to Tamerza, *Letourneux s.n.* (P); Gafsa reg., Heuchir, Ech Chuya, near Bir el Berba, *Long s.n.* (MPU); Métouia, *Murbeck s.n.* (LD); Jebl Gafsa, *Pitard 537* (G, L, LY); Nabeul, *Pitard 982* (G); Bordj-Eoum, valley of Medjerda, NE Medjez-al-Bab, *Roux s.n.* (P); near Maktar, *Vavilov s.n.* (WIR 2723, type of *Aegilops ovata* ssp. *globulosa*).

ASIA: IRAQ: N Suara Tuka, *Al-Kaisi & al. 51003* (BAG); Sulaf, *Omar 37723* (C, K); Kirkuk reg., Chemchemal, *Rechinger 10050* (G).

JORDAN: NW Salt to El Ghôr, *Al-Eisawi 1056* (G); N Suwaileh, *Al-Eisawi & Jarrar 6459* (K); W Salt, *Eig & al. s.n.* (HUJ, US); Petra, *Seetzen s.n.* (JE); Mafraq, Hamama, W Rihab, *van Slageren & Jaradat MSAJ-88011H, 88012H* (ICARDA, WAG); Mafraq, Al Lakeidir, near Syrian border, *van Slageren & Jaradat MSAJ-88038H* (ICARDA); Zarqa, El Jubeiha to Yajuz, *van Slageren & Shibli MSRS-88044H* (ICARDA); Jarash – Irbid, *Vavilov 29510* (WIR 959).

LEBANON: Jebl Liban, above Baruk, *Ball 2075* (E); Terbol, *Blanche 44* (G-BOIS); S Beirut, *Blanche 1837* (FI, K); Jebl Liban, *Blanche 3470* (G-BOIS); Brummana, *Bornmüller 1741* (BR, G, JE, K, LE, OXF, P, US, Z); Rayak, *Edgecombe A-338* (BEI); Ain Ksour, *Edgecombe A-822* (BEI); Dahr el Baidar, *Edgecombe A-865* (BEI); Antilebanon, Saïda to Damascus, *Gaillardot s.n.* (JE); Seta to Boghaz Jautha on Saïda (Sidon) – Damascus road, *Gaillardot 509* (G-BOIS, K, P); Djebel Khailoun, near Damman, *Gaillardot 2359* (G-BOIS, JE, LE); Chemlan, *Maitland 36* (LE); Tripoli, *Mandon s.n.* (JE); near Sidon, *Mandon 3940* (JE); Ta'nayil, *Mouterde 5324* (G); Jtuleh, *Post 703* (BEI); Quadi el Karm, *Samuelsson 1482* (BM).

PALESTINE: Benjamina, *Alcott s.n.* (A); Mt. Scopus, Jerusalem, *Amdursky 114* (A, BC, BM, BR, C, CAI, E, ERE, G, HUJ, K, L, LD, LE, NY, P, PR, PRC, RAB, RNG, SOM, U, US, WAG, Z); Mt. Tabor, *Ball s.n.* (E); Jaffa, *Bornmüller 1746* (P); Mt. Carmel, near Haifa, *Bornmüller 1736* (G); Jerusalem, Givat Ram, *Danin & al. 37-2/1339* (RNG); Latrun, *Dinsmore B724* (E); Capernaum, *Druce s.n.* (OXF); Galilee, Mt. Meron, *Hepper FNH 3518* (K); Mt. Tabor, *Lowne s.n.* (BM, E, K); Jerusalem, *Meyers & Dinsmore 8724* (E, L); Jerusalem, Wadi Rumeimin, *Meyers & Dinsmore M724* (E, F, G, K, L); Jericho, *Nábělek 3166* (SAV, type of *Aegilops ovata* forma *nudiglumis*); Mt. Carmel, near Haifa, *Polunin 6714* (K); Motzah, *Samuelsson 663* (BM, LD); upper Galilea, *Vavilov 29512* (WIR 960, type of *Aegilops ovata* ssp. *umbonata*).

SYRIA: Kasab, N of Lattakia, W of A'in el Dilbek, *Barkoudah 482* (U); Hama to Palmyra, *Blanche 3942* (G-BOIS); Oudéhi, N Syria, *Gombault 597* (P); Jebl el Amiri, *Gombault 2954* (P); near Aleppo, *Kotschy s.n.* (Pl. Alepp. Kurd. Moss. 174) (BM, G-BOIS, LY-Jordan, MO, OXF, P), *144* (G-BOIS); Quneitra, near Beni Zid, foot of Jebl Aziza, *Kralik 342* (BM, LY-Jordan); Dahr el Hazir, *Mouterde 10289* (G); Qariatayn, *Mouterde 3771* (G); Barze and Qatrana, *Norris s.n.* (BM); Douma, *Pabot* *s.n.(345)* (Min.Agr.Syr.); Qtaife, *Pabot s.n.* (G); Jebl Qassyoun, *Pabot s.n.* (G); Maalula, *Pabot s.n.* (G); Bludan, *Pabot s.n.* (G); Banias, *Post 704* (BEI, K); 22 km W Damascus, *Rechinger 13122* (G); s.loc., *Aucher-Eloy 2964* (BM, G, G-BOIS, MPU, OXF, P).

TURKEY: Kocaeli, Kourdkeny, *Aznavour s.n.* (G); Kartal to Yacadjik, *Aznavour s.n.* (G); Maraş, *Balls 1121b* (ANK); Izmir, *Barbey 939* (G); Thrace, Develiyenenice, Tekirdag, Ganos Dag Mts., *Bauer & Spitzenberger 974* (W); Adana to Ceyhan, *Coode & Jones 368* (E); Gremlik, Marmara, *Cumani s.n.* (JE); Gaziantep, Nisib – Bireçik, *Davis & Hedge 27933* (ANK, BM, E, K); Adana, Feke, Bakir Dag, Suphandere to Gurumze, *Davis & al. 19425* (BM, E, K); Çanakkale, Karabiga, Alman Pinari, *Ekim 1633* (ANK); Cayirova, Kocaeli, *Harlan 2477* (K, UCR); S Gelibolu, Çanakkale, *Harlan 2873* (K, UCR); Bursa – Keles, near Soğukpinar, *Holtz & al. s.n.* (E); 28 km E Gaziantep, *Johnson & Hall s.n.* (UCR); Istanbul, *Murmann 116* (G); Kirfez to Hissar, *Post s.n.* (G); Aydin, Lydia, Kuşadasi, *Runemark 20038* (LD); Lemas-Sir on road Mersin – Silifke, *Scheibe s.n.* (JE); Renkoei, *Sintenis 187* (K); Zonguldak, Safranbolu, *Tobey 1940* (E); Sinop, Boyabat, *Tobey 1940A* (E); Balikesir, 22 km SW Süsürlük, *Tüten & al. CNM-230689-0103* (IZ); Bosphorus, Beykos, *Vannaire 790* (LY); Amanos Mts., Nurdagi pass, *Watson 1034* (K); 20 km S Yalova, *Zohary s.n.* (UCR).

EUROPE: ALBANIA: Bazar Shah, near Tirana, *Hruby & al. s.n.* (PRC); Elbasan, *Stöhr s.n.* (PR); Drac, *Stöhr s.n.* (PR).

AZERBAIJAN: Pyralagai, island Swätoi, *Bruhns s.n.* (BM); near Lenkoran, *Levandovski s.n.* (LE).

BOSNIA and HERCEGOVINA: near Zitomislici, *Malý s.n.* (BM, K); Buna, *Petter s.n.* (PRC); Mostar, bank of the Narenta, *Raap 165* (K, Z).

BULGARIA: Strandza Mts., Vassiliko – Ahtopol, *Achtarov s.n.* (SOM); Topolovgrad, *Bojadzjinski s.n.* (SOM); near Mihajlovgrad, *Bondev s.n.* (SOM); near Malko Tarnovo, *Delipavlov s.n.* (SOA); Micurin, *Delipavlov s.n.* (SOA); near Varna, *Gramatikov s.n.* (SOA); near Varna, *Hruby 64* (LD); Ahtopol to Sinemoritz, *Jordanov s.n.* (SO); near Zernevo, Shilka Mt., *Kitanov s.n.* (SO); Pazardzik, *Mervicka s.n.* (SOM); Elhovo, *Panov s.n.* (SOM); Dragoman, *Stříbrný s.n.* (BM); Micurin to Ahtopol, *Vihodcevsky s.n.* (SO, SOM); Balgari, *Zacharieva s.n.* (IIPGR).

CROATIA, DALMATIA: Dubrovnik, Lapad, *Bornmüller s.n.* (PRC); Losinj, Vere, *Botteri s.n.* (BM, G, JE, LY-Gandoger, P); Losinj piccolo, *Fandgauf s.n.* (BEI, BR, FI, PI, Z); Zara, Giardino, *Krebs s.n.* (JE, LD); Dubrovnik (= Ragusa), *Nicolic s.n.* (JE); Rijeka, *Noë s.n.* (K, LE, LY-Gandoger, NY, PI); Masjan Mt., near Split, *Oberwinkler 8188* (TUB); Split, *Petter 5* (PR, WAG), *12* (LE), *s.n.* (JE, L, PR, TUB); Split, NW Harjan, *Rademaker 326* (L); Rijeka to Volasca, *Rossi 2239* (JE); island Solta, Stomorska to Gornje Selo, *van Oostroom 19051* (L); Rijeka, Tersatto Mt., *von Degen 94* (A, BM, JE, K, LE, LY, US). ISTRIA: near St. Servolam, *Beck 2* (BR, LY, PR); Sta. Catherina island, near Rovigno, *de Marchesetti s.n.* (FI); Pirano, *de Marchesetti s.n.* (FI); Poreč, *Geissler s.n.* (W); Abazzia, *Richter s.n.* (Exsicc. Kneucker 58a) (BM, C, G, GAT, GE, K, L, LD, LE, MO, PR, US, W, Z); Brioni, *Romieux s.n.* (G); near Sikic, *Untchj s.n.* (FI); Pola, *Veselsky s.n.* (B, JE); Isola, *Veselsky s.n.* (B, JE, LD, PR); Cape d'Istria, *Veselsky s.n.* (JE, K, LY, LY-Gandoger); S Buje, *Wagenitz 20* (B, G, LD). OTHER CROATIA: Jurjevo, Velibit (Mts.) to Krasno, *Leins s.n.* (LE); Rab island, Dundovo – Kampor, *Mück 56-59* (W); Caslopago, *Sagorski s.n.* (JE).

CYPRUS: Kyrenia, *Casey 497* (K); Lacovounera, *Chapman 67, 656* (CYP, K); Ayios Demetrianos, Kythrea, *Chapman 105* (CYP, K); Paphos, Morokambos, Kouklia, *Della s.n.* (ARI 2019, K); Pissouri, *Della s.n.* (ARI 2018, 2101, K); Lysos to Stavros tis Psokas, *Della s.n.* (ARI 2054, K); Ayios Antonios, Sotira, *Della s.n.* (ARI 2037, K); Palechouri, *Della s.n.* (ARI 3144a); Athalassa, *Druce s.n.* (OXF); Nicosia, *Holmboe s.n.* (C); Akrotiri, *Huddle 111* (K); Plathres, Perapedi, *Kennedy 55a* (K); Acheritou, *Meikle 2621* (C, CYP, US); Dhiorios, *Meikle 2347* (C, CYP, K); W Larnaca tis Lapithou, *Merton 2721* (CYP, K); Athalassa, *Merton 99, 155* (ARI, K, LE); Syrianochori, *Merton 777* (K); Campos, *Platt 438* (K); Paphos, Ayios Georgios to Kithasi, *Rechinger 62025* (W); Trikomos to Famagusta, *Semple 277* (US); near Kythraea, *Sintenis & Rigo s.n.* (LE); Pentedactylos, *Sintenis & Rigo 657* (LY-Gandoger); Nisou to Stavrovonni, *Syngrassides 32* (K).

FRANCE, ALPES-DE-HAUTE-PROVENCE: La-Palud-sur-Verdon, *Duval-Jouve s.n.* (MPU-Duval-Jouve); Digne, *Jordan de Puyfol s.n.* (LY, MPU-Coste); near Entrevaux, *Polunin 8685* (BM); Oraison, *Wurzell 408* (MO). ALPES-MARITIMES: near Nice, *Bonafous s.n.* (L, LE); Cap d'Antibes, *Chopinet s.n.* (Exsicc. Soc. Franç. 717) (BR, G); Cannes, *Delacour s.n.* (F); Mougins, St. Barthilimy, *de Witte s.n.* (BR); Chabestan, *Faure s.n.* (LY); Garbio to Roquebrune, *Faust s.n.* (G); W Menton, *Hertel 2763* (LE); Grand Corniche, near Beaulieu, *Oberwinkler 4937* (TUB); Nice, *Rousseau s.n.* (BR);

Castellar, near St. Bernard, *van Assche s.n.* (BM, BR). ARDÈCHE: Orgnac, *Billiet & Jadin 750* (BR); Les Vaux, *Copineau s.n.* (F); Aubenas, *Girod s.n.* (G). AUDE: Issel, Salesses, *Chevalier s.n.* (BC); Narbonne, *Copineau s.n.* (C); Carcassonne, *Dalby 2770* (K); Durban-Corbières, *Gandoger s.n.* (LY-Gandoger); Le Pech d'Aguèle, *Gauthier s.n.* (LY-Gandoger); La Nouvelle, *Jordan de Puyfol s.n.* (PR); island St. Luci, near Narbonne, *Lardière s.n.* (L); Camigne, *Neyraut s.n.* (LY-Gandoger); near Quillan, *Schafer 2* (BM); Sigeau, *Sennen s.n.* (LY, MO). AVEYRON: Millau, *Copineau s.n.* (F, US); St. Paul-des-Fonts, *Coste s.n.* (MPU); Tarn valley, *Coste s.n.* (MPU-Coste); Millau, *Fourès 4221* (MPU); Tournemire, *Guillon s.n.* (F); St. Véran, *Vanden Bergen s.n.* (BR); La Roque Ste. Marguerite, *Vanden Berghen s.n.* (BR). BASSES-ALPES: E Corbière, *Barrier & Boivin 418* (G); near La Brillane, *Charpin & Greuter 8344* (G, NY); Sisteron, *Wängsjö s.n.* (LD). BOUCHES DU RHÔNE: Martigues, *Autheman s.n.* (PRC); Cap Croisette, *Battandier s.n.* (RAB); St. Just, near Marseille, *Kralik s.n.* (Exsicc. Billot 297) (G, L, LY, LY-Gandoger, MPU, P, PI, TO); Le Redon, near Marseille, *Lawalrée 9267* (BR); Aix-en-Provence, *Lèbre 293* (BC, L); St. Vidon, near Marseille, *Niciol s.n.* (BR); Maillane, *Renaud 4670* (MPU); NNE Les Saintes Maries, *Snogerup s.n.* (LD); La Crau, near Arles, *van Oostroom & Reichgelt 21274* (L). CANTAL: St. Flour to Millau, near Minaster, *'s.coll.' 48* (MO). CHARENTE: Chatelaillou, Trois-Chapeau, *Foucaud s.n.* (BR, G); Angoulême, *Weiller s.n.* (MPU). CHARENTE-MARITIME: Douil, *Dunouchaud s.n.* (LY); Oulnay, *Foucaud s.n.* (LY); La Pré aux Boeufs, near Nieul-sur-Mer, *Foucaud s.n.* (LY); Triaize, *Jousset s.n.* (LY); La Repentie, near La Rochelle, *Letourneux s.n.* (Exsicc. Billot 297b) (BM, BR, C, F, G, JE, LD, LE, LY, LY-Gandoger, MPU, OXF, P, PI, WAG); Dompierre-sur-Mer, Gondes, *Tesseron s.n.* (Exsicc. Soc. Rochelaise 191) (LY). DEUX-SÈVRES: Ste. Radegonde, Ligron to Vrines, *Guillet 363* (BR, BM). DOUBS: Besançon, *Paillot 88* (P). DRÔME: Vivriers, *Briquet 193* (G); Romans, Poudrière, *Hervier-Basson s.n.* (Exsicc. Schultz 181) (A, G, JE, K, L, LD, LE, MPU, OXF, P, PR, Z); Valence, *Juillard s.n* (P). GARD: Villeneuve-les-Avignon, *Aujard-Catot & Ledoux s.n.* (CAI); Nîmes, *Ducoinun s.n.* (JE, Z); E Nîmes, *Halliday 128/69* (OXF); near Alès, at Bagard, *Ruffier-Lanche s.n.* (LD, W); Breurey, *Sudre s.n.* (W). GERS: Belmont, Clapayrol, *Coste s.n.* (MPU-Coste); near Auch, *Dupuy s.n. (260?)* (LY-Gandoger, MPU, P, TO). GIRONDE: La Tourue, *Delbos s.n.* (LY-Gandoger); Langoiran, near Bordeaux, *Lespinasse s.n.* (MPU-Duval-Jouve); Quinsac, *Pitard s.n.* (G). HAUTES-ALPES: Gap, *Aunier s.n.* (C); Gap to Glaiz, *Borel s.n.* (K); Montmaur, *Despaty s.n.* (P); Ribiers, *Reverchon s.n.* (A, BM, BR, K). HAUTE-GARONNE: Pech David, near Toulouse, *Leredde s.n.* (BR, LD); Beaupuy, near Toulouse, *Marçais s.n.* (Exsicc. Soc. Dauphin. 260b) (LD, LY, LY-Gandoger, MPU, P, TO, Z). HAUTES PYRÉNÉES: near Maubourguet, *Dulac s.n.* (P). HÉRAULT: Ardide, near Béziers, *Albaille s.n.* (MPU); Montmaur, near Montpellier, *Blanchet s.n.* (RAB); Castelnau, *Braun-Chur s.n.* (Z); Gangues de la Valette, *Collin s.n.* (Z); Bédarieux, *Coste s.n.* (MPU-Coste); Montblanc, *de Witte 14720* (BR); Grammont, near Montpellier, *Gadeceau s.n.* (BM); Béziers to Agde, *Humbert s.n.* (P); St. Martin de Londres, *Jourdan s.n.* (P); Assas, N Montpellier, *Leenhouts 2183* (WAG); La Colombière, NW Montpellier, *Leeuwenberg 1466* (MO, U); Lunel, *Mandon s.n.* (BR, G); Montarnaud, *Mandon s.n.* (GE, LY, MPU); Murviel, *Mouillefarine s.n.* (BM); St. Chinian to Pirou, *Neyraut s.n.* (MPU); La Valette, *Neyraut s.n.* (Exsicc. Magnier 3393) (G, JE, LY, LY-Gandoger, MPU, P); road to Montpellier, *Rouweler 80-26* (U); Béziers, *Théveneau s.n.* (G); Port Juvénale, *Touchy 294* (K, MPU, type of *Aegilops echinus*). ISÈRE: Prunières, *Berneau s.n.* (BR, MPU); la Mure, St. Arey, *Dongé s.n.* (BR); Abilly, *Tourlet s.n.* (G). LOIR-ET-CHER: Blois, *Franchet s.n.* (P); Cheverny, *Franchet s.n.* (P); near Vendôme, *Juillard s.n.* (L, P); Le Gué du Loir, near Venôme, *Rolland s.n.* (LY, LY-Gandoger, US). LOT: Gourdon, Laucosthonie, *de Valon s.n.* (BR); Figeac, *Héribaud s.n.* (Exsicc. Magnier 658) (BR, G, LY, P), *120* (US). LOT-ET-GARONNE: Layrac, *Arnaud s.n.* (JE, LD); Agen, *Debeaux 96* (LY-Gandoger); Fumel, *Guillon s.n.* (BR, LY, MPU); Aiguillon, Bellevue, *Jeanjean s.n.* (Exsicc. Duffour 5807) (BM, G, L, Z). LOZÈRE: Mendel, *Delvosalle s.n.* (L). PYRÉNÉES ATLANTIQUES: Montagne de Cette (-Eygun?), *Ducommun s.n.* (BM, US); St. Jean-de-Luz, *Foucaud s.n.* (LY). PYRÉNÉES ORIENTALES: Boulou to Le Perthus, *Brummitt & al. 201* (BM); Cases-de-Pène, *Charpin & al. 87* (BM, C, G, LD, LE, NY, US, W); Sorède, *Conill s.n.* (JE, L); near Perpignan, *Guillon s.n.* (BR, LY, LY-Gandoger, MPU, MPU-Duval-Jouve, P); near Banyuls, Portes Vendres, *Segal 121* (WAG). RHÔNE: Vaux-en-Velin, *Gandoger 619* (BM, JE, LD, LY, MO, W). SAVOIE: Mourienne, Ponta, *Becherer s.n.* (G). TARN: St. Michel-de-Vax, *Lawalrée 397* (BR); N of Vaour, *Sipman 90* (U); Albi, *Sudre s.n.* (GE, LD, LY, MPU); Brens, *Sudre s.n.* (G, LY). TARN-ET-GARONNE: Calvaire, *Guillon s.n.* (MPU); Malari, near Moissac, *Lagrèze-Fossat s.n.* (Exsicc. Fl. Gall. Germ. 964) (G, JE, K, L, LE, MPU, P, PI, TUB); Toufailles, *Marcailhou d'Ayméric s.n.* (LY-Gandoger); S of Puylaroque, *Sipman 42* (U). VAR: near

Toulon, Pont-du-Las, *Bourgeau s.n.* (LY-Jordan, MPU); Le Prayas, *Bruynseels 902* (BR); Cuers, *Charpentier s.n.* (LE); Hyères, Ceinturon, *d'Alleizette s.n.* (G, LE); Toulon, *Huet du Pavillon s.n.* (BEI, G, L, MPU-Duval-Jouve); island of Porquerolles, *de Palávieux s.n.* (G); Fréjus, *Müller- Argoviensis s.n.* (L, Z); St. Raphael, *Romieux s.n.* (G). VAUCLUSE: Avignon, *Requien s.n.* (BOLO, LE, PI); Mt. Ventoux, *Cosson s.n.* (LY-Gandoger, MPU); Cavaillon, *Lequders 1089* (WAG); Beaucet to St. Didieu, *Miège s.n.* (G). VIENNE: Chateau de Beaumont, *Lloyd s.n.* (G, JE, MPU-Duval-Jouve, P). ISLANDS: CORSICA: Agascello, S Aleria, *Aellen 4923* (F, LD, LE, MO), *4928* (US); St. Florent, *Bijl 39* (U); Biguglia, *Foucaud s.n.* (LY); Ajaccio, *Jansen 45419* (L); Parata, *Jansen 45421* (L); Barchetta, Golo valley, *Lambinon 87/461* (G, RNG); Col de Teghine, near Bastia, *Lousley s.n.* (BM); Bonifacio, *Reverchon 331* (LE, NY, P); near Manáti, Golo reg., *Sintenis s.n.* (LY); Caldo, near Bonifacio, *Stephani s.n.* (L, LY).

GEORGIA: Tblisi, *von Radde s.n.* (LY-Gandoger).

GREECE, ATTICA: Cape Sunion, *Haussknecht s.n.* (JE); Launion, *Haussknecht s.n.* (JE); Attica, near Pentelikon monastery, *Haussknecht s.n.* (BR, BM, JE, LD, LE); Salamis, *Kaae s.n.* (C); Mandra, near Athens, *Pichler s.n.* (FI); Gerania Mt., *Tuntas s.n.* (PI-GUAD). MACEDONIA: Kalamaria, S Saloniki, *Ramsbottom s.n.* (BM); Lake Doiran, Macedonia, *Rechinger 9059* (BM); S side Struma plain, Turica to Kopriva, *Turrill 250* (K). STEREÁ: Nomas Arkanikis, SSE Préveza, *Jury & Warren 65* (RNG); Voiotia ('Boeotia'), *Schousbou s.n.* (LD-Retzius). PELEPONNESUS: Kyllene, *Bretzl s.n.* (BM). THESSALIA: Thessalia plain, Aïvali, *Haussknecht s.n.* (BR, JE); Orman Magula, *Haussknecht s.n.* (BM, JE, LE, PRC); near Pharsalum, *von Heldreich s.n.* (W). THRACE: Makri, near Alexandroúpolis, *Rechinger 5993* (BM, K, LD). ISLANDS: ALLONISOS (Sporades): Pigadhi hill, Tourokovligla, *Snogerup 3801* (LD); NE part Mt. Stenochorafo, *Snogerup & Gustavsson 44127* (LD). ASTIPALEA: SSW Livadia to Vardia, *Burri & Krendl s.n.* (W). CHIOS: NW Marmara, Giosonas, *Snogerup 7300* (LD). CORFU: S Deka, Kastellani, *Baenitz s.n.* (Exsicc. Hb. Europ. Baenitz 9197) (L, LY, SO); Papanti, *Baenitz s.n.* (LD); Corfu town, *Bowen 1827* (RNG); W Vistonas, *Krendl s.n.* (W); slope W Kanoni strait, *Snogerup 23528* (LD). CRETE: Nomos Lasithou, *Cannon 4247* (BM); Rethymnon, Platania, *Gandoger 12835* (G, P); Candia, Nida, *Gandoger 11793* (G, P); Ep. Kidonia, Oelhaine, SW Chania and Perivolia, *Greuter 4579* (Z); Hierapetra, Kavoúsi, *Patten K141a* (A); Sitia, *Rechinger 12588* (BM, G, US); Gavdhos island, Kastri, *Runemark & Snogerup 47692* (LD); Heraklion, *van Soest 122* (L). IKARIA: S Evthelo, Agios Nikolaos, *Runemark & Snogerup 6791* (LD). IOS: harbour of Ios, *Runemark 2255, 2326* (LD). IRAKLIA: s.loc., *Runemark 4159* (LD). KARPATHOS: Olympos to Prof. Elias, *Burri & Krendl s.n.* (W). KHÁLKI: s.loc., *Hedenborg s.n.* (LD-Retzius). KITHERA: Kapsali, *Rechinger 24252* (G). KORAKAS (Sporades): s.loc., *Snogerup & al. 43876, 43868* (LD). MIKONOS: Rinia island, Kounellonisi, *Runemark & Engstrand 35957* (LD). NAXOS: ENE Skado, *Runemark 3735* (LD); Zeus Oros, *Runemark 2693* (LD); Filoti to Apiranthos, *Runemark 2014* (LD); SE Apollonia, *Runemark 4087* (LD); SSE Koronos, *Runemark 2928* (LD); Akr. Agios Nikolaos, *Runemark 1855* (LD). PATMOS: NW Scala, *Townsend 70/55* (K). PHARMAKO: s.loc., *Runemark & von Bothmer 46867* (LD). RHODES: Bastida, *Bourgeau 325* (G-BOIS); Mt. Attaviros, SSE Embona, *Carlström 1062, 1073* (LD); S and E Trianda, *Carlström 6244, 9091* (LD); S Malona, *Carlström 5917* (LD); Ekousai, *Carlström 5897* (LD); Mt. Prophet Elias, near Salakos, *Rechinger 7238* (BM, K, LD). SAMOS: Karlovassi, *Runemark & al. 18705 & 18822* (LD); W Leka, *Runemark & al. 18955* (LD); Tigani, *von Sterneck 504* (PRC). SAMOTRAKE: Palaeapolis to Therma, *Stojanov & Kitanov s.n.* (SO). SKANTILION (Sporades): s.loc., *Snogerup & al. 43887* (LD). SKANTZOURA (Sporades): s.loc., *Snogerup & Gustafsson 44010, 44011* (LD). SKIROS: W Ormos Mealos, *Snogerup & Gustavsson 44361* (LD). SKOPÉLOS: Nom. Magnisios, Kira Panagia, Tragorema valley, *Snogerup 5413* (LD). THASOS: Limenas, *Sintenis & Bornmüller 1132* (LD). TINOS: N Isternia, *Runemark & Engstrand 37206* (LD). YOURA: SW Kerasa, *Snogerup & Phitos 43296* (LD); Akr. Geronti, *Snogerup 4430* (LD).

HUNGARY: Budapest, Gerardi Mt., *Baguet s.n.* (BR).

ITALY, CALABRIA: Aspromonte, Capo Dell'Armi, *Davis & Sutton 62791* (BM); near Rotonda, *Huter & al. 442* (MPU, P); Catanzaro, *Micheletti s.n.* (TO); Pucci, Catanzaro to Mosofoto, *Micheletti s.n.* (TO). FRIULI VENEZIA GIULIA: Opcina, *Baumbach s.n.* (JE); Campo Marzio, *de Marchesetti s.n.* (JE, LD, LY-Gandoger); Cologna, *de Marchesetti 218b* (A, BC, BM, FI, G, K, OXF, P, PI, TO, Z); Mt. Spaccato, *de Marchesetti 1486* (A, BC, BM, C, FI, G, K, L, LD, LE, LY, MO, OXF, P, PR, SO, US, Z); Trieste, near Zaule, *Hoppe s.n.* (L, PRC); Venice, Bonacum, *Porta s.n.* (BM, FI, JE, MO, OXF, US); Val del' Rosandra, *Sablich s.n.* (LD). LIGURIA: Porto Maurizio, *Berti s.n.* (FI); Genoa, Lagazzo, *Bertoloni s.n.* (BOLO); San Remo, *Bicknell s.n.* (TO, Z); Bordighera, *Bicknell s.n.* (Exsicc. Kneucker

58) (A, BM, C, G, GAT, GE, K, L, LD, LE, NY, MO, RNG, PR, SO, US, W, Z); Voltaggio, *Carestia s.n.* (TO); Sestrit di Levante, *Casaretto s.n.* (TO); S. Lazzaro Reale, near the Impero, *Corradi s.n.* (PI-PASS); Genoa, *Haussknecht s.n.* (JE); Ospedaletti, *Huguenin s.n.* (Z); Alassio, *Leuzinger s.n.* (Z); Monterosso al mare, *Mattirolo & Fontana s.n.* (TO); La Mertola, *Raap s.n.* (Z); Genoa, Sarjana, *Tenore s.n.* (BM). PIEMONTE: Susa to Seghino, *Cappelletti & Fontana s.n.* (GAT, TO); Nizza Monferrato, *Chiappori s.n.* (FI); Ormeo Torria, *Corradi s.n.* (PI-PASS); Alba, Guarene, *Ferrari & Vignolo-Lutati s.n.* (TO); Cortemilia, Gorrino, *Fontana & Vignolo-Lutati s.n.* (TO); Susa, Rocciamelone, *Montacchini & Forneris s.n.* (TO); Casale Monferrato, *Negri s.n.* (TO); Castellino, *Romano s.n.* (TO); Acqui, *Vetter s.n.* (Z). TOSCANA: Montepulciano, Val d'Orcia, *Antoni 1385* (FI, LD); Viarggio, *Ariello & Montacchini s.n.* (TO); Palude Diacca, *Bicchi s.n.* (PI); Lucca, Piaggione to Moriano, Serchio river, *Burri & Krendl s.n.* (W); Livorno, *Caruel s.n.* (PI-CAR); Mt. Rivecchi, near Florence, *Costa-Reghini s.n.* (PI); Florence, Paterno, *Fiori 218* (A, BM, G, GE, FI, K, LE, LY, PI, PI-PASS, PI-GUAD, OXF, TO, Z); Vallombrosa to Sega, *Fiori s.n.* (FI); Florence, Mt. Cuccioli, *Groves s.n.* (BM, G, OXF); S Livorno, Fortullino to Castiglioncella, *Jakobs 5803* (L); Castiglion della Petraia, *Martelli s.n.* (FI); mountains near Pisa, *Savi s.n.* (A, F, FI, G, K, MPU, PR, TO); near Lucca, *Zeccoli s.n.* (TO). VALLE D'AOSTA: Mompatero, *Noelli s.n.* (TO); Aosta to Aymaville, *Papon s.n.* (FI); Aosta, Pont Romano, *Vaccari s.n.* (FI). OTHER ITALY: Lazaretto nuovo, *Agardh s.n.* (LD); Lombardia, near Mantova, *Barbieri s.n.* (FI); Spezia, isola Tino, Semaforo, *Barsali s.n.* (PI); Bacotta to Mt. Paderzio, *Bertoloni s.n.* (LY-Gandoger); Tra Porretta and Il Silla, Bologna reg., *Bertoloni s.n.* (BOLO); Castellato, near Carrara, *Bolson s.n.* (FI, Z); Viareggio, *Bottini s.n.* (PI); Pergola, near Faenza, *Caldesi s.n.* (FI, PI, TO); Livorno, *Danielli s.n.* (PI); Zuebi, *Davies 88* (K); Cilento, Capo Palinuro, *Davis & Sutton 62704* (BM); near Viterbo, *de Brixia s.n.* (BOLO); Segusia, *de Cesati 183* (BM); near Padua, *de Cesati 51* (JE); Termini, *Gandoger 1003* (LY, LY-Gandoger, MO); Naples, Formicola and Aguano, *Gandoger 220, 221* (K, LY-Gandoger, MO); Lucca, *Gasparrini s.n.* (LD); Mte. Argentario, above Porto Saulo Stéfano, *Geissler 5570* (G); Brescia, Rocca di Nauerba, *Geissler 5571* (G); Castelleto, *Haussknecht s.n.* (JE); Civita, Vecchia, *Jansen & Wachter 13877* (L); Monferrato, Crea, above Camposanto, *Javosi s.n.* (OXF); Naples, Pompeï, *Kefselmeyer s.n.* (BM); Cervia, Milano Maritimo, *Koster 6450* (L); Leucaspide, near Tarento, *Lacaita s.n.* (BM, LY-Gandoger); Sorrento penin., San Cataldo, Scala, *Larsen 59* (C); Terni, *Lochenies s.n.* (BR); Modena, Calli di Sassuoto, *Mori s.n.* (PR); Veglia, near Brindisi, *Müller s.n.* (G, JE, LE, MO, P, TUB); Gravina to Oltamura, *Negri & Messeni s.n.* (FI); Puglia, N Manfredonia, *Oberwinkler 6818* (TUB); Ancona, *Paolucci s.n.* (LY-Gandoger); Caserta, *Pasquale s.n.* (LY-Gandoger); Abruzzo, Teramo, *Pellegrini s.n.* (PI-PELL); near Modena, *Pirotta s.n.* (JE); Verona, near S. Ambrosio, Pulicella valley, *Rigo s.n.* (K); Porretta Terme, *Romano s.n.* (TO); Bologna, San Luce, *Schibler s.n.* (Z); Genna, Righi, *Schoenmakers 1973* (U); La Pineta on foot of Mt. Vesuvius, *Seligman 8* (K); Rome, Ponte Molle, *Tenacciano s.n.* (G, Z); Tivoli, near Ripoli, *Vaccari s.n.* (LE); Livorno, Mt. Pelato, *Zocco Pisano s.n.* (PI). ISLANDS: CAPRI: Anacapri to Damecuta, *Hultén & Norlindh s.n.* (LD). ELBA: Miniere di Capoliveri, Mt. Calamita, *Fabbri & al. s.n.* (FI); Fono ali Bagnaia, *Innamorati s.n.* (FI); Porto Portino, *Innamorati s.n.* (FI); near Procchio, *Kramer & Westra 3386* (U); Monto Castello, Vallone di Monserrato, *Negri & Bavazzano s.n.* (FI); Capo Enfola, *Sappa & Ariello s.n.* (TO); Portolongone, *Sommier s.n.* (FI). ISCHIA: Mt. Epomeo, *Guadagno s.n.* (PI-GUAD); Port d'Ischia, *Koster 4865* (L). LAMPEDUSA: Zubriacola, *Roth(?) s.n.* (LD). LIPARI: s.loc., *Borzi s.n.* (LY-Gandoger). PIANOSA: s.loc., *Gandoger s.n.* (LY-Gandoger). SARDINIA: Canal Grande, *Bornemann s.n.* (JE); Nuragli, near Barumini, *Clark 3A* (RNG); C. Figari, *Forsyth Major 257* (PI-PASS); near Ste. Michele, *Huet du Pavillon s.n.* (G, P); Sta. Margherita, *Kaae s.n.* (C); Oristano, *Moris s.n.* (TO); Sassari, *Nicotra s.n.* (B, LY-Gandoger); Terralba, Euganei, *Penzig s.n.* (Z); Sta. Teresa Gallura, near Tempio, *Reverchon 195* (LY, LY-Gandoger, PR, PRC, W), *196* (TO); Allieno, Mt. Altu Tammina, *Schmid s.n.* (Z); Cagliari, Stagno Simbirizzi, *Urmi 703* (Z); Alghero, *Wängsjö 528* (LD). SICILY: Mt. Valleguino, near Palermo, *Arcangeli s.n.* (PI); Mondello, Capo Gallo, *Boom 44431* (L); Messina, Taormina to Castelmola, *Brummitt 4599* (K); Caltanisetta, *di Giovanni 495* (GE, LY); prov. Syracuse, Cape Campolato, Brucoli, N Augusta, *Larsen 24197* (AAU, ULT); Aidone, *Larsen & al. 35865* (AAU, MO); Francaville, *Larsen & al. 36006* (AAU, MO); Ustica, N Palermo, Spalmatore, *Ronsivalle s.n.* (L); near S. Nicola, Messina to Villa Franca, *Stace & Cotton 59* (BM); Mistretta, E Cephalu, *Stace & Cotton 262* (BM); Palermo, *Todaro 1002* (BM, BR, JE, K, LY-Gandoger, P, TO, US), *s.n.* (LD, LE, LY, MPU, P, PI, W). TREMITI: S. Domingo, *Martelli s.n.* (LY-Gandoger).

MACEDONIA: s.loc., *Frivaldszky von Frivald s.n.* (BM, P).

MALTA: St. Antonio, *Daveau s.n.* (P); near Ras Wardia (Ras Id-Dawwara), *Duthie s.n.* (BM, K); Gaulos island, Raula, *Duthie s.n.* (K); Gaulos island, Gozo, *Gandoger s.n.* (LY-Gandoger); Mellieña Ridge, S of Mellieña, *Kramer & Westra 4194* (U).

PORTUGAL: Ajuda, *Atchley 293* (K); Eiras, Caminha, *Beau 664, 883* (COI); Loredo, Coimbra, *Beau 1284* (COI); Lumiar, *Brotherus 918* (COI); Baleia, near Coimbra, *Carreiro 453* (BM, COI, LY-Gandoger); Baixa Alentejo, near Beja, *da Silva 2503* (G); near Lisbon, Tapada d'Ajuga, Jachères, *Daveau 312* (P), *s.n.* (LE, LY-Gandoger, P); Serra do Monsanto, *Daveau 349* (BM); near Miranda de Douro, Picote, *de Mariz s.n.* (COI); Algarve, near Moncarapacho, *d'Escayrac 383, 389* (P); Monte das Aldeias, near Estremoz, *Fernandes & Sousa 1617* (COI); Ferreiha de Alentejo, *Fernandes & al. 7559* (COI, SOM); Bondeixa, Corga, near Babaços, *Fernandes & al. 5761* (COI); Coimbra hills, Eiras, Tojal, *Ferreira 1411* (COI, G, LY-Gandoger); Bragança, *Ferreira 646* (BR); Tomar, *Ferreira s.n.* (COI); Castello de Vide, *Ferreira s.n.* (COI); Algarve, Portimão, *Gandoger s.n.* (LY-Gandoger, MO); Pernambuco, *Gardner s.n.* (K); Murça, *Guirão y Navarro s.n.* (C); Setil, *Matos s.n.* (C); Coimbra, Hidalgo, Pedrulha, *Moller s.n.* (COI); Santarem, *Murray s.n.* (BM); Alto Alentejo, Elvas, near St. Vincente, *Rothmaler 16119* (JE); Sra. da Boa Viagem, *Ruiz Moura 752* (COI); Porto, *Schmitz s.n.* (LY-Gandoger); Algarve, near Faro, *Welwitsch 420* (G, JE, K, P).

SLOVENIA: Karst, *Kastern s.n.* (PI).

SPAIN, ALAVA: Vitoria, *Gandoger s.n.* (MO); Nanclares, *Gandoger s.n.* (LY-Gandoger); Vitoria, *Rouanet s.n.* (LY). ALBACETE: Balazote, *Gandoger s.n.* (LY-Gandoger); El Angel, Muyron Mt., *Gandoger s.n.* (LY-Gandoger). ALICANTE: SE Bigastro, near Orihuela, *Alston 10980* (BM); NE Alicante, *Ellman & Sandwith 1032* (K); Sierra Mariola, Agrès, *Gandoger s.n.* (LY-Gandoger); Denia, *Groves s.n.* (BM); NW La Coveta Fuma, *Thornberg s.n.* (C); Benidorm, *Wieslander s.n.* (LD). ALMERIA: Sorbas to Tabernas, *Cabezudo & al. 971/76* (RNG, SEV); Sierra del Cabo de Gata, Sabinal, *Gandoger s.n.* (LY-Gandoger); Cabo de Gata, Campir Nijar, *Gardner & Jury 1104* (RNG); outskirts Almería, *Glanville 262* (BM); Aguadulce do Felix, *Miles & al. 331* (BM); 25 km E Almería, *Reijnders 3145* (WAG); Sierra de Vélez, near Vélez Rubio, *Rossmässler s.n.* (BM); Sierra de Gador, *Stace 119* (BM); Minas de Beires, *Wilmott & Lofthouse s.n.* (BM). ARAGÓN: Balanguer, *Boom 41522* (L); Broto, *Bordère s.n.* (W); Brolie, *Bordères s.n.* (L). AVILA: s.loc., *Gandoger s.n.* (LY-Gandoger). BADAJOZ: valley of the Ortiga de Lin, *Visa & al. s.n.* (BC). BURGOS: Cerreva de Pisuerga to Dehesa de Montejo, *Brenan 13092* (K); Aranda, *Gandoger s.n.* (LY-Gandoger); Pancorbo, *Gandoger s.n.* (LY-Gandoger). CÁCERES: s.loc., *Raunkiaer 1113* (C). CÁDIZ: Puerto Sta. Maria, *Bourgeau s.n.* (LY-Gandoger, P); San Rogue, *Brinton Lee 208* (BM); Algodonales, Sierra de Lijar, *Cabezudo & al. s.n.* (RNG, SEV); S. Fernando, La Carraca, *de Bolòs y Vaireda s.n.* (BC); Sierra Carbonera, *Gandoger s.n.* (LY-Gandoger); Grazalema, *Font Quer s.n.* (BC); Arcos de la Frontera to Bornos, *Leadley & al. 378* (BM, RNG); W Sanlúcar de Barrameda, *Leadley & al. 436* (BM, RNG); Gibraltar, *Petit 3052* (BR); Pujeskov, near mouth of Guadalete river, *Raunkiaer 395* (C); near Algeciras, *Wolley-Dod 1009* (BM). CANTABRIA: Santander, *Blackburn & Schafer s.n.* (BM). CASTELLON: Benicassim, *Calduch s.n.* (BC); city of Castellon, *Gandoger s.n.* (LY-Gandoger). CATALUÑA, BARCELONA: Matorelle, *Bourgeau 309* (BM, G, K, LY-Gandoger, LY-Jordan, P); Monserrato, near Barcelona, *Debeaux 14* (LY-Gandoger); Vich to Moya, *Devesa & al. 2068/81* (RNG, SEV); near Barcelona, *Rothmaler 1401* (JE); Rubí, road of S. Mus, *Sennen 4220* (BC, BM, G, L, LE, MPU, MPU-Coste, P, type of *Aegilops fonsii*); Montalegne, *Trémols y Borrell s.n.* (W, Z). CATALUÑA: Bilidales, near S. Fenis, *Sennen s.n.* (BM). CIUDAD REAL: near Manzanares, *Mompaño 94* (LY-Gandoger); Alcazar, *Raunkiaer 1252* (C). CÓRDOBA: Luque, *Hernández s.n.* (BC); N Córdoba, *Hubbard & Ellman 68* (RNG, K). CUENCA: Sierra de Valdemenas, *Gandoger s.n.* (LY-Gandoger); Cuenca, El Hito, *Pantel s.n.* (NY). EXTREMADURA: near Alemguez, *Murray s.n.* (BM). GERONA: Mutanyes de Prades, Plane de Pagès, *Masclans s.n.* (BC); Sierra Junquera, *Reuter s.n.* (G); Costa Brava, Rosas, *van der Meer Mohr s.n.* (L). GRANADA: Puerto del Zegri, N Granada, *Alston 10811* (BM); Granada, *del Campo s.n.* (JE, NY, PR); Alpujerres, *Domingo s.n.* (G); Sierra Nevada, Lanteira, *Font Quer s.n.* (BC); Alrededores de Baza, *Galiano & Valdés s.n.* (RNG, SEV); Silla del Moro, *Gandoger s.n.* (LY-Gandoger); Guadix, *Gandoger s.n.* (LY-Gandoger); Sierra Nevada, *Gardner 1389* (BM); Huéscar, Sierra de Guillimona, near La Vidriera, *Leal 350* (NY); Silla de Moro, *Losa-Quintana s.n.* (Exsicc. Lambinon 13766) (C, G, RNG); Churiana, *Luttman 137* (BM); Puebla de Don Fadrique, *Saint Lager s.n.* (G); Jerez del Marquesado, La Debesa, *Valdés et al 260* (RNG); Huéscar, Sierra de Moncayo, *Valdés & al. 1635* (RNG); Morede, near Granada, *Vavilov 55130* (WIR 938, type of *Aegilops ovata* ssp. *planiuscula*). GUADALAJARA: near Guadalajara, *Fernández* *s.n.* (LY-Gandoger); Loranca, *Gil s.n.* (LY-Gandoger). HUELVA: Finca de Cigninella, E Aracena, *Hammer 2613* (GAT); Cumbres Majores to Ensinásola, *Hammer 2632* (GAT); Aracena to Alajar, *Rivera s.n.* (RNG, SEV). HUESCA: Torla, *Bordère s.n.* (GAT); Broto, *Bordère s.n.* (G); Gandamos to Has del Hungari, *Charpin & al. 19502* (G); Sierra de Guara, *Gandoger s.n.* (LY-Gandoger); Fiscal, valley river Ara, *Sandwith 4678* (K); N Huesca, near Igres, *Walker 143* (BM). HUESCA/ZARAGOZA: Los Monegros Mts., *Sappa & al. s.n.* (TO). JAÉN: Jaén, *Blanco 394* (G, P); near S. Roque, *Boissier s.n.* (LE, P); Despeñaperros, *Ferguson 1743b* (BM); Sierra del Pozo, Cerro Cavaña, *Gandoger s.n.* (LY-Gandoger); Ubeda, *Gandoger s.n.* (LY-Gandoger); Sierra de Jabaliuz, Martos, *Gandoger s.n.* (LY-Gandoger); Sierra de Chazorla, *Heywood 1115* (BM, RNG), *2642* (BM); Sierra de Segura, *Heywood 2689* (BM, RNG); Baños de la Encina, *Pedersen 10338* (C). LOGROÑO: Haro, *Gandoger s.n.* (LY-Gandoger); La Rioja, near Villarejo, *Wilmott s.n.* (BM). LEÓN: city of León, *Gandoger s.n.* (LY-Gandoger); Peña Corada, near Cistierna, *Gandoger s.n.* (LY-Gandoger). LÉRIDA: Tárrega, *Buwalda 2383* (L); Cervera, *Gandoger s.n.* (LY-Gandoger); Segrià to Almatret, *Masclans s.n.* (BC); Pons to Oliana, *Soulié s.n.* (MPU-Coste); Montagut, *Xiberta s.n.* (BC). MADRID: Campos de la Moncioa, *Borja Carbonell s.n.* (K); Madrid, University city, *Borja Carbonell & Jiménez s.n.* (ERE, F, G, MA); Cerro Negro, *Gandoger s.n.* (LY-Gandoger); Madrid to Segovia, *Lange s.n.* (C, W); Aranjuez, *Lange s.n. ('98')* (C, L); Dehesa de Arganda, *Vicioso s.n.* (BC). MÁLAGA: Sierra Tejeda, *Boissier s.n.* (G); near Málaga, *Brandt 892* (L); near Estepona, *Gibbs & al. 1615.69* (BM); Sierra de Agno, *Gandoger s.n.* (LY-Gandoger); Estepona, Bahia Casares, *Hallworth s.n.* (RNG); Citio de Cala Ronda, *Michel 7263* (BR); Alhaurin de la Torre, *Thornberg s.n.* (C); Antequera, Torcal, *Valdés & al. 112* (RNG). MELILLA (in Morocco); Gurugu, *Sennen & Mauricio s.n.* (BC, BM); NNW Melilla to Trois Fourches, *Dahlgren & al. M39-25* (LD); Mazuza, *Sennen & Mauricio s.n.* (MPU); Cabo tres Forcas, *Gandoger s.n.* (G). MURCIA: Cartagena, *Cordoniu s.n.* (LY-Gandoger); Sierra de Taibilla, *Gandoger s.n.* (LY-Gandoger); near Murcia, *Guirão y Navarro s.n.* (P); Cartagena, *Nilsson 267* (LD); Caravaca, Sierra de Mojantes, *Ortíz s.n.* (NY). NAVARRA: Pamplona, W Oricain, *Gardner 711* (BM, RNG); near Olave, *Willkomm 237* (BM, C, G, K, LE, P, PRC). OVIEDO: Carazo, Salas, *Pons-Sorolla & Suzanna 267* (G, WAG). PALENCIA: Cervera de Pisguera, *Gandoger s.n.* (LY-Gandoger). PONTEVEDRA: Barro, *Menzhaith s.n.* (COI). SALAMANCA: Sierra de Francia, *Gandoger s.n.* (LY-Gandoger); near S. Christobal de la Cuesta, *Suarez s.n.* (K). SANTANDER: Mataparquera, *Font Quer s.n.* (BC). SEGOVIA: S. Rapael, Sierra de Guadarrama, *Castagne s.n.* (BR); Segovia, near station, *Ellman & Hubbard 1158* (K). SEVILLA: El Gandul to Trujillo, *Cabezudo & al. 1532/75* (RNG); Empalme, *Gandoger s.n.* (LY-Gandoger); near Alcala de Guadaira, *Heywood & al. 17* (RNG); Isla major in the Guadalquivir, *Kaae s.n.* (C). SORIA: Sierra Martin de Moncayo, *Gandoger s.n.* (LY-Gandoger); Aldehuela de Périañez, Almajano, *Granzow & Zaballos 144* (G); Castillo, *Montferrat s.n.* (BC). TERUEL: Muela de S. Juan, *Almazan s.n.* (LY-Gandoger); Montalbán, *Gandoger s.n.* (LY-Gandoger); Albarracín, *Zapater s.n.* (LY-Gandoger). TOLEDO: Navahermosa, *Gandoger s.n.* (LY-Gandoger); Polan, *Gandoger s.n.* (LY-Gandoger); Sierra de Calderina, *Gandoger s.n.* (LY-Gandoger); Toledo, near Alcantara bridge, *Wilmott s.n.* (BM). VALENCIA: Utiel to Pantano de Generalissimo, *Cannon & al. 50* (BM); Játiva, *Gandoger s.n.* (LY-Gandoger); Puerto de Contreras, *Leadley & Petty 61* (BM, MO, RNG); Siete Aguas, *Lopez Guillén s.n.* (LY-Gandoger). ZAMORA: Toro, *Gandoger s.n.* (LY-Gandoger); Benavente, *Gandoger s.n.* (LY-Gandoger). ZARAGOZA: near Bujaraloz, Zaragoza reg., *Auquier 1838* (BC); Alborton, *Gandoger s.n.* (LY-Gandoger); Calatayud, *Vicioso s.n.* (LY-Gandoger). BALEARIC ISLANDS: FORMENTERA: La Mola, Punta de la Xindri, *Avellano & al. 1971* (BM); Cala Sabina, *Nordborg & al. 1023* (LD). IBIZA: Cala Talamanca to Jesus, *Bowden & Sims 1503* (BM); El Caña, near Sta. Eulalia, *Cannon 3148* (A, BM, RNG); San Antonio, *Skovgaard Christensen 2434* (C); near Port d'es Torrent, *Finchow 744* (BM); Pla de Vida, *Font Quer s.n.* (BC). MALLORCA: Puerto Potenza, *Beckett 1235* (RNG); Soller, *Bicknell s.n.* (GE); Cala Ratjana, *Bowden & Sims 402* (BM); Biniaraix to l'Ofre, *Bowden & Sims 131* (BM, ERE); distr. Soller, E Puerto, *Cannon 2401* (BM); Cala Peñas Roja, *Cannon 3849* (BM); Palma to Inca, *Dahlgren 120* (LD); S. Andraitx, *Dahlgren & al. 81* (LD); Gador, *Delvosalle s.n.* (BR); near Palma Nova, *Duvigneaud 66E13* (BR); E San Telmo, *Friis 892* (C); Calvia, *Gandoger s.n.* (LY-Gandoger); Soller, *Knoche s.n.* (MPU); N Estellencs, *Malicky s.n.* (W); Puerto de Colon, *Nordborg & al. 390* (LD); Los Rapiuya, *Palau 799* (BC); Palma, *Sjöstedt 54* (LD); Valltemosa, *Sjöstedt 107* (LD); Derja, *Skovgaard Christiansen s.n.* (C); near Albufera, *van Steenis 18783* (L). MENORCA: Ciudadela to Mahon, *Bowden & Sims 1308* (BM, ERE); Cabo dartuch, *Dahlgren 879* (LD); Cauasia, *Pons s.n.* (LY-Gandoger). CANARY ISLANDS: GRAN CANARIA: s.loc., *Despreaux s.n.* (G). TENERIFE: Sta. Cruz, *Husnot 24* (LY-Gandoger); Boca Tojodio, near S. Cruz, *Murray s.n.* (BM, K).

SWITZERLAND: Geneva, *Ayasse s.n.* (G); Cran, *Meylan s.n.* (G); Solothurn, Luterbach, *Probst s.n.* (Z); Ascona, near Lago Maggiore, *Scriba s.n.* (MO).

UKRAINE, CRIMEA: Simferopol, *Andrejev s.n.* (LE); Jaila pass N Alushta, *Branco s.n.* (JE); S beach, vill. Chaytan Merdvin, *Fedtschenko s.n.* (LE); Alupka, *Golde s.n.* (LE, SOM); Jalta, *Golde s.n.* (LE, SOM); Laspi, *Kryshtofowicz s.n.* (LE); Misgor, *Sprygin 112, 266* (LE); W Sebastopol, *Tzvelev 125* (LE).

YUGOSLAVIA, MONTENEGRO: Kotor, *Lenander s.n.* (BM, NY); Podgorica, *Rohlena s.n.* (BM, LD, PRC); Bar, *Rohlena s.n.* (PR). SERBIA: Leskovač, *Pančić s.n.* (FI).

ADVENTIVE: AMERICA: U.S.A., CALIFORNIA: Mendacino Co., W Willits, *Fuller 4491* (DAV); Mendacino Co., Little lake valley, *Jones s.n.* (DAV). EUROPE: BELGIUM: Comines, *Baily s.n.* (BR); near Alost (Aalst), *Crépin s.n.* (BR); Ensival, *Michiels s.n.* (BR); Malines, Galgenberg, *Pelgrims s.n.* (RNG); Dolhain, Vesdre, *Pelgrims s.n.* (RNG). CZECH REPUBLIC: near Luže, *Rostan s.n.* (L). FRANCE, LOIR-ET-CHER: Gué du lois, near Vendôme, *Guillard s.n.* (MPU). HAUTS-DE-SEINE: Bruyères de Sèvres, *de Bullemont s.n.* (BR). PARIS, s.loc., *Chatin s.n.* (F). SEINE-ET-MARNE: Fontainebleau, *Mérat de Vaumartoise s.n.* (P). VAL d'OISE: Argenteuil, *Mottet s.n.* (P). GERMANY: Erfurt, *Reinecke s.n.* (LD); s.loc., *Roth s.n.* (BM, LE, TUB, type of *Aegilops geniculata*); Tessin, Clara, *Stauffer s.n.* (Z). SWEDEN: Goteborg, Kvarnen Tre Lejon, *Blom s.n.* (K). SWITZERLAND: Zürich, Güterbahnhof ('adventiv'), *Thellung s.n.* (Z). U.K., SCOTLAND: Leith, near Musselburgh, *Fraser 509* (E, K, RNG). WALES: Cardiff, Splot, *Melville s.n.* (K).

CULT.: EUROPE: FRANCE, ALPES-DE-HAUTE-PROVENCE: Digne, Basses-Alpes, cult. at Lyon, *Jordan s.n.* (K, LY-Jordan, type of *Aegilops pubiglumis*). AUDE: Mas-Cabardés, cult. at Lyon, *Jordan s.n.* (LY-Gandoger, MPU-Coste, type of *Aegilops erigens*). HÉRAULT: near Montpellier, cult. at Lyon, *Jordan s.n.* (MPU-Coste, type of *Aegilops procera*). VAUCLUSE: Valrèas, cult. at Lyon, *Jordan s.n.* (K, LY-Jordan, type of *Aegilops erratica*). ITALY: ISLANDS: SICILY: s.loc., cult. at Lyon, *Jordan s.n.* (LY-Jordan, LY-Gandoger, MPU-Coste, type of *Aegilops sicula*); from botanic garden in Palermo, cult. at Lyon, *Jordan s.n.* (LY-Jordan, type of *Aegilops parvula*); Palermo, cult. at Lyon, *Jordan s.n.* (LY-Gandoger, MPU-Coste, type of *Aegilops divaricata*).

Germplasm collections examined:

AFRICA: ALGERIA: Djelfa, Birfef, *Holly & al. DZA-74* (ICARDA, ITGC, NARC-J); Tifla, 25 km after Tebessa to Constantine, *Holly & al. DZA-25* (ICARDA, ITGC, NARC-J); Constantine, Al Barrawiae, station Al Kharoub, *Holly & al. DZA-3* (ICARDA, ITGC, NARC-J); Tlemcen, Sebdou, *Humeid & al. 90-DZA-56* (ICARDA, ITGC); W Tlemcen, *Humeid & al. 90-DZA-46* (ICARDA, ITGC).

LIBYA: Jebl Ahdar, El Fatayeh station, E Derna, *van Slageren & Zentani MSAZ-90050* (ARC, ICARDA); Tripoli, Chadra, E Tarhouna to Homs, *van Slageren & Jibreel MSAJ-91011* (ARC, ICARDA).

MOROCCO: Tetuan, Dar Chaoui, 23 km Torle to Rabat, *Damania & al. DAF-121* (ICARDA, INRA-M, NARC-J); Oued Amlil, Abjelil to Taza, *van Slageren & Istar MSAI-90122* (ICARDA, INRA-M); Marrakech, Aouzzer, Amizmiz to Asni, *van Slageren & Istar MSAI-90069* (ICARDA, INRA-M); Shrahma, Oued Hanasseur, NW Demnate, *van Slageren & Istar MSAI-90080* (ICARDA, INRA-M); Azilal, Bin El-Ouidane to Beni-Mellal, *van Slageren & Istar MSAI-90096* (ICARDA, INRA-M).

ASIA: JORDAN: Karak, *Bourgois SY-20243* (IPGRI, ICARDA); Karak, S Wadi Mujib, *Bourgois SY-20239* (IPGRI, ICARDA); Karak, S Mauta on King's Highway, *van Slageren & al. MSBHAJ-88159* (ICARDA, JUST).

SYRIA: Tartous, Kadmous, *Bourgois SY-20204* (IPGRI, ICARDA); Aleppo, Atareb to Qalat Sam'an, *Bourgois & Witcombe SY-20181* (IPGRI, ICARDA); Manbij to Jarablus, along Euphrates, *Bourgois SY-20150* (IPGRI, ICARDA); Idlib, Taftanaz, *Bourgois SY-20171* (IPGRI, ICARDA); Idlib to Harem, *Bourgois SY-20173* (IPGRI, ICARDA); Aleppo reg., near Azaz, *Bourgois SY-20173* (IPGRI, ICARDA); Lattakia, Kabr El Abid, *Elings & al. ID-367-c* (ICARDA, SARD); Lattakia to Kasab road, *Humeid & al. BMW-47-1* (ICARDA, SARD); Damascus, Wadi Adra, near Palmyra road, *Humeid & al. BMW-1-1* (ICARDA, SARD); 20 km E Homs, Ain Khadra, *Humeid & al. BMW-16-4* (ICARDA, SARD); NE Homs from Salamie, *van Slageren & Obari MSKO-89126* (ICARDA, SARD).

TURKEY: 25 km SW Elâziğ, *Metzger & Jana 79TK016-71B* (USDA); Balikesir, E Erdek, *Metzger & Jana 84TK016-71B* (USDA); Bursa, NW Karacabey, *Metzger & Jana 84TK230-002* (USDA);

Elâziğ, 32 km E Kaban, *Metzger & Kanbertay 84TK446-009* (USDA); 25 km E Bozüyük – Eskişehir – Kutahya junction, *Metzger & Jana 84TK257-001* (USDA); 33 km SE Zonguldak, *Metzger & Jana 84TK281-001* (USDA); Bolu Dag, seven lakes park, *Metzger & Jana 84TK290-001* (USDA); S Çanakkale, Gizelyali, *Metzger & Jana 84TK212-008* (USDA); S Balya towards Balikesir, *Tüten & al. CNM-210689-0902* (ICARDA, PGRRI); Bursa, N Yenişehir at Iznik lake, *Tüten & al. CNM-240689-0801* (ICARDA, PGRRI); E Bursa – Iznik junction, *Tüten & al. CNM-240689-0303* (ICARDA, PGRRI); Koceli, N Izmit to Kandira, *Tüten & al. CNM-250689-0101* (ICARDA, PGRRI); Koceli, NE Kandira, *Tüten & al. CNM-250689-0202* (ICARDA, PGRRI); Çanakkale, SW Lapseki, *Tüten & al. CNM-200689-0501* (ICARDA, PGRRI); Çanakkale, W Çan, *Tüten & al. CNM-210689-0305* (ICARDA, PGRRI); Istanbul, NW Silivri – Çerkezköy junction, *Tüten & al. CNM-270689-0203* (ICARDA, PGRRI); Edirne, N Keşan, *Tüten & al. CNM-290689-0603* (ICARDA, PGRRI); NE Edirne to Lalapaşa, *Tüten & al. CNM-280689-0402* (ICARDA, PGRRI); suburb of Pozanti, *Eig s.n.* (ICARDA – from unknown source).

EUROPA: BULGARIA: Burgas, Kamenec, Kalcevo to Zornica, *van Slageren & al. MSRIMZ-89184* (ICARDA, IHAR, IIPGR); Burgas, Grudovo to Boljarovo, *van Slageren & al. MSRIMZ-89186* (ICARDA, IHAR, IIPGR); Djuni, Sozopol to Burgas, *van Slageren & al. MSRIMZ-89191* (ICARDA, IHAR, IIPGR); Burgas, S Jambol to Kalcevo, *van Slageren & al. MSRIMZ-89182* (ICARDA, IHAR, IIPGR); near Kaprivlen, S Goce Delcev, *van Slageren & al. MSMZNN-90264* (ICARDA, IIPGR, VIR); Kaprivlen to Paril, *van Slageren & al. MSMZNN-90265* (ICARDA, IIPGR, VIR).

CYPRUS: 40 km S Nicosia to Limassol, *van Slageren & al. MSLGAD-89094* (ARI, IPGRI, ICARDA).

PORTUGAL: Alcacer do Sal, Setubal, Palma, *Mota & al. 12-B* (INIA); Lagos, Faro, Benagil, *Mota & al. 186-A* (INIA); Alcacer do Sal, *Mota & al. 16-B* (INIA); Vila do Bispo, Faro, Sagres, *Mota & al. 34-A* (INIA); Beja, *Mota & al. 95-A* (INIA); Evora, Arraiolos, *Mota & al. 143-A* (INIA).

Notes: 1. The transfer of *Aegilops geniculata* to *Triticum* cannot be made because of the existence of *T. geniculatum* Trin. in von Ledebour, Fl. altaic. 1: 117 (1829), which is *Elitrigia geniculata* (Trin.) Nevski, and of *T. geniculatum* (K.Koch) Walp., Ann. bot. syst. 3: 783 (1852), which is based on *Brachypodium geniculatum* K.Koch. As a result, *T. vagans*, based on *Ae. vagans* Jord. & Fourr., was proposed instead by Greuter (in Greuter & Rechinger, 1967: 170) as the name for the combination in *Triticum*. Because of the uncertain status of this basionym (see Chapter 13) Greuter's combination is not acceptable. As, contrary to Greuter, the separation of *Aegilops* and *Triticum* is maintained, the surprising conclusion is that a valid name of this well-known species in the latter genus does not exist (see Table 2).

2. Eig (1929a: 144, note 1) expressly created a typical variety of *Ae. ovata*, var. *vulgaris* Eig, although he was aware that a variety with this name had already been created by Cosson & Durieu de Maisonneuve in 1855. Similar taxa were created by Grisebach (1846: 425, as var. *genuina*) and Fiori & Paoletti (1896: 109, as var. α *typica*). Eig's motif was that the other authors included what were for him separate species in their concept of *Ae. ovata*: *triaristata* with Grisebach (as β *triaristata*), *triaristata* and *biuncialis* with Fiori & Paoletti (as var. β *biuncialis* and var. γ *triaristata*). Eig's argument does not hold in my view as in all three cases the function of the typical variety (here with the correct name *ovata* as it is the autonym) is the same: to denominate all forms not to be separated from the type of the species name.

3. The various species described by Jordan & Fourreau (1868: 128-131) in their *Breviarum plantarum novarum* can be regarded as 'microspecies' in the sense of Art. 33.4 of the *Code*. This would render these names invalid. Some of the taxa were taken up as varieties by Rouy (1913: 332). Greuter (in Greuter & Rechinger, 1967: 170) used *Aegilops vagans* rather randomly to make the combination with *Triticum* since *Aegilops geniculata* could not serve this purpose (see note 1). This choice proved to be an unfortunate one after my inspection of the Jordan herbarium in LY. Not only do not all the microspecies taxonomically belong to *Ae. geniculata* (e.g., *Ae. nigricans* and *virescens*), but also the original material received by Jordan, as well as any material subsequently cultivated by him that may be associated with the names *Ae. microstachys* and *vagans*, could not be traced (besides in LY-Jordan, not found in LY-Gandoger nor in MPU-Coste). Hence the taxonomic identity of these species is unsure and, next to *Ae. geniculata*, *Ae. neglecta*, which also occurs in southern France (see Fig. 55), may very well have been involved. *Ae. vagans* and *Ae. microstachys* are therefore excluded from *Aegilops* (see Chapter 13). A specimen named *Ae. vagans* in LY-Gandoger ('Gall., Aude, Durban 79, *Dupuy*'; the '79' = 1879) is clearly not linked with Jordan nor with the location associated with the epithet ('...circa Monspelium etc...', l.c., 130) in the *Breviarum*, hence cannot serve as the type specimen.

Inspection of the Jordan herbarium showed that, next to *Ae. vagans*, no specimens that may serve as types of the Jordan & Fourreau microspecies have been available. Most probably these collections were sent to Jordan by various collectors, and he multiplied all of these in an experimental garden. Where possible, and following Arts. 7.9 and 7.10, most species have now been neotypified with those collections in Jordan's herbarium that contain a label with his handwriting and that carry site data (more or less) identical to that mentioned in the *Breviarum*. These collections in LY-Jordan are packed together with piles varying between 25 and 500 sheets of Jordan's multiplications over the years 1862-88. Dates on the neotypes are in several cases later than those of the publication of the names. The selected specimens represent multiplications by Jordan. A subset was (apparently) sent during or after 1869 to Coste as they are present in his herbarium at MPU, carrying labels identical to the ones in LY-Jordan. Where possible (*Ae. erratica*, *nigricans*, *parvula*, *pubiglumis*) specimens from before 1868, which, theoretically, may have served for the descriptions, were chosen as neotypes. It is, however, impossible to ascertain whether they ever served as such; hence their designation as neotypes rather than holotypes. For *Ae. divaricata*, *Ae. erigens*, *Ae. procera* and *Ae. virescens* no specimens were found in LY-Jordan, but sheets in MPU-Coste could serve as neotypes as they carry the same labels from Jordan. Relevant data on the Jordan & Fourreau species are summarized in Table 12.

4. *Aegilops geniculata* may be confused with the sympatric *Ae. umbellulata*, with which is has a general spike outline and the number of awns on the glumes of fertile spikelets in common. Differences are keyed out under *Ae. umbellulata* (see at 10.19).

10.9 **Aegilops juvenalis** (Thell.) Eig **Figs. 45-47**

Aegilops juvenalis (Thell.) Eig, Feddes Repert., Beih. 55: 93 (1929a); Nevski in Komarov, Fl. URSS 2: 672 (1934, Russian) / 535 (1963, English); Parsa, Fl. Iran, Suppl. Gén. 3: 608 (1952); Chennaveera-

Table 12. Summary of species published under 'Grex *Ægilops ovatæ* L.' in Jordan & Fourreau's *Breviarum plantarum novarum*, Fasc. 2: 128-132 (1868)

Species	Identification	Page	Neotype (if identified) or syntypes
divaricata	*Ae. geniculata*	129	Italy, Sicily ('In incultis Siciliæ'), Palermo, cultivé à Lyon, fl. 4 juin 1869, *Jordan s.n.* (MPU-Coste; isoneotype: LY-Gandoger).
erigens	*Ae. geniculata*	131	France, Aude ('In incultis Galliae australis: Mas-Cabardès (Aude) etc.'), Mas-Cabardès, cultivé à Lyon, fl. 28 mai 1869, *Jordan s.n.* (MPU-Coste; isoneotype: LY-Gandoger). Not found in LY-Jordan.
erratica	*Ae. geniculata*	130	France, Vaucluse ('In incultis Galliæ australis: Valrèas (Vaucluse) etc.'), Valrèas, cultivé à Lyon, fl. 3 juin 1865, *Jordan s.n.* (LY-Jordan; isoneotype: K).
microstachys	?	131	Described from France ('In incultis Galliæ australis: Montjoyer (Drôme)', l.c., 132). No neotype designated as no material was found in LY-Jordan, LY-Gandoger, or MPU-Coste. Excluded species (Chapter 13).
nigricans	*Ae. umbellulata*	128	Turkey, Lycia ('In incultis Lyciæ, ex clar. *E. Bourgeau*'), cultivé à Lyon, fl. 30 mai 1865, *Jordan s.n.* (LY-Jordan).
parvula	*Ae. geniculata*	131	Italy ('In Italia. Ex Horto botan. heidelbergensi olim acceptum'), cultivé à Lyon, fl. 28 mai 1865, *Jordan s.n.* (LY-Jordan).
procera	*Ae. geniculata*	129	France, Hérault ('In incultis Galliæ australis: circa Monspelium, ex dom. E. Revelière'), cultivé à Lyon, fl. 3 juin 1869, *Jordan s.n.* (MPU-Coste). Not found in LY-Jordan.
pubiglumis	*Ae. geniculata*	131	France, Alpes-De-Haute-Provence ('In incultis Galliæ australis: Digne (Basses-Alpes) etc.'), cultivé à Lyon, fl. 16 juin 1865, *Jordan s.n.* (LY-Jordan; isoneotype: K).
sicula	*Ae. geniculata*	129	Italy, Sicily ('In incultis Siciliæ'), cultivé à Lyon, fl. 4 juin 1869, *Jordan s.n.* (LY-Jordan; isoneotypes: LY-Gandoger, MPU-Coste).
vagans	?	130	Described from France ('In incultis Galliæ australis: circa Monspelium etc.'). No neotype designated as no material was found in LY-Jordan, LY-Gandoger or MPU-Coste. Excluded species (Chapter 13).
virescens	*Ae. neglecta*	130	Syntypes: (1) Algeria ('circa Bône'), cultivé à Lyon, fl. 3 juin 1869, *Jordan s.n.* (MPU-Coste). Not found in LY-Jordan. (2) France, Var, Toulon ('in incultis Galliæ australis, circa Telonem'), cultivé à Lyon, 1869, *Jordan s.n.* (LY-Gandoger). Not found in LY-Jordan.

iah, Acta Horti Gotoburg. 23: 167 (1960); Mouterde, Nouv. Fl. Liban, Syrie 1: 152 (1966); Bor, Fl. Iraq 9: 182 (1968); Goloskokov, Ill. key to Kazakhstan pl. 1: 124 (1969); Bor, Fl. Iranica 70/30: 194 (1970); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973), in Fedorov, Zlaki SSSR: 158 (1976, Russian) / 226 (1984, English); Hammer, Feddes Repert. 91: 235 (1980b); Nikitin & Geldykhanov, Opredelitel rastenich Turkmenistana [Key to Turkmenistan plants] 46 (1988).

Basionym: *Triticum juvenale* Thell., Feddes Repert. 3: 281 (1907), Fl. adv. Montpellier 151 (1912); Bowden, Can. J. Bot. 37: 676 (1959); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 74 (1987).

Type: (France, Hérault) Port Juvénale, V.1857, *Touchy s.n.* (holo: MPU; iso: W).

Homotypic synonym:

Aegilonearum juvenale (Thell.) Á.Löve, Biol. Zentralbl. 101 (1982), Feddes Repert. 95: 502 (1984).

Heterotypic synonyms:

Ae. turcomanica (Roshev.) Roshev., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 413 (1928); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 457, 556 (1928); Hammer, Feddes Repert. 91: 235 (1980b, see note 1). – Based on: *Triticum turcomanicum* Roshev., Consp. Gram. Turkest. Ross., Not. Syst. Herb. Hort. Petrop. 38: 91 (1923, separate (pre-)print of Acta Horti petro. 38 of 1924), in Fedtschenko & Fedtschenko, Consp. Flor. Turkest. Kirgh. 1, Trudy Jmp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 38(1): 149 (1924), *nom. nud.* (See also at Chapter 12, Nomina nuda). – Syntypes (fide Roshevitz, 1928): (Iraq) iter Syriaco-Armeniacum, in deserto Singaroe (= Sinjar), 1867, *Haussknecht s.n.* (BM, JE, LE, W); (Turkmenistan) 'Turcomania', Bami, in steppis, *Antonov s.n.* (LE, not found). – Homotypic synonym: *Triticum turcomanicum* (Roshev.) Bowden, Can. J. Bot. 37: 676 (1959), Can. J. Gen. Cyt. 8: 135 (1966).

Ae. juvenalis (Thell.) Eig var. *aristata* Pop., Bull. Appl. Bot. & Pl. Breeding 22(2): 436 (1929), **syn. nov.** – Type: not indicated.

Ae. juvenalis (Thell.) Eig var. *mutica* Pop., Bull. Appl. Bot. & Pl. Breeding 22(2): 436 (1929), **syn. nov.** – Type: not indicated.

Uncertain status:

Ae. crassa Boiss. var. *obscura* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923). – Type: (Uzbekistan) 'Turkestan', Samarkand, Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*.

Ae. crassa Boiss. var. *rufescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923). – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*.

Note: the varieties *obscura* and *rufescens* of *Ae. crassa* are described by Popova with pubescent spikes and glume awns as: 'aristis glumis ± aequalibus'. Contrary to *Ae. crassa* this may apply to the related *Ae. juvenalis* (compare Fig. 31-5 and 8 with Fig. 45-7). As no type material was available their status is unclear, but for the time being at best under *Aegilops juvenalis*. Contrary to the other five Popova varieties of *Ae. crassa* these two are not commented upon by Hammer (1980b).

Diagnostic characters: robust, loosely tufted annuals, (10-)15-30(-40) cm tall excluding spikes, spikes cylindrical to slightly moniliform, 3-7 cm long excluding awns, with 3-6 spikelets, rudimentary spikelets 1-3; glumes adpressed-velutinous, the truncate apex of lateral glumes with 2 widely spaced awns, one of which sometimes reduced to a tooth; lemmas of fertile florets coriaceous in upper-lateral parts,

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Fig. 45. *Aegilops juvenalis*. 1, habitus (x 1/2); 2a-c, spikes, showing spikelets *in situ* and variation in glume and lemma awns (all x 1); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 5a (x 5); 4, stem, leaf sheath, ears and leaf blade (x 2); 5-6, lowest floret of lowest fertile spikelet: 5, glume (x 3), 6, lemma (x 3); 7-10, spikelet in centre of spike: 7, glume (x 2), 8-9, lemmas, showing variation in awn development (both x 2), 10, palea with mature seed (x 3); 11, mature seed of 10, ventral surface (x 3); 12-15: apical spikelet: 12-13, glumes (x 2), 14, lemma (x 2), 15, seed and palea (x 5). (1, 2c. *van Slageren & Sweid MSFS-91041H*; 2a-b, 3-15. *Nikitin s.n.* (VIR 681), cultivated at ICARDA from germplasm accession.)


15
13
2a
2b
2c
14
9
7
8
12
1
3b
3a
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11

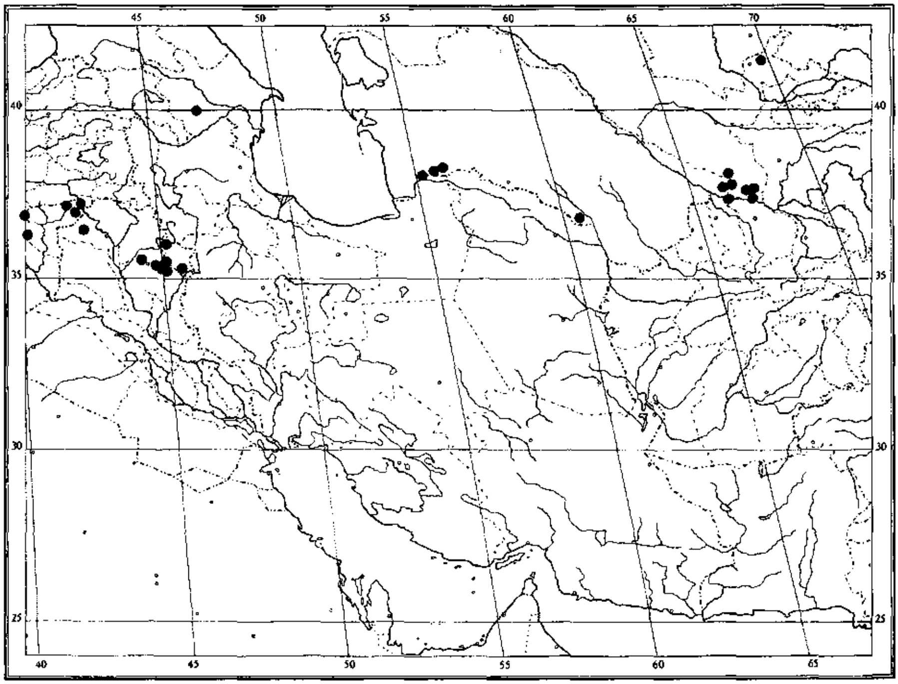


Fig. 46. Distribution of *Aegilops juvenalis* in central Asia. Adventive locations in Turkey and France not shown.

with 1 flat, central awn, 2-5 mm long in base of spike but up to 2-4 cm near apex, with 2 lateral teeth, one of which may develop in a short awn; caryopsis adherent.

Description (Fig. 45): robust, loosely tufted *annuals* (*Fig. 45-1*) with few to many tillers. *Culms* erect, slightly geniculate at base, (10-)15-30(-40) cm tall excluding spikes; foliage evenly distributed, somewhat more dense at base of culm. *Leaf* blades linear-acuminate, 5-15 cm long, 0.3-0.5 cm wide, surface scabrous even at base of culms; margins of sheaths hyaline, ciliate in the upper parts but this only at base of culm (*Fig. 45-4*). *Inflorescence* (*Fig. 45-2*) a cylindrical to slightly moniliform spike, tapering towards the apex, 3-7 cm long excluding awns, 0.5-0.7 cm wide; disarticulating barrel-type at maturity into individual spikelets with the rudimentary spikelets remaining attached to the culm; with 3-6 fertile spikelets and 1-3 rudimentary spikelets. *Spikelets* sessile, cylindrical to urceolate, 8-13 mm long excluding teeth and/or awns, around 5 mm wide; the apical spikelet obconical, ± 8 mm long and 3 mm wide; spikelet length 1-1.3 times the length of the supporting rachis internode; with 3-5 florets of which the upper 2-3 sterile. *Glumes* (*Fig. 45-5, 7*) 2, coriaceous, broadly ovate-truncate, 5-7(-9) mm long; the surface closely adpressed-velutinous; veins unequally wide, sunk into the surface, ± parallel, usually somewhat lighter in colour than the glume surface; apex of lateral glumes truncate with 2 short to longer, setulose awns, or 1 tooth and 1 awn, awns 2-3 mm spaced apart and with often a tooth, rarely even a short awn, developed in between, adaxial awn 5-20(-35) mm long, abaxial awn of equal length but often shorter and in basal part of the spike sometimes reduced to a sharp tooth only; apex of apical spikelet (*Fig. 45-13*) with a central awn of 7-25 mm long, flanked by 2 sharp, lateral teeth, each of which may develop into a shorter awn (mostly 1 awn and 1 tooth present). *Lemmas* (*Fig. 45-6, 8-9*) of fertile florets slightly exserting the glumes, 8-10 mm long, narrowly ovate, boat-shaped, hyaline in central and basal part, more coriaceous in the apical- and upper-lateral parts; the apical part flat, the inner surface velutinous, the outer surface with ornamentation as of the glumes; apex truncate with a short (2-5 mm only in base of spike) to longer, 2-3(-4) cm, central awn, flanked by 2 teeth, one of which often develops into a shorter awn; lemmas of apical spikelets (*Fig. 45-14*) similar as of lateral spikelets, usually with 2 sharp, lateral teeth, the central awn often diverging; lemma awns flat at the base. *Paleas* (*Fig. 45-10, 15*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 45-11*) around 7 mm long, adherent to lemma and palea.

Variation: in length of the spike: 3-7 cm; number of spikelets: 3-6; glume apical awns: 5-20(-35) mm in lateral glumes, 7-25 mm in apical ones, and in lemma awn length: 2-5 mm in base of spike, increasing to 2-3(-4) cm towards spike apex.

Distribution (Fig. 46): a Western Asiatic element occurring at rather dispersed locations in central Asia (Turkmenistan, Uzbekistan) as well as in Azerbaijan and in the northern part of the Fertile Crescent: northern Syria and Iraq. Its probable evolutionary origin may explain this erratic occurrence (see Chapter 6.1.1). Although recent germplasm collection activities have yielded new sites, these have not extended its known area of distribution. Rare throughout its range.

Ecology (Fig. 47): in steppe, dry roadsides, grasslands (Fig. 47), cultivated fields (wheat, maize) and hillsides. Found on clay but probably also on other soil textures. Drought tolerant as the range of recorded annual rainfall from the known sites is only 250-350 mm. Data on ecology, soil types and altitudinal range are, however, scarce.

Altitude: 140-1000 m.

Flowering and fruiting time: April – June (in Iraq, cf., Bor, 1968: 185).

Genome: DMU (female parent 'DM' x male parent 'U') with 2x = 6n = 42 (Chennaveeraiah, 1960: 92; Waines & Barnhart, 1992: Table 2). This notation is in contrast with the one of Kimber & Tsunewaki (1988: as '<u>DMU</u>', sub *T. juvenale*) who consider all constituting genomes as modified from the original, diploid ones.

Vernacular name:

Turkmenian: Turkmen bogdayli-tchair (Nikitin & Kerbabajev, 1962: 141).

Uses: a pasture plant in Iraq (coll. *Al-Effendi 3858* (K); cited by Bor, 1968: 184).

Etymology: the final epithet refers to Port Juvénale near Montpellier in southern France. This was a group of meadows used for drying imported wool (Stafleu & Cowan, 1976: 962) where many adventive plants, stuck as seeds in the wool, were found and described by Godron in his *Florula juvenalis* (1853). *Aegilops juvenalis* was apparently among those adventives and collected there in 1857 by Touchy, thus a long time before Thellung described it in 1907 as *Triticum juvenale.*

Most of the 76 herbarium specimens examined:

ASIA: IRAQ: Kirkuk prov., *Al-Effendi 3858* (K); NE Chemchemal to Sulaymaniyah, *Bot. Exp. Univ.*

Fig. 47. *Aegilops juvenalis* (*van Slageren & Sweid MSFS-91041H*, ICARDA) in a grassland between Jawady and Malkiye, NE Syria.

Kyoto BMUK 5-30-1-B (K), *5-30-1-C* (C); 12 km E Chemchemal, *Gillett & Al-Rawi 11603* (K); Baba Yurgur, near Kirkuk, *Guest 4380* (K); desert of Sinjar, *Haussknecht s.n.* (BM, JE, LE, W, type of *Aegilops turcomanica*); Jarmo, camp wadi, *Helbaek 1184* (C), *1276, 1278* (K); Jarmo, *Helbaek 1135* (K, LE); Jarmo, adobe ruin near camp, *Helbaek 1201, 1203, 1205* (C), *1202, 1204* (C, K); Hajbi, *Helbaek 1880, 1938* (C).

SYRIA: hill in the Qaratchok Dagh, *Mouterde P467* (G); Jebl Abd-el-Aziz, *Pabot s.n.(353)* (G, Min.Agr.Syr.); Jezira, Ras el Ain, *Pabot s.n.* (G); W Qatrana, *Pabot s.n.* (G); Qaratchok Dag, S Deirik, Khan Serri, *Pabot s.n.* (G); E Qamishly, *Pabot s.n.* (G); Qaratchok Dagh, Jawady to Malkiye, *van Slageren & Sweid MSFS-91041H* (ICARDA).

TURKMENISTAN: Serach reg., Gjaz-Gjadik Mt., *Chepanov s.n.* (ASH); Kugitangh, pass Ghodzja-Pil, *Chepanov s.n.* (ASH); Gjaz-Gjadik, Adan-Alen, Rachnatur, *Chepanov s.n.* (ASH); near Kurgitangh Mts., *Chepanov s.n.* (ASH); Kurgitangh, Bazar-Tepe, *Gutkova & Ataeva s.n.* (ASH); Kopet Dag, Bogundar, near Kara-Kala, *Popov 541a* (B, BC, BR, C, E, G, K, LE, NY, MO, TASH, W).

UZBEKISTAN: Sherabad reg., near river Sherabadka, Kugikangh Mts., *Jarmolenko 42* (LE); Surkan – Darinska reg., E Sayroka river, near Talla-Kamar, *Nikitin & Zhilenko s.n.* (G, GAT, LD, MO, W); W Tian-Shan, Kaplanbek, near Tashkent, *Radkewicz 541b* (B, BC, BR, C, E, G, NY, MO, P, TASH, W).

EUROPE: AZERBAIJAN: Elizabethpol (= Kirovabad), *Hohenacker s.n.* (JE).

ADVENTIVE: ASIA: TURKEY: Smirna (= Izmir), *s.coll., s.n.* (JE). EUROPE: FRANCE, HÉRAULT: Port Juvénale, *Touchy s.n.* (MPU, W, type of *Aegilops juvenalis*).

Germplasm collections examined:

ASIA: TURKMENISTAN: Kara-Kala reg., Kizyl-Ilgin, 20 km NE Sharlauk towards Kara-Kala, *van Slageren & al. MSPGZK-91109* (ICARDA, VIR); Kara-Kala reg., 10 km SE Kara-Kala, near Sakar, *van Slageren & al. MSPGZK-91120* (ICARDA, VIR).

UZBEKISTAN: Surkhan-Darin reg., near Sarav, *Nikitin s.n.* (VIR 681).

Notes: 1. Awaiting genomic analysis, Hammer (1980b: 235) maintained *Ae. turcomanica* as a separate species, closely related to *Ae. ventricosa* and *Ae. juvenalis*. This was based on Bowden's (1959) remark that his plants of *turcomanica* were tetraploid, contrary to hexaploid *juvenalis*. Morris & Sears (1967: 23) express their doubt on this remark as all their other collections of *Ae. turcomanica* were hexaploid. Examination of the type specimen at LE clearly showed *Aegilops juvenalis*, which then, theoretically, may be present in tetraploid and hexaploid forms.

2. Thellung (1907: 282) considered a hybrid origin for this species as both *Ae. crassa* and *Ae. triuncialis*, the parental species, were also found on the Port Juvénale near Montpellier. [At this location the occurrence of *Ae. triuncialis* is natural (Fig. 77), but that of *Ae. crassa* adventive (not presented in Fig. 32).] The morphology of the spike of *Ae. juvenalis* was considered intermediate. Eig (1929a: 94) doubted Thellung's remark and considered the relationship with *Ae. crassa* so close that an independent specific status for *Ae. juvenalis* was pending on future knowledge of the latter species' geography and ecology. He nevertheless maintained separate specific status. On a printed annotation of the collection *Popov 541a*, present in many herbaria, Nevski considers this species the natural hybrid of *crassa* ♀ x *triuncialis* ♂, as the reverse cross from Popova apparently yielded rather different forms.

3. This species can be confused with the sympatric *Ae. crassa*. Differences are keyed out as follows:

Spike (4.5-)6-10(-13) cm long, with (4-)6-9(-12) spikelets (*Fig. 31-2*); apex of *lem-*

mas of fertile florets with a sharp tooth (in basal part of spike – *Fig. 31-6*) that develops into a long, flat awn, up to 8.5 cm (in the upper parts of a spike – *Fig. 31-9, 11-12, 15, 17*), awn without lateral teeth at the base; glume apex with 1 broad, sometimes indistinct tooth on the abaxial side (*Fig. 31-5*), and 1 sharp tooth on the adaxial side that often develops into a short (1-4 mm at base of spike) to longer (up to 15 mm subapically) awn (*Fig. 31-8, 14, 16*) .... **crassa**

Spike 3-7 cm long, with 3-6 spikelets (*Fig. 45-2*); apex of lemmas of fertile florets with a short (2-5 mm in basal part of spike – *Fig. 45-6*) to longer (2-3(-4) cm in upper parts of spike) flat awn with sharp, lateral teeth at the base, one of which often developes into a short, second awn (*Fig. 45-8, 9*); glume apex with 2 awns, 5-20(-35) mm long, spaced at 2-3 mm from each other, one of which may sometimes be reduced to a sharp tooth (*Fig. 45-5, 13*) .... **juvenalis**

10.10 **Aegilops kotschyi** Boiss. — **Figs. 48-50**

Aegilops kotschyi Boiss., Diagn. pl. orient., Sér. 1(7): 129 (1846); von Steudel, Syn. pl. glumac. 1: 354 (1854); Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 331 (1928a), Feddes Repert., Beih. 55: 127 (1929a, with var. *typica*); Pampanini, Prodr. fl. ciren. 136 (1930); Post, Fl. Syria (ed. 2) 2: 785 (1933, with var. *typica*); Nevski in Komarov, Fl. URSS 2: 673 (1934, Russian) / 536 (1963, English); Grossheim, Fl. Kavkaza (ed. 2) 1: 352 (1939, with var. *typica*), Opredelitel rastenich Kavkaza [Key to Caucasus plants] 719 (1949); Oppenheimer & Evenari, Florul. Cisiord. 171 (1941); Täckholm et al., Fl. Egypt 1: 270 (1941); Karjagin, Fl. Azerbaijana 1: 337 (1950, with var. *typica*); Parsa, Fl. Iran 5: 822 (1952); Thiébaut, Fl. Lib.-Syr. 3: 317 (1953); Maire & Weiller, Fl. Afrique nord 3: 361 (1955); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960, '*Kotschyi*'); Bor in Rechinger, Fl. lowland Iraq 112 (1964); Bor, Fl. Iranica 70/30: 198 (1970, with var. *kotschyi*); Keith, Checklist Libyan Fl. 197 (1965); Mouterde, Nouv. Fl. Liban, Syrie 1: 148 (1966); Bor, Grasses India, Burma, Ceylon, Pakistan 654 (1960), Fl. Iraq 9: 184 (1968); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 483 (1969; with var. *typica*); Stewart, Cat. Vasc. Pl. W Pakistan, Kashmir, in Nasir & Ali, Fl. W Pakistan 171 (1972); Osorio-Tafall & Seraphim, List Vasc. Pl. Cyprus 10 (1973); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 38 (1973), in Fedorov, Zlaki SSSR: 159 (1976, Russian) / 227 (1984, English); Hammer, Feddes Repert. 91: 237 (1980b, with var. *kotschyi*); Cope, Key Grasses Arab Penin., Arab J. Sci. Res., Spec. Publ. 1: 74 (1985); Meikle, Fl. Cyprus 2: 1822 (1985); Davis, Fl. Turkey 9: 241 (1985); Feinbrun-Dothan, Fl. Pal. 4: 175 (1986, with var. *kotschyi* emend.); Al-Rawi, Fl. Kuwait 2: 327 (1987); Sherif & Siddiqi in El-Gadi, Fl. Libya 145: 107 (1988); Chaudhary, Grasses Saudi Arabia 181 (1989).

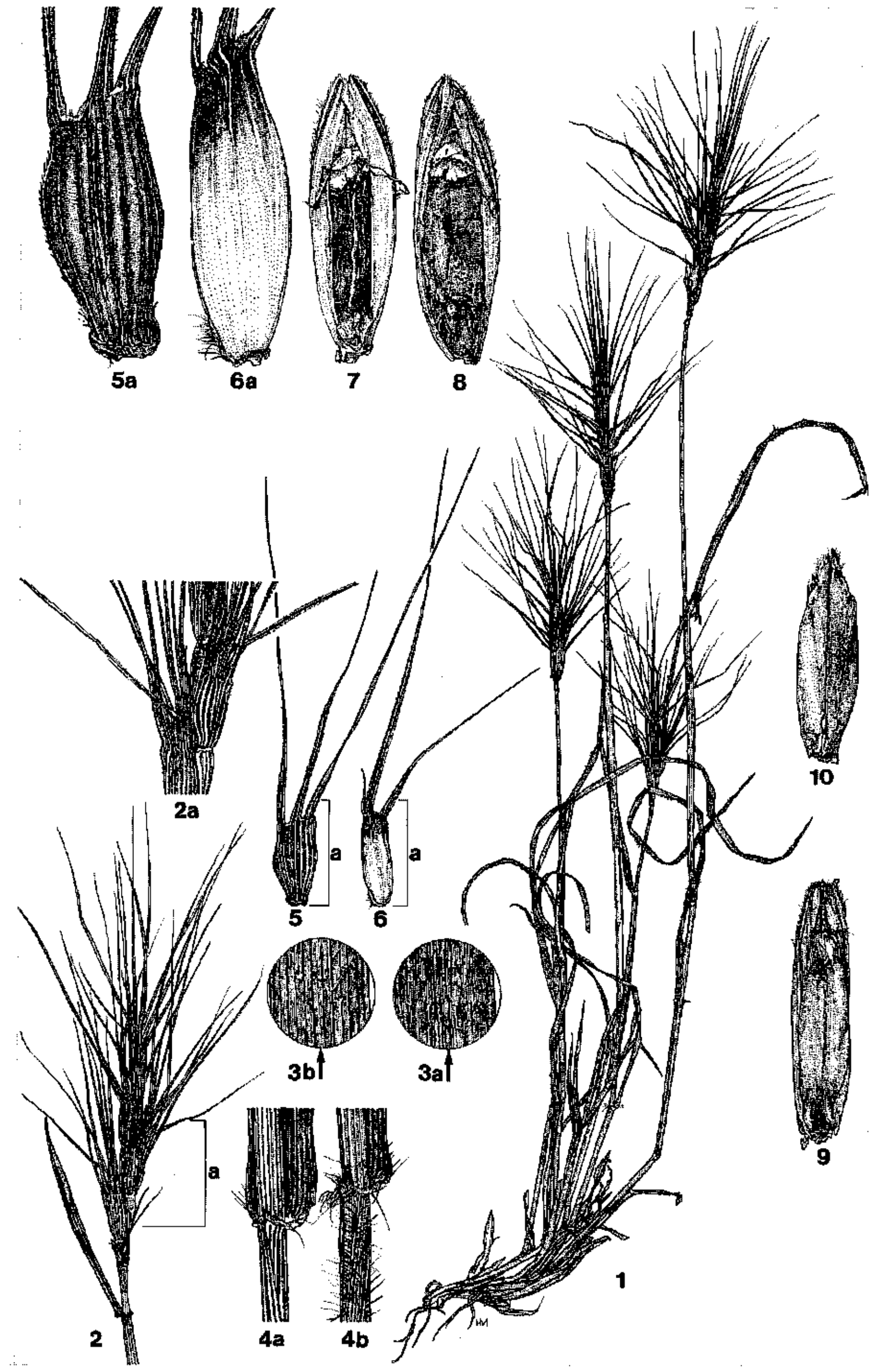
Lectotype (*nov.*): (Iran) ad canales prope pago Sabst-Buschom, majo m. 1842, *Kotschy 366a* (holo: G-BOIS; iso: BM, C, E, FI, G, K, LE, OXF, P, PI, PRC, TUB). See note 1.

Homotypic synonyms:

Ae. triuncialis L. var. ('γ') *kotschyi* (Boiss.) Boiss., Fl. orient. 5(2): 674 (1884); Bornmüller, Beih. Bot. Centralbl. 26: 438 (1910).

Triticum triunciale (L.) Rasp. ssp. ('C') *kotschyi* (Boiss.) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 707 (1902).

Fig. 48. *Aegilops kotschyi*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlargement of basal part of the spike, showing spikelets in situ (x 2); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 3a (x 5); 4a-b, stem, leaf sheath, ears and leaf blade in upper part of culm (4a) and lower part (4b) (both x 3); 5-8, lowest floret of lowest fertile spikelet: 5, glume (x 11/2), 5a, enlargement of basal part of 5 (x 5), 6, lemma (x 11/2), 6a, enlargement of lower part of 6 (x 5), 7, palea with mature seed (x 5), 8, mature seed with adherent parts of palea (x 5); 9, palea and immature seed (x 5); 10, ventral surface of mature seed (x 5). (1-2, 5-10. *van Slageren & al. MSBHSS-89062H*; 3-4. *van Slageren & Jaradat MSAJ-88021*, cultivated at ICARDA from germplasm accession.)


5a
6a
7
8
2a
a
a
5
6
10
3b
3a
a
2
4a
4b
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9

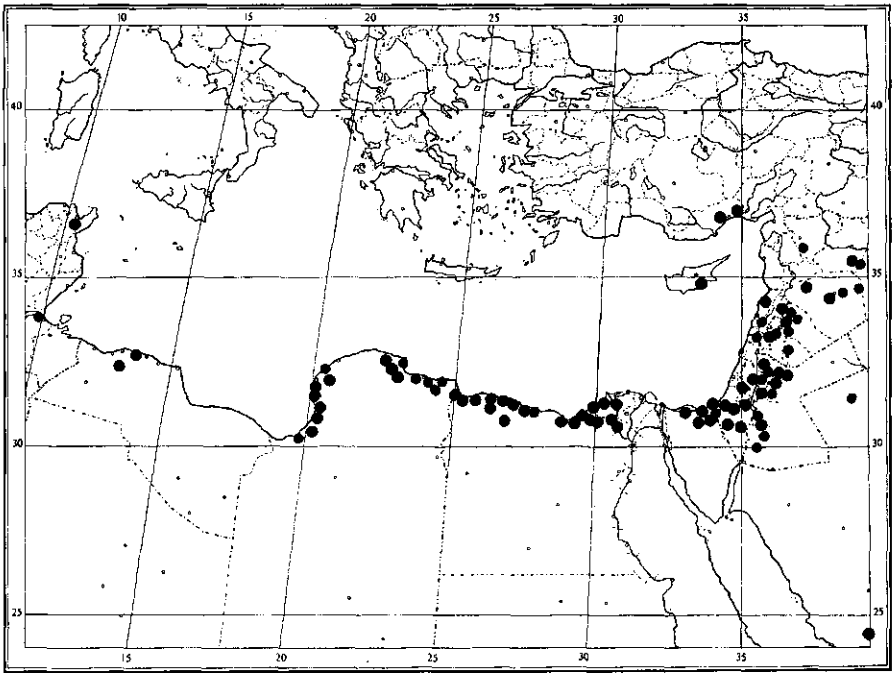

Fig. 49. Distribution of *Aegilops kotschyi* in the eastern Mediterranean.

Ae. triuncialis L. ssp. *kotschyi* (Boiss.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 499 (1928).

Triticum kotschyi (Boiss.) Bowden, Can. J. Bot. 37: 675 (1959), Can. J. Gen. Cyt. 8: 134 (1966); Morris & Sears in Quisenberry & Reitz, Wheat and Wheat Improvement 20 (1967, includes the species '*Ae. kotschyi* Boiss. + *Ae. variabilis* Eig'); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 62 (1987).

Aegilemma kotschyi (Boiss.) Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 499 (1984).

Heterotypic synonyms:

Ae. geniculata Fig. & De Not., Agrost. aegypt. 1: 262 ('1852') / 18 (1853, reprint); Eig, Feddes Repert., Beih. 55: 127 (1929a); Bor, Grasses India, Burma, Ceylon, Pakistan 654 (1960); Hammer, Feddes Repert. 91: 246 (1980b); Löve, Feddes Repert. 95: 499 (1984), *nom. illeg.* (Art. 64.1), non Roth, Bot. Abh. Beob. 45 (1787). – Type: (Egypt?) 'In depressis humidis convallium', *Figari & de Notaris s.n.(?)* (not seen). Probably at FI or GE (Stafleu & Cowan, 1976: 830, state that part of the Egypt and Sudan herbarium is in GE). – Notes: 1. The paper by Figari and de Notaris appeared in two volumes in the Mem. R. Accad. Sci. Torino, ser. 2, nos. 12 and 14. *Ae. geniculata* was published on p. 262 of the first volume, probably in 1852 (Stafleu and Cowan (1976: 830) are not sure of the year), and later on p. 18. of the one-volume reprint in 1853. 2. Typification follows Eig (1929a). Two collections from Egypt in FI, viz. 'Alexandria, *Figari s.n.*', and 'Sinai, *Figari s.n.*' may be type materials, but were not indicated as such, and Figari & de Notaris are not specifying a location. As their status is that of a heterotypic synonym anyway, I do not designate them as types.

Ae. glabriglumis Gand., Österr. Bot. Zeitschr. 31: 82 (1881); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 38 (1973), in Fedorov, Zlaki SSSR: 159 (1976, Russian) / 227 (1984, English). – Type: (Azerbaijan) Mare Caspi, Swatoï island, *Becker s.n.* (holo: LY; iso: LE).

Triticum ovatum auct. non Rasp. var. *bispiculatum* Kuntze, Pl. Orientali-Ross., Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 20: 256 (1887), **syn. nov.** – Type: Azerbaijan, Baku, V.1886, *Kuntze s.n.* (holo: NY).

Ae. triuncialis L. var. *leptostachya* Bornm., Beitr. Kenntnis Fl. Syrien, Palästina, Verh. k.k. zool.-bot. Ges. Wien 48: 651 (1898) / 109 (page no. of a separate reprint, also 1898), **syn. nov.** – Type: (Iraq) Assyria, in collibus, Jebl Hamrin, 26.IV.1893, *Bornmüller 1904* (holo: B; iso: G, JE, US). – Homotypic synonym: *Ae. kotschyi* Boiss. var. *leptostachya* (Bornm.) Eig, Feddes Repert., Beih. 55: 128 (1929a, cites page 109 of the reprint of Bornmüller's paper); Hammer, Feddes Repert. 91: 238 (1980b).

Ae. kotschyi Boiss. var. *caucasica* Eig, Feddes Repert., Beih. 55: 129 (1929a); Grossheim, Fl. Kavkaza (ed. 2) 1: 353 (1939); Karjagin, Fl. Azerbaijana 1: 338 (1950); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 483 (1969); Hammer, Feddes Repert. 91: 238 (1980b), **syn. nov.** – Type: (Azerbaijan) Transcaucasia, Mardakiany, near Baku, 1927, *Sorokina s.n.* (holo: HUJ, not seen; type specimen(s) cultivated from seed from WIR).

Ae. kotschyi Boiss. var. *hirta* Eig, Feddes Repert., Beih. 55: 129 (1929a); Grossheim, Fl. Kavkaza (ed. 2) 1: 353 (1939); Karjagin, Fl. Azerbaijana 1: 338 (1950); Bor, Fl. Iraq 9: 185 (1968); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 483 (1969); Bor, Fl. Iranica 70/30: 198 (1970); Tzvelev in Fedorov, Zlaki SSSR: 159 (1976, Russian) / 227 (1984, English); Hammer, Feddes Repert. 91: 238 (1980b), **syn. nov.** – Type: (Azerbaijan) Transcaucasia, Mardakiany, near Baku, 1927, *Sorokina s.n.* (holo: HUJ, not seen; type specimen(s) cultivated from seed from WIR).

Ae. kotschyi Boiss. var. *palaestina* Eig, Feddes Repert., Beih. 55: 128 (1929a); Pampanini, Prodr. fl. ciren. 136 (1930); Oppenheimer, Florul. Transiord. 151 (1931); Post, Fl. Syria (ed. 2) 2: 785 (1933); Grossheim, Fl. Kavkaza (ed. 2) 1: 353 (1939); Oppenheimer & Evenari, Florul. Cisiord. 171 (1941); Täckholm et al., Fl. Egypt 1: 270 (1941); Karjagin, Fl. Azerbaijana 1: 337 (1950); Maire & Weiller, Fl. Afrique nord 3: 362 (1955); Keith, Checklist Libyan Fl. 198 (1965); Mouterde, Nouv. Fl. Liban, Syrie 1: 149 (1966); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 483 (1969); Täckholm, Students' Fl. Egypt (ed. 2) 702 (1974); Scholz, Liste Gräs. Libyens, Willdenowia 7: 435 (1974); Hammer, Feddes Repert. 91: 238 (1980b), **syn. nov.** – Syntypes (14 specimens cited by Eig, 1929a; inspected ones listed): Egypt, Mariut, 1903, *Schweinfurth s.n.* (B, BR); Libya, Cyrenaica, Benghasi-Lihadabna, 1869, *Rohlfs s.n.* (B, not found, probably †, P); Libya, Benghasi, 1883, *Ruhmer 399* (B, not found, probably †, E, G, LD, LE, Z), *s.n.* (B, not found, probably †, BR, JE, P, Z); Tunisia, Tunis, 1854, *Kralik s.n.* (LE).

Ae. kotschyi Boiss. var. *brachyathera* Eig, Bull. Appl. Bot., Gen. & Pl. Breeding 24: 396 (1930); Post, Fl. Syria (ed. 2) 2: 785 (1933, err. as var. *anathera*); Mouterde, Nouv. Fl. Liban, Syrie 1: 149 (1966, err. as var. *anathera*); Feinbrun-Dothan, Fl. Pal. 4: 175 (1986), **syn. nov.** – Type: (Jordan) Transjordan, 40 km S Ma'an towards Aqaba, 18.IV.1929, *Eig s.n.* (holo: HUJ, not seen).

Ae. kotschyi Boiss. forma *nuda* Maire & Weiller in Maire, Contr. étude fl. Afrique Nord 26, Bull. Soc. Hist. nat. Afrique Nord 30: 311 (1939); Maire & Weiller, Fl. Afrique nord 3: 362 (1955); Keith, Checklist Libyan Fl. 198 (1965), **syn. nov.** – Type: (Libya) Tripolitania, in lapidosis aridis ad Aras Philaenorum, 17.IV.1938, *Maire & Weiller 1639* (holo: MPU). – Note: Maire (1939: 311) describes this location as 'Cyrénaïque, steppes près de l'Arc des Philènes', thus from Cyrenaica rather than from the western Tripolitania part of Libya as is mentioned on the type label. Keith (1965: 198) gives as location 'Marble Arch'. If this is the Arc des Philènes, then its location is on the coast in the central part of Libya at the eastern border of Tripolitania.

Diagnostic characters: tufted, many-tillered annuals, 10-30(-40) cm tall excluding spikes; spikes narrowly ovoid, 2-3(-4) cm long excluding awns; with (2-)3-5(-6) fertile and 2-3 rudimentary spikelets; glume surface with ± parallel, protruding, equally wide venation, the apex with 3(-4 in apical glumes) equally wide, setulose awns; lemmas with 1-3 awns of equal length as of the glumes; caryopsis adherent.

Description (Fig. 48): tufted *annuals* (*Fig. 48-1*), usually with many tillers. *Culms* geniculate at base, then ascending, 10-30(-40) cm tall excluding spikes; foliage sparse, more dense at base of culm. *Leaf* blades linear-acuminate, 2-10 cm long, 0.2-0.3 cm wide; sheath margins hyaline, only ciliate in base of culm (*Fig. 48-4*). *Inflorescence* (*Fig. 48-2*) a narrowly ovoid spike, 2-3(-4) cm long excluding awns, 0.3-0.4 cm wide; disarticulating as one unit at maturity with the rudimentary

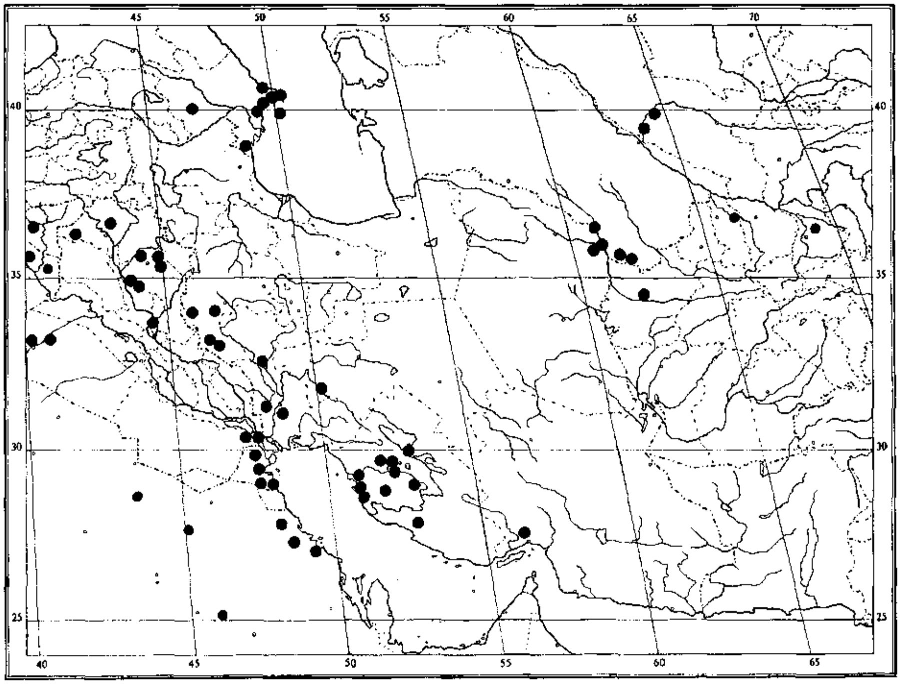

Fig. 50. Distribution of *Aegilops kotschyi* in Asia.

spikelets remaining attached to the culm; with (2-)3-5(-6) fertile spikelets and 2-3 rudimentary spikelets. *Spikelets* sessile, ovoid-oblong, 0.6-1 cm long excluding awns, 0.2-0.4 cm wide, 0.8-1.5 times the length of the supporting rachis internode; with 4-5 florets, the lower 2-3 fertile, the apical spikelet with 3-4 florets, the lower 1-2 fertile. *Glumes* (*Fig. 48-5*) 2, coriaceous (but lateral margins hyaline), broadly ovate-truncate, 5-8 mm long; the surface glabrous or scabrid, glaucous-green; veins setulose, equal in width, ± parallel, protruding from the surface, equally spaced, usually somewhat lighter in colour than the rest of the glume surface; the truncate apex ending in 3 setulose awns, equally wide at the base, 2.5-3.5(-4.5) cm long, the central one sometimes reduced and 1 cm long or less, apical glume occasionally 4-awned, awns often purplish-green, diverging up to erecto-patent in position (*Fig. 48-1, 2*); inner surface of apex velutinous. *Lemmas* (*Fig. 48-6*) of fertile florets slightly exserting the glumes, 7-9 mm long, narrowly ovate, the apex extending into 1-3 setulose awns, up to 4.5 cm long and thus of the same length as the glume awns, often 1, rarely 2 reduced to a short awn, less than 1 cm, or a sharp tooth only; inner surface of apical region velutinous, outer surface sometimes setose. *Paleas* (*Fig. 48-7, 8-9*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 48-9, 10*) around 7 mm long, adherent to lemma and palea.

Distribution (Figs. 49-50): a Mediterranean / Western Asiatic element occurring mainly along the coast of eastern North Africa, and the western arc of the Fertile Crescent. Common in this region, but more much rarer and only scattered presence is known from the central and eastern parts of the Crescent, eastern Transcaucasia and southern Iran. One of the few species of *Aegilops* clearly extending into the Saharo-Arabian Region (sensu Takhtajan (1986); see at 6.1.1): Kuwait and eastern Saudi Arabia, with a few, probably introduced, localities known from more central parts of the latter country. Rarely also on Cyprus. Distinctly allopatric with the related *Ae. peregrina* (compare Fig. 49 and 58; see also below at note 2) in Egypt, Palestine, Jordan, and southwestern Syria. Usually in scattered populations, but sometimes in large stands.

For the first time reported here from southeastern Turkmenistan (Badghis region according to herbarium collections in ASH), and from near Bukhara, Uzbekistan (according to a collection in TASH), thus extending its distribution significantly into central Asia.

Ecology: in dry and mainly sandy areas such as wadis (dry riverbeds) and sand dunes. Also known from (stony) steppe, wastelands, roadsides and dry grasslands, barley fields, fig, olive and *Pistacia* plantations, and *Juniperus* woodlands. Predominantly on sandy soils but also on löss, gravel, sandy clays and loams, and light clayloams. Bedrock types are mainly sandstone and limestone, less frequently alluvium or maritime sands (e.g., in Kuwait), and occasionally basalt. A clearly drought-tolerant species, growing under 100-425 mm annual rainfall. See also note 2.

Altitude: from -300 m (Dead Sea region) up to 1550 m.

Flowering and fruiting time: April – July.

Genome: SU (female parent 'S' x male parent 'U') with 2x = 4n = 28 (Chennaveeraiah, 1960: 91; Waines & Barnhart, 1992: Table 2).

Vernacular names:

Arabic: Sha'ier iblis [sha'ier = barley; iblis = devil, Satan] (Täckholm et al., 1941: 270); Sha'eer el-faar [= barley (of the) mouse/rat] (Täckholm, 1974). Both also used for *Ae. bicornis*.

Azeri: Kochi bugdayiot [kochi = probably referring to Th. Kotschy] (Karjagin, 1950: 337).

Uses: reportedly a forage grass in Kuwait (Bor, 1968: 184; in quotation).

Etymology: the final epithet refers to C.G.Th. Kotschy (1813-66), Austrian botanical explorer; travelled extensively in Egypt, the Sudan, Syria, Turkey, Iraq and Iran during 1836-43 and returning there irregularly until 1862; curator of the Royal Botanical Cabinet [Botanischen Hofkabinet] in Vienna until his death.

A geographical selection of the ca 475 herbarium specimens examined:

AFRICA: EGYPT: El Dekhelia, *Abbas & Al-Shaer s.n.* (CAIM); El Dirâ, north of Burg el Arab, *Abbas & Al-Shaer s.n.* (CAIM, W); Mersa Matrouh to Sellum, *Abbas & Al-Shaer s.n.* (CAIM); Sellum to Sidi Barrani, *Abdul-Majeed & Shalty 171* (CAIM); Wadi El Garawla, near Mersa Matrouh, *Amin & al. s.n.* (CAI); Alexandria, Ramleh, *Beccari s.n.* (FI); 108 km W Mersa Matrouh, *Björqvist & al. 604* (LD); Agiba bay, W Mersa Matrouh, *Björqvist & al. 744* (LD); 63 km from Cairo towards Alexandria, *Björqvist & al. 103* (LD); Mersa Matrouh to Siwa oasis, *Botschantzev s.n.* (LE); Ras-el-Hekma to Mersa Matrouh, *Botschantzev s.n.* (LE); Alexandria, Amria, lake Mareotici, *Bornmüller 11110* (B); Wadi Habs, W Mersa Matrouh, *Cope & al. 241* (K); Mariut, Amria, *Davis 8432* (K); Wadi el Arish, *Deflers 221* (MPU); Wadi Heridan, S El Arish, North Sinai, *Drar & Sa'ad s.n.* (CAIM); Wadi El Absani, *Drar s.n.* (CAIM); Diamontini, near Ramleh, *du Parquet 488, s.n.* (BR); Alexandria, *Ehrenberg s.n.* (C, K, L, LE); ibid., *Figari s.n.* (FI); Sidi Abdel Qadir, *El Khanagry & Makhtar 275* (CAIM); Umm Sighew, *El Khanagry & Makhtar 327* (CAIM); Sinai, *Figari s.n.* (FI); Sidi Barakat, Mersa Matrouh, *Helmy & al. 42* (CAIM); Nile delta, *Hurst s.n.* (C); Mariut, *Muschler 409a* (G, LY); Fuka to Mersa Matrouh, *Shabetai F 4667* (K); Mariut, Merzgheb, *Schweinfurth s.n.* (B, BR, type of *Aegilops kotschyi* var. *palaestina*); Bahiq ridge, *Simpson 3274* (CAIM); Wadi Tawawiya, near Mersa Matrouh, *Simpson 4575* (B, CAIM); Wadi El Amih, *Simpson 2503* (CAIM, K); 180 km W Cairo towards Alexandria, *Täckholm & al. s.n.* (CAI, LD, MO, U, ULT); fields around Ikingi – Mariut, *Täckholm & al. s.n.* (CAI); Burg El Arab to El Alamein, *Täckholm & al. s.n.* (BR, CAI, K); Saniet Hagg Ayyad, Wadi Habs, Mersa Matrouh to Agiba, *Täckholm & al. s.n.* (CAI); Mersa Matrouh to El Kasr, *van Slageren & al. MSBHSS-89007H* (ICARDA); Psamalah, E Mersa Matrouh, *van Slageren & al. MSBHSS-89039H* (ICARDA); Sinai, W El Rafah, *van Slageren & al. MSBHSS-89062H* (ICARDA, WAG); E Maratia, nr. El Alamein; *van Slageren & al. MSBHSS-89046H, 89047H* (ICARDA); 60 km S Alexandria from Cairo, *Wanntorp & Sjödin 2092* (K); 30 km from El Noubaria, *Wisse & Nabih 3373* (CAIM).

LIBYA: Wadi El Kuf, E Benghazi, *Basin Brahim-Basha s.n.* (ACSAD 131); Wadi Derna, *Boulos 2443* (CAI); Garian to Yefren, *Boulos 3026* (CAI); E Tripoli near seashore, *Boulos & al. 1596* (CAI); Tamini to Omm Rezem, *Davis 50332* (E, K, RNG); S Nalut to Ghadamus, *Faruqi 1419* (ULT); Marmarica, El Omaied, foot Jebl Chasm-el-Aish, *Gauba s.n.* (W); just S Agadabia, *Guichard CYR/63/58* (BM); Tripolitania, at Aras Philaenorum, *Maire & Weiller 1639* (MPU, type of *Aegilops kotschyi* var. *palaestina* forma *nuda*); 52 km from Magroun (= Al Maqrun, S Benghasi), *Maire & Weiller 1641* (MPU); Driana (= Daryanah), *Maire & Weiller 1638* (MPU); Ghemines, *Maire & Weiller 1640* (MPU); Sidi Bu Amud, Tobruq to Bardiyah, *Pampanini 188* (G); Qaminis, S Benghasi, *Ramadan & al. 412/Z* (ULT); Benghasi to Agedabia, *Rohlfs s.n.* (P, type of *Aegilops kotschyi* var. *palaestina*); Cyrenaica, Benghasi, *Ruhmer 399* (E, G, LD, LE, Z, type of *Aegilops kotschyi* var. *palaestina*), *s.n.* (BR, JE, P, Z, type of *Aegilops kotschyi* var. *palaestina*); Marmarica, Mirsa Badia, *Schweinfurth & Riva 139* (G, K); Benghasi, 40 mi. from Agadabia on Gâlo track, *Simpson 39095, 39460* (BM).

TUNISIA: Tunis, *Kralik s.n.* (LE, type of *Aegilops kotschyi* var. *palaestina*); Oued Oumm ed Dzenar, *Letourneux s.n.* (P); Beger, Gabès to Matmata, *Maire & Weiller s.n.* (MPU); Jebl Aziza, *Murbeck s.n.* (LD).

ASIA: AFGHANISTAN: Herat, *Köie 4249* (BM, C); Gholrondi, W Charikhar, *Podlech 10881* (K); Mazar-i-Sharif, W Shibaghlu, 34 km E Tash Kurgan, *Rechinger 34289* (G); Sarobi, *Volk 1864* (US).

IRAN: Lorestan, Pusht-i Kuh, Halat-e Mehran, *Behbudi 219, 223* (US); Khalij-e Fars, Bushir to Bandar Lengeh, SE Kangan, *Bokhari & Wendelbo 127* (LE); Bandar Abbas, *Cherbjanovsky s.n.* (LE); SE Bashi, S Bushir, *Davis & Bokhari 56531* (E, K, MO); SSE Khormuj, *Davis & Bokhari 55997* (E, K, MO); Kermanshah, Thassr Shirine, *Farakbakhsh 8017E* (K); 25 mi. N Ahwaz, *Gentry 14600* (UCR, US); E Kazerun to Shiraz, *Gentry 14680* (US); 13 mi. W Shiraz, *Gentry 15016* (UCR); Takht-e Jamshid, *Gentry 14953* (UCR, US); 50 mi. N Ahwaz, *Gentry 14627* (UCR, US), *14628* (UCR); W Lorestan, Ilam, *Jacobs 6269* (L); Shaban, Bakhtiari, *Koelz 14996* (US); 60 km NE Dezful, *Köie 299* (LE); Bushir, *Köie 212* (C, LE); Sabst-Bushom, near Shiraz, *Kotschy 366a* (BM, C, E, FI, G, G-BOIS, K, LE, OXF, P, PI, PRC, TUB, type of *Aegilops kotschyi*); foot of Mt. Sabst-Bushom, near Shiraz, *Kotschy 366* (BM, G, G-BOIS, W); Sabst-Bushom, near Shiraz, *Kotschy 1003* (G-BOIS); near Dalechi, *Kotschy 152* (BM, G, LE, MO, P); Gilan prov., above lake Manjil, *Lamond 2859* (E); Khamseh, Manjil to Zanjan, W Tashvir, *Lamond & Transhahr 3451* (E); Kerman prov., Rouchoun hills, Khabr-va-Rouchoun, *Parris 75.593* (E); Kerman prov., S Deh Bakri, *Parris 75.239* (E); prov. Fars, near Mián Jangal, *Soják 5113* (PR); Komaridj, *Stapf 775* (K); Kermanshah, Mehran Massour-Abed, *Vakilian 9023E* (K).

IRAQ: SE Zerbatiya, *Al-Kaisi & Al-Khayat 50635* (K); Shbaichan, 90 km N Rawah, *Alizzi 31973* (K); WNW Um Qasr, *Alizzi & Omar 35007* (K), *Alizzi 34362* (K); 18 km W Al-Khumran, *Alizzi & Husain 33786* (K, US); Khder Alma, *Alizzi 32709* (K); 12 km W Ukhaidir, *Al-Rawi 30838* (K); 190 km NW Ramadi on Ramadi – Rutbah road, *Al-Rawi 20903* (K); Jiraibiyat, 24 km from neutral zone, *Al-Rawi & al. 29160* (K); Khadar-al-Mai, *Al-Rawi & al. 29103* (K); Chlat, near Iranian border, *Al-Rawi & Haddad 25737* (K); 7 km NE Kirkuk, *Al-Rawi & al. 27896* (K); Haditba, on the Euphrates, *Al-Rawi 5762* (K); Udain, Ghurfa, 5 km from Bagdad – Kirkuk road, *Al-Shehbaz & Al-Mousawi s.n.* (A, BUA); S slope Jebl Sanam, *Al-Shehbaz & al. s.n.* (LE); Mosul, Qdiyarah, *Bayliss 98* (K); Jebl Hamrin, *Bornmüller 1904* (B, G, JE, US, type of *Aegilops triuncialis* var. *leptostachya*); 70 km NW Falluya, near Thirthar, *Chakrabarty & Al-Rawi 30420* (K); Hawran wadi, *Chakrabarty & al. 31706* (K); W Falluja, *Chakrabarty & Al-Rawi 30312* (K); Jebl Makhul, near Baiji, *Evans & Guest 13228* (K); E Hit, *Gillett*

6832 (K); Baghdad reg., S Baiji, *Gillett 10708* (K); Rawah, *Gillett & Al-Rawi 6988* (K); Iranian border, E Zerbatiya, *Gillett 6695* (K); Jebl Al-Muwaila, E Jebl Hamrin, N Amara, near Kuwayt, *Guest & al. 17551* (K); Jumaima, 140 km SW Salman, *Guest & al. 19115* (K); WNW Um Qasr, *Guest & al. 16922* (K); 23 km SE Zubair, *Guest & al. 16846* (K); 35 km SE Shabicha, *Guest & al. 14071* (K); Al-Batin, 65 km SW Basra, *Guest & al. 17052* (K); Jarmo, *Helbaek 1041, 1042, 1045, 1047, 1049* (C), *706, 1038, 1071, 1127* (K); desert of Sinjar, ruins of Al Hadhv, *Loftus 9* (BM); near Darognah, N Kifri, *Moore 656* (K); 100 km Romaidi to Rutbah, *Omar & Hassid 36735* (K); Wadi Al Ahmar, She Wa Sure, *Omar & al. 37098* (C); Sudur, *Omar & al. 44310* (K); Qaraghan, *Rogers 0141, H2333* (K); N Saadiya, *Tahir & Al-Kaisi 42579* (K); Kuwait border, Shakraban, *Wheeler Haines W924* (E, K); Khanaquin, *Wheeler Haines s.n.* (E); Sersang, *Wheeler Haines W575* (E).

JORDAN: Shoubak, *Abdel-Karim & Al-Qaran 2333* (Yarmouk, K); Al Jubaiha, University Campus, *Al-Eisawi 1439* (BM); Midway Zarqa – Azraq road, *Boulos & al. 7109* (BM, K); Qatrana to Jurf el Darawish, *Boulos & Wallad 7833* (E); Petra to Wadi Rum, *Davis 9069* (K); Zarqa Maîn to Jebl Attaru, *Davis 9388* (K, E); Wadi Rum, *Davis 8942* (E, K); Rashadiyah, *Park s.n.* (G); Moab reg., ascent to Aynn Musa, *Post s.n.* (BEI); Surra, near Mafraq, *Semple 45* (US); Jöduda, S Amman, *Semple 83* (US); E Um Qeis, *Täckholm & al. 8827* (CAI); Jarash, SE Tumeira on road Irbid – Bal'ama, *van Slageren & Jaradat MSAJ-88013H* (ICARDA, WAG); Madaba, Dab'a, on Desert Highway, *van Slageren & Jaradat MSAJ-88073H* (ICARDA); Mafraq, W El Buweida, *van Slageren & Jaradat MSAJ-88002H* (ICARDA); Mafraq, close to Khanarira, *van Slageren & Jaradat MSAJ-88005H* (ICARDA, WAG); Mafraq, Al Lakeidir, near Syrian border, *van Slageren & Jaradat MSAJ-88037H* (ICARDA); Tafila, E Rashadiya, *van Slageren & Jaradat MSAJ-88075H* (ICARDA); near Amman, *Vavilov 29508* (WIR 1409).

KUWAIT: Al Khiran, *Al-Rawi 11637* (KTUH, RNG); Al Zot, near Mira Sand, *Al-Rawi & al. 10559* (KTUH, RNG); Al-Subiyah, *Al-Rawi & El-Kholy 12297* (KTUH, RNG); Al Khiran, *Al-Rawi 11673* (E); Al-Subiyah, facing Bubyan island, *Boulos 15478* (E, KTUH); Arafjan, *Dickson 241* (K); Ahmadi, at golf course, *Green & al. 11* (ACSAD 2035, E, K).

LEBANON: Tripoli, *Blanche 402* (G-BOIS, LE); Chouf Mts., *Mouterde 7832* (G); Ras Cheqqa, *Mouterde 10518* (G).

PALESTINE: Hau el Hatrura, *Aaronsohn 669* (MPU); Jerusalem to Jericho, *Barbey 939* (G, MPU, Z); Jericho, *Bornmüller 1737* (G, JE, K, LE); near Beersheba, *Eig s.n.* (L, WIR 1408); C Negeb, Sde Boger, S Beersheba, *Kramer 6725* (Z); Wadi El Kefrein, *Meyers & Dinsmore 2724* (K, L); Wadi Al Quelt, *Musselman 10194* (CAI, E); Maz Saba, *Musselman 10110* (E); Mt. Scopus, near Jerusalem, *Samuelsson 606* (B, BM, C, K, LD, MO, NY); Khan Yunis, *Shabetai Z 2211* (CAIM); Beersheba to Hebron, *Vavilov 29500* (WIR 1413); Negeb, near Revivim, *Yaffe s.n.* (C); Khirbeth el Mankushiye, NW Mitripe-Shalem, *Zohary 1183* (Z); SE Tekoa, *Zohary s.n.* (Z); Gilat, northern Negeb, *Zohary s.n.* (UCR); Negeb, Qurnub, *Zohary & d'Angelis 592* (B, BC, BM, BR, C, CYP, E, ERE, FI, G, K, L, LD, LE, HUJ, MO, NY, OXF, PI, PRC, RAB, SO, SOM, U, US, W, WAG, Z).

SAUDI ARABIA: Umm Figra, 50 km W Medinah, at Al Tawr, *Collenette 7088* (E, K); NE Zubriah camp, 100 km N Gila (Giba), *Collenette 5063* (E, K, RIY); Turayf camp, *Collenette 4267* (E, K, RIY 12422); Huraima, 100 km NNW Riyadh, *Collenette 7427* (K); Eastern Province, WSW Umm 'Ushar, *Mandaville jr. 3874* (BM); Eastern coast, Damman – Khafji road, *Migahid & El-Sheikh 459-a* (CAI).

SYRIA: Palmyra, Dawara Mt., *Ismail il-Chaikh s.n.* (ACSAD 2435); near Aleppo, *Kotschy 176b, 280* (TUB); Rasafa, *Fre. Louis s.n.* (ex hb. Gombault 6294) (P); El Qaryatayn, *Mouterde 3867* (G); Chahba, *Mouterde 7323* (G); Kfar Chima, *Mouterde 5251* (G); SE Damascus, Jeramana, Ghouta, *Pabot s.n.* (G); Qtaife, *Pabot s.n.* (G); Palmyra to Arak, *Pabot s.n.* (G); NE Jebl Bishri, *Pabot s.n.* (G); near Roda, south Jezira, *Pabot s.n.* (G); Jebl Qassyoun, *Pabot s.n.* (G); Jebl Abou-el-Aata, N Damascus, *Pabot s.n.* (G); Qasr Rhabarel, Soukhni to Deir-ez-Zor, *Pabot s.n.* (G); Qatana to Assem Foka, *Samuelsson 4888* (BM); Antilebanon Mts., W Damascus, *Rechinger 13152* (B, E); Hassake, N Jebl Abd-el-Aziz, coming from Tall Tamr, *van Slageren & Sweid MSFS-91029H* (ICARDA); Damascus, Maalula to Yabroud, *van Slageren & Mir-Ali MSGM-88107H* (ICARDA).

TURKEY: Hatay, Antakya, *Davis & Hedge 27243* (E); Urfa, *Haussknecht s.n.* (K); Kiremithaneler, S Antalya, *Hennipman & al. 574* (K); Içel, E Mersin, *Hennipman 1181* (K, L, WAG); Cilicia, near Mersin, *Zhukovsky s.n.* (WIR 1404).

TURKMENISTAN: Badghis, S Aper-Chechme, *Belolov s.n.* (ASH); Karabil, Tek-Tek, near frontier, *Berdyev s.n.* (ASH); Karabil, Poskrepka, *Berdyev s.n.* (ASH); Badghis, Kizyl-Dagar, *Nichajeva &*

Michelson s.n. (ASH); Serach reg., W Pul-i-Chatum, *Timochenko s.n.* (ASH); Ata-Murat, near Tachta-Bazar, *s.coll., s.n.* (TASH).

UZBEKISTAN: Bukhara, SE Kokaite, *Kudrjaschev s.n.* (TASH); SE Kara-Kuli, N Biash-Azhi, *Mosolov s.n.* (ASH).

EUROPE: AZERBAIJAN: Sumgait reg., river Sumgait-Chai, *Alexeenko 1254* (LE); Swatoï island in Caspian sea, *Becker s.n.* (LE, LY, type of *Aegilops glabriglumis*); near Baku, *Bornmüller 8460* (B); Baku distr., Goerden, *Grossheim s.n.* (BM, ERE); Baku, Kischly, *Holmberg 235* (LD); Baku, Sikh, *Holmberg 464* (LD); Baku, Achmedlu, *Holmberg 627* (LD); Baku, Tcherny Yorod, *Holmberg 123* (LD); Apcheron pen., Shureljany vill., *Karjagin s.n.* (LE); Baku, *Kuntze s.n.* (NY, type of *Triticum ovatum* var. *bispiculatum*); Mardakyan, *Nielsen s.n.* (GAT cult.); Baku, Saljany, Mil steppe, Kjabirly to Shor-Gel, *Prilipko s.n.* (LD).

CYPRUS: Dhekelia, *Merton 2664* (K).

Germplasm collections examined:

AFRICA: EGYPT: 60 km E Mersa Matrouh, *van Slageren & al. MSBHSS-89045* (ARCG, ICARDA); W Rafah, *van Slageren & al. MSBHSS-89062* (ARCG, ICARDA).

LIBYA: Jebl Ahdar, 20 km E Derna, W Om Erzin, *van Slageren & Zentani MSAZ-90051* (ARC, ICARDA).

ASIA: JORDAN: S Amman towards Aqaba, at Jiza, *Bourgois SY-20245* (IPGRI, ICARDA); Ma'an to Petra, *Bourgois SY-20260* (IPGRI, ICARDA); Ifjetj, near Shoubak, *van Slageren & Jaradat MSAJ-88079* (ICARDA, JUST); Jarash, SE Tumeira on Irbid – Bal'ama road, *van Slageren & Jaradat MSAJ-88013a* (ICARDA, JUST); Khuf es Samra, Mafraq – Zarqa road, *van Slageren & Jaradat MSAJ-88021* (ICARDA, JUST); Salt, Es Selibi to Um Ed-Dananir, *van Slageren & al. MSBHAJ-88183* (ICARDA, JUST); Ma'an, Humaima, road Ras en Naqb – Quweira, *van Slageren & al. MSBHAJ-88183* (ICARDA, JUST).

SYRIA: Aleppo, near Khan Asser, coming from Sfireh, *Bourgois SY-20144* (IPGRI, ICARDA); Homs, Awajan, N Domeir, *Humeid & Hamran BM-3-a* (ICARDA); Sweida, Srura to Roddaime, *van Slageren & Mir-Ali MSGM-88088* (ICARDA, SARD); Maaloula to Yabroud, *van Slageren & Mir-Ali MSGM-88107* (ICARDA, SARD).

Notes: 1. Boissier (1846: 129) cites two collections from Kotschy (nos. 366a and 1003) with his newly described *Aegilops kotschyi*, but in his *Flora orientalis* (1884: 674) only no. 366a in connection with this taxon, which he transferred to a variety under *Ae. triuncialis*. In addition, his herbarium indicates only no. 366a as 'Typus', hence my designation of this collection as the lectotype.

2. *Ae. peregrina* may be confused with *Ae. kotschyi* to the extent that they are presented as a 'species pair' (Witcombe, 1983: 3). Their distinction is indeed somewhat tenuous. The suggestion of separate habitats (*kotschyi* being the 'more arid' species, cf., Zohary & Feldman, 1962: 56) is balanced by the same authors through their report of joint occurrence in southern Palestine. In addition, comparison of Figs. 49 (*kotschyi*) and 58 (*peregina* var. *peregrina*) shows distinct sympatric distribution in Jordan and southern Syria. Admittedly, *Ae. kotschyi* is, however, a more continental, and *Ae. peregrina* a more coastal species. Both species have a clear parallel and protruding glume venation in common, as is shown in Figs. 48-5a and 57-6 and 8. Differences appear at best when comparing living or herbarium material, and are keyed out as follows:

One glume of the lowest fertile spikelet with 3 awns that are equally wide at the base (*Fig. 57-6*), one with only 2 awns that are unequally wide at the base (*Fig. 57-8*); – spike stout, with an 'irregular' appearance, caused by variation in glume and lemma awn development (*Fig. 57-2*); glume awns 2-4 cm; lemmas with 1 or

2 awns of 0.3-3 cm (always shorter than the glume awns) and 1 or 2 teeth .... **peregrina**

Both glumes of the lowest fertile spikelet always with 3 awns that are equally wide at the base (*Fig. 48-5, 5a*); – spike with a slender, 'regular' appearance, caused by the awns of all glumes and lemmas being more or less equally long (*Fig. 48-1, 2*) .... **kotschyi**

10.11 **Aegilops longissima** Schweinf. & Muschl. **Figs. 51-52**

Aegilops longissima Schweinf. & Muschl. in Muschler, Man. fl. Egypt 1: 156 (1912); Eig, Sec. contr. fl. Pal., P.Z.E. Inst. Agric. Nat. Hist., Bull. 6: 73 (1927, re-description), Feddes Repert., Beih. 55: 79 (1929a); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 455, 542 (1928); Post, Fl. Syria (ed. 2) 2: 788 (1933); Oppenheimer & Evenari, Florul. Cisiord. 170 (1941); Täckholm et al., Fl. Egypt 1: 269 (1941); Chennaveeraiah, Proc. summer school bot., Darjeeling 46 (1962; with ssp. *longissima* next to the other ssp., *sharonensis*; see at 10.15, note 1); Mouterde, Nouv. Fl. Liban, Syrie 1: 152 (1966); Täckholm, Students' Fl. Egypt (ed. 2) 702 (1974); Hammer, Feddes Repert. 91: 231 (1980b, as spp. *longissima*); Feinbrun-Dothan, Fl. Pal. 4: 171 (1986).

Lectotype (*nov.*): Egypt, Mariut-Mergheb, Abd el Qader, bei Alexandria, an Ackerrändern, 30.IV.1903, *Schweinfurth s.n.* (B; isolectotypes: CAIM, MPU, US). See note 1.

Homotypic synonyms:

Triticum longissimum (Schweinf. & Muschl.) Bowden, Can. J. Bot. 37: 666 (1959), Can. J. Gen. Cyt. 8: 133 (1966); Chennaveeraiah, Acta Horti Gotoburg. 23: 163 (1960, with ssp. *longissimum*); Morris & Sears in Quisenberry & Reitz, Wheat and Wheat Improvement 20 (1967; includes the species: '*Ae. longissima* S. & M. + *Ae. sharonensis* Eig'); Feldman & Sears, Sci. Am. 224: 102 (1981); Kimber & Feldman, Wild Wheat 32 (1987).

Sitopsis longissima (Schweinf. & Muschl.) Á.Löve, Feddes Repert. 95: 492 (1984).

Heterotypic synonyms:

Ae. longissima Schweinf. & Muschl. ssp. *suprahians* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 543 (1928), **syn. nov.** – Type: not indicated.

Ae. longissima Schweinf. & Muschl. [ssp. *suprahians* Zhuk.] var. *solaris* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 544 (1928), **syn. nov.** – Syntypes: Palestine, Hedera, *Vavilov s.n.* (WIR?, not found); Palestine, Rafah, *Vavilov s.n.* (WIR?, not found).

Diagnostic characters: tall, slender, erect culms, (30-)40-70 cm tall excluding spikes; spikes narrowly cylindrical, 10-20 cm long excluding awns, with 8-17 spikelets, rudimentary spikelets absent, rarely 1-2; lateral glume apex bidentate with hyaline depression in between; lemmas exserting glumes more than 1/3 of their length, lower ones of apical spikelets extending into a awn, 6-13 cm long, diverging, triangular in cross section at the base, with 2 lateral teeth at the base, up to 6 mm long; caryopsis adherent.

Description (Fig. 51): slender, tall *annuals* (*Fig. 51-1*) with usually a few tillers only. *Culms* erect, (30-)40-70 cm tall excluding spikes; foliage sparse, mainly at base of culms. *Leaf* blades linear-accuminate, 6-12 cm long, 0.3-0.5 cm wide; margins of sheaths hyaline, ciliate. *Inflorescence* (*Fig. 51-2*) a narrowly cylindrical spike, only slightly tapering in the basal and apical parts, 10-20 cm long excluding awns, 0.2-0.3 cm wide, disarticulating as one unit at maturity with the rudimentary or a few lower, fertile spikelets remaining attached to the culm; with 8-17 spikelets, usually without rudimentary spikelets but rarely 1(-2) developed. *Spikelets* (*Fig.*

51-2a) sessile, 0.9-1.5 cm long, narrowly ellipsoid, somewhat laterally compressed, 0.6 times the length of the rachis internode as base of spike, increasing to 1.4 times in centre of spike, then decreasing to around 0.8 times at spike apex; with 3-5 florets, the lower 2-3 fertile. *Glumes* (*Fig. 51-8, 9*) 2, coriaceous, the lateral margins hyaline, narrowly elliptical, green to purplish-green, 6-8 mm long, the surface scabrous to setose, the apex with 2 sharp teeth, the adaxial one somewhat stronger developed, especially in the basal part of the spike, the depression between the teeth hyaline; the apical glumes narrowly ovate-elliptical, typically one glume with the apex acute to apiculate, the other glume with the central vein extending into a short, setulose awn, flanked by 2 lateral teeth; venation sunk into the surface (but often appearing as elevated upon maturity), unequally spaced and unequal in width, usually more yellowish and lighter in colour than the rest of the glume surface. *Lemmas* (*Fig. 51-6*) of fertile florets narrowly elliptical, 9-12 mm long, exserting the glumes for more than 1/3 of their length, boat-shaped, the apical part in lateral spikelets conduplicate and keeled; the apex with 1-2 small, sharply acute teeth of uneven size, outer surface of apical and upper-lateral regions as of the glumes; apex of lower lemmas in apical spikelet (*Fig. 51-10, 11*) flat, extending into a long, setulose awn, 6-13 cm long, diverging, in each of the fertile apical florets of equal length, flanked by slender, setulose, lateral teeth that may develop in short awns of up to 6 mm long, awns triangular in cross section at the base; apex of lemma of third floret in the apical spikelet sharply acute, extending in a short to long awn of 0.8-2.5(-7.5) cm; inner surface of apical regions in all lemmas velutinous (*Fig. 51-11*). *Paleas* (*Fig. 51-7*) narrowly elliptical, with 2 sharp, setose keels, each ending in a sharply acute apex. *Caryopsis* (*Fig. 51-12*) 5-6 mm long, adherent to lemma and palea.

Distribution (Fig. 52): a Mediterranean / Saharo-Arabian element occurring in coastal Egypt, Palestine, and northwestern Jordan. Uncommon in Palestine to rare elsewhere. Sympatric with most species of the section *Sitopsis* (only *Ae. speltoides* excepted, see Chapter 6.1.3 and Fig. 12).

Ecology: on light sandy soils and sandstones. Present in (siliceous) sandy fields and sandstone hills of the Palestinian coastal plain and on Nubian sandstone in Jordan (Eig, 1927: 74). Ankory & Zohary (1962: 314-315) mention calcareous sandstone and somewhat silty and poorly drained sandy loams as soil types, and edges of cultivation and roadsides as habitats where *Ae. longissima* can be found in Palestine, often together with the related *Ae. sharonensis*. In Jordan the species was recently found on limestone with Mediterranean terra rosa in the undergrowth of a *Pinus* forest. It is also known from dry grasslands and abandoned fields. Rarely on

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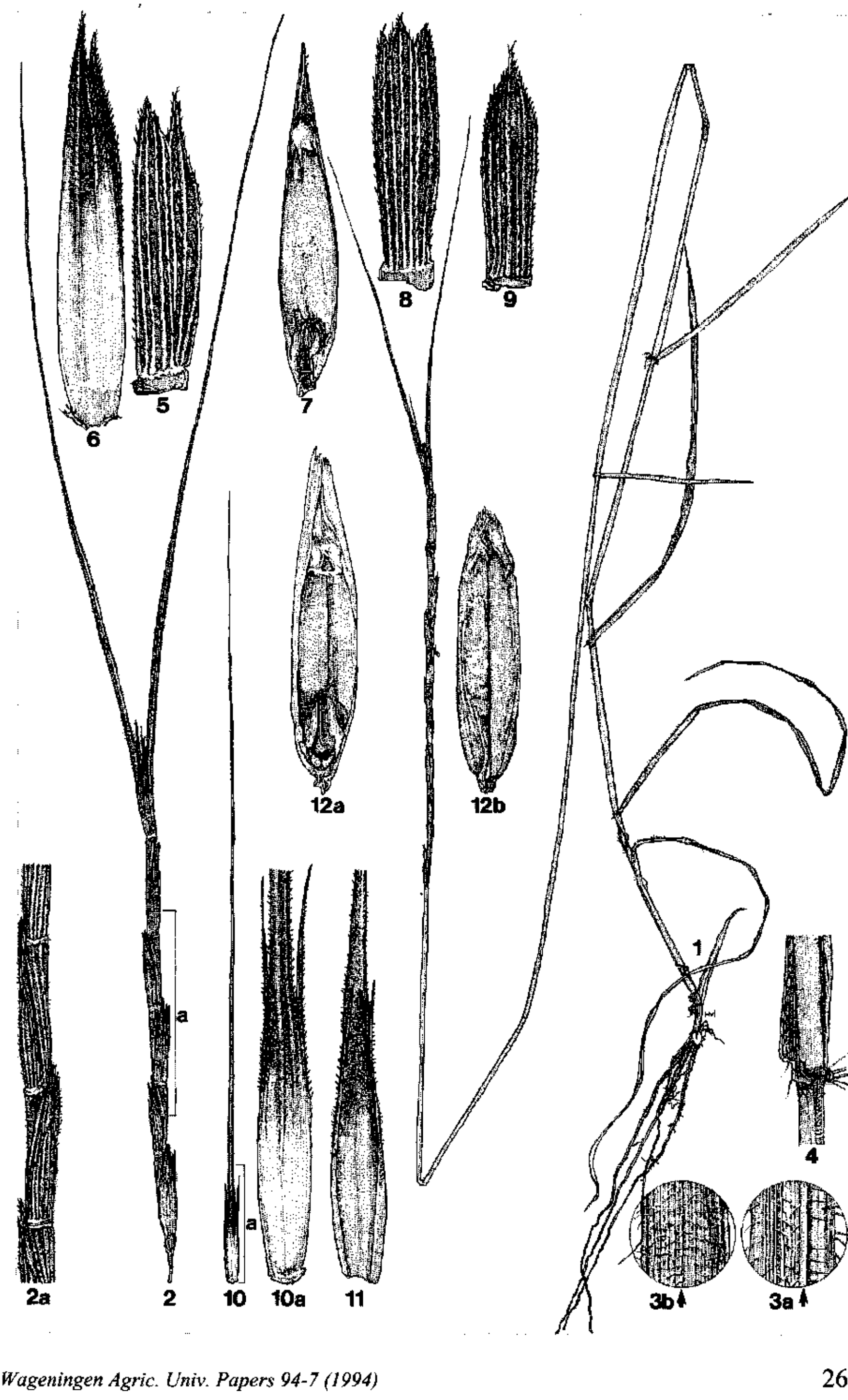
Fig. 51. *Aegilops longissima*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlarged part of spike, showing spikelets in situ (x 2); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 3a (x 5); 4, stem, leaf sheath, ears and leaf blade (x 2); 5-7, lower floret of spikelet in centre of spike: 5, glume, 6, lemma, 7, palea with mature seed (5-7 all x 5); 8-12, apical spikelet of a spike: 8-9, glumes (both x 5), 10, lemma of lower floret (x 1), 10a, enlargement of lower part of 10 (x 4), 11, inner view of lemma at base of awns, showing hairy surface (x 4), 12a, palea and mature seed in lower floret (seed probably turned around during preparation) (x 5), 12b, ventral surface of mature seed (x 5). (1-12. *van Slageren & Shibli MSRS-88049H*).


6
5
7
8
9
12a
12b
a
a
1
4
2a
2
10
10a
11
3b
3a

more heavy soil types. Similar to other species of the *Sitopsis* section (*Ae. bicornis, Ae. searsii*) possessing good drought tolerance as collated data on annual rainfall varied only from 250 to 400 mm.

Altitude: from -200 m (Wadi El Kefrein, near the Dead Sea, Palestine) up to 100 m. In Jordan found at 400-600 m.

Flowering and fruiting time: April – June.

Genome: S^l with 2x = 2n = 14 (Chennaveeraiah, 1960: 90; Waines & Barnhart, 1992: Table 1).

Etymology: the final epithet is derived from the Latin 'longissimus' [= very long], a reference to the spike (and whole plant) outline.

Most of the 84 herbarium specimens examined:

AFRICA: EGYPT: Mariut-Merzgheb, Alexandria, *Muschler 408a* (BR, G, LY); Mariut-Merzgheb, Abd el Qadar, Alexandria, *Schweinfurth s.n.* (B, CAIM, MPU, US, type of *Aegilops longissima*); Merzgheb, SW Mariut, *Schweinfurth s.n.* (BR); Khan Younis, *Shabetai 46* (K); Abd el Qader, *Simpson 4750* (CAIM, K); Burg el Arab, *Simpson 3323* (CAIM, K).

ASIA: JORDAN: E Dead Sea to Amman, *Bot. Exp. Univ. Kyoto BMUK 5752* (UCR); Jordan river basin (Amman – Salt – Dead Sea), *Bot. Exp. Univ. Kyoto BMUK 5754* (UCR); Moab reg., ascent to Aynn Musa, *Post s.n.* (BEI); Jarash, near Dibbin, *van Slageren & Humeid MSBH-88145H* (ICARDA, WAG); Mafraq, NW Es-Sukha, *van Slageren & Shibli MSRS-88049H* (ICARDA, WAG).

PALESTINE: Sharon, Kfar Malal, *Abraham s.n.* (K); Jaffa, *Bornmüller 1742* (B, G, JE, K, LE, P, W); Acre, *de Labillardière s.n.* (G); ibid., *Peyron s.n.* (G, voucher of *Aegilops palaestina*); Ramath-Gan, near Tel-Aviv, *Eig & Zohary 26* (A, B, BC, BEI, BM, C, E, ERE, FI, G, HUJ, GAT, K, LE, MPU, P, PR, PRC, RAB, RNG, US, W, Z); Hedera, *Jofé & Aaronsohn 337* (MPU); Gilat, N Beersheba, northern Negeb, *Johnson & Hall s.n.* (UCR); Sharon plain, N Raanana, *Johnson & Hall s.n.* (UCR); Evenyehuda, *Johnson & Hall s.n.* (UCR); SE Rehovoth, *Johnson & Hall s.n.* (UCR); N Beersheba, *Johnson & Hall s.n.* (UCR); entrance to Ashquelon, *Johnson & Hall s.n.* (UCR); Wadi El Kefrein, *Meyers & Dinsmore 7270* (G, K, L, Z); Jaffa, near Beil Dadjan, *Samuelsson 734* (B, K, LD); Haifa, *Samuelsson 1032* (B); Sharon, Netanja, *Wängsjö 1609* (LD); Herzliah, N of Tel-Aviv, *Zohary s.n.* (K); Distr. Lakish, near Gat, *Zohary s.n.* (Z); Sharon plain, Benjamina, *Zohary s.n.* (L).

Notes: 1. Muschler (1912: 157) does not cite collectors, only a site location (Mariut-Mergheb). Two collections from this site appeared as syntypes: *Muschler 408a* with date 28.II.1903 and '*Aegilops longissima* Schweinf. spec. nov.' on the specimen in BR, and *Schweinfurth s.n.* with date 30 April 1903, together with a second sheet, which carries a reference to place and page of publication of the species. Both Schweinfurth sheets in B are annotated by Bowden as 'syntype'. In view of this annotation I have chosen the *Schweinfurth* collection as the lectotype.

2. Natural hybridisation of *Ae. longissima* with *Ae. bicornis* may have raised *Ae. sharonensis* on the Sharon plain in Palestine, but independent evolution of the latter species is also suggested (Waines et al., 1982).

3. *Aegilops longissima* is rather similar to the allopatric *Ae. searsii*. Differences are presented in the following key:

Culms (30-)40-70 cm excluding spikes (*Fig. 51-1*); apical spikelet with 2 fertile and 2 sterile florets, lemmas of fertile florets both extending into an equally long awn of 6-13 cm, each with 2 slender, up to 6 mm long, aristulate lateral teeth at the base (*Fig. 51-10*); – spike 10-20 cm long excluding awns, with 8-17 spikelets (*Fig. 51-2*); glumes of apical spikelets typically with one having an acute to

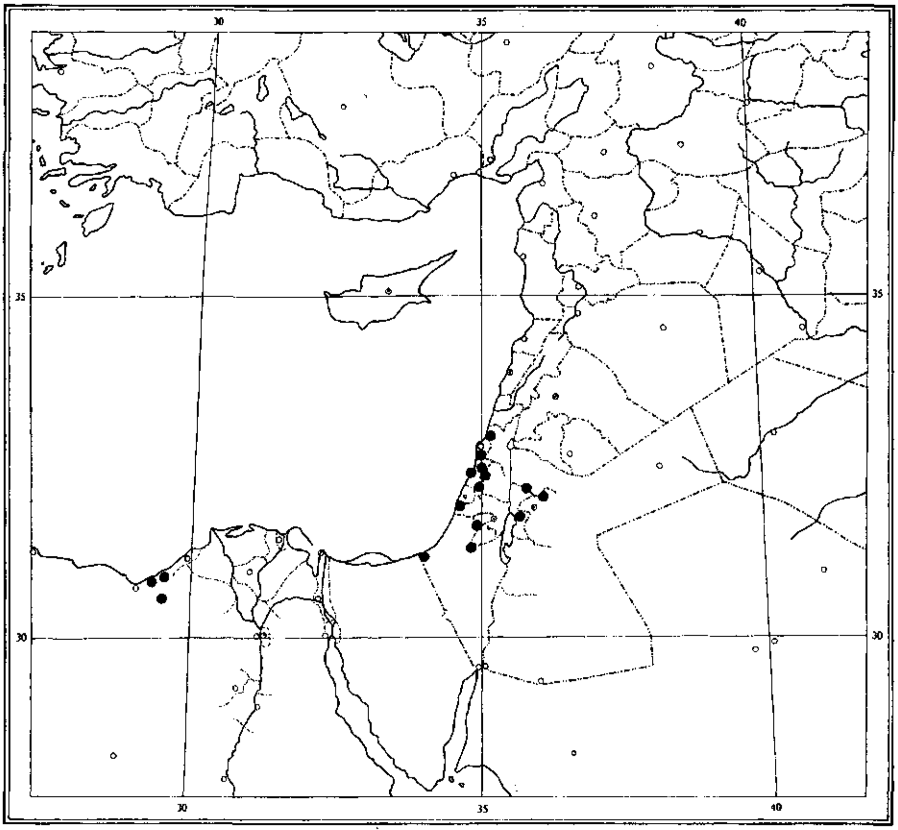


Fig. 52. Distribution of *Aegilops longissima* in the eastern Mediterranean.

apiculate apex, one with an apex showing a central, short awn and 2 lateral teeth (*Fig. 51-8, 9*) .... **longissima**

Culms (10-)15-35 cm excluding spikes (*Fig. 61-1*); apical spikelet with 1 fertile and 2 sterile florets, lemma of the fertile floret extending into a 5-13 cm long awn with 1-2 aristulate, up to 30 mm long, lateral teeth in the basal part (but *not* at the base) of the awn (*Fig. 61-11*), lemma of the lower sterile floret extending into a shorter, (0.5-)1.5-7 cm long awn, usually without lateral teeth (sometimes 1-2 aristulate teeth developed in the basal part) (*Fig. 61-9*), ratio between apical lemma awns varying from 10:1 to 9:5 (*Fig. 61-1*); – spike 6.5-13.5 cm long excluding awns, with 7-10(-14) spikelets (*Fig. 61-2*); glumes of apical spikelets typically one with 2 sharply acute teeth, one with a central, sharply acute tooth, developing into a short awn of up to 1 cm, flanked by 2 shorter, lateral teeth (*Fig. 61-8*) .... **searsii**

10.12 **Aegilops neglecta** Req. ex Bertol. **Figs. 38, 53-56**

Aegilops neglecta Req. ex Bertol., Fl. ital. 1: 787 (1834); Tenore, Fl. napol. 5: 287 (1835); Scholz, Liste Gräs. Libyens, Willdenowia 7: 435 (1974); Zangheri, Fl. ital. 1: 979 (1976); Kerguelen, Bull. Soc. bot. France 123: 318 (1976); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 202 (1980); Hammer, Feddes Repert. 91: 239 (1980b, with ssp. *neglecta* var. *neglecta*); Demiri, Fl. ekskur. shqip. (Albania) 80 (1981); Pignatti, Fl. italia 3: 542 (1982); Davis, Fl. Turkey 9: 244 (1985); Cope, Key Grasses Arab Penin., Arab J. Sci. Res., Spec. Publ. 1: 74 (1985); Thiébaud & Deschatres in Jeanmonod et al., Not. Fl. Corse, Candollea 41: 55 (1986); Talavera in Valdés et al., Fl. Vasc. Andal. Occ. 3: 376 (1987); Sherif & Siddiqi in El-Gadi, Fl. Libya 145: 105 (1988).

Type: (France) Avignon, misit *Requien*, 1833 (holo: BOLO-Bertoloni (Fl. ital.); iso: AV (not seen), MPU-Duval-Jouve). See Fig. 56 and note 1.

Homotypic synonym:

Triticum neglectum (Req. ex Bertol.) Greuter in Greuter & Rechinger, Boissiera 13: 171 (1967); Kimber & Feldman, Wild Wheat 52 (1987).

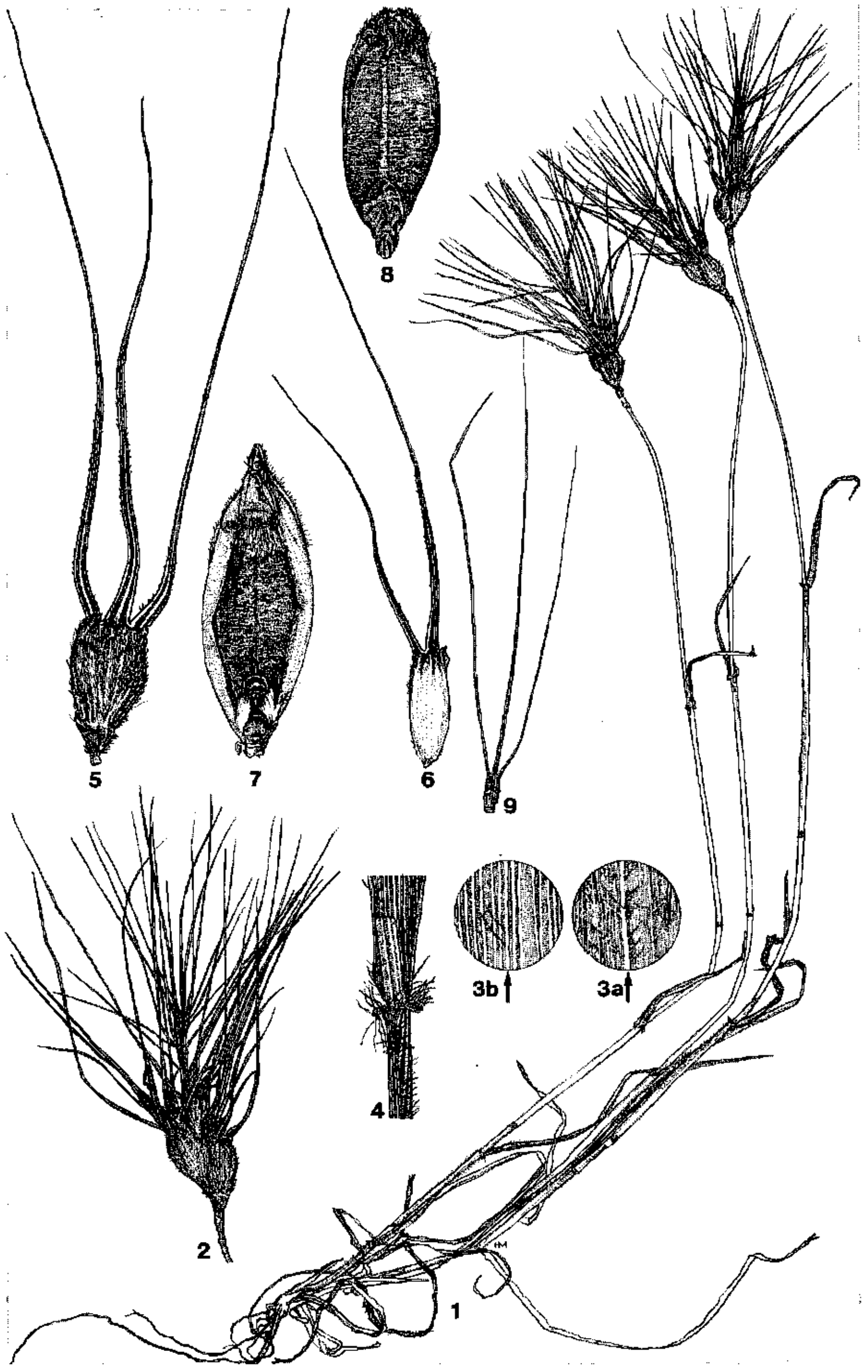
Heterotypic synonyms:

Ae. ovata L., Sp. pl. (ed. 1) 2: 1050 (1753), (ed. 2) 2: 1489 (1763) *pro parte*. – Type: the illustration presented at Tab. 1, fig. 2A, B, C. in Scheuchzer's (1719) *Agrostographia*. Designated by Greuter (in Greuter & Rechinger, 1967: 170). – Note: nomenclature and bibliography of the other part of *Ae. ovata* (*ovata sensu stricto*) is enumerated at 10.8, *Ae. geniculata*. See note 2.

Synonyms of *Ae. ovata* L. *pro parte*:

Ae. triaristata Willd., Sp. pl. (ed. 4) 4(2): 943 (1806); Marschall von Bieberstein, Fl. taur.-caucas. 1: 433 (1808); Roemer & Schultes, Syst. veg. 2: 771 (1817); Gussone, Pl. rar. 371 (1826); Reichenbach, Fl. germ. excurs. 1(1): 17 (1830); Chaubart & Bory de Saint-Vincent in Bory de Saint-Vincent, Exp. sci. Morée, Bot. 3(2): 45 (1832); Kunth, Enum. pl. 1: 458 (1833), Suppl. tomi primi 371 (1835); Mutel, Fl. franç. 4: 153 (1837), Atlas Tab. 92, fig. 646 (1837); Boissier, Voy. bot. Espagne 2: 682 (1844a); Grisebach in von Ledebour, Fl. ross. 4: 327 (1852); Lange, Pug. pl. hispan. 1: 56 (1860); Tchichatscheff, Asie min., Bot. 2: 582 (1860); Willkomm & Lange, Prod. fl. hispan. 1: 107 (1861); Schlosser von Klekovski & Vukotinovič, Fl. croat. 1295 (1869); del Amo y Mora, Fl. fan. Penins. Iberica 1: 254 (1871); Loret & Barrandon, Fl. Montpellier (ed. 1) 2: 770 (1876), (ed. 2) 577 (1886); Schlechtendal et al., Fl. Deutschl. ed. 5, vol. 8: 220 (1881); von Regel, Descriptiones plantarum novarum 8, Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 7: 577 (1881); Nyman, Consp. fl. eur. 4: 839 (1882), Suppl. 2: 342 (1890); Battandier & Trabut, Fl. Alger 107 (1884), Fl. Algérie 1(2): 241 (1895); Stapf, Beitr. Fl. Lycien 1: 5 (1885; err. as '*divaricata*', see note 3); Velenovský, Fl. bulg. 627 (1891); de Marchesetti, Fl. Trieste 656 (1897); Coste, Fl. descr. France 3: 658 (1906); Lázaro é Ibiza, Comp. fl. Españ. (ed. 2) 1: 658 (1906), (ed. 3) 2: 72 (1920); Fiori, Fl. Italia 4: 33 (1907); Koch, Syn. deut. schweiz. Fl. (ed. 3) 3: 2799 (1907); Albert & Jahandiez, Cat. pl. vasc. Var 561 (1908); Hegi, Ill. Fl. Mitt.-Eur. (ed. 1) 1: 390 (1908), (ed. 2) 1: 500 (1936); Lojacono, Fl. sicul. 3: 369 (1908-09); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 448, 475 (1928); Eig, Feddes Repert., Beih. 55: 138, 140 (1929a, with ssp. *typica* var. *vulgaris*); Pampanini, Prodr. fl. ciren. 135 (1930); Jansen & Wachter, Nederl. Kruidk. Arch. 145 (1931); Jahandiez & Maire, Cat. pl. Maroc 1: 89 (1931, with ssp. *typica* var. *vulgare*); Post, Fl. Syria (ed. 2) 2: 783 (1933); Nevski in Komarov, Fl. URSS 2: 674 (1934, Russian) / 537 (1963, English); Cadevall y Diars, Fl. Catalunya 6: 274 (1937); Kolakovski, Fl. Abkhazia 1: 183 (1938); Grossheim, Fl. Kavkaza (ed. 2) 1: 357 (1939), Opredelitel rastenich Kavkaza [Key to Caucasus plants] 719 (1949); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 766 (1943); Gismondi, Pros. fl. ligust. 154 (1950); Karjagin, Fl. Azerbaijana 1: 338 (1950); Jansen, Fl. neerl. 1(2): 124 (1951); Thiébaut, Fl. Lib.-Syr. 3: 318

Fig. 53. *Aegilops neglecta.* 1, habitus (x 1/2); 2, spike (x 1); 3a, abaxial surface of leaf, midway (x 5); 3b, adaxial surface of 3a (x 5); 4, stem, leaf sheath, ears and leaf blade (x 2); 5-7, lowest floret in lowest fertile spikelet: 5, glume (x 2), 6, lemma (x 2), 7, palea with mature seed (x 5); 8, ventral surface of mature seed (x 5); 9, glume of uppermost, sterile spikelet of a spike (x 2). (1-2, 5-7, 9. *Tüten & al. CNM-210689-0302H*; 3-4, 8. *Tüten & al. CNM-190689-0102*, cultivated at ICARDA from germplasm accession.)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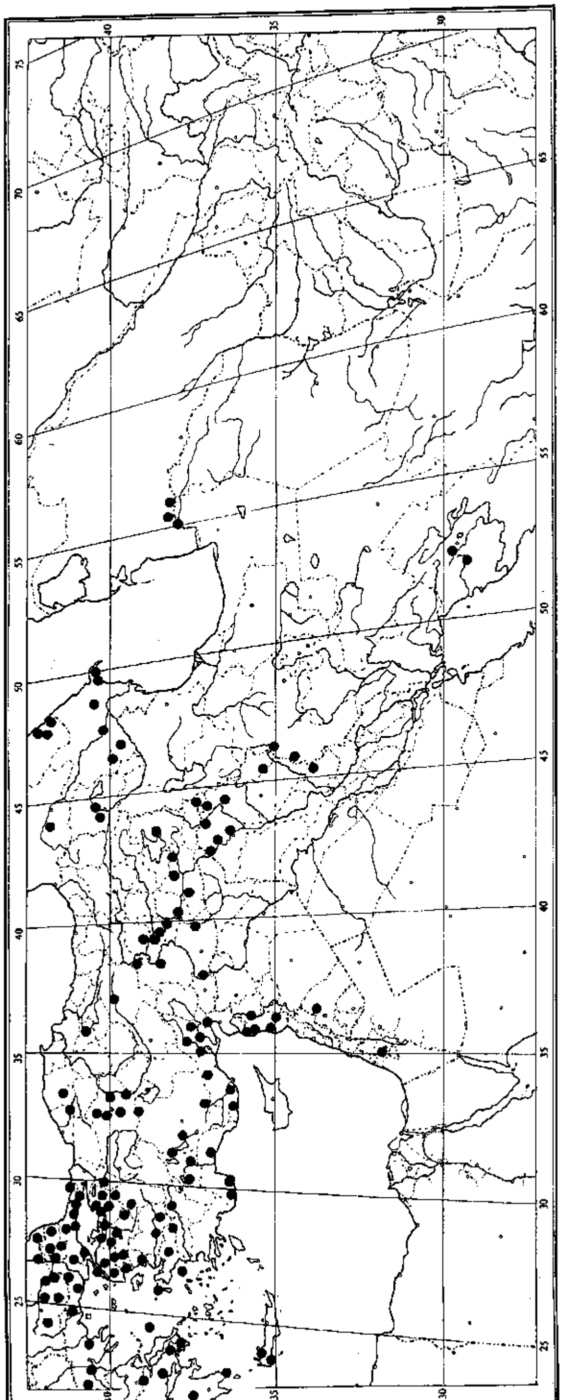

Fig. 54. Distribution of *Aegilops neglecta* in the eastern Mediterranean, the Caucasus and in central Asia.

(1953); Geideman, Opredelitel rastenich Moldavskoi CCP [Key to pl. Moldavian SSR]: 424 (1954); Chennaveeraiah, Acta Horti Gotoburg. 23: 165 (1960); Mouterde, Nouv. Fl. Liban, Syrie 1: 146 (1966); Bor, Fl. Iraq 9: 188 (1968), Fl. Iranica 70/30: 201 (1970); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 483 (1969); Rubtsova, Opredelitel vysschich rastenich Kryma [Key to higher pl. Crimea] 68 (1972); Guinochet & Vilmorin, Fl. France 3: 967 (1972); Osorio-Tafall & Seraphim, List Vasc. Pl. Cyprus 10 (1973, uncertain according Meikle, 1985: 1824); Guinea Lopez & Ceballos Jiménez, Elenco Fl. Vasc. Españ. 357 (1974); Josifovič, Fl. rep. soc. serbie 8: 445 (1976); Haslam, Sell & Wolseley, Fl. Maltese isl. 457 (1977); Gandilyan in Kazarjan, Red data book Armenian SSR 248 (1990), *nom. illeg.* (Art. 63.1). See note 2.

Triticum triaristatum (Willd.) Godr. & Gren. in Grenier & Godron, Fl. France 3(2): 602 (1856); de Cesati, Passerini & Gibelli, Comp. fl. ital. 1(4): 86 (1869); Durand & Schinz, Consp. fl. afric. 5: 939 (1894); Bubani, Fl. pyren. 4: 396 (1901-02); Zimmermann, Adv. Ruderalfl. Mannheim 72 (1907); Fedtschenko & Flyorov, Fl. Eur. Russia 148 (1910, subheaded under *Triticum ovatum*); Coutinho, Fl. Portugal (ed. 2) 117 (1939); Bowden, Can. J. Bot. 37: 675 (1959), Can. J. Gen. Cyt. 8: 134 (1966); Feldman & Sears, Sci. Am. 244: 102 (1981, tetraploid and hexaploid forms).

Ae. ovata L. var. ('β') *triaristata* (Willd.) Bluff, Nees & Schauer, Comp. fl. German. (ed. 2) 1(1): 209 (1836); Grisebach, Spic. fl. rumel. 2: 425 (1846); Cosson & Durieu de Maisonneuve, Expl. sci. Algérie 2: 211 (1855); Boissier, Fl. orient. 5(2): 674 (1884); Ascherson & Schweinfurt, Ill. fl. Égypte, Mém. Inst. Egypte 2: 177 (1887); Fiori & Paoletti, Fl. Italia 1: 109 (1896, as 'γ *triaristata* (W.)', and interpreted as a variety (see note 1 at 10.16b), thus an isonym); Post, Fl. Syria (ed. 1) 899 (1896); von Halácsy, Consp. fl. Graec. 3: 431 (1904); Durand & Barratte, Fl. libyc. prodr. 276 (1910); Muschler, Man. fl. Egypt 1: 155 (1912); Borg, Descr. fl. Malt. isl. 790 (1927); Lindberg, Itin. medit. 9 (1932); Parsa, Fl. Iran 5: 818 (1952). – Note: although many authors ascribe this combination to Grisebach or Cosson & Durieu de Maisonneuve, the earlier combination by Bluff, Nees von Esenbeck & Schauer is a variety because of Art. 35.3 of the *Code*, and has preference.

Triticum ovatum auct. non Rasp. β (ssp./var.?) *triaristatum* (Willd.) Schmahlh., Fl. ssredn. jushn. Rossii [Fl. central and southern Russia] 2: 662 (1897); Paczoski, Dikorastushchie zlaki Kherson gub. [Wild cereals of Cherson govern.] 140 (1913, not seen, fide Zhukovsky, 1928: 476, citing this reference as '*Triticum ovatum triaristatum* (Schmalh.) Patchos.'). – Note: the rank of the combination by Schmahlhausen, as well as the one by Paczoski are unclear, and *not* a variety because of Art. 35.3 as they are more recent than 1890.

Triticum ovatum auct. non Rasp. ssp. ('B. I.') *triaristatum* (Willd.) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 703 (1901); Briquet, Prodr. fl. Corse 1: 19 (1910; rank as 'β var.' but with authors 'Asch. et Graebn.'); Stojanov & Stefanoff, Fl. Bulg. (ed. 3) 174 (1948; rank as ssp., authors as 'Asch. et Gräbn.'); Diapulis, Syn. fl. graec. 167 (1939, as 'var. α *triaristatum* A. u. G.'). – Note: see note 1 at 10.16b.

Triticum ovatum auct. non Rasp. var. *triaristatum* (Willd.) Stoj. & Stef., Fl. Bulg. (ed. 1) 1: 168 (1924), von Hayek, Prod. fl. pen. Balcan. 3: 224 (1932, as var. 'B' *triaristatum*, but authors as 'A. u. G.'). - Note: see note 1 at 10.16b.

Ae. ovata L. ssp. *triaristata* (Willd.) Rouy, Fl. France 14: 333 (1913); Jávorka, Magyar fl. 1: 114 (1924; interpreted by Anghel & Beldie as 'ssp. *triaristata* (Willd.) Jáv.', and then an isonym); Douin in Bonnier, Fl. ill. France 12: 63 (1934); Cuénod et al., Fl. Tunisie 157 (1954); Maire & Weiller, Fl. Afrique nord 3: 366-367 (1955, with var. *vulgaris* on p. 367); Quézel & Santa, Nouv. fl. Algérie rég. dés. merid. 1: 158 (1962; erroneous as ssp. of *Ae. triuncialis*, see entry of Quézel & Santa (1962) at *Ae. triuncialis* var. *triuncialis*, and note 4 at 10.18a); Keith, Checkl. Libyan Fl. 198 (1965, also with var. *vulgaris* Eig); Stojanov et al., Fl. Bulg. (ed. 4) 1: 148 (1966, '*triaristatum*' and authors as '(Willd.) Asch. & Gr.'); Anghel & Beldie in Savulescu, Fl. Rep. Soc. Romania 12: 563 (1972); Bonafé, Fl. Mallorca 1: 219 (1977).

Sub nom. *Ae. ovata* L. emend. Roth in Usteri, Ann. Bot. 2(4): 41 (1793): Takhtajan & Fedorov, Fl. erevana (ed. 2) 366 (1972); Sljusarenko in Prokudin et al., Zlaki Ukrainy 96 (1977); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 38 (1973), in Fedorov, Fl. part. Eur. URSS 1: 155 (1974), Zlaki SSSR 159 (1976, Russian) / 228 (1984, English); Löve, Feddes Repert. 95: 503 (1984); Nikitin & Geldykhanov, Opredelitel rastenich Turkmenistana [Key to Turkmenistan plants] 46 (1988). – Note: these authors use the name *Ae. ovata* in the sense of *Ae. neglecta*. See note 2.

Other heterotypic synonyms of *Ae. neglecta*:

Ae. gussonii Link, Linnaea 17: 388 (1843), **syn. nov.** – Type: not indicated. – Note: Link equates his species with '*A. triaristata* Gussone, Pl. rar. 371 (1826) non Willd.'. At Gussone there is '*Aegylops triaristata* Will.', which is *Ae. neglecta* Req. ex Bertol. Whether specimens from Gussone (in NAP) to which there is reference are actually *Ae. neglecta* needs confirmation.

Ae. virescens Jord. & Fourr., Brev. pl. nov. 2: 130 (1868); Richter, Pl. eur. 1: 127 (1890), **syn. nov.** – Syntypes: (Algeria: 'circa Bône') cultivé à Lyon, fl. 3 juin 1869, *Jordan s.n.* (MPU-Coste); (France, Var, Toulon: 'in incultis Galliæ australis, circa Telonem') cultivé à Lyon, 1869, *Jordan s.n.* (LY-Gandoger). – Note: neither found in LY-Jordan; see note 3 at *Ae. geniculata*, 10.8. – Homotypic synonyms: *Ae. ovata* L. var. α *virescens* (Jord. & Fourr.) Rouy, Fl. France 14: 332 (1913). *Ae. ovata* L. forma *virescens* (Jord. & Fourr.) Maire & Weiller, Fl. Afrique nord 3: 368 (1955).

Ae. algeriensis Gand., Österr. Bot. Zeitschr. 31: 82 (1881), **syn. nov.** – Type: Algeria, in incultis circa Constantine, *Choulette 398* (holo: LY-Gandoger).

Ae. calida Gand., Österr. Bot. Zeitschr. 31: 81 (1881), Contr. fl. terr. slav. merid. 36 (1883), **syn. nov.** – Syntypes: (Italy) Italia orient., in monte Brisighella prope Faenza, VI.1875, *Caldesi s.n.* (LY-Gandoger); (Croatia) Dalmatia, ad Salona, *de Visiani s.n.* (LY).

Ae. campicola Gand., Österr. Bot. Zeitschr. 31: 82 (1881), **syn. nov.** – Type: (France, Bouches du Rhône) in campis ad Martigues, *Autheman s.n.* (holo: LY-Gandoger; iso: B, BEI, FI, LY).

Ae. mesantha Gand., Österr. Bot. Zeitschr. 31: 82 (1881), **syn. nov.** – Type: (Italy, Toscana) Italia, secus vias pone Florence, *Sommier s.n.* (holo: LY-Gandoger).

Ae. viridescens Gand., Österr. Bot. Zeitschr. 31: 81 (1881), **syn. nov.** – Type: (France, Var; with Gandoger as: 'Gallia, Hérault'), pone Les Arcs, *Verriet-Litardière s.n.* (holo: LY-Gandoger).

Ae. triaristata Willd. subvar. ('S.-V.') *robusta* Trab. in Battandier & Trabut, Fl. Alger 208 (1884), **syn. nov.** – Type: (Algeria) Kabylie, Fort National, *Trabut s.n.* (holo: AL, not seen; iso: MPU). – Homotypic synonym: *Ae. ovata* L. forma *robusta* (Trab.) Maire & Weiller, Fl. Afrique nord 3: 367 (1955).

Ae. ovata L. subvar. *subbiaristata* Trab., Additions à la flore d'Algérie (Graminées), Bull. Soc. bot. France 32: 398 (1886), **syn. nov.** – Type: (Algeria) Kabylie, *Trabut s.n.* (holo: AL, not seen). – Note: a more specific indication of the type locality (as with subvar. *robusta*; see above) is lacking, and no material from Trabut (e.g., in MPU) could be connected with this taxon.

Ae. triaristata Willd. forma *kabylica* Battand. & Trab., Fl. Algérie 1(2): 241 (1895), Fl. Algérie Tunisie 393 (1905, as 'β *kabylica*'); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 478 (1928); Hammer, Feddes Repert. 91: 240 (1980b). – Type: (Algeria) Kabylie, *Trabut 167* (holo: AL, not seen; iso: MPU). – Note: Zhukovsky and Hammer locate this forma under the hexaploid form of *Ae. neglecta*, ssp. *recta*.

Ae. triaristata Willd. forma *glabrescens* Podp., Verh. k.k. zool.-bot. Ges. Wien 52: 683 (1902); Nábělek, Iter turc.-pers. 5, Publ. Fac. Sci. Univ. Masaryk 111: 29 (1929), **syn. nov.** – Type: not indicated. – Homotypic synonyms: *Triticum ovatum* auct. non Rasp. forma *glabrescens* (Podp.) Stoj. & Stef., Fl. Bulg. (ed. 1) 1: 168 (1924); von Hayek, Prod. fl. pen. Balcan. 3: 225 (1932).

Ae. triaristata Willd. forma *velutina* Podp., Verh. k.k. zool.-bot. Ges. Wien 52: 683 (1902); Nábělek, Iter turc.-pers. 5, Publ. Fac. Sci. Univ. Masaryk 111: 29 (1929). – Type: not indicated. – Homotypic synonyms: *Triticum ovatum* auct. non Rasp. forma *velutinum* (Podp.) Stoj. & Stef., Fl. Bulg. (ed. 1) 1: 168 (1924, '*velutina*'); von Hayek, Prod. fl. pen. Balcan. 3: 225 (1932). *Ae. ovata* L. forma *velutina* (Podp.) Parsa, Fl. Iran 5: 819 (1952, author as 'podpera Nábělek' – sic!). – Note: Parsa refers to both Podpěra and Nábělek, but meanwhile reports this taxon under *Ae. ovata*.

Ae. triaristata Willd. var. *brachychaeta* Font Quer, Treb. Mus. Cièn. Nat. Barcelona, Ser. Bot., Vol. 5(5): 54 (1924), **syn. nov.** – Type: (Spain, Burgos) Gamoral, near Burgos, *Font Quer 235* (holo: BC).

Ae. triaristata Willd. var. *macrochaeta* K.Mey., Pflanzenbau 3: 303 (Fig. 2), 304 (1927), **syn. nov.** – Type: not indicated. – Note: the imprecise figure on p. 303 suggests *Ae. triuncialis*, but this variety is located here as no material has been seen.

Ae. triaristata Willd. ssp. *contorta* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 479 (1928), **syn. nov.** – Lectotype: (Turkey) 'Asia Minor', Lydia, Boz-Dagh, 500 m, 20.VI.1927, *Zhukovsky s.n.* (holo: WIR 1154). Designated by Zhukovsky in WIR. – Homotypic synonym: *Ae. neglecta* Req. ex Bertol. var. *contorta* (Zhuk.) Hammer, Feddes Repert. 91: 240 (1980b, includes Eig's ssp. *contracta*).

Ae. triaristata Willd. ssp. *intermixta* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 479 (1928), **syn. nov.** – Type: not indicated.

Ae. triaristata Willd. var. *ochreata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 480 (1928), **syn. nov.** – Type: (Turkey) Tauria littoralis, *Busch s.n.* (holo: WIR, not found). – Homotypic synonym: *Ae. neglecta* Req. ex Bertol. var. *ochreata* (Zhuk.) Hammer, Feddes Repert. 91: 240 (1980b).

Ae. triaristata Willd. var. *hirtula* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 480 (1928), **syn. nov.** – Type: not indicated; only a few countries mentioned.

Ae. triaristata Willd. ssp. *recta* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 478 (1928), **syn. nov.** – Lectotype: (Algeria) Algiers, Kabylie, Fort National, on stony soils, 29.VII.1926, *Vavilov 246* (holo: WIR 1160). Designated by Zhukovsky in WIR. – Homotypic synonyms: *Ae. recta* (Zhuk.) Chennav., Acta Hort. Gotoburg. 23: 165 (1963); Löve, Feddes Repert 95: 504 (1984). *Triticum rectum* (Zhuk.) Bowden, Can. J. Gen. Cyt. 8: 135 (1966); Kimber & Feldman, Wild Wheat 54 (1987, '*recta*'). *Ae. neglecta* Req. ex Bertol. ssp. *recta* (Zhuk.) Hammer, Feddes Repert. 91: 240 (1980b). See note 4.

Ae. triaristata Willd. var. *trojana* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 328 (1928a), Feddes Repert., Beih. 55: 140 (1929a); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 766 (1943); Karjagin, Fl. Azerbaijana 1: 339 (1950), **syn. nov.** – Type: (Turkey) Thymbra, près de Troja, 1889, *Calvert s.n.* (holo: B, not found, probably †). – Homotypic synonym: *Ae. neglecta* Req. ex Bertol. var. *trojana* (Eig) Hammer, Feddes Repert. 91: 240 (1980b).

Ae. triaristata Willd. ssp. *contracta* Eig, Feddes Repert., Beih. 55: 141 (1929a), **syn. nov.** – Type: (Turkey) Cilicia, Trache(?), IV.1872, *Péronin s.n.* (holo: G-BOIS, not found). – Note: the collector, cited as '*Pér*', is probably *Péronin*. There is a coll. 'Cilicia, near Anamur, *Péronin 105* (L, LY, LY-Gandoger)', but I do not consider this as the type, being absent in G and G-BOIS, and not having 'Trache' on the label. – Homotypic synonyms: *Ae. neglecta* Req. ex Bertol. ssp. *contracta* (Eig) Scholz, Willdenowia 19: 105 (1989).

Ae. triaristata Willd. ssp. *quadriaristata* Eig, Feddes Repert., Beih. 55: 140 (1929a), **syn. nov.** – Type: (Turkey) Taurus, 1926, *Baur s.n.* (holo: M, not seen). – Note: Eig locates these specimens in the herbarium of the Institute for 'Vererbungsforschung' [genetical research] in Berlin under nos. '27, 118, Taurus 9'. Erwin Baur's herbarium is in M (Stafleu & Mennega, 1992: 390), but has not been seen. The Berlin herbarium is no longer extant. – Homotypic synonym: *Ae. neglecta* Req. ex Bertol. var. *quadriaristata* (Eig) Hammer, Feddes Repert. 91: 240 (1980b).

Ae. triaristata Willd. ssp. *attenuata* E.Schiem., Ber. Deut. bot. Gesell. 47: 177 (1929), **syn. nov.** – Type: not indicated. Schiemann indicated that her new form was described on the basis of cultivation of seed samples, sent to her by Eig from the collection of Pepinière at Tel-Aviv, Palestine.

Ae. triaristata Willd. ssp. *elongata* E.Schiem., Ber. Deut. bot. Gesell. 47: 177 (1929), **syn. nov.** – Type: not indicated (see above at ssp. *attenuata*).

Diagnostic characters: tufted, many-tillered annuals, 20-40(-50) cm tall excluding spikes; spikes narrowly ovoid, the lower part inflated and ellipsoid, abruptly constricted to a ± narrowly cylindrical upper part, 2-4.5 cm long excluding awns, with 3-6 spikelets, the upper 1-3 sterile, and (2-)3 rudimentary spikelets; glumes with 2-3 awns, glume surface adpressed-velutinous; apex of lemmas of fertile florets with 2 awns that are shorter than the glume awns, and 1 tooth that is sometimes reduced; caryopsis free.

Description (Fig. 53): tufted *annuals* (*Fig. 53-1*), usually with many tillers. *Culms* geniculate and semi-prostrate at base, then ascending, 20-40(-50) cm tall excluding spikes; foliage ± evenly distributed but more dense and base of culms. *Leaf* blades linear-acuminate, 5-8 cm long, 0.3-0.4 cm wide; sheath margins hyaline, ciliate (*Fig. 53-4*). *Inflorescence* (*Fig. 53-2*) a narrowly ovoid spike, 2-4.5 cm long excluding awns, ovoid-ellipsoid in the lower, fertile part, then abruptly constricted into an upper, ± narrowly cylindrical part; disarticulating as one unit at maturity

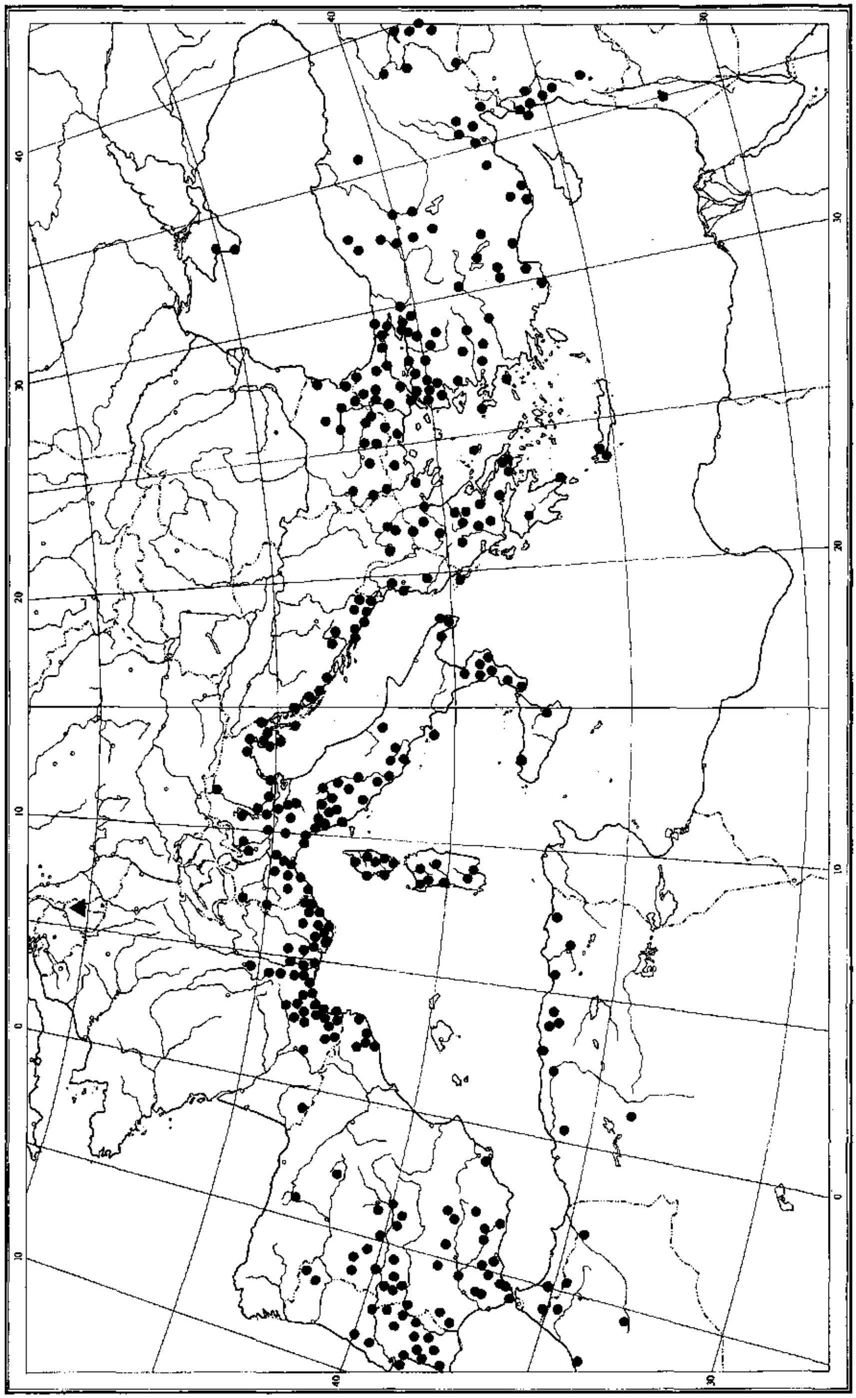

Fig. 55. Distribution of *Aegilops neglecta* in the Mediterranean. ● = locations; ▲ = adventive locations (not shown for the U.K.). For adventive distribution in the U.S.A., see Fig. 38.

with the rudimentary spikelets remaining attached to the culm; with 3-6 spikelets of which the upper 1-3 are sterile, rudimentary spikelets (2-)3. *Spikelets* sessile, (narrowly) ovoid-ellipsoid, the fertile ones 0.8-1.2 cm long and around 0.5 cm wide, the sterile ones much reduced, only 0.4-0.5 cm long and 0.1-0.2 cm wide; around 1.5 times the length of the supporting rachis internode in lower part of spike, decreasing to only 0.5-0.3 times in the upper part; fertile spikelets with 2 fertile and 2-3 sterile florets, the apical spikelets with 1 sterile floret but up to 1 fertile and 1-2 sterile florets may develop under cultivation. *Glumes* (*Fig. 53-5*) 2, coriaceous (but the lateral margins at least partly hyaline), obovate-elliptical, of the lower spikelets 7-10 mm long, of the apical, sterile spikelets (*Fig. 53-9*) elliptical-obtrapezoid, more reduced and only 2-5 mm long; the outer surface adpressed-velutinous, sometimes only scabrid and this more in the apical parts of the spike, green to (sometimes) purplish-green; veins unequal in width, flattened, sunk into the surface, unequally spaced, usually more yellowish and lighter in colour than the rest of the glume surface, adpressed-velutinous to at least setose; the truncate apex with (2-)3 awns (the lower fertile spikelets usually with one glume with 3, and one glume with 2 awns), when 2 awns these uneven at the base; awns setulose, flat and 1-2 mm wide at the base, green, purplish-green or blackish in colour, 2-5.5 cm long, the position varying from diverging to erecto-patent to sometimes deflexed, inner base of awns velutinous. *Lemmas* (*Fig. 53-6*) of fertile florets slightly exserting the glumes or completely concealed, 8-10 mm long, boat-shaped, inner surface of apical region velutinous; apex with 2 setulose awns, 0.5-4 cm long, and 1 lateral tooth, the tooth sometimes reduced to a shoulder only, awn position similar to those of the glumes, inner basis of awns velutinous. *Paleas* (*Fig. 53-7*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 53-8*) 5-7 mm long, free from lemma and palea.

Distribution (Figs. 38, 54-55): a Mediterranean / Western Asiatic / Circumboreal element occurring throughout Mediterranean Europe (from Portugal in the west to the Balkans in the east), Turkey, and western Asia. This constitutes the main area of distribution (Fig. 55), showing locally abundant presence in parts of the area, such as southern France from where *Ae. neglecta* was described. More scattered presence is reported from along the entire Fertile Crescent, eastern Ciscaucasia and in all of Transcaucasia. Next to being uncommon in Morocco and Algeria a few locations are also known from the southern Crimea. *Aegilops neglecta* has thus far not been found on Cyprus.

The easternmost part of the distribution is in southwestern Turkmenistan (Fig. 54), for which Nikitin & Geldykhanov have reported it (1988: 46; sub nom. '*Ae. ovata* L. (*Ae. triaristata* auct.)'). Two collections in ASH underscore this, as well as recent (1991) germplasm collecting in the same region around Kara-Kala. Future collection activities around the southern Caspian Sea might connect these distant locations with the rest of the known distribution area.

Von Regel (1881: 577) cites a collection from Krause of *Aegilops triaristata* from near Tashkent, Uzbekistan. This would indicate a considerable extension of the distribution further east from Turkmenistan. I have been unable, however, to confirm the identity of the specimen involved.

Aegilops neglecta has been reported as an adventive in various countries of central and northwestern Europe, e.g., in Scotland, Belgium (shown on Fig. 55), Germany (Hamburg, Ludwigshafen, Augsburg by Zimmermann (1907: 72) and Hegi, 1908: 390), Switzerland (Basel, cf., Hegi, 1908), and the Netherlands (Jansen, 1951: 124). One collection from the apparent introduction in the U.S.A. was seen (from Virginia: Arlington County, *Pladeck s.n.* (A)).

Ecology: generally in dry, somewhat disturbed habitats and vegetation types such as fallow, grasslands, roadsides, stony fields and hillslopes, maquis, garrigue, in forests or scrubs of e.g., *Acacia*, *Quercus*, *Ceratonia*, and *Pinus*, as well as within and on the edges of various types of cultivation, such as olive, pomegranate, grapes, barley, and wheat (with which it sometimes hybridizes; see Chapter 4.2 at 4.2.2.2). Occasionally found on river banks and generally more humid habitats. The parent rock is mainly limestone, but less frequently also alluvium, basalt, pillow lava, schists, silicates, and sandstone; recorded soil textures include loam, clayloam, sandy loam, and, more rarely, sands and clay. *Aegilops neglecta* is able to grow in marginal habitats where parent rock surfaces and only pockets of the top soil remain. It is also a species of more humid conditions: collated rainfall data vary from 450 to 750 mm, and in some sites it can be as high as 1400 mm.

Altitude: from -200 m (at Lake Tiberias; cf., Nábělek (1929: 29) for Podpera's forma *glabrescens*) up to 2000 m. However, only a few sites are known from above 1400 m.

Flowering and fruiting time: April – July. Varies amoung parts of the distribution area: April – May in Sicily (Lojacono, 1908-09: 369); May – June in Spain (Lázaro é Ibiza, 1906: 658), Portugal (Coutinho, 1939: 117), Italy (Gussone, 1826: 371), Iraq (Bor, 1968: 188); May – July in S France (dept. Var, cf., Albert & Jahandiez, 1908: 561).

Genomes: U<u>M</u> (female parent 'U' x male parent '<u>M</u>') with 2x = 4n = 28 (Chennaveeraiah, 1960: 92, sub *A. triaristata* ssp. *triaristata*; Waines & Barnhart, 1992: Table 2, sub *Ae. triaristata*), and U<u>M</u>N (female parent 'U<u>M</u>' x male parent 'N') with 2x = 6n = 42 (Chennaveeraiah (1960: 92), sub. *Ae. triariastata* ssp. *recta*; Waines & Barnhart, 1992: Table 2, sub *Ae. recta*). Kimber & Feldman (1987) attempt to distinguish the tetraploid and hexaploid forms, as ssp. *neglecta* (4n) and ssp. *recta* (6n), respectively, on morphological characters (see note 4).

Vernacular names:

Albanian: Halmuca i papërfillur [papërfillur = negligent, neglected, disregarded] (Demiri, 1981: 80).

Armenian: Aytzagn yerakist [yera = yerek = three, kist = awn] (Gandilyan et al., 1975: 86); karachod yerakist (Gandilyan in Kazarjan, 1990: 248).

Azeri: Uchgylchygly bugdayiot (Karjagin, 1950: 338, sub *Ae. triaristata*).

English: Three-awned *Aegilops* (Haslam et al., 1977: 457). This name is mainly used for *Ae. triuncialis* (see at 10.18a).

French: Froment à trois arètes [= wheat with three awns] (Acloque, 1904: 718); Égilope aminci [= thin/slender *Aegilops*] (Mutel, 1837: 153); Égilope à trois arêtes [= *Aegilops* with three awns] (Douin in Bonnier, 1934: 63).

German: Dreigranniger Walch [= three-awned Walch] (von Willdenow, 1806: 943; Schlechtendal et al., 1881: 220; Koch, 1907: 2799).

Hungarian: Háromszálkás kalászbojt [három = three; szálkás = awn]. On label of collection *von Degen 95* (LE) from Fiume (= Rijeka), Croatia.

Italian: Fenice della biade [= Fenice of feeds; Fenice = probably a reference to Phenice or Phoenicia, the country now more or less equivalent to Lebanon] (Bertoloni, 1834: 788; de Marchesetti, 1897: 656, sub *Ae. triaristata*); Egilope negletta (Tenore, 1835: 287); Trigu de formigas [= wheat of the ants] (Penzig, 1924: 10, sub *Ae. triaristata*; name from Sardinia).

Spanish: Trigo de los guanchos [= wheat from the 'guanchos' (who are the original inhabitants of the Canary islands; pers. comm. C. Iglesias)] (Hegi, 1908: 390). Also used for *Ae. geniculata* (see at 10.8)

Uses: Hegi (1908: 390) notes that this species is used to cure eye diseases, and also that on the Canary islands the seeds are eaten.

Etymology: the final epithet is derived from the Latin 'neglectus' [= neglected].

A geographical selection of ca 1120 herbarium specimens examined:

AFRICA: ALGERIA: near Constantine, *Choulette 398* (LY-Gandoger, type of *Aegilops algeriensis*); Sidi Ouzou Mts., valley of Sebaoui, prov. Algiers, *Cosson s.n.* (P); Jebl Tamesguida, 30 km S Djidjelli, *Dubuis s.n.* (MPU); El Arouch, *Julien s.n.* (LY, MPU); Tala-Kithane, Akfadou, *Maire s.n.* (MPU); Jebl Amour, Oued Sebyague, *Roux s.n.* (MPU); Kabylie, *Trabut 167* (MPU, type of *Aegilops triaristata* forma *kabylica*); Kabylie, Fort National, *Trabut s.n.* (MPU, type of *Aegilops triaristata* subvar. *robusta*); Djurdjura, Aït Koufi, *Trabut s.n.* (MPU); Algiers, Kabylie, Michlet, *Vavilov 256* (WIR 1159); Algiers, Kabylie, Fort National, *Vavilov 246* (WIR 1160, type of *Aegilops triaristata* ssp. *recta*).

MOROCCO: near Bab-Taza, El Azjmas, *Font Quer 88* (BC, BM, C, G, MPU, Z); Bab Hassem, *Gandoger s.n.* (LD, MO); Bab Taza, *Maire s.n.* (MPU, RAB); Taourirt – Ighil, *Maire s.n.* (MPU); S Arbaouna towards Kenitra, *Reading Univ./BM Exp. 23* (BM, MO); C Taourirt, Ighil, Akfadou, *Trabut s.n.* (RAB).

ASIA: IRAN: Kaserun (Qasr-e-Shirin?, 'Persiæ Australis'), *Haussknecht s.n.* (P); Dalechi, Abushir (Bushire) to Shiraz, *Kotschy 152* (K); distr. Hanikîn (Khanaqin), Kasr-i-Sirîn, *Nábělek 3353* (SAV).

IRAQ: Amadiyah, Gali Mazurka, *Al-Dabbagh & al. 45992* (BAG); NW Sulaymaniyah on Dukhan highway, *Al-Rawi 21750* (K); Plingan, NW Ranya, *Al-Rawi & al. 28642* (K); Kirkuk to Koi Sanjaq, *Al-Rawi 28004* (K); Arbil, Shaqlawa, Kuh-Sefin, *Bornmüller 1895, 1896* (B); 30 km WSW Amadiyah to Dahuk, *Bot. Exp. Univ. Kyoto BMUK 6-18-1-A* (K), *6-18-1-B* (US); Shaqlawa, *Gillett 11551* (K); near Zakho, N Mosul, *Hossain & Soofaji 44, 45* (B), *47* (C), *76* (GAT); Assyria, Mâr Jakub, above Simel (Summel), distr. Mosul, *Nábělek 3257* (SAV); Qaraghan, N Baghdad, *Rogers 0141* (K); W Salahuddin, *Springfield S-63, 67, 69-71* (K); Sundor, near Dahuk, *Wheeler Haines W1707* (E, K, LE).

PALESTINE: Jerusalem, Givat Ram, *Zohary 16* (Z).

SYRIA: Lattakia, at Shelfatiah on road to Slonfah, *Barkoudah & Sanadiki s.n.* (ACSAD); Ras Bassit, *Mouterde 12875* (G); Lattakia to Djable, *Mouterde 10254* (G); before Kasab, coming from Lattakia, *van Slageren & al. MSWRKA-88220H* (ICARDA); Kasab towards Karaduran, *van Slageren & al. MSWRKA-88227H* (ICARDA).

TURKEY: Bandirma, Tatlisu – Sahinburgaz, *Akman 9253* (ANK); Chichi – Klathane, *Aznavour s.n.* (G); near Kartal, *Aznavour s.n.* (G); Anamur, Kilindir, *Birand 37* (ANK); Bithynia, Vesin-Han, Tepaja Mt., *Bornmüller 14742* (G); Diyarbakir, Mermer, *Brown 2547* (K); Izmir, Givzel Camli, S Kuşadasi, *Brummitt 6496* (K); Manisa, Salihli to Kula, *Coode & Jones 2808* (E); Diyarbakir to Cinar, *Davis & Hedge 28764* (ANK, BM, C, E, K); Siirt to Baykan, *Davis 43078* (E, ERE, K, SOM); Adana, Saimbeyli, Bozoglan Dag, *Davis & al. 19696* (ANK, BM, E, K); Diyarbakir, *Davis 22139* (ANK, BM, E, K); Mardin, Cerçuş to Hasankeyf, *Davis 43045* (K, E, ERE); Kurubaş, SE Van, *Davis 44605* (K); Ankara, Kecioren, *Davis & Dodds 18815* (BM, K); Karabük, Cumayani, *Demirörs 1455* (ANK); Hatay, Antakya, N Urdu, *Dinsmore 10742* (G); Anatolia, Bugurlu Mt., *du Parquet 9* (L); Niksar, Tokat, *Harlan 6945* (UCR); Soma, Manisa, *Harlan 2215* (K); Eregli, Manyas, Balikesir, *Harlan 3300, 10286* (K); near

Edirne, *Harlan 2646, 2647* (K); Karakocan Deresi, Elâziğ, *Harlan 8000* (K); Antalya, Kiremithaneler, SW Antalya, *Hennipman & al. 585* (L, WAG); Elâziğ, S Maden, Elâziğ to Ergani, *Hennipman & al. 1519* (A, ANK, B, K, L, U, WAG), *1523* (U, WAG); Bursa to Mudaniya, N Bademli, *Holtz & Hänel 00.284* (B, E); Bitlis to Hizan, *Johnson & Hall s.n.* (UCR); Gelibolu reg., Suvla and Anzac, *Kerr 96, 115, 128* (K); Ağlassum to Isparta, *Khan & al. 340* (E, K); Taurus Mts., *Kotschy 546* (K, PRC); Ankara, Etlik, *Krause 4344* (ANK); Istanbul, Zekerikeny, *Nemetz s.n.* (LY-Gandoger); Istanbul, *Noë 47* (WAG); Istanbul, Maltepe, *Percival 819* (BM, K); Cilicia, near Anamur, *Péronin 105* (L, LY, LY-Gandoger); Isparta, Sütcüler, *Peşmen & Güner 1061* (ANK); Kozan (Sis) to Hadjir, *B. Post s.n.* (BEI, G); S Tunceli, *Spencer 0404* (E); Çanakkale, SW Lapseki, *Tüten & al. CNM-200689-0503* (ICARDA, IZ, WAG); N Bursa to Gemlik, *Tüten & al. CNM-240689-0102* (ICARDA, IZ); Koceli, NE Kandira, *Tüten & al. CNM-250689-0201* (ICARDA, IZ); Edirne, S Üzünküprü, *Tüten & al. CNM-290689-0404* (ICARDA, IZ); Afyon, Bayat, *Vural 60* (ANK); Antalya, *Wängsjö 2637* (LD); Amasya, *Wiedemann 10* (K, JE, PR); Sivas, *Wohak s.n.* (B); Tunceli, Pulumur, *Yildirimli 3085* (ANK, HUB); Maraş, Göksun, Kinikkozki, *Yildiz 2854* (HUB); Adana, Karsanti, Menengicli, *Yurdakul 1397/10216* (ANK); Lydia, Birdje to Göldjik, *Zhukovsky s.n.* (WIR 1150-1152); Lydia, Boz-Dagh, *Zhukovsky s.n.* (LE, WIR 432, 434, 1149, 1153; WIR 1154, type of *Aegilops triaristata* ssp. *contorta*); Galatia, Dizgurt-Dagh and Elma-Dagh, *Zhukovsky s.n.* (WIR 634); W Izmit, *Zohary s.n.* (UCR).

TURKMENISTAN: SW Kopet Dag, Kara-Kala reg., E Shevlan, *Gutkova & Chepanov s.n.* (ASH); Kara-Kala, Parchai, *Seifulin s.n.* (ASH).

EUROPE: ALBANIA: Samt Naoum, *Bourcart s.n.* (P); Kalis, Ura i Lopes to Buštrica, *Dörfler 739* (LD); Bazar Shah, near Tirana, *Hruby & al. s.n.* (PRC); Borsh, at Lumi Borskit, *Meyer 3057* (JE).

ARMENIA: Kaphan reg., Zanghezur, *Arutyunyan s.n.* (YAI); Kaphan, *Arutyunyan s.n.* (ERE); Kaphan reg., Agarak, *Arutyunyan & Muradyan s.n.* (ERE); E foot Mt. Ssarijal, distr. Airum, near Chanachlar, *Kolenati 1751* (G, LE), *2014* (LE, P). NAGORNO-KARABACH: Shusha, *Lipsky s.n.* (LE).

AZERBAIJAN: Baku, Geokczai, Karamarjan river, *Alexeenko 1607, 1608* (LE); Kjurdamir, near Padar, *Grossheim s.n.* (LE); Zanghelon reg., near Pirtchevan, *Grossheim s.n.* (E); Baku, Sikh, *Holmberg 460* (K); Elisabethpol (= Kirovabad), Chankendi, *Lipsky s.n.* (LE); Naftalan, *Zacharieva s.n.* (IIPGR).

BOSNIA and HERCEGOVINA: Sutorina, *Adamovič s.n.* (K, LE, Z); near Mostar, *Duyfjes & al. 624* (B, BM, L); Buna, near Mostar, *Fischer s.n.* (L); Mostar, banks of the Narenta, *Raap 165* (C, JE, K, LD, LE, P, PR, PRC, US); Trebinje, *Vandas s.n.* (PR).

BULGARIA: Kreposta, near Melnik, *Ančev s.n.* (SO); near Melnik, *Buzilova & Vihodcevsky s.n.* (SO); near Kurdjali, *Cheshmedjiev s.n.* (SOA); Varna, *Davidov s.n.* (SOM); near Kresna, *Delipavlov s.n.* (SOA); Malko Ternovo, *Delipavlov s.n.* (SOA); Sladun, near Khaskovo, *Delipavlov s.n.* (SOA); near Krumovgrad, *Gančev s.n.* (SO); Sakar Mt., SW Topolovgrad, *Jordanov & Janev s.n.* (SO); Momcilgrad, *Kožuharov 2158* (SOM); Micurin, Vasiliko, *Manitz & Marstaller s.n.* (JE); Sredna Gora, *Rocheff & Wildeman 9.6.* (BR); Levka, near Svilengrad, *Stojanov s.n.* (SO); Sakar Planina, Teke Tepe, *Stríbrný s.n.* (P, SO); near Sofia, *Urumoff s.n.* (SOM); E Zelenikovo, *van Slageren & al. MSRIMZ-89152H* (ICARDA, IIPGR); Trnovo, *Velenovský s.n.* (PRC); near Pirin, distr. Blagoevgrad, *Vihodcevsky s.n.* (SO); Rakitnici, *Zacharieva s.n.* (IIPGR).

CROATIA, DALMATIA: Ragusa (= Dubrovnik), *Adamovič s.n.* (K, Z); Cattaro, *de Marchesetti s.n.* (FI); Salona, *de Visiani s.n.* (LY, type of *Aegilops calida*); island Lokrum, near Dubrovnik, *Duyfjes & al. 33* (B, BM, L); Vroh Velovič, Lusita, Kotor, *Legitman & Matricevič s.n.* (PRC); Rijeka, *Noë 30* (JE), *506* (BR, G, L, LE, OXF, P, TUB), *1303* (A, BM, BR, G, JE, K, L, OXF, P, TUB, U), *s.n.* (L, LY-Gandoger, NY, P, PI); at Grovosa, Halbins and Lapad, *Sagorski s.n.* (GAT, JE); Rijeka, near Martinscica, *Untchj s.n.* (LD); Rijeka, Belvedere Mt., *von Degen 95* (A, BM, E, JE, K, LE, LY, US), *s.n.* (Exsicc. Kneucker 410) (A, B, BM, C, E, G, GE, GAT, JE, K, L, LD, LE, MO, PR, SO, SOM, Z); Losinj island, near Chinchizu, *Witting s.n.* (B). ISTRIA: Isola, *de Marchesetti s.n.* (FI); Parenzo, *de Marchesetti s.n.* (LD); Abbazia, *Evers s.n.* (PI-GUAD); S Istria, Pola, *Freyn 875* (B, JE, LD, LY-Gandoger, PRC); Mt. Spaccato, *Müllner s.n.* (LY-Gandoger); road near Veruda, *Untchj s.n.* (WAG); Pirano – cape of Istria, *Veselsky s.n.* (B, BM, F, GAT, LY, MPU). CROATIA: N part of Velebit Mts., Jurjevoto Krasno, *Mayr s.n.* (TUB); Georgeu, *Schlosser von Klekovski 74* (BM).

FRANCE, ALPES DE HAUTE PROVENCE: La-Palud-sur-Verdon, *Duval-Jouve s.n.* (MPU-Duval-Jouve). ALPES MARITIMES: near St. Cèzaire, *Bicknell s.n.* (GE); Lingostiere valley, near Nice, *Burnat & Cavillier s.n.* (Z); Juan-les-Pins, *Foucaud s.n.* (LY); Cannes, Mt. Pézou, *Ronniger s.n.*

(W); Fontan, *Rijmers 2899* (BR); Criniez, near Nice, *Van Heurck s.n.* (Z). ARDÈCHE: Les Vaux, *Copineau s.n.* (F); Aubenas, *le Tourneux de la Perraudière s.n.* (LY). AUDE: Narbonne, *Delort s.n.* (LY-Gandoger); Le Pech d'Aguèle, *Gandoger s.n.* (LY-Gandoger); near Narbonne, *Mathieu s.n.* (BR). AVEYRON: Montlaur, *Coste s.n.* (LY-Gandoger). BASSES-ALPES: La Brillane, *Charpin & Greuter 8345* (G, NY). BOUCHES DU RHÔNE: Martigues, *Autheman s.n.* (B, BEI, FI, LY, LY-Gandoger, type of *Aegilops campicola*); Avignon to Tarascon, *Delvaux s.n.* (A); Crau d'Arles, *Duval-Jouve s.n.* (P); Marseille, *Duval-Jouve s.n.* (P); Aix-en-Provence, *Jordan & Fourreau s.n.* (FI); Martegaux, near Marseille, *Roux 4801* (F); Auriol, Rouveyrolle, *Samat s.n.* (Exsicc. Duffour 4832) (BR, G, P). DRÔME: Peyrins, at Crozes, *Chatenier s.n.* (LY); Nyons, at St. Vincent, *Chatenier s.n.* (LY); Saint-Paul-Trois-Chateaux, *de Saulses-Larivière 764* (BR, G, LY). GARD: Nîmes, *Delavaux s.n.* (LE); Manduel, near Nîmes, *de Pouzolz s.n.* (P); Sauve, *Diomède s.n.* (BM); Nîmes, *Duval-Jouve s.n.* (BR); Aigues Mortes, *Lange s.n. ('98')* (C); Vigan, *Lombard s.n.* (K); St. Gilles à Cainargues, *Magnon s.n.* (BM); Quissac, *Meylan 1834* (G). GERS: Belmont, St. Etienne to Borie de Grack(?), *Coste s.n.* (MPU-Coste). HÉRAULT: Mouèze, *Charpin s.n.* (G); Montpellier, *Maille s.n.* (L, LE, LY-Jordan); Ribante, near Béziers, *Dupuy s.n.* (Exsicc. Soc. Dauphinoise 3934) (FI, G, LY-Gandoger, MPU, P, TO); Roquehaute, *Godron s.n.* (LY-Gandoger); Castelnau, near Montpellier, *Jordan s.n.* (LY-Jordan); St. Georges, near Montpellier, *Lange s.n. ('98')* (C, LD); La Colombière, NW Montpellier, *Leeuwenberg 1531* (MO, U); St. Etienne de Mussan, *Loret & Barrandon s.n.* (MPU); Grammont, near Montpellier, *Mansel s.n.* (BM); Castelnau, at La Pompiniane, *Mandon s.n.* (BM); Montpellier, plain of Fontcouverte, *Mandon s.n.* (BR, G, LY, MPU); Murviel, *Mouillefarine s.n.* (B, BM); St Chinian to Pirou, *Neyraut s.n.* (MPU); Montpellier, near Foncaude, *Salle 94* (C, JE, P); Castelnau towards Clapiers, *Sutter L478* (U); Agde, *Théveneau s.n.* (G); Verdus valley, *Zlatnik s.n.* (PR); volcanic mountain near St Thibery, *s.coll. (Requien?), s.n.* (LE). PYRÉNÉES ATLANTIQUES: Mt. de Cette (-Eygun?), *Ducommun s.n.* (LE). PYRÉNÉES ORIENTALES: Collioume, *de Franqueville s.n.* (FI); Banyuls, *Dorgelo & de Wilde s.n.* (WAG); Cosprous to Port-Vendres, *Penchinat s.n.* (Exsicc. Billot 890) (B, BM, F, G, JE, LE, LY, LY-Gandoger, MPU, OXF, P, PI, WAG); St. Antoine de Galamus, *Weiller 3.20* (MPU). TARN: Sorèze, *Conill s.n.* (A); Alban, *Warion s.n.* (MPU-Duval-Jouve). VAR: Solliès-Toucas, *Albert s.n.* (Exsicc. Soc. Rochelaise 2964) (BC, BR, LY, LY-Gandoger, MPU, P); La Crau d'Hyères, foot of Mt. Fenouillet, *Albert s.n.* (Exsicc. Magnier 2371) (BR, G, JE, LD, LY, P, PRC, Z); Valesure, *Bicknell s.n.* (GE, Z); Tourettes-de-Fayence, *Bonafous s.n.* (Exsicc. Soc. Sud.-Est 292) (B, LD, LY, PR, US); Mont Faron, near Toulon, *Hanry s.n.* (LY); St. Tropez, Cap St. Pierre, *Hibon 4671* (P); Collabrières, *Huet du Pavillon s.n.* (K, US); Hyères, *Jordan s.n.* (C, G); St. Raphaël, *Romieux s.n.* (G, Z); l'Esterel, *Shuttleworth s.n.* (K); near Les Arcs, *Verriet-Litardière s.n.* (LY-Gandoger, type of *Aegilops viridescens*). VAUCLUSE: Barthelusse, near Avignon, *Brour s.n.* (LD); Orange, *Godet s.n.* (LY); Mérindol, *Reijnders 1133-1* (BR); Avignon, *Requien s.n.* (BOLO-Bertoloni, MPU-Duval-Jouve, type of *Aegilops neglecta*); ibid., *Requien s.n.* (G, LE, MPU, P, PI). ISLANDS: CORSICA: St. Florent, *Bijl 28* (U); Ghisoni, *Foucaud s.n.* (LY); Barchette, Golo valley, *Lambinon 87/462* (G, RNG); St. Florent, *McCallum-Webster 14600* (E); Bonifacio to Sta. Manza, *Pelgrims s.n.* (BR); Porto-Vecchio, *Revelière 429* (BM); Calvi, *Soleirol 823* (BM); near Costé, *Théveneau s.n.* (P).

GEORGIA: s.loc., *Hohenacker s.n.* (TUB).

GREECE, ATTICA: Anavryta, Pentelikon, *Leutwein de Fellenberg s.n.* (Z); Parnethis, near Dekeliam, *von Heldreich s.n.* (LD). ELLAS: Delphi, around the Marmaria, *Phillips 34A* (K). MACEDONIA: above Armensko, *Alston & Sandwith 721* (K); Tyrnova, Angkatholou, *Alston & Sandwith 830* (BM, K); Almopia reg., Livadhia to Arkhangelos, *Greuter 13964* (G); Drama, *Stainton 7423* (K); Krusa Balkan, N Karamudli, *Turrill 59* (K); S side Struma (Strimón) plain, Turica foothills, *Turrill 200* (K). PELEPONNESUS: Lakonia, N Neapolis, NNW Kampos, *Runemark & Snogerup 20766* (LD); Olympia, *von Sterneck 503* (PRC). THESSALIA: Métsovon, Epirus, *Balls & Gourlay B3775* (BM, K); Kato Zekonia, *Beauverd s.n.* (G); Agios Blasios, *Beauverd s.n.* (G); Grevená, SW Ziakas to Smixi, *Podlech 37731* (G); Kalampaka, *Sintenis 233b* (LD); Nomos Ioanninon, near Métsovon, *Snogerup 5094* (LD); Phanar (Fanárion), *Tedd 293* (K). STEREA: Pindus Tymphaeus, Mt. Zygos, Malakani, *Haussknecht s.n.* (JE); Aitolia, Agios Elias, Mt. Korax, *von Heldreich s.n.* (G-BOIS). ISLANDS: CHIOS: E Vikion, *Snogerup 8547* (LD). CORFU: Kanoni, *Snogerup 23509* (LD). CRETE: Chania to Alikianu, *Rechinger 13387* (BM, G, K); Chania to Omalos, S Foumes, *Runemark & al. 45184* (LD). SAMOS: Karlovassi, *Runemark & al. 18793, 19494* (LD). SKIROS: SW Ormos Mealos, *Snogerup 4044* (LD).

ITALY, CALABRIA: La Sila, NW S. Giovanni in Fiore, *Davis & Sutton 65530* (BM); La Sila, Carlapoli to Zempone, *Fiori s.n.* (FI); Cotrone, *Gussone s.n.* (BOLO); Camigliatello to Acri, *Sarfatti & Corradi s.n.* (FI); W Saracena, SW Castrovillari, *Snogerup 2130* (LD). FRIULI VENEZIA GIULIA: Opcina, *Baumbach s.n.* (G); Cologna, *de Marchesetti s.n.* (G); Trieste, *Fleischer s.n.* (G, JE, K, L, LE, MO, PR, TUB); Venice, Bonacum, *Rigo s.n.* (BM, BR, JE, K, LE, PR, Z); Venice reg., near S. Virgilio, near Verona, *Rigo s.n.* (B, MO); Lago di Garda, rivoli Veronese, *Vleminckx 455* (BR). LIGURIA: Sarzane, near La Spezia, *Bertoloni s.n.* (BOLO); Pigna, Valsteuria, *Bicknell s.n.* (PI-GUAD); Voltri, near Genua, *de Cesati s.n.* (BM, JE). PIEMONTE and VALLE D'AOSTA: Acqui, *Bicknell s.n.* (GE); Susa, *Ducali s.n.* (TO); Nizza Monferrato, *Gmelin s.n.* (F); Susa, Monpastero, *Santi s.n.* (TO); Casnio, Sala Lunghe, near Castillo di Bondir, *Vignolo-Lutati s.n.* (RNG); Mombaldone, Alessandra to Vengore, *Vignolo-Lutati & Fonatana s.n.* (B). TOSCANA: Tavemuzze, S Florence, *Brummitt 4539* (K); Sta. Margherita à Montici, near Florence, *Caruel s.n.* (BR, G, K, LY-Gandoger, PI, PI-CAR); ibid., *Parlatore 47* (BR, C, F, G, JE, K, L, LD, LE, LY-Gandoger, P, PI, PRC, TO, US); Busceto, near Livorno, *Caruel s.n.* (PI-CAR); Etruria, Albanus Mt., *Costa-Reghini s.n.* (B, BC, F, JE, LD, PR, TO, US, Z); Paterno, near Florence, *Fiori 219* (A, BM, E, FI, GE, K, LE, LY, OXF, PI, PI-GUAD, PI-PASS, TO, Z); Etruria, Casaiguidi, *Lojacono 106* (BM); Pisa, *Savi s.n.* (Exsicc. Billot 890b) (BM, BR, G, JE, L, LE, LY, LY-Gandoger, MPU, OXF, P, PI, WAG); forest near Pisa, *Savi s.n.* (F, G, LY-Jordan, MO, MPU, P, PI, PR, RAB, TO, US); near Florence, Casiguano, *Sommier s.n.* (BC, BR, F, MPU, PI, PI-GUAD, PI-PASS, TO, Z); near Florence, *Sommier s.n.* (LY-Gandoger, type of *Aegilops mesantha*); near Florence, N Montelupo, *Tinku & Redhead 12282* (K). OTHER ITALY: Mantua to Del Bosco, *Barbieri s.n.* (BOLO); Bologna reg., Zola, La Càbianco, *Bertoloni s.n.* (BOLO); Mt. Paderno, *Bertoloni s.n.* (BOLO); Zola, Predosa, near Bologna, *G. Bertoloni s.n.* (BOLO); Rome, Macchia di Mattei, *Bolti s.n.* (FI); monte Brisighella, near Faenza, *Caldesi s.n.* (LY-Gandoger, type of *Aegilops calida*); Gissi, *Caruel s.n.* (TO); Lazio, Alexandrina, near Rome, *Chiovenda s.n.* (FI); near Viterbo, *de Brixia s.n.* (BOLO); Marmariccia di Verzano, Reggio Emilia, *Ferrari s.n.* (TO); near Bologna, *Fiori s.n.* (JE, TO); San Bernardi, *Gennari s.n.* (PI-CAR); Padua, *Grabmayr s.n.* (G); Alimini, near Otranto, *Groves s.n.* (OXF); Terni, *Lochenies s.n.* (BR); Viterbo, *Mari s.n.* (FI); Perugia prov., Lisciano Niccione, *Meyer 199-39-85-10* (B); S. Tirol, Valsugano, near St. Christoforo, *Murr s.n.* (LE); Lido de Chioggia, *Naccari s.n.* (BOLO); Veglia, *Noë s.n.* (B, L); Castello Benvenuti, near Pavia, Lombardy, *Penzig s.n.* (LD); Verona distr., Valeggio, *Rigo s.n.* (A, B, JE, OXF, P); Lazio, Terracina, *Sommier s.n.* (FI); Mombaldone, Allesandria, road to Vengore Mt., *Vignolo-Lutati & Fontana s.n.* (GAT); Verona, *Bracht s.n.* (BR, MO, NY, PI, PR). ISLANDS: CAPRI: s.loc., *s.coll., s.n.* (TO). ELBA: Rio to Valterraio, *Sommier s.n.* (FI). SARDINIA: Fonni, *Martelli s.n.* (LY-Gandoger); Cagliari, La Cantiena, *Moris s.n.* (TO); Sassari, *Nicotra s.n.* (B, LY-Gandoger); Tempio, Mt. Limbardo, *Reverchon 217* (BR, E, FI, G, JE, K, LD, LE, LY-Gandoger, TO); near Sta. Barbara to Cagliari, *Sommier s.n.* (FI). SICILY: Palermo, *Jahn s.n.* (PRC); Catania, *Philippi s.n.* (LE).

MACEDONIA: Gradsko, *Bornmüller 2272* (JE); Vodena, *Kindl s.n.* (PR); Niš to Tito Veles, *Klaus s.n.* (W); Babuna Planina, NE Prilep to Tito Velez, *Podlech 28126* (G).

PORTUGAL: Eiras, Coimbra, Caminha, *Beau 883* (COI); Ribatejo, Alcorrochel, *Benta Rainha 332* (US); Baixo Alentejo, Beja, Ervidel to Ferreira do Alentejo, *da Silva 2562* (COI, G); Alto Alentejo, Silveira to S. Tiago, *da Silva 2714* (COI); Baixo Alentejo, Santiago de Cacém, Monto dos Alhos, *do Nascimento Teles 1189* (COI); Degolados to Campo Maior, Mt. dos Segados, *Fernandes & al. 8637* (COI); Grândola, *Gandoger s.n.* (MO); Trás-os-Montes, Sierra de Rebordâos, *Gandoger s.n.* (LY-Gandoger); Orada, *Zercaro 8275* (GE).

SPAIN, AVILA: Sierra de Gredos, El Arenal, *Deverall & Flannigan 0356* (E). BADAJOZ: Fregenal de la Sierra to Zafra, *Hammer 2628* (GAT). BARCELONA: Barcelona to S. Gebia, *de Bolòs y Vaireda s.n.* (BC); Tibidabo, *Sennen 1045* (BM, E, GAT, JE, L, LD, LY, MPU), *3233* (BC, BM, G, L, LD, MPU), *3234* (BC, BM, LY, MPU-Coste, W, material of *Aegilops mixta*); Barcelona, near Bonanova, *Sennen 4065* (BC, BM, LD, P); Barcelona to Valdoncellas, *Sennen s.n.* (BC, BM, LY, material of *Aegilops leveillei*); Barcelona, near Gerasio, *Sennen 3284* (BC). BURGOS: Gamoral, near Burgos, *Font Quer 235* (BC, type of *Aegilops triaristata* var. *brachychaeta*). CACERES: near Plasencia, *Bourgeau s.n.* (C, LD); Sierra de San Pedro, Herreruela, *Gandoger s.n.* (LY-Gandoger). CÁDIZ: near San Roque, *Boissier s.n.* (K); Sierra de Gibalbin, *Gandoger s.n.* (LY-Gandoger); Algeciras, *Reverchon 55* (B, BR, E, G, JE, K, LD, P, PR, SO), *16* (US); Gibraltar, Laja, *Wolley-Dod 2050* (K). CIUDAD REAL: Sierra de Morena, Despeñaperros, *Gandoger s.n.* (LY-Gandoger). CORDOBA: Posadas to Villaviciosa, *Fernández s.n.* (RNG, SEV); Cerro Muriano, *Gandoger s.n.* (LY-Gandoger). GERONA: near Sils, *Font*

Quer 321 (BC, F); Culera, *Humbert s.n.* (P). GRANADA: near Granada city, *Dellampo s.n.* (G); Velez Benandalla, *Wängsjö 3681* (LD). HUELVA: Cartagena, *Gandoger s.n.* (LY-Gandoger); Finca la Ciguenela, E Aracena, *Hammer 2613* (GAT). JAÉN: Mamanis Mts., Val de Flos, near Despeñaperros, *Font Quer s.n.* (BC); Sierra de Cazorla, Fuente del Oso, *Hernández WG0596* (BC). MADRID: near Madrid, *Lange s.n. ('97')* (BR, L, P). MÁLAGA: Sierra de Junquera, *Gandoger s.n.* (LY-Gandoger). SALAMANCA: Ciudad Rodrigo to Pastores, *Weiller 462.26* (MPU); Segueros, *Weiller 309.26* (MPU). SEVILLA: near Cortijo Trinidad, *Wolley-Dod 1126* (BM); near Pedrera, *Wolley-Dod 969* (BM). SORIA: (Sierra de) Cabrejas, *Bicknell & Polini s.n.* (GE). TOLEDO: Navahermosa, *Gandoger s.n.* (LY-Gandoger).

RUSSIA, DAGHESTAN: Derbent reg., *Vlasov s.n.* (C, E, G, GAT, K, LD, LE, MO, W).

UKRAINE, CRIMEA: Tauria, near Sebastopol, *Rehmann 249* (P); Saki, *von Lindemann s.n.* (LY-Gandoger).

YUGOSLAVIA, MONTENEGRO: Petrovač to Virpaza, Bukovil Mt., *Černach 32.752* (B); near Limljani and Vispazar, *Dostál 2156* (PRC); Budva, *Halliday J 11/74* (RNG); Kotor, *Lenander s.n.* (C, S); Bar, *Rohlena s.n.* (PR); Rigeky to Drušiči, *Rohlena s.n.* (PRC). SERBIA: Lescovac, *Alston & Sandwith 1863* (BM, K); Pirav, *Bierbach s.n.* (LE); Gorica hillsat Nissam, *Ilič s.n.* (LE).

ADVENTIVE: AMERICA: U.S.A., VIRGINIA: Arlington County, *Pladeck s.n.* (A). EUROPE: BELGIUM: Verviers, Vesdre, *Pelgrims s.n.* (RNG). U.K., SCOTLAND: Leith, *Fraser 509* (E, RNG).

CULT.: AFRICA: ALGERIA: 'circa Bône', cult. at Lyon, *Jordan s.n.* (MPU-Coste, type of *Aegilops virescens*). EUROPE: FRANCE, VAR: Toulon, cult. at Lyon, *Jordan s.n.* (LY-Gandoger, type of *Aegilops virescens*).

Germplasm collections examined:

AFRICA: MOROCCO: W Ouzzane from Ksar El-Kbir, *van Slageren & Istar MSAI-90145* (ICARDA, INRA-M); Tetouan, W Dar Chaoui to Larache, *van Slageren & Istar MSAI-90139* (ICARDA, INRA-M); Khenifra, near Aguelmous, *van Slageren & Istar MSAI-90111* (ICARDA, INRA-M).

ASIA: SYRIA: Tartous, Masiaf, *Valkoun & al. VDFKO-88* (ICARDA, SARD, VIR).

TURKEY: Hazar lake, 35 km SE Elâziğ, *Metzger & Jana 79TK018-078* (USDA); Hakkari, 21 km SW Semdinli, *Metzger & Jana 84TK565-003* (USDA); Bilecik, N Osmanli, *Metzger & Jana 84TK265-007* (USDA); 32 km W Konya, *Metzger & Jana 84TK347-006* (USDA); Ankara, Kizilcahaman, *Metzger & Jana 79TK135-733* (USDA); Denizli, 25 km S Sarigol to Buldan, *Metzger & Jana 84TK159-046* (USDA); Balikesir, SW Burhaniye, *Tüten & al. CNM-190689-0102* (ICARDA, PGRRI); Kirklareli, NW Çerkezköy to Saray, *Tüten & al. CNM-270689-0401* (ICARDA, PGRRI); Istanbul, SE Çerkezköy *Tüten & al. CNM-270689-0301* (ICARDA, PGRRI); SE Kirklareli, *Tüten & al. CNM-270689-1002* (ICARDA, PGRRI); 22 km SW Balikesir, to Susurluk, *Tüten & al. CNM-220689-0102* (ICARDA, PGRRI); Baikesir, Bandirma to Erdek, *Tüten & al. CNM-220689-0702* (ICARDA, PGRRI); Çanakkale, SW Lapseki, *Tüten & al. CNM-200689-0503* (ICARDA, PGRRI); Çanakkale, W Çan, *Tüten & al. CNM-210689-0401* (ICARDA, PGRRI); Çanakkale, 24 km E Ayvacik, *Tüten & al. CNM-190689-0304* (ICARDA, PGRRI); E Bursa – Iznik junction, *Tüten & al. CNM-240689-0302* (ICARDA, PGRRI); Balikesir, NW Manyas junction, *Tüten & al. CNM-220689-0602* (ICARDA, PGRRI).

TURKMENISTAN: SE Kara-Kala to Sakar, *van Slageren & al. MSPGZK-91118* (ICARDA, VIR – third location for Turkmenistan of this species; see examined herbarium specimens for others).

EUROPA: ARMENIA: Kaphan reg., Narashenik, *Gandilyan s.n.* (AAI).

BULGARIA: Plovdiv, E Zelenikovo, *van Slageren & al. MSRIMZ-89152* (ICARDA, IHAR, IIPGR).

PORTUGAL: Santiago do Cacem, Beja, Cruzamento Sienes, *Mota & al. 11-A* (INIA); Beja, *Mota & al. 100-A* (INIA); Viana do Alentejo, Evora, Aguiar, *Mota & al. 134-A* (INIA); Sesimbra-Setubal, Maca, *Mota & al. 4-A* (INIA).

RUSSIA: Daghestan, E slope Dzhalgan Mt., *van Slageren & Boguslavski MSRB-90182* (ICARDA, WIR).

Notes: 1. Establishing the type and possible isotype specimens of *Aegilops neglecta* showed the same problems as with *Aegilops triticoides* (now x *Aegilotriticum triticoides*, see Chapter 4 at 4.2.2.7). Material was also found and

Fig. 56. Holotype (*Requien s.n.* from near Avignon, France) of *Aegilops neglecta* in Bertoloni's *Flora italica* herbarium, BOLO-Bertoloni.

distributed by Esprit Requien in France and similarly described by Antonio Bertoloni in 1834 in the first volume of his *Flora italica*. I have considered only those specimens to be isotypes which are accompanied by a handwritten label from Bertoloni stating '*Aegilops neglecta* nob.' and '*misit Requien*', indicating that it is a new species and that Requien had sent it. These labels were only found in the *Flora italica* herbarium of Bertoloni in BOLO, and in the separate herbarium of Joseph Duval-Jouve in MPU. Bertoloni (1834: 787) refers to Requien's material as 'Æ. neglecta *Req. Pl. sicc.*' (as he did with 'Æ. triticoides'; see note 3 at 4.2.2.7). The label of the holotype (Fig. 56) indicates that the specimens were sent in 1833 ('*Misit Requien 1833*') and that the specimens were named '*triaristata*' by 'Lois', who is probably J.L.A. Loiseleur-Deslongchamps (1774-1849). An isotype is undoubtly in Requien's herbarium in AV, but has not been seen. Other Requien collections from near Avignon lacking the indications mentioned above were found in G, LE (see below), MPU, P, and PI, and are not considered isotypes.

In LE three sheets were found in a Type folder, as follows: 1. (France) 'Donné à Avignon, en Juin 1817 par M. *Requien* qui venoit de découvrir tout recemment cette espèce aux environs de la ville'; 2. (France) 'Montagne volcanique de St Thibary, le 8 Juillet 1818', *s.coll.,* *s.n.* (collector may be Requien also), and 3. (France) 'Nismes (? probably Nîmes), 13 Juin', *s.coll., s.n.* ('*Delavaux* dedit 19 Juillet 1818'). I do not consider them as (iso)types as even the Requien collections lack the indications outlined above.

2. Eig (1929a: 17) already remarked that *Aegilops ovata* L. as presented in the *Species plantarum* (1753: 1050) contained two taxa: *Ae.* '*ovata*' in a strict sense, and *Ae. triaristata* as it was distinguished by von Willdenow (1806: 943). Von Willdenow's *Ae. triaristata* contained the element of the Scheuchzer (1719: 11, and Tab. 1, fig. 2A, B, C) reference and plate, used earlier by Linnaeus (1753: 1051) at his *ovata*. Hence, the name became illegitimate, the more so after the typification by Greuter (in Greuter & Rechinger, 1967: 171) of the name *Ae. ovata* L. on this illustration. [Brummitt (1986: 557) notes that the Committee for Spermatophyta is unsure whether all parts A, B, and C of this illustration represent one species. I agree that the illustration is so vague that an interpretation as *geniculata* can be made! The shape of the glumes in parts A and B is, however, more alike to *neglecta* than to *geniculata*. This uncertainty illustrates the ineptness of the choice.] Greuter came to this choice after rejecting LINN 1218.1 (a collection from Loefling from Spain, and perfect material of *ovata sensu stricto*) as ineligible: Linnaeus had used a cultivated plant from Uppsala for the phrase description in his *Hortus upsaliensis* (1748: 301), which was reiterated in the *Species plantarum*. Any such material is, however, lacking. There seems, on the other hand, no objection to the choice of LINN 1218.1, as this specimen is annotated by Linnaeus himself and has the number '1' from the *Species plantarum* (as '**1 ovata**'). One can only ponder over the nomenclatural stability *lost* by Greuter's choice: the use of *ovata* would have been unambiguous and, concurrently, its designation as type species of the genus *Aegilops* by Green (in Hitchcock & Green, 1929: 193)!

Roth, having created *Ae. geniculata* earlier in his *Botanische Abhandlungen* (1787: 45), recognized the problem in his paper in Usteri's *Annalen* in 1793: he emendated *Ae. ovata* in the sense of '*triaristata*' (cited at the nomenclature above 'Sub. nom. *Ae. ovata* L. emend. Roth in Usteri'), quoting again the Scheuchzer book and plate. He juxtaposed his emendated *ovata* next to his own *geniculata*, the name which he applied to the more strict interpretation of the original *ovata*. Thus the difference between the two species was already clear in 1793; the problem was that *ovata* was still used. However, most authors, including Eig (1929), kept on using *ovata* in the traditional sense (thus not in the sense of Roth's emendation), and no lectotype was chosen for the name until Greuter (1967). Based on Greuter's choice, Lambinon (1981: 361) proposed rejection of the name *Ae. ovata*, but this proposal was rejected (see Brummitt, 1986: 557-558) with the annotation that *ovata* should not be used in the sense of its lectotypification as this would be contrary previous usage. Since Greuter's lectotypification the name *Ae. ovata*, being ambiguous, has effectively been dropped from usage. Exceptions to this all pertain to Russian authors, added by Löve's (1984: 503) overview of the Triticeae (see the nomenclature above). These complications have made *Ae. ovata* an unfortunate choice as generic type species (Jarvis, 1992: 556), and its replacement by *Ae. triuncialis* is now generally accepted (see Chapter 7, note 5). Summarizing in chronology, the situation developed as follows:

Ae. ovata L., Sp. pl. (ed. 1) 2: 1050 (1753) – containing two taxa, '*ovata*' (*sensu stricto*) and '*triaristata*'.

Ae. geniculata Roth, Bot. Abh. Beobacht. 45 (1787), in Usteri, Ann. Bot. 2(4): 41 (1793) – oldest name available for *ovata sensu stricto*, and now to be used.

Ae. ovata L. emend. Roth in Usteri, Ann. Bot. 2(4): 41 (1793) – emendation of *ovata* in the sense of '*triaristata*'. Not to be used as it is against traditional usage (but done by the 'Russians' and by Löve).

Ae. triaristata Willd., Sp. pl. (ed. 4) 4(2): 943 (1806) – illegitimate renaming for a part of the original *ovata* by von Willdenow, who cites both the Scheuchzer plate and Roth (1793) as elements.

Ae. neglecta Req. ex Bertol., Fl. ital. 1: 787 (1834) – oldest available name to replace the '*triaristata*'-part of the old, Linnaean *ovata*, and now to be used.

[Another interesting idea is put forward by Greuter (1967: 171) in his paper: the consideration of lectotypifying the illegitimate *Ae. triaristata*. He states that this cannot be done because any relevant material in von Willdenow's herbarium belongs to *Ae. triuncialis*. This identification was mentioned by Eig (1929a: 17) and is now confirmed by me (the B-W sheets involved are nos. 18876-1 to 5). The idea of typification of illegitimate names is disputed (see, e.g. Zijlstra, 1992: 374).]

3. Stapf, in his *Beiträge zur Flora von Lycien* 1: 5 (1885), in my opinion misspelled the epithet *triaristata* as '*divaricata*', while referring to von Willdenow's fourth edition of the *Species plantarum*, vol. 4: 943 ('1805' – it must be 1806). Eig (1929a: 226) interpreted Stapf, however, as having published a separate species name: '*Aeg. divaricata* Willd. in Stapf'. Hammer (1980b: 246) cited Eig's name as: '*divaricata* Willd. ex Stapf', while emphasizing its uncertain position and its status as a *nomen nudum*.

4. The tetraploid and hexaploid forms of *Ae. neglecta* pose a taxonomic problem in the sense that they are undistinguishable, but that at the same time the genomic constitution must cause some reproductive isolation and therefore speciation. *Aegilops triaristata* ssp. *recta* is associated with the hexaploid forms, although this was *not* indicated by Zhukovsky (1928: 478-479) who did not mention any chromosome numbers. Inspection of the lectotype in WIR (Algiers, Kabylie, Fort National, *Vavilov 246* (WIR 1160)), moreover, did not show a form that deviates morphologically from other specimens of *Ae. neglecta*. Most likely the connection of '*recta*' with the 6n ploidy level was made for the first time by Senjaninova-Korczagina in her karyosystematical overview of *Aegilops* (1930: 455). Exactly like Zhukovsky's fig. 16 (1928: 478) in his treatment of *Ae. triaristata*, which shows a comparison of ssp. *contorta* and ssp. *recta*, Senjaninova presented chromosome numbers for these two subspecies only: ssp. *contorta* with a haploid number of 14, ssp. *recta* with 21 (l.c., 1930: 455). Since then, the epithet *recta* in various combinations has been associated with the higher ploidy level (e.g., Chennaveeraiah, 1960: 92; Bowden, 1966: 135; Löve, 1984: 504; Kimber & Feldman, 1987: 54). Specimens used for chromosome counting originate from various parts of the distribution area of the species, but the hexaploids are reported as relatively common only in Greece and western Turkey (Kimber & Feldman, 1987). It is remarkable that Kimber & Feldman, who mention Portugal, Spain, France, Italy, Yugoslavia, Greece and western Turkey as countries where the hexaploid forms can be found, do *not* mention Algeria, from where the lectotype specimen of ssp. *recta* originates!

As the distribution of the two ploidy levels is clearly sympatric it would allow separation at variety level, but only *if* a consequent, preferably morphological, additional character can be found that can be linked to the ploidy level. Kimber & Feldman (1987: 14) suggest that the hexaploids possess fertile terminal spikelet(s), and the tetraploids sterile ones. Their illustrations (1987: Plates 16-17) suggest, however, that results were obtained from cultivation under controlled circumstances. As commented above (Chapter 4.1) this is hazardous as it may cause great variation in development. [For example, *Ae. biuncialis* in experimental fields at ICARDA nearly always showed two rudimentary + three fertile spikelets; in natural conditions it is nearly always one + two spikelets only.] In the case of *Ae. neglecta*, luxurious growth may well cause the upper spikelet to be fertile rather than sterile. To find the hexaploids one therefore has to count the chromosomes of each individual population sample. I am aware that a preferred biological species concept has to be abandoned here over a 'classical', morphological one, but I have been unable to find a determiner for the ploidy levels.

10.13 **Aegilops peregrina** (Hack. in J.Fraser) Maire & Weiller **Figs. 57-60**

Aegilops peregrina (Hack. in J.Fraser) Maire & Weiller, Fl. Afrique nord 3: 358 (1955, with var. *peregrina* on p. 359); Melderis in Rechinger, Ark. Bot. 5: 71 (1960; authors as '(Hack.) Meld.' thus as a *comb. nov.* and an isonym); Quézel & Santa, Nouv. fl. Algérie rég. dés. mérid. 1: 158 (1962); Bor in Rechinger, Fl. lowland Iraq 112 (1964); Keith, Checklist Libyan Fl. 199 (1965, with var. *peregrina*); Mouterde, Nouv. Fl. Liban, Syrie 1: 149 (1966, with ssp. *eu-variabilis* var. *typica*); Bor, Fl. Iraq 9:

186 (1968), Fl. Iranica 70/30: 197 (1970); Osorio-Tafall & Seraphim, List Vasc. Pl. Cyprus 10 (1973); Täckholm, Students' Fl. Egypt (ed. 2) 702 (1974); Scholz, Liste Gräs. Libyens, Willdenowia 7: 435 (1974), Gramineae Rhodos und Symi, Willdenowia 19: 106 (1989); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980, err. in syn. of *Ae. uniaristata*); Hammer, Feddes Repert. 91: 236 (1980b, with ssp. *peregrina* var. *peregrina*); Davis, Fl. Turkey 9: 240 (1985); Meikle, Fl. Cyprus 2: 1821 (1985; description includes both varieties); Feinbrun-Dothan, Fl. Pal. 4: 173 (1986, with ssp. *peregrina* on p. 174); Sherif & Siddiqi in El-Gadi, Fl. Libya 145: 107 (1988, includes both varieties), non *Aegilops peregrina* Tabern. ex Honck., q.e. *Aegilops geniculata* Roth, an earlier but invalidly published name (see Chapter 3.1 and at 10.8).

Basionym: *Triticum peregrinum* Hack. in J.Fraser, Ann. Scot. Nat. Hist. 102 (1907); Kimber & Feldman, Wild Wheat 64 (1987).

Lectotype (*nov.*): (U.K., Scotland) Leith Docks, Edinburgh, 3.IX.1906, *J.Fraser s.n.* (E; isolectotypes: K, RNG). Both isolectotypes cultivated from seeds from E. See note 5.

Homotypic synonyms:

Ae. variabilis Eig var. *peregrina* (Hack. in J.Fraser) Eig & Feinbrun in Eig, Feddes Repert., Beih. 55: 125 (1929a); Pampanini, Prodr. fl. ciren. 137 (1930); Oppenheimer, Florul. Transiord. 151 (1931); Post, Fl. Syria (ed. 2) 2: 786 (1933).

Ae. peregrina (Hack. in J.Fraser) Eig, Feddes Repert., Beih. 55: 35, 121 (1929a), *nom. inval.* (Art. 34.1*(a)*: not accepted by author in original publication). See note 3.

Aegilemma peregrina (Hack. in J.Fraser) Á.Löve, Feddes Repert. 95: 499 (1984, with ssp. *peregrina*).

Heterotypic synonyms:

Ae. triaristata Willd. forma *intercedens* Bornm., Beih. Bot. Centralbl. 31(2): 275 (1914), **syn. nov.** – Type: Lebanon, bei Bhamdun, *Bornmüller 13041* (holo: B). – Note: incorrectly suggested by Bornmüller as a hybrid between *Aegilops neglecta* ('*triaristata*') and *triuncialis*.

Triticum triaristatum (Willd.) Gren. & Godr. [var. *lorentii* Hack.] forma *brachyathera* Hack. in Kneucker, Bemerkungen zu den 'Gramineae exsiccatae', 27.-32. Lieferung, All. Bot. Zeitschr. 12: 33 (1915), **syn. nov.** – Type: (Palestine) Wilhelma, near Jaffa, 23.V.1904, *Kneucker 948* (holo: KR, destroyed; iso: A, B (not seen), BM, C, G, K, L, LD, LE, MO, NY, PR, US). – Notes: 1. Type material was cultivated by Kneucker in Karlsruhe during June-July of 1912 and 1913 from eight-year old seeds, collected by him in Palestine. The holotype in Karlsruhe was destroyed in 1942 (Stafleu & Cowan, 1979: 575). An isotype is in B (H. Scholz, pers. comm.) but not seen. 2. the variety *lorentii* Hack. (and thus *non* Hochst. in von Lorent, see at 10.2) and the forma *brachyathera* were simultaneously published by Hackel.

Triticum ovatum auct. non Rasp. ssp. *violaceum* Braun-Blanq. & E.Wilcz., Bull. Soc. Hist. Nat. Afr. Nord 14: 192 (1923), **syn. nov.** – Type: (Morocco) in sabulosis prope Kenitra, in imperio Maroccano, ubi floret mense Aprili, 7.IV.1921, *Wilczek s.n.* (holo: LAU, not seen; iso: MPU). – Homotypic synonyms: *Ae. ovata* L. var. *violacea* (Braun-Blanq. & E.Wilcz.) Maire in Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931). *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller forma *violacea* (Braun-Blanq. & E.Wilcz.) Maire & Weiller, Fl. Afrique nord 3: 360 (1955).

Ae. variabilis Eig, Feddes Repert., Beih. 55: 121, 123 (1929a, with ssp. *eu-variabilis* var. *typica*); Pampanini, Prodr. fl. ciren. 137 (1930); Jahandiez & Maire, Cat. pl. Maroc 1: 89 (1931); Oppenheimer, Florul. Transiord. 151 (1931, with var. *typica*); Post, Fl. Syria (ed. 2) 2: 785 (1933); Täckholm et al.,

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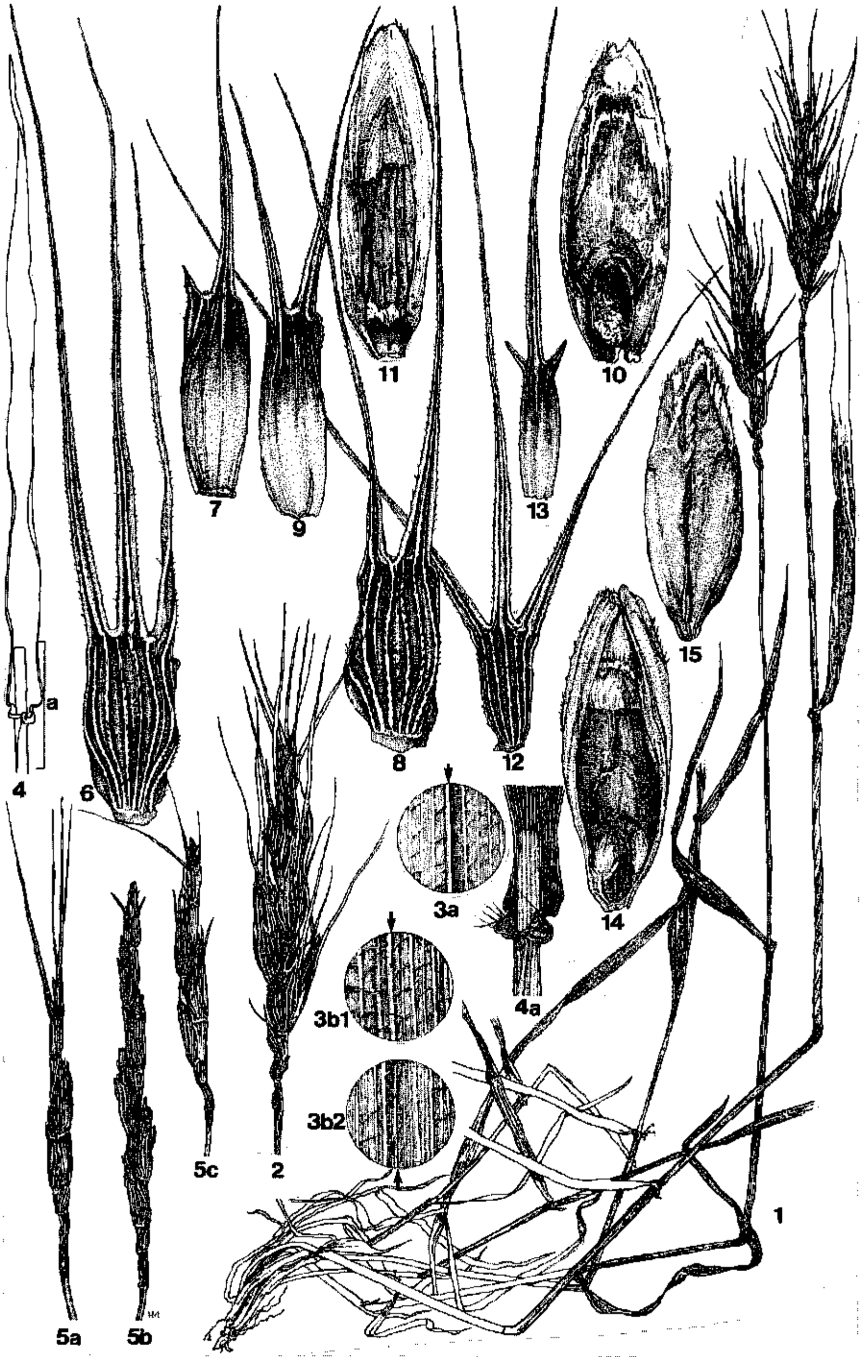
Fig. 57. *Aegilops peregrina*. 1, habitus (x 1/2); 2, spike (x 1); 3a, abaxial leaf surface, midway (x 5); 3b1, adaxial surface of leaf at base of culm (x 5); 3b2, adaxial surface of leaf halfway culm (x 5); 4, outline of leaf blade and sheath (x 1); 4a, stem, leaf sheath, ears and leaf blade (x 2); 6-7, upper floret in lowest fertile spikelet: 6, glume, 7, lemma (both x 3); 8-11, lower floret in lowest fertile spikelet: 8, glume (x 3), 9, lemma (x 3), 10, mature seed in palea (x 5), 11, palea with ovary at the base and the three anthers, which are slightly darkened to enhance their position (x 5); 12-13, uppermost spikelet: 12, glume, 13, lemma (both x 3); 14, palea with lodicules at the base and immature seed with its apical tuft of hairs (x 5); 15, ventral surface of mature seed (x 5). *Aegilops peregrina* var. *brachyathera*. 5a-c: variation in spike outline (all x 1). (1-4, 6-15. *van Slageren & Jaradat MSAJ-89031H*; 5a. *van Slageren & Jaradat MSAJ-88018H*; 5b. *van Slageren & al. MSLGAD-89084*; 5c. *van Slageren & Guarino MSLG-89074*; 5b-c cultivated at ICARDA from germplasm accessions.)


1
2
3a
3b1
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Fl. Egypt 1: 271 (1941); Oppenheimer & Evenari, Florul. Cisiord. 171 (1941, with var. *typica*); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 767 (1943); Thiébaut, Fl. Lib.-Syr. 3: 317 (1953); Chennaveeraiah, Acta Horti Gotoburg. 23: 165 (1960), *nom. illeg.* (Art. 63.1). See note 2. – Vouchers (13 collections cited by Eig, 1929a; inspected ones listed): Palestine, Herzliah, V.1928, *Zohary s.n.* (HUJ (not seen), L); Greece, Crete, Chania, 1883, *Reverchon 180* (BM, BR, G, JE, K, LD, LE, P, PRC, Z). – Homotypic synonyms: *Triticum variabile* (Eig) Markgr. in von Hayek, Prod. fl. pen. Balcan. 3: 225 (1932); Diapulis, Syn. fl. graec. 167 (1939); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980, err. in syn. of *Ae. uniaristata*); Feldman & Sears, Sci. Am. 244: 102 (1981); Löve, Feddes Repert. 95: 499 (1984); Scholz, Willdenowia 19: 105 (1989). See note 4. *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *variabilis* (Eig) Hammer, Feddes Repert. 91: 237 (1980b).

Ae. variabilis Eig var. *intermedia* Eig & Feinbrun in Eig, Feddes Repert., Beih. 55: 124 (1929a); Post, Fl. Syria (ed. 2) 2: 786 (1933); Oppenheimer & Evenari, Florul. Cisiord. 171 (1941); Täckholm et al., Fl. Egypt 1: 272 (1941), **syn. nov.** – Syntypes (seven collections cited by Eig, 1929a; inspected ones listed): Greece, Athens, 1926, *Vavilov s.n.* (HUJ); Egypt, Mariut, Abdel Qadr, Alexandria, 18.III.1903, *Schweinfurth s.n.* (B). – Homotypic synonyms: *Triticum variabile* (Eig) Markgr. forma ('β') *intermedium* (Eig & Feinbrun) Markgr. in von Hayek, Prod. fl. pen. Balcan. 3: 226 (1932). See note 4. *Ae. peregrina* (Eig) Maire & Weiller var. *intermedia* (Eig & Feinbrun) Mouterde, Nouv. Fl. Liban, Syrie 1: 149 (1966); Täckholm, Students' Fl. Egypt (ed. 2) 702 (1974), *comb. inval.* (Art. 33.2). *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *intermedia* (Eig & Feinbrun) Hammer, Feddes Repert. 91: 237 (1980b).

Ae. variabilis Eig var. *latiuscula* Eig & Feinbrun. in Eig, Feddes Repert., Beih. 55: 124 (1929a); Post, Fl. Syria (ed. 2) 2: 785 (1933), **syn. nov.** – Syntypes: Palestine: Karmel, IV.1927, *Smoly s.n.*; Hedera, IV.1927, *Smoly s.n.* (both HUJ, not seen). – Homotypic synonym: *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *latiuscula* (Eig & Feinbrun) Hammer, Feddes Repert. 91: 237 (1980b).

Ae. variabilis Eig var. *multiaristata* Eig & Feinbrun in Eig, Feddes Repert., Beih. 55: 124 (1929a); Post, Fl. Syria (ed. 2) 2: 785 (1933), **syn. nov.** – Syntypes (five collections cited by Eig, 1929a; inspected ones listed): Lebanon, Beirut, 6.VI.1898, *Post 994* (BEI); Lebanon, Beirut, 10.IV.1898, *Post 995* (BEI, K); Tripoli, 1868, *Blanche s.n.* (BEI (?, not found), E). – Note: two Post collections in BEI can be referred to with Eig's (1929a: 124) citation: 'Lebanon, Beirut, 1868'. – Homotypic synonyms: *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *multiaristata* (Eig & Feinbrun) Maire & Weiller, Fl. Afrique nord 3: 360 (1955); Mouterde, Nouv. Fl. Liban, Syrie 1: 149 (1966); Hammer, Feddes Repert. 91: 237 (1980b; as a *comb. nov.*, thus an isonym).

Ae. variabilis Eig var. *mutica* Eig & Feinbrun in Eig, Feddes Repert., Beih. 55: 124 (1929a); Post, Fl. Syria (ed. 2) 2: 785 (1933), **syn. nov.** – Syntypes (fide Eig, 1929a): Palestine: Schechunath Bochorov, V.1927, *Zohary s.n.*; Hedera, IV.1927, *Eig s.n.* (both HUJ, not seen). – Homotypic synonyms: *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *mutica* (Eig & Feinbrun) Maire & Weiller, Fl. Afrique nord 3: 360 (1955); Mouterde, Nouv. Fl. Liban, Syrie 1: 149 (1966); Hammer, Feddes Repert. 91: 237 (1980b; as a *comb. nov.*, thus an isonym).

Ae. variabilis Eig var. *planispicula* Eig & Feinbrun in Eig, Feddes Repert., Beih. 55: 124 (1929a); Post, Fl. Syria (ed. 2) 2: 785 (1933, '*planisiliqua*'), **syn. nov.** – Syntypes (fide Eig, 1929a): Palestine: Galilea, Jebl Jermak, VI.1926, *Eig s.n.*; Wadi Kala'at el Kadi, VI.1926, *Zohary s.n.* (both HUJ, not seen). – Homotypic synonym: *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *planispicula* (Eig & Feinbrun) Mouterde, Nouv. Fl. Liban, Syrie 1: 149 (1966, '*planiuscula*'), *comb. inval.* (Art. 33.2). *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *planispicula* (Eig & Feinbrun) Hammer, Feddes Repert. 91: 237 (1980b).

For literature, typification and synonyms referring specifically to the varieties, see under there.

Key to the varieties:
Glume apex with 2-3 awns, 1.5-5 cm long, apical glume with 3 awns; lemma apex

of all spikelets with 1-2 awns of widely uneven length, 0.3-3 cm long, flanked by 1-2 teeth .... var. **peregrina**

Glume apex of lateral spikelets with 2-3 sharp teeth, 1 or 2 of which may develop into a short awn of up to ± 7 mm long, increasing to 15 mm subapically, glume of apical spikelet with 1-3 awns, 1-3 cm long (when 1 awn only then flanked by acute teeth of up to 6 mm long); lemma apex of all spikelets 2-3 dentate only .... var. **brachyathera**

10.13a **Aegilops peregrina** (Hack. in J.Fraser) Maire & Weiller var. **peregrina**
Figs. 57(1-4, 6-15), 58-59

Diagnostic characters: tufted, many-tillered annuals, 15-40 cm tall excluding spikes; narrowly ovoid spikes 1.5-5 cm long excluding awns, with (2-)3-5 fertile and (2-)3 rudimentary spikelets; glume surface with ± parallel, protruding, equally wide venation, the apex with 2-3 unequally wide and long awns; lemma apex with 1-2 awns and 1-2 teeth, widely uneven in length and shorter than the glume awns; caryopsis adherent.

Description (Fig. 57: 1-4, 6-15): tufted *annuals* (*Fig. 57-1*), usually with many tillers. *Culms* geniculate at base, then ascending, 15-40 cm tall excluding spikes; foliage sparse, more dense at base of culm. *Leaf* blades linear-acuminate, 2.5-10 cm long, 0.2-0.3 cm wide; sheath margins hyaline, ciliate only in base of culm (*Fig. 57-4a*). *Inflorescence* (*Fig. 57-2*) a narrowly ovoid spike, 1.5-5 cm long excluding awns (commonly around 3 cm long), 0.4-0.6 cm wide; disarticulating as one unit at maturity with the rudimentary spikelets remaining attached to the culm; with (2-)3-5 fertile spikelets and (2-)3 rudimentary spikelets. *Spikelets* sessile, narrowly ovoid, 0.7-1.2 cm long excluding awns, 0.2-0.3 cm wide, from 1.2 times the length of the supporting rachis internode in the base of the spike decreasing to around 0.5 times in the apical part; with 3-5 florets, the upper 2 sterile. *Glumes* (*Fig. 57-6, 8*) 2, coriaceous (but the lateral margins at least partly hyaline), broadly obovate-truncate, 5-8 mm long, those of the apical spikelet (*Fig. 57-12*) obtrapezoid and around 4 mm long, green to purplish-green; the surface glabrous or scabrid; veins setulose, equal in width, ± parallel, protruding from the surface, equally spaced, usually yellowish and somewhat lighter in colour than the rest of the glume surface; the truncate apex with 2-3 setulose awns, 1.5-5 cm long, unevenly wide at the base, especially with 2 awns only (the basis of the wide awn 1-2 mm and this awn often bifurcating above), lower spikelets typically with one glume with 2, one glume with 3 awns, apical glume always with 3 awns, awns often purplish-green, diverging up to erecto-patent; inner glume surface at base of the awns velutinous. *Lemmas* (*Fig. 57-7, 9, 13*) of fertile florets slightly exserting the glumes, 6-9 mm long, narrowly ovate, boat-shaped, apical region rounded, the inner surface at the base of the awns, velutinous, the outer surface often setose; 1-2 awns at the apex of widely uneven length, 0.3-3 cm long, flanked by 1-2 acute teeth that may be up to 5 mm long, thus becoming short awns. *Paleas* (*Fig. 57-14*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 57-10, 15*) 5-7 mm long, adherent to lemma and palea.

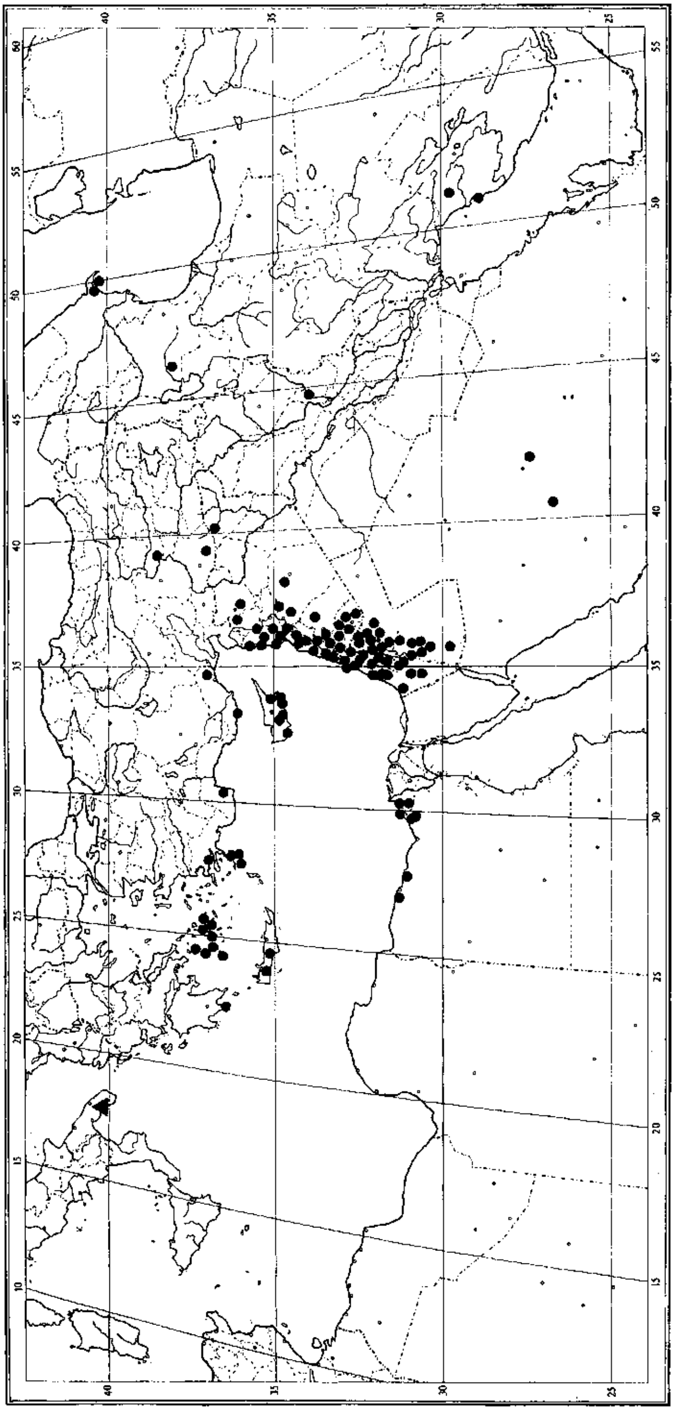

Fig. 58. Distribution of *Aegilops peregrina* var. *peregrina* in the eastern Mediterrean and western Asia. ● = locations; ▲ = adventive location (not shown for the U.K.).

Variation: both in length (1.5-5 cm) and width at the base of the glume awns, and in length of the lemma awns: 0.3-3 cm.

Distribution (Figs. 58-59): a Western Asiatic element occurring abundantly in a limited area: Palestine, western Jordan, Lebanon, and western Syria. Uncommon to rare elsewhere: southern and eastern Turkey, some Greek islands (Crete, Rhodes), Iraq, Azerbaijan, coastal Egypt and Cyprus. Extending eastwards into northwestern Iran, but also known from the south (Persepolis ruins near Shiraz, coll. *Kuckuck 287e2* (B), cited by Scholz, 1989: 106). The distribution of *Ae. peregrina* may be compared with those of its putative parents: *Ae. umbellulata* (Fig. 86) and a *Sitopsis* (Figs. 16-17, 52, 62, 64, 66-67) species. Thus, it seems dominated by the distribution of the *Sitopsis* parent (but *speltoides* less so), while the *umbellulata* parent may explain its wider spread outside the western arc of the Fertile Crescent.

Both the typical variety and var. *brachyathera* have been found as adventives in northern Africa (Fig. 59). The typical variety was described from Morocco as *Triticum ovatum* ssp. *violaceum* by Braun-Blanquet & Wilczek (1923: 192), who thought that it fitted into the highly variable species *ovata*. The var. *brachyathera* was found near Oran, Algeria (see specimens examined at 10.13b).

Aegilops peregrina var. *peregrina* has been found as an adventive in Italy and Scotland, from where the type specimens originate and where the species was probably introduced with grain refuse.

Ecology: a species from rather dry, ruderal sites in coastal areas and hill and mountain slopes. In sparse and open to more rich and herbaceous vegetation types, including kefkalla, *Poterium*-dominated garrigue shrubland, semi steppe batha with e.g., *Echinops* and *Phlomis*, heaths, maquis, *Zygophyllum* shrubland, open *Quercus* and *Pinus* forests, as well as *Cupressus*, *Pistacia*, *Acacia*, olive and grape plantations. The predominant bedrock is limestone, with basalt, sandstone, schistous and siliceous rocks, and Mediterranean terra rosa to a much lesser extent. The soil texture is often sandy, but löss, clayloam and sandy clay are also reported. The ability to grow on very shallow, stony soil at places where the bedrock surfaces is recorded. In Palestine also reported from saline locations near the Dead Sea as well as from margins of a salt marsh. Rainfall data in the range of 150-350 mm only indicate a potential for drought tolerance. However, most data are from sites with the annual rainfall varying from 300 to 800 mm, showing a preference for more humid environments than many other species of the genus, especially as *Ae. peregrina* is also reported from mountainous locations (in Lebanon, Syria, and Turkey) that receive as much as 1300 mm annually. See also note 2 at 10.10, *Ae. kotschyi*.

Altitude: from -380 m (Wadi Araba in the Dead Sea region, coll. *Kasapligil s.n.* in G) up to 1600 m; above sea level rather evenly distributed.

Flowering and fruiting time: April – July.

Genome: SU (female parent 'S' x male parent 'U') with 2x = 4n = 28 (Chennaveeraiah, 1960: 91, sub *A. variabilis*; Waines & Barnhart, 1992: Table 2). – Note: I assume that the same genome type is present in the var. *brachyathera*, but no literature references for that variety have been found. Although overviews of the genus point at the similarity of the *peregrina* genome with that of *Ae. kotschyi* (e.g., Kihara, 1954: 342, Table 3), Waines & Barnhart (1992: 209) suggest that further biosystematical research will confirm the commonly accepted separate status of the two species.

Etymology: the final epithet is derived from the Latin 'peregrinus' [= foreign], and may have been Hackel's reference to the adventive status of the species in Scotland from where it was first described.

A geographical selection of ca 425 herbarium specimens examined:

AFRICA: EGYPT: near Ramleh at Diamantini, *du Parquet 476, 488* (BM); station Bulkely, near Ramleh, *du Parquet s.n.* (BM); Alexandria, *Ehrenberg s.n.* (C, L, LD, US); Mariut, Abdel Qadr, Alexandria, *Schweinfurth s.n.* (B, type of *Aegilops variabilis* var. *intermedia*); Burg El Arab, *Simpson 3248* (CAIM, K); Dekhelia, *Simpson 4728* (CAIM); NE Burg el Arab, N coastal road, *Snogerup & al. 2664* (LD); Wadi El Habs, *Täckholm & al. s.n.* (CAI, MO); Wadi Umm Rakham, Mersa Matrouh to Agiba, *Täckholm & al. s.n.* (B, CAI, NY).

ASIA: IRAN: Tabriz, *Bowles Scho. Bot. Exp. 2553* (K); 25 mi. NE Ahmas, *Gentry 14600* (K); Shiraz, Persepolis ruins, *Kuckuck 287e2* (B); near Rishahr, *Stapf 2781* (K).

IRAQ: Diyala reg., Jebl Hamrin, *Barkley & Askari 1791* (US).

JORDAN: Wadi Shueib, just N Dead Sea, *Al-Eisawi 1151* (RNG); Wadi Rum Ergaybe, *Kasapligil & Mouterde 2277* (G); Wadi Araba at Ghor Feifa, *Kasapligil s.n.* (G); near Mejdel, *Samuelsson 843* (B); S side Zarqa river, Er Rumman, *Semple 23* (US); E Um Qeis, *Täckholm & al. 8827* (G); Irbid – Ajlum at start road to Zubyia, *van Slageren & Humeid MSBH-88138H* (ICARDA, WAG); Jarash, SE Tumeira on road Irbid – Bal'ama, *van Slageren & Jaradat MSAJ-88015H* (ICARDA); Jarash, El-Mastaba to Jubba, *van Slageren & Jaradat MSAJ-88055H* (ICARDA, WAG); Irbid, Er Rafida, *van Slageren & Jaradat MSAJ-88029* (ICARDA, WAG); Kura, Khanzira, *van Slageren & Jaradat MSAJ-88085H* (ICARDA, WAG); Madaba, El Rawdha, SW Naur, *van Slageren & Jaradat MSAJ-88064H* (ICARDA); Mafraq, NW Es-Sukha, *van Slageren & Shibli MSRS-88048H* (ICARDA); Zarqa, El Jubeiha to Yajuz, *van Slageren & Shibli MSRS-88045H* (ICARDA, WAG); near Salt, *Vavilov 29504* (WIR 1544).

LEBANON: Rua Sait el Hammer, *Ball 2258* (G-BOIS); S Beirut, *Blanche 1837* (B, BR, F, G, JE, LE, LY, LY-Gandoger, MO, MPU, P, PI); S Beirut at Saïda (Sidon), near Saïnik, *Blanche 776* (BEI, L, P), *777* (G-BOIS, L, LY, P, W); Tripoli, Deir Oman – Burhal, *Blanche 801* (A, BEI, LE), *804* (G-BOIS, JE); Tripoli, *Blanche 49, 50* (G-BOIS, LY-Gandoger), *s.n.* (E, type of *Aegilops variabilis* var. *multiaristata*); near Bhamdun, *Bornmüller 13041* (B, type of *Aegilops triaristata* forma *intercedens*); Alamuddin estate, Jezzine to Nabatiyeh, *Edgecombe B-586, B-588* (BEI); Ain Ksour, *Edgecombe A-882-1* (BEI); Saharah, Oadi el Djouze to Dimar, *Gaillardot s.n.* (JE); Mayrouba, *Mouterde 1962* (G); Sidon, Roumeilé, *Mouterde 5190* (G); Nahr el Kelb, *Peyron s.n.* (G); Beirut, *Post 236* (BEI), *305* (FI), *347, 922* (BM), *153, 536* (PH), *169* (K), *994* (BEI, type of *Aegilops variabilis* var. *multiaristata*), *995* (BEI, K, type of *Aegilops variabilis* var. *multiaristata*); Brummana, *Vavilov 28627, 28639, 28640, s.n.* (WIR 1454, 1455, 1461-1467, 1469-1471).

PALESTINE: Benjamina, Sharon plain, *Amdursky s.n.* (K); lake Tiberias, *Ball 1509* (A, E, G-BOIS); Tel Achzib, *Barbey 939* (G); Haifa, *Bornmüller 1739* (B, G); lower Jordan valley, NE Pzael, N Jericho, *Danin & al. 9-37/538* (RNG); desert of C Palestine, near Mishar Adumin, *Danin & al. 5-10/247* (RNG); Nablus, foot of Ebal, *Davis 4333* (E, K); Jaffa, *Dinsmore 1478* (E, L); Tell El-Kadi, *Dinsmore & Meyers 724b* (G, K); Latrun, *Dinsmore 724c* (B); near Rishon-le-Zion, *Eig s.n.* (HUJ, L); Hedera, *Eig s.n.* (MPU); Carmel, Wadi e'Tra, *Eig & al. s.n.* (HUJ, US); Shelefa, near Qubab, *Feinbrun & al. s.n.* (HUJ, LD, PR); Ramle, Latrun, *Fischelsohn 82* (K); Massada, Ein Jidi, *Gabrielith 77* (K); N Raanana, Sharon plain, *Johnson & Hall s.n.* (UCR); Hebron to El Qarm, *Kasapligil 2388* (G); Wilhelma, near Jaffa, *Kneucker 948* (A, BM, C, G, K, L, LD, LE, MO, NY, PR, US, type of *Triticum triaristatum* var. *lorentii* forma *brachyathera*); Jaffa to Sawona, *Kneucker 322* (A, B); C Negeb, S of Beersheba, outskirts of Sde Boger, *Kramer 6725* (U); Akka, *Markovic 210* (WIR 1517); around Dzermak Mt., *Markovic 216, 218* (WIR 1521, 1522); Ben-Chemen, *Markovic 204, 205* (WIR 1525, 1526); Ramle, Latrun, *Meyers & Dinsmore 724c* (JE, K), *B744* (K); Jabbok river, *Meyers & Dinsmore G107* (E, K); Galilea, Ain Tabra (and Tabira), near Tiberias, *Nábělek 3143* (SAV); Schechunath Borochov, near Jaffa, *Percival 850* (BM, K); Haifa, *Petry s.n.* (JE, LY, LY-Gandoger); Jaffa to Ramleh, *Post s.n.* (BEI); Carmel Mt., Bet Zevi to Bet Oren, *Rilke 1253* (B); Motza, near Jerusalem, *Samuelsson 657* (B, BM, K); Beit Dadjan, near Jaffa, *Samuelsson 732* (B, LD); near Hebron, *Semple 32* (US); Khan Younis, *Shabetai 44* (K); N Galilea, near Rosh-Pinah, *Vavilov 29514* (WIR 1531); Akka, *Vavilov 29493* (WIR 1519);

around Ben-Chemen, S Tel-Aviv, *Vavilov 29496-29498* (WIR 1535-1537); Milhamia, near Jordan river, *Vavilov 17256, 29511* (WIR 1541-1542); Beersheba to Hebron, *Vavilov 29500* (WIR 1490); near Jaffa, *Vavilov 29491* (WIR 1491); Canaa, *Weiss s.n.* (G-BOIS); Herzliah, N Tel-Aviv, *Zohary s.n.* (L, voucher of *Aegilops variabilis*); Sharon plain, Givatayim, *Zohary s.n.* (Z); Benei Barak, near Tel-Aviv, *Zohary 27* (B, BC, BEI, BM, E, ERE, FI, G, K, MPU, P, PR, PRC, RNG, US, Z); Mt. Hermon, slopes facing Nathal Man, *Zohary 1014* (U, Z).

SAUDI ARABIA: near Baida Natheel, Ha'il – Jaharah road, *Collenette 5727* (K).

SYRIA: Tartous, Safita, El Nakaib, *Barkoudah & Sanadiki s.n.* (ACSAD); Damascus, Kutaifeh to Nabq, *Barkoudah & Sanakidi s.n.* (ACSAD); Sweida, Jebl Druze, Sahawat, El Ghaddir, *Barkoudah & Sanadiki s.n.* (ACSAD); Aleppo, *Kotschy 144* (L); Golan, Mt. Hermon, *Lyshede s.n.* (C); Massaade, near Quneitra, *Pabot s.n.(355)* (G, Min.Agr.Syr.); Tel Kalakh, *Pabot s.n.* (G); W Kum, N Soukhni, on Palmyra – Deir-ez-Zor road, *Pabot s.n.* (G); SE Ras el Ain, Jezira, *Pabot s.n.* (G); Tripoli to Tartous, Nahr Abrach, *Pabot s.n.* (G); W Damascus, *Rechinger 13152* (BM); Quadi El Karm, *Samuelsson 1485* (BM, K); E slope Jebl Druze, El Hamad, *Sanadiki s.n.* (ACSAD 770); Ma'ada, E Sweida, *van Slageren & al. MSGMNR-88092H* (ICARDA, WAG); Baydiah, Lattakia to Borj Islam, *van Slageren & al. MSWRKA-88239H* (ICARDA); N Sweida near road to Damascus, *van Slageren & Mir-Ali MSGM-88097H* (ICARDA, WAG); Salamie, *Vavilov 29027* (WIR 1478).

TURKEY: opposite Berythum (Berit Mts.), *Blanche s.n.* (hb. Hance 15996) (BM); Antalya, SW Antalya at Kiremithaneler, *Hennipman & al. 564* (L, WAG); NW Elaziğ, Merkez, Hidir Basa, Asvan, *Hillman 2732* (RNG); Hierafalyma Mts., *Nath s.n.* (K); Içel, Anamur, *Péronin 104* (BM, K, L, LD, LY, LY-Gandoger, MPU, P), *105* (LY, LY-Jordan, Z); Antalya, Gazipasa, *Sümbül 1003* (ANK); near Bodrum, *Wallace s.n.* (RNG).

EUROPE: AZERBAIJAN: Baku, *Becker s.n.* (LY-Gandoger); Swätoi island, near Baku, *Bruhns s.n.* (BM).

CYPRUS: Larnaca airport, *Chapman 450* (CYP, K); Malounda, *Della s.n.* (ARI 3086); Klirou, *Della s.n.* (ARI 3087); Lapithos, *Druce s.n.* (OXF); Kato Pathos, *Holub s.n.* (K); Larnaca, *Kotschy 274* (G-BOIS); near Agios Memmon, *Mavromoustakis s.n.* (K); Dhekelia, *Merton 2664* (CYP, W); Kyrenia, *Syngrassides 14* (K).

GREECE, ATTICA: Athens, *Vavilov s.n.* (HUJ, type of *Aegilops variabilis* var. *intermedia*). PELEPONNESUS: Lakonia penins., Mani, Plitra, *Runemark & Svensson 48041* (LD). ISLANDS: ANTIPAROS: s.loc., *Runemark & al. 41447* (LD). CRETE: Chania, *Reverchon 180* (BM, BR, G, JE, K, LD, LE, P, PRC, Z, voucher of *Aegilops variabilis*); Kissamos, *Reverchon 180* (G, LY, P, Z). DILOS: Rinia, *Runemark & Engstrand 36323* (LD). KITHNOS: Kastro, *Runemark & al. 40503* (LD); E Merixas, *Runemark & Engstrand 38168* (LD). MIKONOS: Ormos Ornos, *Runemark & Engstrand 35500, 35508* (LD); Elia bay, *Runemark & Engstrand 36249* (LD). MILOS: Chivadolimni, *Runemark & Bentzer 29872* (LD). NAXOS: S Naxos town, *Runemark 2181* (LD); Agios Chrysostomos to Aggidia, *Runemark & Nordenstam 13075* (LD). PAROS: E Parikia, *Runemark & Bentzer 29537* (LD). RHODES: E Salakos, *Carlström 6787* (LD); Rivulet, NNW Salakos, *Carlström 352* (LD); Philerimos, *Huber s.n.* (BM); Embona, *Rechinger 7307* (BM). SERIFOS: Livadion, *Runemark & Bentzer 27424* (LD); Koutalas, *Runemark & Bentzer 27999* (LD). SIFNOS: Faros, *Runemark & al. 40331* (LD).

ADVENTIVE: AFRICA: MOROCCO: Rabat, Temara, *Lewalle 8317* (MO), *8397* (BR, MO), *9070* (BR), *10185* (BM, BR); Casablanca to Mazagan, *Maire & Wilczek s.n.* (FI, G, MPU); near Mazagan, *Maire & Wilczek 58* (G, US); Kenitra, sands of Mamora, *Maire s.n.* (MPU); near Salé, *Mouret 1049* (MPU); Chaouïa, Tedhala, *Pitard 1259* (P); Casablanca, Bou Azza, *Pitard 1260* (K, P); near Kenitra, *Wilczek s.n.* (MPU, type of *Triticum ovatum* var. *violaceum*). EUROPE: ITALY: Gallipoli, *Groves s.n.* (FI). U.K., SCOTLAND: Leith Docks, *Fraser s.n.* (E, K, RNG, type of *Aegilops peregrina*); Slateford, *Fraser s.n.* (E).

Germplasm collections examined:

ASIA: JORDAN: Karak, S Wadi Mujib, *Bourgois SY-20240* (IPGRI, ICARDA); Ma'an to Petra, Dilagha, *Bourgois SY-20261* (IPGRI, ICARDA); Karak, Qasr, on King's Highway, *van Slageren & al. MSBHAJ-88154* (ICARDA, JUST); Karak, just S Mauta on King's Highway, *van Slageren & al. MSBHAJ-88160* (ICARDA, JUST); Tafila, Rashadiah, road to Shoubak, *van Slageren & al. MSBHAJ-88178* (ICARDA, JUST).

SYRIA: Idlib to Harem, *Bourgois SY-20174* (IPGRI, ICARDA); Tartous, Housin al Baheir, *Valkoun & al. VDFKO-73* (ICARDA, SARD, VIR); close to Lebanese border coming from Tartous, *Valkoun &*

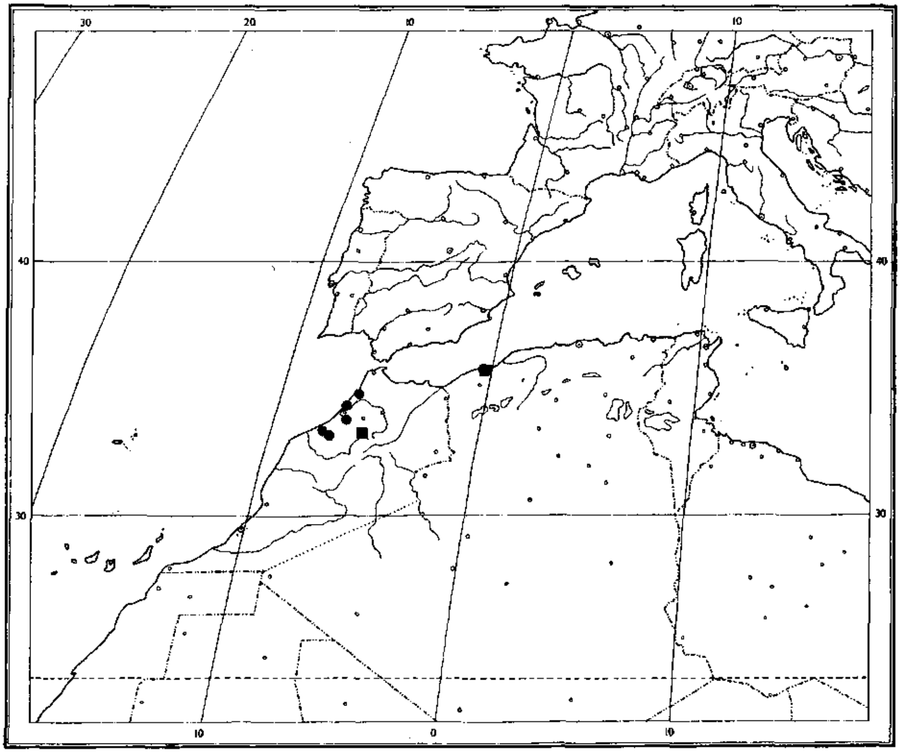

Fig. 59. Adventive distribution of *Aegilops peregrina* var. *peregrina* and var. *brachyathera* in northern Africa. ● = var. *peregrina*; ■ = var. *brachyathera*.

al. VDFKO-99 (ICARDA, SARD, VIR); Raha, E Sweida, *van Slageren & Mir-Ali MSGM-88099* (ICARDA, SARD); Lattakia, Alsemeha, W Heffe, *van Slageren & al. MSWRKA-88231* (ICARDA, SARD); just outside Homs to Palmyra, *van Slageren & Obari MSKO-89127* (ICARDA, SARD).

TURKEY: 48 km E Urfa, *Metzger & Jana 84TK124-023* (USDA).

EUROPE: CYPRUS: near Paphos airport, *van Slageren & al. MSLGAD-89104* (ARI, ICARDA).

Notes: 1. Eig's treatment of *Aegilops peregrina* is based on two seasons of cultivation of material on, I suppose, experimental fields (Eig, 1929a: 123, footnote 1). Thus, the variation observed does not necessarily reflect what can be found in nature. My own experience with evaluation of populations collected from the wild at ICARDA showed that under favourable circumstances the morphology of the plants can vary, e.g., in size or in development of individual parts, in a way that will never be found in nature. I suspect that Eig's observed and described variation is at least partly due to this feature. Apart from Hammer's (1980b) treatment of the genus *Aegilops*, the distinction of Eig's varieties has not or has hardly been followed by recent authors; only the subspecies *cylindrostachys* is present in recent floras (e.g., Bor, 1968, 1970; Davis, 1985; Feinbrun-Dothan, 1986).

2. In retrospect the nomenclature of *Aegilops peregrina* var. *peregrina* shows considerable confusion, which is mainly caused by the determination of the correct species name. Eig (1929a: 35, 121) was aware of the older epithet *peregrinum* from Hackel when he proposed his *nom. nov.*, *variabilis*. The main reason for renaming appears to have been that Hackel's plant was an 'atypical' form within the displayed variation of the taxon. Other reasons for Eig were that he felt that the diagnosis of the species had to be altered too much if Hackel's plant was to be included, and that the original combination was with *Triticum*. However, in his subdivision of *Ae. variabilis* he considered the *peregrina* form as belonging to the typical forms of the species! The form was included as a variety within the subspecies *eu-variabilis*, with the (presumably cultivated) 'very narrow lanceolate to linear' (l.c., 121, transl. from the German) forms united in the subspecies *cylindrostachys*. In order not to become superfluous and illegitimate because of Art. 63.1 of the ICBN: 'the taxon to which the (species) name applies, as circumscribed by its author, definitely includes the holotype...of a name which ought to have been adopted, or whose epithet ought to have been adopted, under the rules'. Thus the correct species epithet should be *peregrina* instead of *variabilis*, even when based on an atypical form of the species.

3. Maire & Weiller (1955) and Mouterde (1966) transfer most of the infraspecific taxa of Eig (1929a) from the species epithet *variabilis* Eig to the correct one, *peregrina* Hack. in J.Fraser, but several of these transfers are invalid since the ICBN in Art. 33.2 requires full citation of the basionym for new combinations made after 1 January 1953. This applies to the combinations with the vars. *intermedia* and *planispicula* by Mouterde (1966: 149), and the combination of *intermedia* by Täckholm (1974: 702).

The combination *Aegilops peregrina* (Hack. in J.Fraser) Eig, presented by Eig (1929a: 35, 121) is invalid following Art. 34.1 since it is clearly not accepted by the author in his original publication, who favoured his new name *variabilis*. This has already been noted by Bor (1968, 1970) and Hammer (1980b: 236). It would have been valid, however, in view of Art. 34.3 as an alternative name since it was published before 1 January 1953.

4. *Aegilops peregrina* (Hack. in J.Fraser) Maire & Weiller and *T. variabile* 'Markgr.' (it should be '(Eig) Markgr.') are erroneously cited by Tutin & Humphries in the *Flora Europaea*, Vol. 5 (1980: 201) as synonyms of the rather different *Ae. uniaristata*, as was noticed by Feinbrun-Dothan (1986: 175) and Scholz (1989: 106). To indicate, however, that *T. variabile* (Eig) Markgr. is a heterotypic synonym of *Ae. uniaristata* Vis. as is suggested by Scholz is erroneous as Markgraf cites Eig's combination in *Aegilops* as the basionym.

Although only *T. variabile* is indicated as '(Eig) Markgr.' in the posthumous publication of von Hayek's *Prodromus* (1932: 225), I have assumed that the combination of *Triticum* with the forma ('β') *intermedium* (with 'Eig et Feinbrun' in brackets, l.c., 226) is also effected by Markgraf.

5. The type collection of *Aegilops peregrina* ('Patria ignota, introductam in Scotia prope Edinburgh (Slateford and Leith Docks), invenit *J. Fraser*') has been considered a single specimen in the flora's that quote it (Bor, 1970: 197; Davis, 1985: 241). Inspection at herbarium E revealed, however, that it is actually a syntype, consisting of specimens from two sites and collected at diferent times: the Slateford specimen on 4.VII.1906, and the Leith Docks specimen on 3.IX.1906. Other material in the type-folder at E, which carries an annotation from Eig, represents cultivated material from 1907 from seeds of the Leith Docks type. Both syntypes are perfectly comparable. In addition, both carry an annotation from a certain Evans who writes on the Leith Docks specimen: 'This is the *type* (or perhaps co-type) of the species...', and on the Slateford specimen: 'This is the *syntype* gathering...'. This indication is followed, together with the fact that isotypes exist in K and RNG, and the collection 'Leith Docks, 3.IX.1906, coll. *James Fraser*' is designated as the lectotype of the typical forms of *Ae. peregrina*.

The type specimen of *Ae. peregrina* is in E as Hackel (whose herbarium is in W) requested to contribute the description to James Fraser (Fraser, 1907: 102).

6. The differences with the rather similar species *Ae. kotschyi* are keyed out under the latter (see at 10.10, note 2).

10.13b **Aegilops peregrina** (Hack. in J.Fraser) Maire & Weiller var. **brachyathera** (Boiss.) Maire & Weiller **Figs. 57(5), 59-60**

Aegilops peregrina (Hack. in J.Fraser) Maire & Weiller var. *brachyathera* (Boiss.) Maire & Weiller, Fl. Afrique nord 3: 360 (1955); Hammer, Feddes Repert. 91: 237 (1980b, as a *comb. nov.*, thus an isonym).

Basionym: *Ae. triuncialis* L. var. ('β') *brachyathera* Boiss., Fl. orient. 5(2): 674 (1884); Ascherson & Schweinfurt, Ill. fl. Égypte, Mém. Inst. Egypte 2: 178 (1887); Post, Fl. Syria (ed. 1) 899 (1896); Bornmüller, Beitr. Kenntnis Fl. Syrien, Palästina, Verh. k.k. zool.-bot. Ges. Wien 68: 651 (1898); Durand & Barratte, Fl. libyc. prodr. 276 (1910); Muschler, Man. Fl. Egypt 1: 156 (1912); Pampanini, Prodr. fl. ciren. 136 (1930); Keith, Checklist Libyan Fl. 198 (1965, '*brachyanthera*'); Sherif & Siddiqi in El-Gadi, Fl. Libya 145: 107 (1988, uncertain record).

Lectotype (*nov.*): (Lebanon) 'Syria', prope Tripoli, *Blanche 805* (holo: G-BOIS). See note 1.

Homotypic synonyms:

Triticum triunciale (L.) Rasp. var. *brachyatherum* (Boiss.) Th.Durand & Schinz, Consp. fl. afric. 5: 940 (1894).

Triticum triunciale (L.) Rasp. ssp. ('B') *brachyathera* (Boiss.) Asch. & Graebn., Syn. mitteleur. Fl. 2(1): 707 (1902).

Ae. brachyathera (Boiss.) Bornm., Beih. Bot. Centralbl. 31(2): 276 (1914), *nom. illeg.* (Art. 64.1), non Pomel, Nouv. mat. fl. atl. 389 (1874).

Ae. triuncialis L. ssp. *brachyathera* (Boiss.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 499 (1928); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960).

Ae. variabilis Eig ssp. *cylindrostachys* Eig & Feinbrun in Eig, Feddes Repert., Beih. 55: 125 (1929a); Post, Fl. Syria (ed. 2) 2: 786 (1933).

Ae. variabilis Eig var. *brachyathera* (Boiss.) Eig & Feinbrun in Eig, Feddes Repert., Beih. 55: 125 (1929a); Oppenheimer, Florul. Transiord. 151 (1931); Post, Fl. Syria (ed. 2) 2: 786 (1933).

Ae. peregrina (Hack. in J.Fraser) Maire & Weiller ssp. *cylindrostachys* (Eig & Feinbrun) Maire & Weiller, Fl. Afrique nord 3: 360 (1955); Mouterde, Nouv. Fl. Liban, Syrie 1: 150 (1966, as a *comb. nov.*, thus an isonym; but invalid because of Art. 33.2); Hammer, Feddes Repert. 91: 237 (1980b, as a *comb. nov.*, thus an isonym); Feinbrun-Dothan, Fl. Pal. 4: 174 (1986).

Aegilemma peregrina (Hack. in J.Fraser) Á.Löve ssp. *cylindrostachys* (Eig & Feinbrun) Á.Löve, Feddes Repert. 95: 499 (1984).

Triticum peregrinum Hack. in J.Fraser ssp. *cylindrostachys* (Eig & Feinbrun) Kimber & Feldman, Wild Wheat 64 (1987), *comb. inval.* (Art. 33.2).

Heterotypic synonyms:

Ae. triuncialis L. var. *anathera* Hausskn. & Bornm. in Bornmüller, Beitr. Kenntnis Fl. Syrien, Palästina, Verh. k-k. zool.-bot. Ges., Wien 48: 651 (1898); Eig, Feddes Repert., Beih. 55: 134 (1929a); Post, Fl. Syria (ed. 2) 2: 784 (1933); Hammer, Feddes Repert. 91: 239 (1980b), **syn. nov.** – Type: (Iran) Persia, in segetibus ad Bushir, bei Bahmeni, 7.III.1893, *Bornmüller 772* (holo: B; iso: JE). – Homotypic synonym: *Ae. triuncialis* L. var. *exaristata* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 323 (1928a), *nom. illeg.* (Art. 63.1).

Ae. variabilis Eig var. *aristata* Eig & Feinbrun in Eig, Feddes Repert., Beih. 55: 125 (1929a); Jahandiez & Maire, Cat. pl. Maroc 1: 89 (1931); Oppenheimer, Florul. Transiord. 151 (1931); Post, Fl. Syria (ed. 2) 2: 786 (1933), **syn. nov.** – Syntypes (five collections cited by Eig, 1929a; inspected ones listed): Italy, Gallipoli, 1881, *Gross s.n.* (G, G-BOIS); Morocco, Chaonia, Fedhala, 1912, *Pitard s.n.* (G). – Homotypic synonym: *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *aristata* (Eig & Feinbrun) Maire & Weiller, Fl. Afrique nord 3: 360 (1955); Hammer, Feddes Repert. 91: 237 (1980b; as a *comb. nov.*, thus an isonym).

Ae. variabilis Eig var. *elongata* Eig & Feinbrun in Eig, Feddes Repert., Beih. 55: 126 (1929a); Post, Fl. Syria (ed. 2) 2: 786 (1933), **syn. nov.** – Type: (Palestine) Wadi Kefrin Schitimebene, dry places, -200 m, 20.IV.1911, *Dinsmore s.n.* (holo: HUJ, not seen; iso: E, K). – Homotypic synonym: *Ae. peregrina* (Hackel) Maire & Weiller var. *elongata* (Eig & Feinbrun) Hammer, Feddes Repert. 91: 237 (1980b).

Ae. comosa Sm. in Sibth. & Sm. var. *brachyathera* Post, Fl. Syria (ed. 1) 900 (1896), **syn. nov.** – Type: (Jordan) 'Plantae Moabiticae', El-Ghôr, 24.IV.1886, *Post s.n.* (holo: BEI).

Description (Fig. 57-5): *inflorescence* a narrowly ovoid to subcylindrical spike, more slender and elongated in outline than in var. *peregrina*, 2-3.5 cm long excluding awns, 0.2-0.5 cm wide; with 2-5 spikelets, the apical one sometimes sterile, and 2-3 rudimentary spikelets. *Glume* apex of lateral spikelets with 2-3 sharp teeth, 1 or 2 of which may develop into a short awn, up to around 7 mm long, increasing to 15 mm subapically; glume apex in apical spikelet with 1-3 awns of 1-3 cm, when 1 awn only then flanked by acute teeth of up to 6 mm that may gradually extend into an awn. *Lemma* apex of lateral and apical spikelets 2-3 dentate only and not awned. Otherwise as var. *peregrina*.

Note: the description of var. *brachyathera* as well as of the typical variety allow for less variation than is suggested by, e.g., Feinbrun-Dothan (1986: 174). Under cultivation the spike length of var. *brachyathera* reached 6.5 cm and the number of spikelets six. Slender, cylindrical spikes were observed, as well as considerable variation in lateral glume awn development. See also Chapter 4.1.

Distribution (Figs. 59-60): similar to var. *peregrina* and sometimes growing together. This variety is, however, less frequently encountered, not known from Greece, Iraq and Transcaucasia, and is more confined to coastal and lowland areas than the var. *peregrina*.

Ecology, flowering and fruiting time: similar to var. *peregrina*. However, fewer data limit the rainfall amplitude to only 150-450 mm annually.

Altitude: from -350 m (Wadi Kefrein in the Dead Sea region, coll. *Meyers & Dinsmore 1637* from LD) up to 750 m.

Etymology: the variety name refers to the Greek words 'brachys' [= short; 'brachy-' in compound words, cf., Stearn, 1978: 394], and the Greek 'thera' or 'tera' [from 'teras' = monster], possibly indicating that the plants were seen as a monstrosity.

A geographical selection of ca 150 herbarium specimens examined:

EGYPT: Mersa Matrouh, Qasabit El Kharrub, *Drar 176* (CAIM); near Ramleh, Diamantini, *du Parquet s.n.* (BM); Alexandria, *Ehrenberg s.n.* (G-BOIS); El Hauwariya, *El Khanagry & Makhtar 119* (CAIM); Sidi Barrani, *Helmy & al. 1866* (CAIM); Ras el Hekma, *Kamal s.n.* (CAI); W Umm El Rakham, *Shabetai Z 3277* (CAIM); coastal road 45 km E Mersa Matrouh, *Täckholm s.n.* (CAI, MO);

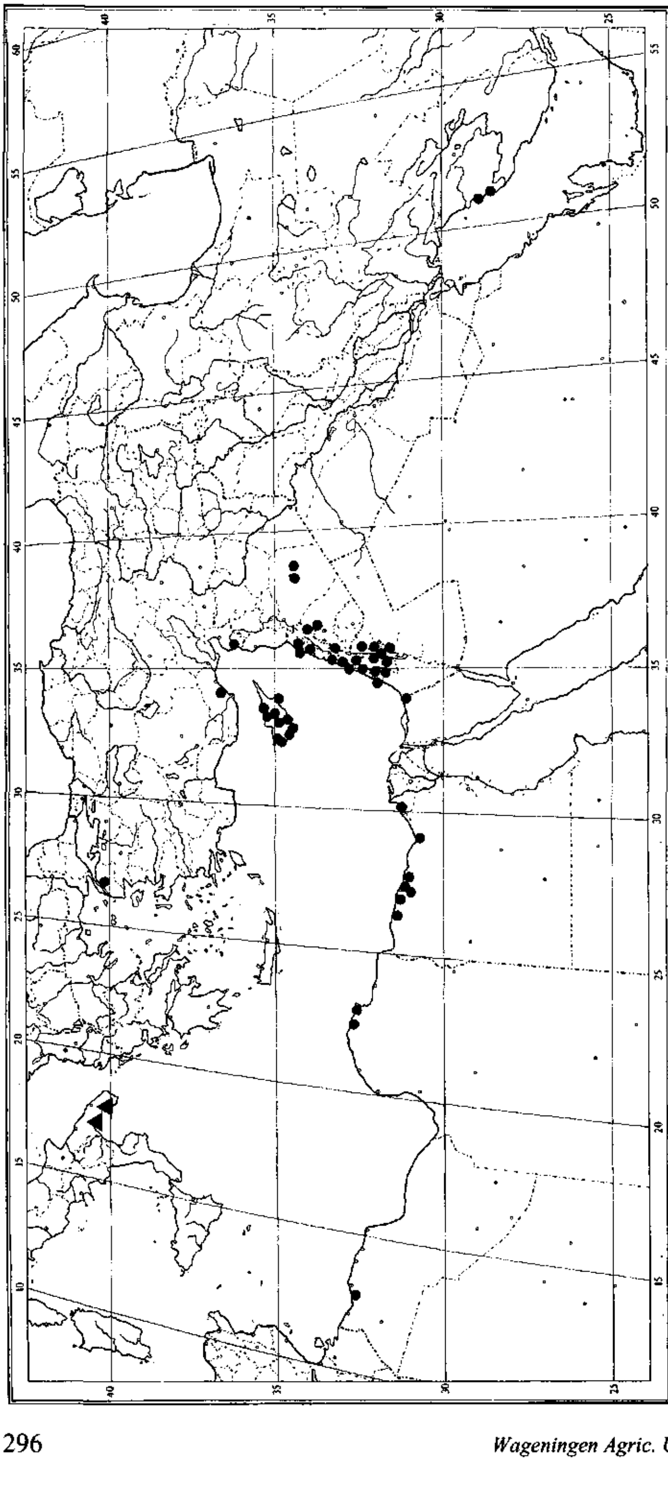

Fig. 60. Distribution of *Aegilops peregrina* var. *brachyathera* in the eastern Mediterranean and western Asia. ● = locations; ▲ = adventive locations.

Sinai, El Rafah, *van Slageren & al. MSBHSS-89063H* (ICARDA); Wadi El Habs, W Mersa Matrouh, *van Slageren & al. MSBHSS-89018H* (ICARDA, WAG); E Maratia, nr. El Alamein, *van Slageren & al. MSBHSS-89048H* (ICARDA).

LIBYA: W Tripoli, *Letourneux s.n.* (P); Cyrenaica, Derna, Pharum, *Simpson 39486* (BM); Cyrenaica, Derna, Pharum, *Taubert 345* (G, JE, K, P).

ASIA: IRAN: Bushir, near Bahmeni, *Bornmüller 772* (B, JE, type of *Aegilops triuncialis* var. *anathera*); Fars, S Bushir city, *Lambinon 76/162* (BR).

JORDAN: Jarash, Burma, *Kasapligil & Mouterde 2674* (G); Mt. Nebo, *Post s.n.* (BEI, K); El-Ghôr, *Post s.n.* (BEI, type of *Aegilops comosa* var. *brachyathera*); Wadi Shuerb, E side Jordan valley on Amman – Jerusalem road, *Semple 76* (US); Salt, Er Rumeimin, road to Um El-Amad, *van Slageren & al. MSBHAJ-88189H* (ICARDA, WAG).

LEBANON: near Tripoli, *Blanche 805* (G-BOIS, type of *Aegilops peregrina* var. *brachyathera*); Tripoli, Tell, *Blanche s.n.* (A, JE); Brummana, *Mooney 4426* (K); Tyrus, *Mouterde 10474* (G); Qued Harir, *Pabot s.n.* (G); La Citerne (= Masna'a), *Peyron 1645* (G).

PALESTINE: Ain el Kamara to W of Mescheblis, *Aaronsohn s.n.* (WIR 1613); Jerusalem, *Amdursky s.n.* (C, HUJ); 'Aujah river, *Dinsmore 5253, 5637* (B, JE); Wadi Kefrin Schitimebene, *Dinsmore s.n.* (E, K, type of *Aegilops variabilis* var. *elongata*); ibid., *Meyers & Dinsmore 1629* (E, G, K), *1629b* (L), *1637* (LD); Schechunath Borochov, near Tel Aviv, *Eig & al. s.n.* (E, HUJ); Jaffa to Sawona, *Kneuker 169* (A, B); Jaffa, *Meyers & Dinsmore 3637b* (G, WIR 1492); Kubab, *Meyers & Dinsmore 1253* (L); Ramath-Gan, *Samuelsson 771* (B, K, LD, NY), *s.n.* (BM); Haifa, *Stříbrný s.n.* (SOM); Sharon plain, Eliashev, E of Kefar, *Zohary s.n.* (SOM); Benjamina, *Zohary s.n.* (B, GAT, JE); Benei-Barak, near Tel-Aviv, *Zohary 27* (A, LE, RAB, W).

SYRIA: Deir to Achaïa (= Deir Atieh?) to Damascus, *Letourneux s.n.* (C, FI); Palmyra, *Mouterde 8008, 8328* (G).

TURKEY: Gallipoli, *Groves s.n.* (K); opposite Eregli, *Johnson & Hall s.n.* (UCR); Cilicia, near Dorak, *s.coll., s.n.* (WIR 1358).

EUROPE: CYPRUS: Ayios Antonios, Sotira, *Chapman 597* (CYP, K); Akames, Neokhorio forest, *Davis 3305K* (E); Ayios Antonios, Sotira, *Della s.n.* (ARI 2035-2036, 2038; K); Pissouri, *Della s.n.* (ARI 2102, K); Petra-to-Romiou to Paphos, *Della s.n.* (ARI 3205); Yioti, *Meikle 2523* (C, CYP, K); Akanthou, *Merton s.n.* (ARI 775); 11/2 mi. Larnaca tis Lapithou, *Merton 2720* (CYP, K); Akhna forest, *Merton 1478* (CYP); Vatia Mina State Forest, *Merton 1780* (CYP); Kanli, *Semple 288d* (US); near Athalassa, *Syngrassides 11* (CYP, K).

ADVENTIVE: AFRICA: ALGERIA: Oran, batterie Espagnole, *Doumergue s.n.* (LY). MOROCCO: Chaonia, Fedhala, *Pitard s.n.* (G, type of *Aegilops peregrina* var. *aristata*). EUROPE: ITALY: Gallipoli, *Gross s.n.* (G, G-BOIS, type of *Aegilops peregrina* var. *aristata*); near Callepolena (= Gallipoli?), Papygia (= Puglia?), *Profeta s.n.* (FI).

Germplasm collections examined:

ASIA: TURKEY: Hatay, SW Samandag, *Metzger & Jana 84TK057-148* (USDA).

EUROPE: CYPRUS: S Kyrenia to Nicosia, *van Slageren & Guarino MSLG-89079* (IPGRI, ICARDA).

Notes: 1. Boissier (1884: 674) mentions two collections in connection with his var. β *brachyathera* of *Aegilops triuncialis*: *Blanche 805* from Tripoli, Lebanon, and *Ehrenberg s.n.* from Alexandria, Egypt. Both collections are present in G-BOIS, and both are genuine *Ae. peregrina* var. *brachyathera*. The *Blanche* collection was chosen as the lectotype as it is somewhat more copious and the only one with the note 'an spec. nov.?' written on the label.

2. The name of this taxon at different ranks is a similar case to the atypical forms of *Ae. comosa* (see at 10.5b, note 1): at subspecies level the final epithet is *cylindrostachys* (Eig & Feinbrun) Maire & Weiller, at varietal level the epithet is *brachyathera* (Boiss.) Maire & Weiller.

10.14 **Aegilops searsii** Feldman & Kislev ex Hammer **Figs. 61-62**

Aegilops searsii Feldman & Kislev ex Hammer, Feddes Repert. 91: 231 (1980b).

Based on: *Ae. searsii* Feldman & Kislev, Isr. J. Bot. 26: 191 (1977), *nom. inval.* (Art. 34.3: alternative name with the combination in *Triticum*), Wheat Info. Serv. 45-46: 39 (1978), *nom. nud.*

Type: Palestine, Judean hills, Yattir, Sarcopoterietum spinosi semistepposum, terra rossa mixed with loess, 15.VI.1976, *Feldman, Kislev & Kushnir s.n.* (holo: HUJ, not seen; iso: K).

Homotypic synonyms:

Triticum searsii (Feldman & Kislev) Feldman & Kislev, Isr. J. Bot. 26: 191 (1977), *nom. inval.* (Art. 34.3: alternative name with the combination in *Aegilops*), Wheat Info. Serv. 45-46: 39 (1978), *nom. nud.*; Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 34 (1987), *comb. inval.* – Note: both the 1981 and 1987 combinations invalid because of Art. 33.2.

Sitopsis searsii (Feldman & Kislev ex Hammer) Á.Löve, Feddes Repert. 95: 492 (1984).

Sub nom. *Ae. longissima* auct. non Schweinf. & Muschl. (1912): Samuelsson, Cives Nov. Fl. Syriacae, in Schwarz, Bornmüller-Festschrift, Feddes Repert., Beih. 100: 40 (1938, see note 1); Thiébaut, Fl. Lib.-Syr. 3: 316 (1953, see note 1); Mouterde, Fl. Djebel Druze 65 (1953); Melderis in Rechinger, Ark. Bot. 5: 71 (1960); Yamashita & Tanaka, Wheat Info. Service 11: 28 (1960, see note 1).

Diagnostic characters: slender, erect annuals; culms (10-)15-35 cm long excluding spikes; spikes narrowly cylindrical, 6.5-13.5 cm long excluding awns, with 7-10(-14) spikelets, rudimentary spikelets absent; glume apex bidentate with hyaline depression in between; lemmas exserting glumes ± 1/3 of their length, lower ones of apical spikelet extending into unequal awns: of the fertile floret 5-13 cm long with 1-2 aristulate lateral teeth in the basal region, of the sterile floret (0.5-) 1.5-7 cm only and without teeth; caryopsis adherent.

Description (Fig. 61): slender *annuals* (*Fig. 61-1*) with usually a few, sometimes many tillers. *Culms* geniculate at first 2 nodes, then erect, (10-)15-35 cm excluding spikes; foliage sparse, mainly at base of culms. *Leaf* blades linear-acuminate, 2.5-8 cm long, 0.2-0.3 cm wide; margins of sheaths hyaline, ciliate. *Inflorescence* (*Fig. 61-2*) a narrowly cylindrical spike, slightly tapering in the basal and apical parts, 6.3-13.5 cm long excluding awns, around 0.2 cm wide; disarticulating as one unit at maturity with a few lower spikelets remaining attached to the culm; with 7-10(-14) spikelets, rudimentary spikelets absent. *Spikelets* (*Fig. 61-2a*) sessile, 0.6-1 cm long, narrowly ellipsoid, somewhat laterally compressed, at base of spike 0.7-1.3 times the length of the supporting rachis internode, becoming shorter up to equal in the central and apical parts of the spike; with 2-4 florets, the lower 1-2(-3) fertile. *Glumes* (*Fig. 61-5*) 2, coriaceous (but the lateral margins hyaline), narrowly ovate-elliptical, green to purplish-green, 6-8 mm long, the surface scabrous to setulose; the apex with 2 sharp teeth, the adaxial one slender and sharply acute, the abaxial one more flat and broadly triangular, the depression be-

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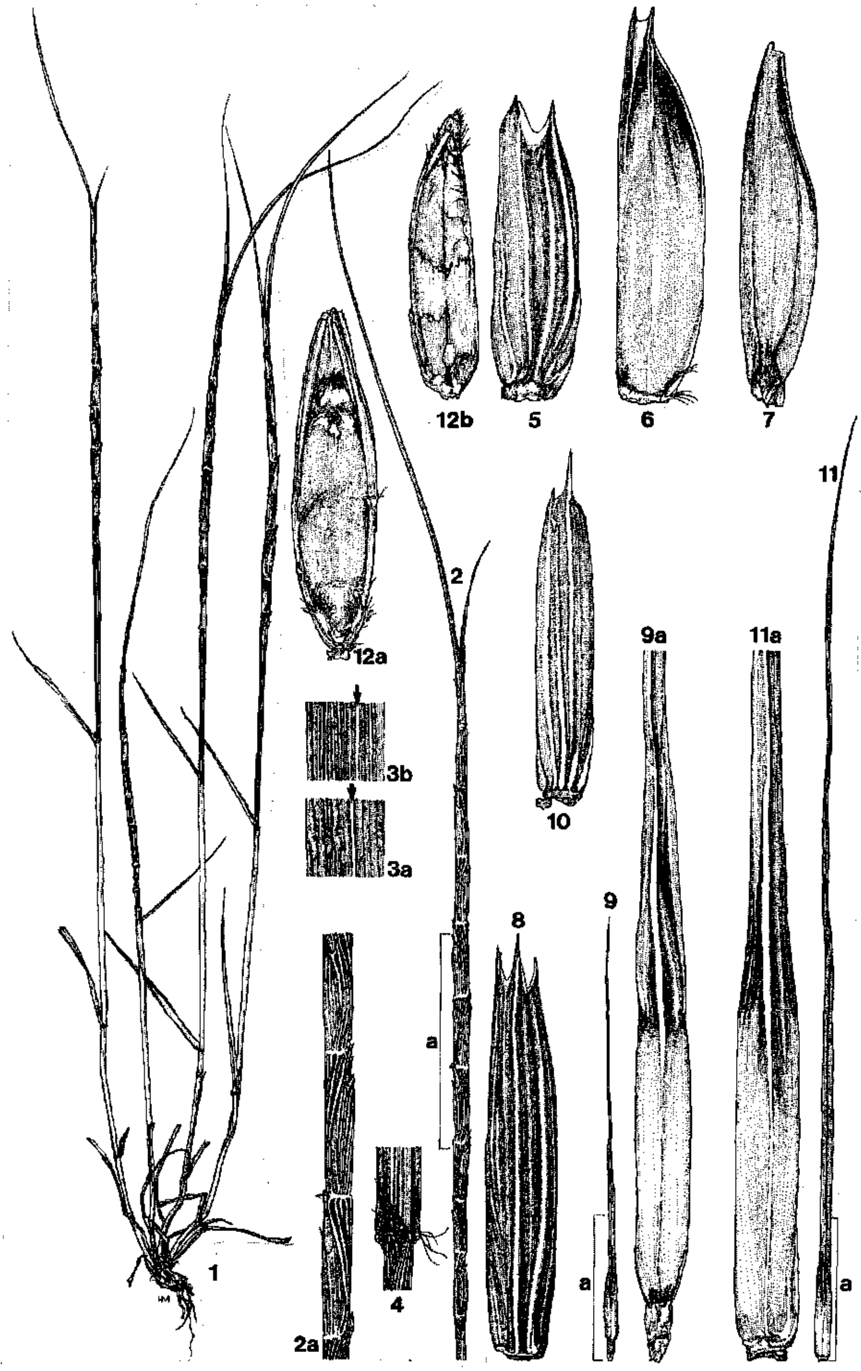
Fig. 61. *Aegilops searsii*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlarged part of spike, showing spikelet in situ (x 2); 3a, abaxial surface of leaf, midway (x 2); 3b, adaxial surface of 3a (x 2); 4, leaf sheath, ears and leaf blade (x 2); 5-7, lowest floret of spikelet in centre of spike: 5, glume, 6, lemma, 7, palea (5-7 all x 5); 8-11, apical spikelet: 8, glume of upper floret (x 5), 9, lemma of upper floret (x 1), 9a, enlarged basal part of 9 (x 5), 10, glume of lower floret (x 5), 11, lemma of lower floret (x 1), 11a, enlarged basal part of 11 (x 5); 12a, palea and dorsal surface of mature seed (x 5); 12b, ventral surface of mature seed, with partial remains of the palea (x 5). (1-12. *Bourgois SY-20258*; cultivated at ICARDA from germplasm accession.)


12b
5
6
7
11
12a
2
9a
11a
3b
3a
10
8
9
a
a
a
a
1
4
2a

tween the teeth hyaline; apical glumes (*Fig. 61-8, 10*) narrowly elliptical, typically one with 2 sharply acute teeth (similar in shape, thus different from the lateral glumes) and covering the lemma bearing the long apical awn (forms with 1 sharply acute and 2 shorter, lateral teeth are also found), and one with a sharply acute central tooth that may develop into a short awn of ± 1 cm long, flanked by 2 shorter, sharply acute, lateral ones, covering the lemma with the short apical awn; venation sunk into the surface, unequally wide and unequally spaced, ± parallel, usually more yellowish and lighter in colour than the rest of the glume surface, scabrous to setulose. *Lemmas* (*Fig. 61-6*) of fertile florets narrowly elliptical, 9-11 mm long, exserting the glumes for ± 1/3 of their length, boat-shaped, the apical part of lateral spikelet lemmas conduplicate and more or less keeled; the apex with 1 sharply acute tooth at the location of the keel, and 1 lateral tooth, acute but comparatively broader, outer surface of apical and upper-lateral regions as of the glumes; apex of the 2 lower, apical lemmas (*Fig. 61-9, 11*) flat, extending into distinctly different awns: the one of the fertile floret (*Fig. 61-11*) well-developed, 5-13 cm long with 1-2 unevenly placed, aristulate, lateral teeth, up to 3 cm in the basal part (*not* at the base of the awn but slightly higher up), the one of the second, sterile floret (*Fig.*

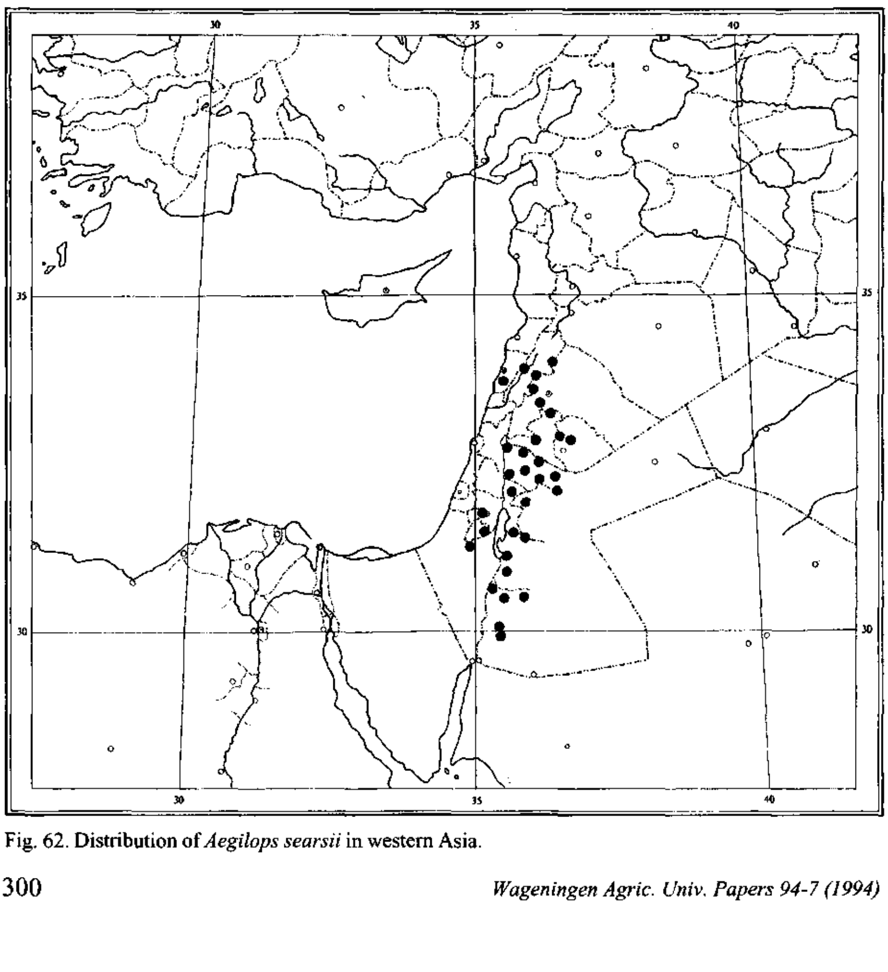


Fig. 62. Distribution of *Aegilops searsii* in western Asia.

61-9) (0.5-)1.5-7 cm only and usually without lateral teeth (rarely 1-2 short ones developed), awns setulose, at the base triangular in cross section, ratio between awns from 10:1 to 9:5 but the shorter one usually less than half the length of the longer one; inner surface of lemma apical regions velutinous in lateral spikelets. *Paleas* (*Fig. 61-7, 12a*) narrowly elliptical, with 2 sharp, setose keels, each ending in a sharply acute apex. *Caryopsis* (*Fig. 61-12b*) 5-6 mm long, adherent to lemma and palea.

Variation: conspicuously in the development of the apical lemma awns: 5-13 cm long for the one of the fertile apical floret, only 1.5-7 cm for the one of the sterile floret (sometimes virtually absent and a few mm long only). The ratio between the lengths of the two awns differs widely: from 10:1 up to 9:5. The basal aristulate teeth of the large awn, which are up to 3 cm long, are thus sometimes longer than the entire shorter apical awn.

Distribution (Fig. 62): a Mediterranean element of which occurrence is limited to central Palestine, the western mountain ranges of Jordan, and in southwestern Syria and Lebanon. Uncommon throughout its range. A species of hills and more mountainous regions and thus distinctly allopatric with the closely related and geographically close – but strictly coastal – *Aegilops sharonensis*. The area of distribution of *Ae. searsii* is exactly where the Mediterranean and Irano-Turanian Regions *sensu* Takhtajan (1986) meet. In view of its phytogeographical affinities, however, a characterization as a Mediterranean element seems more appropriate.

Ecology: in dry open grasslands, steppe, ruderal fields and roadsides; more rarely also at the margins (*durum* wheat, barley) and within cultivated fields such as fruit and olive orchards. Feldman & Kislev's (1977: 198) detailed study of *Ae. searsii* in Palestine describes its habitat as a meagre batha, phytosociologically characterized as a semi-steppe formation dominated by *Sarcopoterium spinosum*. Usually in scattered populations, but capable of developing large and dense stands. Bedrock is almost exclusively limestone, only rarely basalt or sandstone. Soil texture includes clay- and sandy loam, loam, clay, and more rarely sand and Mediterranean terra rosa. Annual rainfall data of 150-300(-550) mm indicate that *Ae. searsii* is one of the more drought-tolerant species of the genus.

Altitude: 450-1600 m in Jordan, Lebanon and Syria. In Palestine just reaching the eastern end of the coastal plain and occurring lower to around 100 m.

Flowering and fruiting time: April – June.

Genome: S^s with 2x = 2n = 14 (Feldman & Kislev, 1977: 198; Waines & Barnhart, 1992: Table 1).

Etymology: the final epithet refers to E.R. Sears (1910-1991); worked for the Agricultural Research Service of the United States Department of Agriculture (USDA-ARS) at the Department of Agronomy of the University of Missouri, Columbia, Miss., U.S.A., 1936-80, becoming a great authority on the cytogenetics of wheat.

Herbarium specimens examined:

ASIA: JORDAN: Ramtha, *Bot. Exp. Univ. Kyoto BMUK 5755* (GAT cult., UCR); midway Amman and Madaba, *Boulos & Wallad 7227a* (BM, K); near El Sahab, *Samuelsson 897* (B, BM); Jarash, SE Tumeira on road Irbid – Bal'ama, *van Slageren & Jaradat MSAJ-88016H* (ICARDA); El Madwar, E Jarash, *van Slageren & Jaradat MSAJ-88023H* (ICARDA, WAG); Jarash, Balila on road Irbid – Jarash, *van Slageren & Jaradat MSAJ-88040H* (ICARDA, WAG); Quafqafa, N Jarash, *van Slageren & Jara-*

dat MSAJ-88052H (ICARDA); Jarash, El Mastaba to Jubba, *van Slageren & Jarardat MSAJ-88056H* (ICARDA); Madaba, W Jureina, *van Slageren & Jaradat MSAJ-88067H* (ICARDA); Mafraq, Hamama, W Rihab, *van Slageren & Jaradat MSAJ-88009H* (ICARDA, WAG); Mafraq, El Buweida, *van Slageren & Jaradat MSAJ-88017H* (ICARDA, WAG); Mafraq, Haiyan er Ruweibid near Bal'ama, *van Slageren & Jaradat MSAJ-88019H* (ICARDA, WAG); Tafila, E Rashadiya, *van Slageren & Jaradat MSAJ-88077H* (ICARDA).

LEBANON: Sabha, S Beirut, *Blanche s.n.* (LY); Khaldé, *Gombault 2957* (G, K, P); Antilebanon Mts., La Citerne (= Masna'a), *Peyron 1646* (G).

PALESTINE: 13 km N Hebron to Jerusalem, *Bot. Exp. Univ. Kyoto BMUK 5751* (UCR); Judean hills, Yattir, *Feldman & al. s.n.* (K, type of *Aegilops searsii*); Jerusalem, *Meyers & Dinsmore B856* (E, K, L, LD).

SYRIA: Ouadi el Qarm, *Gombault 2955* (P); Jebl Druze, Mourdouh, near Shahba, *Mouterde s.n.* (G); Damascus, Kessoue, *Peyron 5392b* (G, P).

Germplasm collections examined (see note 2):

ASIA: JORDAN: Karak reg., Dana, Tafila – Shaubak junction, *Bourgois SY-20258* (IPGRI, ICARDA); Karak, S Wadi Mujib valley, *Bourgois SY-20238* (IPGRI, ICARDA); Amman, Shafra Badran, *Humeid & al. 91-JOR-170* (ICARDA); Irbid, near Amrawa, facing Tell Ashab, *van Slageren & Jaradat MSAJ-88036* (ICARDA); W Naur, off Dead Sea highway, *van Slageren & Jaradat MSAJ-88061* (ICARDA); Madaba, El Rawdha, SW Naur, *van Slageren & Jaradat MSAJ-88066* (ICARDA); Madaba, W Ibb, *van Slageren & Jaradat MSAJ-88070* (ICARDA); Ifjetj, near Shaubak, *van Slageren & Jaradat MSAJ-88081* (ICARDA); Karak, N Qasr on King's Highway, *van Slageren & al. MSBHAJ-88156* (ICARDA); Karak, S Mauta on King's Highway, *van Slageren & al. MSBHAJ-88158* (ICARDA); Ma'an, El Beida on road Shaubak – Petra, *van Slageren & al. MSBHAJ-88164* (ICARDA); NW Basta on Petra – Ma'an road, *van Slageren & al. MSBHAJ-88169* (ICARDA); Tafila, Rashadia, near cement factory towards Shaubak, *van Slageren & al. MSBHAJ-88180* (ICARDA); Salt, Er Rumeimin, road to Um El-Ahad, *van Slageren & al. MSBHAJ-88188* (ICARDA); E Jarash to Zarqa, *van Slageren & al. MSBHAJ-88198* (ICARDA).

SYRIA: El Hasim, on road Sweida – Damascus, *van Slageren & Mir-Ali MSGM-88086* (SARD, ICARDA); just near Dour, 30 km W Sweida, *van Slageren & Mir-Ali MSGM-88104* (SARD, ICARDA); Damascus, just before Maddaya towards Zabadani, *van Slageren & al. MSGMKO-88113* (SARD, ICARDA); Damascus, Tukkaya, on road to Zabadani, *van Slageren & al. MSGMKO-88124* (SARD, ICARDA).

Notes: 1. Thiébaut (1953: 316) most likely referred to *Ae. searsii* when he listed *Ae. longissima* in his flora of Lebanon and Syria, but the former species was not yet described by then. The locations presented (Khaldé, near Beirut, and Baalbek in Lebanon, and the Hauran region of southern Syria) are outside the distribution of *Ae. longissima* (see Fig. 52), while fitting into that of *Ae. searsii* (Fig. 62). His description, however, may apply to both species as the distinctive character of the apical lemma awns is presented as '...de 2 arêtes de 4-10 cm. long...' [...with 2 awns of 4-10 cm long...] (l.c., 316) without indicating whether they were of equal length or not.

A similar, earlier case is presented by Samuelsson (1938: 40), who lists two collections under the name of *Ae. longissima*, which are outside the distribution of that species and within that of *Ae. searsii*: Lebanon, Beka'a valley ('Coelesyria'), near Yâat, *Samuelsson 1889*, and (Syria) Hauran reg., near Sanamein, *Samuelsson 4472* (both collections unfortunately not seen). Collections from Baalbek, Lebanon, and southwestern Syria, mentioned by Yamashita & Tanaka (1960: 28) also concern *Ae. searsii*, as was noted by Feldman & Kislev (1977: 196).

2. Recent germplasm collections have now doubled the numbers of available herbarium specimens, indicating the importance of this species as a potential donor of desirable traits in wide-crossing programs for wheat improvement. This is enhanced by reports that it may be the donor of the B-genome to tetraploid wheat (Feldman & Kislev, 1977: 200).

3. Differences between *Ae. searsii* and *Ae. longissima* are presented under the latter (see at 10.10, note 3).

10.15 **Aegilops sharonensis** Eig **Figs. 63-64**

Aegilops sharonensis Eig, Notitzbl. Bot. Gart. Mus. Berlin; Band 10(95): 489 (1928b), Feddes Repert., Beih. 55: 73, 75 (1929a; '*Sharonensis*' and with var. *typica* on p. 75); Oppenheimer & Evenari, Florul. Cisiord. 170 (1941); Post, Fl. Syria (ed. 2) 2: 788 (1933); Mouterde, Nouv. Fl. Liban, Syrie 1: 153 (1966); Feinbrun-Dothan, Fl. Pal. 4: 170 (1986, with var. *sharonensis* on p. 171). See notes 1 and 3.

Basionym: *Ae. bicornis* (Forssk.) Jaub. & Spach var. *major* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 326 (1928a). See note 3.

Type: (Palestine) environs de Migdal (Magdi'el), près de Tel-Aviv, 2.V.1923, *Eig s.n.* (holo: HUJ, not seen; iso: MPU). See note 2.

Homotypic synonyms:

Triticum longissimum (Schweinf. & Muschl.) Bowden ssp. *sharonensis* (Eig) Chennav., Acta Horti Gotoburg. 23: 163 (1960).

Ae. longissima Schweinf. & Muschl. ssp. *sharonensis* (Eig) Chennav., Proc. summer school Bot., Darjeeling 46 (1962); Hammer, Feddes Repert. 91: 231 (1980b, as *comb. nov.*, thus an isonym).

Triticum x *sharonense* (Eig) Waines & Johnson, Abstr. Bot. Congress 231 (1969), *comb. inval.* (Art. 33.2).

Ae. longissima Schweinf. & Muschl. var. *major* (Eig) Hammer, Feddes Repert. 91: 231 (1980b).

Triticum sharonense (Eig) Feldman & Sears, Sci. Amer. 244: 102 (1981, '*sharonensis*'); Kimber & Feldman, Wild Wheat 30 (1987), *comb. inval.* – Note: invalid in both cases because of Art. 33.2.

Sitopsis sharonensis (Eig) Á.Löve, Feddes Repert. 95: 492 (1984).

Sub nom. *Ae. bicornis* auct. non (Forssk.) Jaub. & Spach (1850): Bornmüller, Beitr. Kenntnis Fl. Syrien, Palästina, Verh. k-k. zool.-bot. Ges., Wien 48: 651 (1898). – Note: Bornmüller cites his two Palestinian collections *1744* and *1745* under *Aegilops bicornis*. These were most likely used by Zhukovsky (1928: 543) for his *Ae. longissima* var. *polycarpa*. See at the heterotypic synonyms below and note 4.

Heterotypic synonyms:

Ae. bicornis (Forssk.) Jaub. & Spach var. *mutica* Post, Fl. Syria (ed. 1) 901 (1896); Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 326 (1928a), **syn. nov.**, non var. *mutica* (Asch.) Eig, Feddes Repert., Beih. 55: 73 (1929a; which is thus a later, illegitimate homonym). – Type: (Palestine) Haifa, sands, 12.IV.1891, *Post s.n.* (holo: BEI; iso: K, Z). – Homotypic synonyms: *Ae. sharonensis* Eig var. *mutica* (Post) Eig, Feddes Repert., Beih. 55: 75 (1929a); Post, Fl. Syria (ed. 2) 2: 788 (1933); Feinbrun-Dothan, Fl. Pal. 4: 171 (1986). *Ae. longissima* Schweinf. & Muschl. [ssp. *sharonensis*] var. *mutica* (Post) Hammer, Feddes Repert. 91: 231 (1980b).

Ae. longissima Schweinf. & Muschl. ssp. *aristata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 543 (1928). – Type: not indicated.

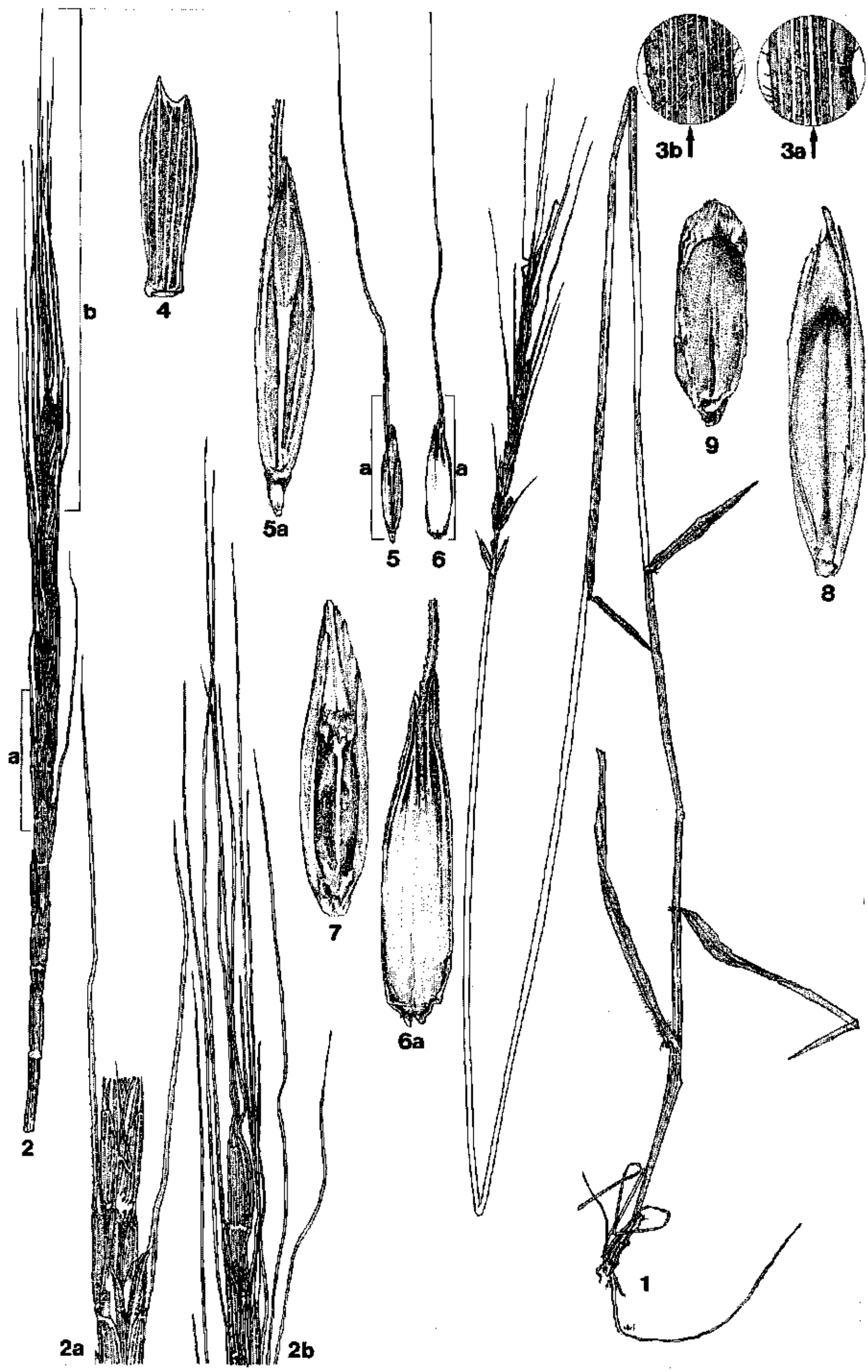
Ae. longissima Schweinf. & Muschl. [ssp. *aristata* Zhuk.] var. *polycarpa* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 543 (1928); Hammer, Feddes Repert. 91: 231 (1980b). – Syntypes: Palestine: near Tel-Aviv, *Vavilov s.n.* (WIR, not found); Ishar, *Aaronsohn s.n.* (WIR, not found); Jaffa, Haifa, in arenosis maritimis, *Bornmüller 1744* (B, BM, BR, G, JE, K, LD, LE, MPU, OXF, P, PR, PRC, W, Z), *1745* (B, G, JE, W). Not found in WIR. See note 3.

Diagnostic characters: tall, slender annuals; erect culms (30-)40-70 cm tall excluding spikes; spikes narrowly cylindrical, 7-10 cm long excluding awns, with 7-12 spikelets, rudimentary spikelets absent; glume apex bidentate with hyaline depression between them; lemmas exserting glumes ± 1/3 of their length, with a slender, not diverging awn of only 0.4-0.8 cm long at the base of the spike, increasing to 3-7 cm, and up to 9 cm in apical spikelet, awns with 2 small, acute, lateral teeth at the base; caryopsis adherent.

Description (Fig. 63): slender, tall *annuals* (*Fig. 63-1*) with usually a few tillers only. *Culms* erect, (30-)40-70 cm tall excluding spikes; foliage sparse, mainly at base of culms. *Leaf* blades linear-acuminate, 2.5-10 cm long, 0.2-0.4 cm wide; margins of sheath hyaline, ciliate in basal part of culms only. *Inflorescence* (*Fig. 63-2*) a narrowly cylindrical spike, tapering slightly in the basal and apical parts, distichous and more or less flattened, 7-10 cm long excluding awns, 0.2-0.3 cm wide; disarticulating wedge-type into individual spikelets at maturity, a few of the lowest spikelets remaining attached to the culm; with 7-12 fertile spikelets, rudimentary spikelets absent; apical spikelets at a 90° angle compared with the lateral ones. *Spikelets* sessile, 0.8-1.1 cm long excluding awns, narrowly ellipsoid, somewhat laterally compressed, slightly shorter to slightly longer than the supporting rachis segment; with 3-4 florets, the lower 2 fertile. *Glumes* (*Fig. 63-4*) 2, coriaceous (but the lateral margins hyaline), narrowly elliptical, 5-7 mm long, the surface glaucous green, scabrid, with 6-8 major veins of which 2 extend into an apical tooth; veins setulose, unequal in width, flattened, sunk into the surface, unequally but ± parallel spaced, usually more yellowish and lighter in colour than the rest of the glume surface; apex with 2 teeth, the adaxial one acute and up to 1 mm long, the abaxial one blunt and indistinct, hyaline depression between the two teeth, apical glume apex with 2 triangular, equally shaped teeth or with a short, central, acute tooth flanked by 2 smaller, lateral ones. *Lemmas* (*Fig. 63-6*) of fertile florets narrowly eliptical, 8-11 mm long, exserting the glumes for ± 1/3 of their length, boat-shaped, the apical part conduplicate and keeled; apex extending into a short to longer, setulose awn, 0.4-0.8 cm only in base of spike, rapidly increasing to 3-7 cm (*Fig. 63-2a*) and up to 9 cm at the apical spikelet (*Fig. 63-2b*), parallel to the spike, awns of the 2 fertile floret lemmas in a spikelet sometimes strikingly uneven in development (e.g., one of 0.5 cm and one of 4.5 cm), awns with small but distinct, acute lateral teeth at the base; inner surface of apical region velutinous. *Paleas* (*Fig. 63-7, 8*) narrowly elliptical, with 2 sharp, setose keels, each ending in a sharply acute apex. *Caryopsis* (*Fig. 63-9*) around 7 mm long, adherent to lemma and palea.

Variation: conspicuous in the lemma awns: 0.4-0.8 cm at base of spike, 3-7 in most of spike, and up to 9 cm in apical spikelets.

Fig. 63. *Aegilops sharonensis*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlarged basal part of spike, showing spikelets in situ (x 2); 2b, enlarged upper part of spike, showing spikelets in situ (x 2); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 3a (x 5); 4, 6-7, lowest floret of spikelet in centre of spike: 4, glume (x 5), 6, lemma (x 2), 6a, enlargement of basal part of 6 (x 5), 7, palea with immature seed (x 5); 5, inner view of lemma of upper floret of spikelet in centre of spike, together with third, sterile floret (x 2); 5a, enlargement of basal part of 5 (x 5); 8, palea and ventral surface of mature seed (seed probably turned around during preparation) (x 5); 8b, dorsal surface of mature seed (x 5); 9, ventral surface of mature seed. (1-9. *Metzger & Jana 84TK154-045*; cultivated at ICARDA from germplasm accession, received from PGRRI; material originally from Palestine.)


b
4
5a
a
5
6
a
3b
3a
9
8
a
7
6a
2
1
2a
2b

Distribution (Fig. 64): a Mediteranean element occurring from Tel-Aviv northwards to Haifa and Acco in the coastal Sharon and Acco plains of Palestine, as well as further north into the adjacent area of southern Lebanon up to the Litani river (Feinbrun-Dothan, 1986: 171). One collection (*Johnson & Hall s.n.*, UCR) is reported from Ashdad, which is probably Ashdod and south of Tel-Aviv. This would represent the southernmost location of this species,outside the Sharon plain proper. This is the species with the most limited distribution of the genus, estimated by Eig (1928b: 491) not to exceed 110 by 15 km. In its area, however, it is reported to be common and occurring in sometimes dense stands (Kimber & Feldman, 1987: 30).

Ecology: dry open grassland and consolidated sand dunes (Ankory & Zohary, 1962: 314) on a soil texture of sand or sandy loam with sandstone or weathered marine diluvium (Eig, 1928b: 491) bedrock. See also note 1 on the tenuous ecological difference with the related *Ae. longissima.*

Altitude: from sea level up to 100 m. Possibly at a higher altitude in southern Lebanon but no data are available.

Flowering and fruiting time: May – June, probably later at higher altitude.

Genome: S^s with $2x = 2n = 14$ (Chennaveeraiah, 1960: 90; Waines & Barnhart, 1992: Table 1).

Etymology: the final epithet refers to the Sharon plain in Palestine from where this species was first described as the variety *major* of *Aegilops bicornis* by Eig in 1928, later that year elevated to species level under the name *Aeglops sharonensis.*

Most of the ca 80 herbarium specimens examined:

ASIA: LEBANON: Bir Hassan, *Gilbert 21* (BM); N of Tyrus, *Mouterde 6782* (G), *s.n.* (hb. Gombault 5859, 6198) (P).

LEBANON/PALESTINE: Jeanne d'Arc, *Peyron s.n.* (G).

PALESTINE: S of Nathania (Netanya), *Abraham s.n.* (K); Haifa, *Bornmüller 1744* (B, BM, BR, G, JE, K, LD, LE, MPU, OXF, P, PR, PRC, W, Z, type of *Aegilops longissima* var. *polycarpa*); ibid., *Dinsmore 1381* (E, L, LD); Jaffa, *Bornmüller 1745* (B, G, JE, W, type of *Aegilops longissima* var. *polycarpa*); Even Yehuda, *Davis 4704* (K); Magdi'el, Sharon plain, *Eig s.n.* (MPU, type of *Aegilops bicornis* var. *major*); Herzliah (Herzliyya), N Tel-Aviv, *Feinbrun s.n.* (HUJ, L); 10 km N Haifa to Acco, *Johnson & Hall s.n.* (UCR); 2 km E Ashdad (Ashdod), *Johnson & Hall s.n.* (UCR); Haifa, *Post s.n.* (BEI, K, Z, type of *Aegilops bicornis* var. *mutica*); Ramath-Gan, near Tel-Aviv, *Samuelsson 770* (B, BM, K, LD); ibid., *Zohary 25* (A, B, BC, BEI, BM, C, ERE, FI, G, HUJ, K, L, LD, LE, MPU, P, PR, PRC, RAB, RNG, US, Z), *s.n.* (MPU, US, W); Sharon plain, Tel Mond to Yekuda, *Zeven s.n.* (GAT cult.); Caesarea (north in coastal plain), *Zeven s.n.* (GAT cult., UCR); Shelefa, near Zikim, *Zohary 33* (Z); Acre (Acco) plain, *Zohary s.n.* (C, HUJ).

Notes: 1. This species was first published as a climatic (gigas) race of *Aegilops bicornis* by Eig (1928a: 326) under the varietal name *major* Eig. About half a year after this publication (l.c., 1928b: 490: '...Und so veröffentlichten wir auch diese Pflanze vor ungefähr einem halben Jahr als eine klimatische Rasse von *Ae. bicornis...*' [And so we published this plant about half a year ago as a climatic race of...]) he raised the 'climatic race' to specific status as *Aegilops sharonensis* Eig after gaining more information of the geography and edaphic requirements of *Ae. bicornis*, *Ae. longissima*, and his new species. The new information Eig referred to is, except for *Ae. sharonensis*, not specified by him in his second 1928 publication, but apparently corroborated the separating morphological characters of his species. Eig's monograph (1929a: 75) suggests different rainfall numbers for Egypt, the

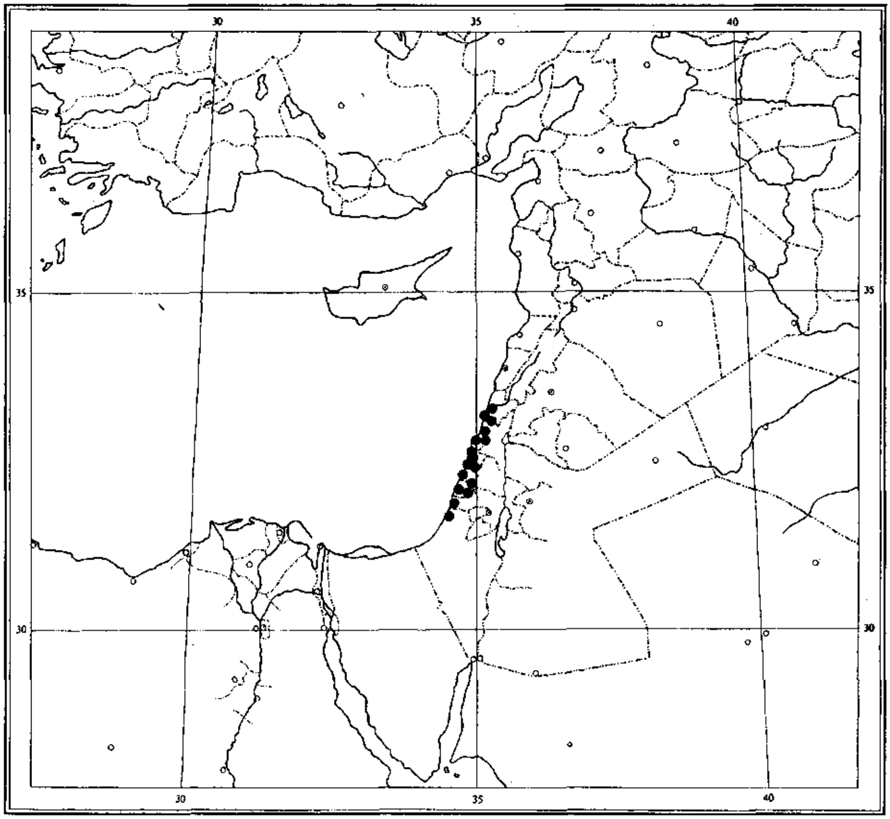


Fig. 64. Distribution of *Aegilops sharonensis* in Palestine and southern Lebanon.

Sinai and Palestine, with each region then corresponding with a climatic race of *Ae. bicornis*. Indirectly he suggests, that as the Sharon plain has the highest rainfall, therefore the largest 'race' should grow there. However, after comparison of material he reports that this is not the case. In addition, in the southern Palestinian Negeb desert *Ae. bicornis* and *Ae. sharonensis* occur together, but intermediate forms appeared to be lacking (Eig, 1929a: 76). The ecological differences are, however, minimal, as appears from close investigation by Ankory & Zohary (1962: 314): 'consolidated sand dunes and well drained, somewhat loose sandy loams' for *Ae. sharonensis*, and 'mainly calcareous sandstone soils, and somewhat siltier or ill-drained sandy loams' for *Ae. longissima* (that is, on the Sharon plain). [Note the occurrence of 'somewhat' and of 'sandy loams' in both characterizations! That *Ae. bicornis* has yet again a different ecological requirement may be true, but this is not commented upon by Ankory & Zohary, contrary to the remarks by Waines (1969: 37) and Waines et al. (1982: 97).] Ankory & Zohary report natural hybridization between *Ae. longissima* and *Ae. sharonensis* in recently disturbed areas with the presence of many intermediate forms (l.c., 1962: 315 and Fig. 1). This may point at close genetical relationships, as was earlier expressed by Chennaveeraiah (1960) and Morris & Sears (1967: 20) through the location of *sharonensis* as a subspecies under *Ae. longissima*. However, as Waines & Johnson (1972) and Waines & al. (1982) have pointed out on the bases of seed electrophoration patterns and artificial crosses, the differences between these species are distinct, and *Ae. sharonensis* may probably be even more closely related to *Ae. bicornis* (l.c., 1972: 415). Two options on the evolutionary origin of *Ae. sharonensis* were concluded by Waines et al. (1982: 94-95, 97): (1) independent evolution from an ancestor, which, in my opinion, it will have in common with *Ae. bicornis* and *longissima*, or (2) formation out of a segregant from a backcross of an F_1 between *Ae. longissima* and *Ae. bicornis* [The initial cross produces a self-sterile hybrid, but a backcross to either parent may set seed when the hybrid was the female parent (Waines & Johnson, 1972: 414) – similar to the artificially created x *Aegilotriticum speltaeforme*, see Chapter 4.2.] Separate specific status seems, however, justified in all cases.

2. Eig (1928b: 491) listed several locations and collectors in connection with his newly described *Ae. sharonensis*, as follows (in literal citation from the German): 'Palästina: Beer-Jakob (an der Haifa – Kantara-Bahn), Tel-Aviv und Umgebung, Schechunath Borohov (coll. EIG); Herzlia, Arsuf (coll. ZOHARY); Ein-Hai, Benjamina, Cäsarea, Hedera, Haifa (coll. EIG).'. The description 'Tel-Aviv und Umgebung' with collector Eig includes the specimen used for the *Ae. bicornis* var. *major* ('...environs de Migdal, près de Tel-Avive,...', l.c., Eig, 1928a: 326), which now serves as the type of the species name *Ae. sharonensis*. Eig mentions as the type location of his variety 'Migdal (près de Tel-Avive)' (Eig, 1928a: 326). This is almost certainly Magdi'el. There is a Migdal in Palestine but this is close to Lake Tiberias, and an unlikely location for any *sharonensis*.

Eig could have retained the varietal epithet *major* when he changed the rank to species level (Rec. 61.A.3. of the *Code*). Under the rules one is, however, not obliged to do so, and *Aegilops sharonensis* is a valid name (see Art. 60.1).

3. Zhukovsky (1928: 543) mentions the collections by Bornmüller as: '...Iaffa, Haifa, in arenosis maritimis, leg. Bornmüller!...' [arenosus = sandy places]. Earlier, Bornmüller (1898: 651) cited his two Palestinian collections under *Aegilops bicornis* as: 'Palästina: In den Sanden und Weingarten bei Jaffa (exs. Nr. 1745) und Haifa (exs. Nr. 1744);...'. Given the similarity in citation it appears, in my opinion, that the Bornmüller collections most likely have been among the materials used by Zhukovsky for his variety *polycarpa* in *longissima* (which was considered by Hammer (1980b: 231) as *Ae. longissima* ssp. *sharonensis*). Zhukovsky may have seen material from (some of) the many herbaria in which the nos. 1744 and 1745 are present, but strangely enough they have not been found in WIR.

4. *Aegilops sharonensis* may be confused with the sympatric *Ae. longissima* and *Ae. bicornis*. Differences are keyed out under the latter (see at 10.1a, note 3).

10.16 **Aegilops speltoides** Tausch **Figs. 1, 65-70**

Aegilops speltoides Tausch, Flora 20: 108 (1837); Grenier, Fl. massil. adv., Mém. Soc. Emul. Doubs 3(2): 434 (1858); Eig, Sec. contr. fl. Pal., P.Z.E. Inst. Agric. Nat. Hist., Bull. 6: 72 (1927) *pro parte*, Feddes Repert., Beih. 55: 83 (1929a, with var. *typica*); Post, Fl. Syria (ed. 2) 2: 789 (1933); Hegi, Ill. Fl. Mitt.-Eur. (ed. 2) 1: 500 (1936); Oppenheimer & Evenari, Florul. Cisiord. 171 (1941); Parsa, Fl. Iran 5: 827 (1952); Thiébaut, Fl. Lib.-Syr. 3: 316 (1953); Bor in Rechinger, Fl. lowland Iraq 111 (1964); Mouterde, Nouv. Fl. Liban, Syrie 1: 153 (1966); Stojanov et al., Fl. Bulg. (ed. 4) 1: 148 (1966); Bor, Fl. Iraq 9: 187 (1968), Fl. Iranica 70/30: 193 (1970); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980); Hammer, Feddes Repert. 91: 230 (1980b, with ssp. *speltoides* var. *speltoides* forma *speltoides*); Pignatti, Fl. italia 3: 542 (1982, adventive and including var. *ligustica*); Davis, Fl. Turkey 9: 235 (1985, with var. *speltoides*); Feinbrun-Dothan, Fl. Pal. 4: 172 (1986, with var. *speltoides*).

Neotype: (Turkey, Anatolia) Yozgat to Corum, *Bornmüller 1735* (B; isoneotypes: BM, FI, G, JE, K, L, LD, LE, LY-Jordan, LY-Gandoger, NY, OXF, P, SO, W, Z). Here designated. See note 1 at *Ae. ventricosa* (10.22) for a comment on the neotypes, now designated for both Tausch species.

Homotypic synonyms:

Triticum speltoides (Tausch) Gren., Fl. massil. adv., Mém. Soc. Emul. Doubs 3(2): 434 (1858), *nom. inval.* (Art. 34.1*(b)*: provisional name).

Triticum speltoides (Tausch) Gren. ex K.Richt., Pl. eur. 1: 129 (1890); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 711 (1902); Fedtschenko & Flyorov, Fl. Eur. Russia 148 (1910); von Hayek, Prod. fl. pen. Balcan. 3: 228 (1932); Diapulis, Syn. fl. graec. 167 (1939); Stojanov & Stefanoff, Fl. Bulg. (ed. 3) 175 (1948); Bowden, Can. J. Bot. 37: 665 (1959), Can. J. Gen. Cyt. 8: 132 (1966, here and in 1959 as forma *speltoides*); Chennaveeraiah, Acta Horti Gotoburg. 23: 163 (1960, with ssp. *speltoides*); Morris & Sears in Quisenberry & Reitz, Wheat and Wheat Improvement 20 (1967, includes the species '*Ae. speltoides* Tausch + *Ae. ligustica* (Savign.) Cosson'); Feldman & Sears, Sci. Am. 244: 102 (1981), non *T. speltoides* Flaksb. (1915) – a later homonym.

Ae. ligustica (Savign.) Coss. ssp./var. *speltoides* (Tausch) Eig in Hannig & Winkler, Die Pflanzenareale 4: 46 (1936). – Note: the species is with author 'Coss.'; the rank is indicated as 'ssp. (oder var.)' [subspecies (or variety)] (sic).

Sitopsis speltoides (Tausch) Á.Löve, Feddes Repert. 95: 491 (1984, includes *speltoides* and *ligustica* forms).

Sub nom. *Ae. squarrosa* auct. non Linnaeus (1753): Linnaeus, Sp. pl. (ed. 1) 2: 1051 (1753), (ed. 2) 2: 1489 (1763) *pro parte*. – Note: other parts of the Linnaean taxon are *Ae. tauschii* (see note 2 at 10.17) and *Ae. ventricosa* (see note 1 at 10.22).

Sub nom. *Ae. caudata* auct. non Linnaeus (1753): Bertoloni, Fl. ital. 6: 622 (1847).

Heterotypic synonyms:

Ae. aucheri Boiss., Diagn. pl. orient., Sér. 1(5): 74 (1844b), Fl. orient. 5(2): 678 (1884); von Steudel, Syn. pl. glumac. 1: 355 (1854, '*augeri*'); Nyman, Consp. fl. eur., suppl. 2: 342 (1890); Gandoger, Fl. Eur. 25: 9 (1892); Post, Fl. Syria (ed. 1) 901 (1896); Fiori & Paoletti, Fl. Italia 1: 108 (1896, as adventive); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 454, 531 (1928). – Type: (Syria, Aleppo) in agro halepensi, *Aucher-Éloy 2980* (holo: G-BOIS; iso: G, K, MPU, P). – Note: the isotype in P of this collection serves as the holotype of *Ae. macrura* Jaub. & Spach. – Homotypic synonyms: *Triticum aucheri* (Boiss.) Parl., Fl. ital. 1: 508 (1850); de Cesati, Passerini & Gibelli, Comp. fl. ital. 1(4): 86 (1869); Nyman, Consp. fl. eur. 4: 840 (1882); Richter, Pl. eur. 1: 129 (1890); Fedtschenko & Flyorov, Fl. Eur. Russia 148 (1910, subheaded under *Triticum speltoides*); Gismondi, Pros. fl. ligust. 154 (1950). *Triticum speltoides* (Tausch) Gren. ex K.Richt. ssp. ('A') *aucheri* (Boiss.) Asch. & Graebn. in Ascherson, Magyar Bot. Lapok 1(6): 11 (1902); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 711 (1902); Thellung, Fl. adv. Montpellier 152 (1912); Eig, Sec. contr. fl. Pal., P.Z.E. Inst. Agric. Nat. Hist., Bull. 6: 73 (1927); Chennaveeraiah, Acta Horti Gotoburg. 23: 163 (1960, '*Aucheri*'; cited as a *comb. nov.*, thus an isonym after Ascherson & Graebner in Ascherson, 1902). See note 1 at 10.16b. *Ae. speltoides* Tausch var. ('α') *aucheri* (Boiss.) Fiori, Fl. Italia 4: 32 (1907), Nuovo Fl. Italia 1: 159 (1923); Bornmüller, Beih. Bot. Centralbl. 26(2): 438 (1910; cited as a new combination but without *comb. nov.*, thus an isonym); Meyer, Pflanzenbau 3: 305 (1927, '*Aucheri*'). – Note: this varietal combination is attributed to Bornmüller (1910) and Meyer (1927) but *not* to Fiori by Chase & Niles (1962: 10). *Ae. aucheri* Boiss. ssp. *virgata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 533 (1928), *nom. inval.* (Art. 26.1: the diagnosis indicates 'Formae typicae'; thus invalid because of Art. 32.1*(b)*). *Ae. speltoides* Tausch ssp. *aucheri* (Boiss.) Chennav., Proc. summer school bot., Darjeeling 46 (1962). *Triticum speltoides* (Tausch) Gren. ex K.Richt. ssp./var.(?) *aucheri* (Boiss.) Kimber & Feldman, Wild Wheat 24 (1987), *comb. inval.* (Arts. 33.2 and 35.1; combination proposed as '*T. speltoides* (*aucheri*)').

Agropyron tournefortii Savign., Atti della ottava ruinione degli scienziati italiani tenuta in Genoa dal XIV al XXIX settembre 1846: 602 (published 1847), Flora 35: 569 (1847); Ascherson, Magyar Bot. Lapok 1(6): 11 (1902, in syn.). – Lectotype (*nov.*): (Italy, Liguria, Genoa) in alveo Feritoris prope La Foce, *Savignone s.n.* (BOLO-Bertoloni). – Homotypic synonym: *Triticum tournefortii* (Savign.) Steud., Syn. pl. glumac. 1: 344 (1854). See note 1.

Ae. macrura Jaub. & Spach, Ill. pl. orient. 4: 21, Tab. 315 (1851a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 357 (1851b); Walpers, Ann. bot. syst. 3: 791 (1852); von Steudel, Syn. pl. glumac. 1: 355 (1854). – Type: (Syria) in agro Halepensi, *Aucher-Éloy 2980* (holo: P). See note 2.

Ae. agropiroïdes Godr., Fl. juvenalis (ed. 1, Latin) 48 (1853) / Mém. Acad. Montp., sect. Méd. 1: 456 (1853), (ed. 2, French) 115 (1854) / Mém. Acad. Stan. (Nancy) 435 (1853, '*agropyroïdes*'); von Steudel, Syn. pl. glumac. 1: 355 (1854). – Type: (France, Hérault) Port Juvénale, *Touchy 291* (holo: NCY, not seen; iso: LY-Gandoger, MPU).

Aegilops singularis Steud., Syn. pl. glumac. 1: 354 (1854), **syn. nov.** – Type: (Iran) Persia, inter Afswaer et Tschalaya, ex hb. *Lenormand 12* (holo: P).

Ae. speltoides Tausch var. *macrostachys* Eig, Sec. contr. fl. Pal., P.Z.E. Inst. Agric. Nat. Hist., Bull. 6: 73 (1927); Post, Fl. Syria (ed. 2) 2: 789 (1933), **syn. nov.** – Type: (Palestine) banks of Wadi Kurn, 30.V.1926, *Eig s.n.* (holo: HUJ, not seen). – Note: Eig's description does not mention any awns for the lateral spikelets. Hence I have assumed that this variety represents the typical form of the species.

Ae. aucheri Boiss. [ssp. *virgata* Zhuk.] var. *striata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 536 (1928), **syn. nov.** – Syntypes: several *Vavilov* colls. are mentioned by Zhukovsky (1928), but they have not been available at WIR. – Homotypic synonym: *Ae. speltoides* Tausch forma *striata* (Zhuk.) Hammer, Feddes Repert. 91: 230 (1980b).

Ae. aucheri Boiss. [ssp. *virgata* Zhuk.] var. *vellea* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 533 (1928); Hammer, Feddes Repert. 91: 230 (1980b, considers it a synonym of the typical forma *speltoides*). – Type: not indicated by Zhukovsky, as only several countries are mentioned. Also not found at WIR.

Ae. aucheri Boiss. forma *hirtiglumis* Nábělek, Iter turc.-pers. 5, Publ. Fac. Sci. Univ. Masaryk 111: 30 (1929), **syn. nov.** – Syntypes: (Iraq) Assyria, ad pagum Mâr Jakub supra pagum Simel, dit. Mosul, in steppis, 7.VI.1910, *Nábělek 3361* (BRA (not seen), SAV); (Iraq) distr. Serizor, ad pagum Baba Gigik inter Erbil (Arbela) et Rewandûz, in steppa, 20.V.1910, *Nábělek 3361a* (BRA (not seen), SAV). – Homotypic synonym: *Ae. speltoides* Tausch forma *hirtiglumis* (Nábělek) Parsa, Fl. Iran 5: 827 (1952).

Ae. aucheri Boiss. forma *nudiglumis* Nábělek, Iter turc.-pers. 5, Publ. Fac. Sci. Univ. Masaryk 111: 30 (1929), **syn. nov.** – Type: (Iraq) Assyria, ad Altunköpri inter Kerkuk et Erbil (Arbela), ad fossam irrigationis, 17.V.1910, *Nábělek 3308* (holo: BRA, not seen; iso: SAV). – Homotypic synonym: *Ae. speltoides* Tausch forma *nudiglumis* (Nábělek) Parsa, Fl. Iran 5: 827 (1952).

Ae. aucheri Boiss. var. *schultzii* Nábělek, Iter turc.-pers, Publ. Fac. Sci. Univ. Masaryk 105: 30 (1929), **syn. nov.** – Type: (Iran) 'Persica austro-occidentalis', ad oppidum Kasr-i-Sirîn, dit. Hanikîn, prope

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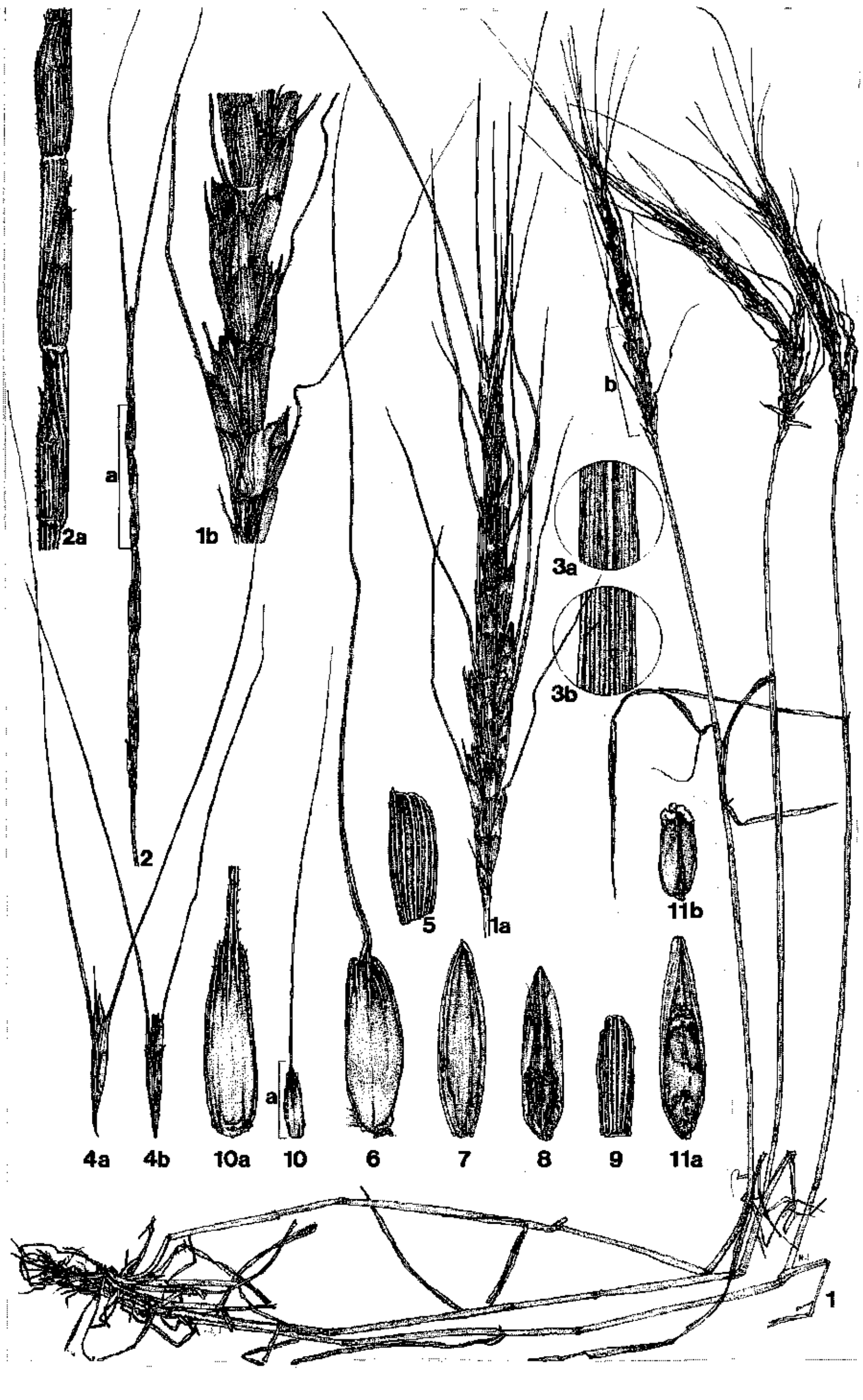
Fig. 65. *Aegilops speltoides* var. *ligustica*. 1, habitus (x 1/2); 1a, spike (x 1); 1b, enlarged part of spike, showing spikelets in situ (x 2); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 3a (x 5); 4a, apical spikelet (x 1); 4b, lateral spikelet (x 2); 5-8, lower floret of spikelet in centre of spike: 5, glume, 6, lemma, 7, palea, 8, palea with immature seed (5-8 all x 3); 9-10, apical spikelet: 9, glume (x 3), 10, lemma (x 1), 10a, enlargement of 10 (x 3); 11a, palea and dorsal surface of immature seed (x 3), 11b, ventral surface of mature seed (x 3). *Aegilops speltoides* var. *speltoides*. 2, spike (x 1/2); 2a, enlarged part of spike, showing spikelets in situ (x 2). (1, 3-11. *van Slageren & Zacharieva MSMZ-90237H*; 2. *van Slageren & Sweid MSFS-91048H*.)



2a
a
1b
b
3a
3b
2
5
1a
11b
a
4a
4b
10a
10
6
7
8
9
11a
1

confines Turcica, in steppa, 7.V.1910, *Nábělek 3351* (holo: BRA, not seen; iso: SAV). – Homotypic synonyms: *Triticum speltoides* (Tausch) Gren. ex K.Richt. var. *schultzii* Nábělek, Iter turc.-pers. 5, Publ. Fac. Sci. Univ. Masaryk 111: 30 (1929). – Note: alternative name to the combination with *Ae. aucheri*, but not invalid because of Art. 34.3 as it is from before 1953. *Ae. speltoides* Tausch forma *schultzii* (Nábělek) Parsa, Fl. Iran 5: 828 (1952).

For literature, typification and synonyms referring specifically to the varieties, see under there.

Key to the varieties:
Only lemmas of the 2 lower florets of the apical spikelet with (equally) long (4.5-10 cm) awns; spikes narrowly cylindrical, 7-15(-20) cm long ..... var. **speltoides**
Lemmas of all lateral as well as apical fertile florets with awns, increasing in length from 2.5 cm in basal spikelets up to 10 cm; spikes narrowly cylindrical, but distichous and somewhat compressed laterally, generaly shorter than of var. *speltoides*, 7 – 10 cm long .... var. **ligustica**

10.16a **Aegilops speltoides** Tausch var. **speltoides** **Figs. 65(2), 66, 68-69**

Diagnostic characters: tufted, slender, usually many-tillered annuals, 30-75 cm tall excluding spikes; spikes narrowly cylindrical, 7-15(-20) cm long excluding awns, with (4-)6-13 spikelets, rudimentary spikelets absent or 1-2; lateral glumes with truncate, thickened apex and one adaxial mucro; apex of lateral lemmas with a short tooth, of the apical lemmas extending into a long awn, 4.5-10 cm, without teeth at the base; caryopsis adherent.

Description (Fig. 65): tufted *annuals* (*Fig. 65-1*) with few to (usually) many slender tillers. *Culms* geniculate at base, then ascending, 30-75 cm tall excluding spikes; foliage sparse, more dense at base of culm. *Leaf* blades linear-acuminate, 6-13 cm long, 0.2-0.4 cm wide; margins of sheaths hyaline, sometimes ciliate. *Inflorescence* (*Fig. 65-2*) a narrowly cylindrical spike, slightly tapering towards the apex, greatly varying in length: 5-15(-20) cm excluding awns, only 0.2-0.4 cm wide; disarticulating at maturity as one unit with the rudimentary spikelets remaining attached to the culm (or the lower spikelets when no rudimentary ones developed); with (4-)6-13 fertile spikelets, rudimentary spikelets absent or 1-2 developed. *Spikelets* (*Fig. 65-2a*) sessile, narrowly ellipsoid to cylindrical, 7-13 mm long, 2-3 mm wide; spikelet length roughly equalling that of the supporting rachis internode, decreasing to ± 3/4 of that length in the apical part of the spike; with 3-6 florets, the upper 1-2 sterile. *Glumes* (*Fig. 65-5*) 2, coriaceous (but the lateral margin partly hyaline), narrowly elliptic-truncate, 5-7 mm long, green to purplish-green, the surface scabrid; the apex of lateral spikelet glumes truncate with a thickened rim and a mucro on the adaxial side, the thickened rim scabrous, often setulose with a narrow, hyaline, membranous margin beyond rim; veins unequally wide, sunk into the surface (but somewhat protruding at maturity), ± parallel, scabrous but often setulose, usually yellowish and ligher in colour than the glume surface, sometimes purplish and darker than the glume surface, the vein ending in

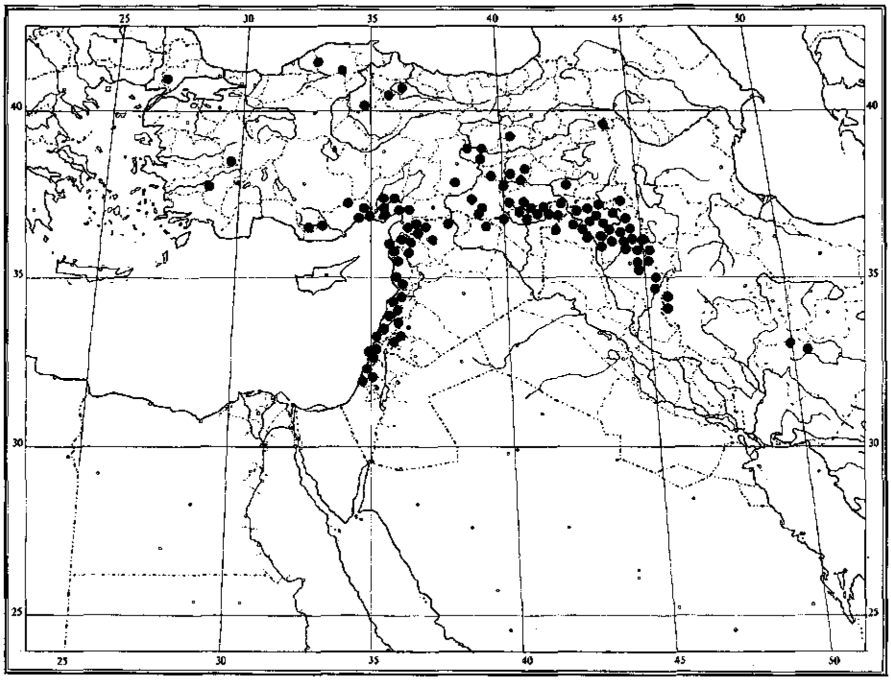


Fig. 66. Distribution of *Aegilops speltoides* var. *speltoides* in the eastern Mediterranean and western Asia. Adventive locations in Europe not shown.

the mucro somewhat more prominent; apex of glumes in apical spikelets (*Fig. 65-9*) obtuse, thickened, setulose, without a mucro. *Lemmas* of fertile florets exserting the glumes for ± 1/4-1/3 of their length, 7-10 mm long, narrowly ovate-elliptical, boat-shaped, coriaceous in the exserting upper part; the apical part folded to conduplicate, keeled apex with a mucro or short, setulose tooth, outer surface scabrous to setulose; the two lowest lemmas of the apical spikelet extending into a long, diverging, setulose, 4.5-10 cm long awn, awn triangular at the base, without lateral teeth, apex of third lemma sometimes extending into a shorter, 1.5-3 cm long awn. *Paleas* (*Fig. 65-7, 8, 11a*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 65-11b*) 6-7 mm, adherent to lemma and palea.

Variation: in the length of the spike: 5-15(-20) cm excluding awns; in the number of spikelets per spike: (4-)6-13, and in the length of the apical lemma awns: 4.5-10 cm.

Note: rare, intermediate forms between the typical variety and var. *ligustica* have the length of var. *speltoides* spikes but disarticulate wedge-type, a var. *ligustica* character. Various degrees of awning in the lateral lemmas occur, as is shown in Fig. 68.

Distribution (Fig. 66): a Western Asiatic element that is more confined than any other *Aegilops* species to the entire Fertile Crescent arc. Here its major area of

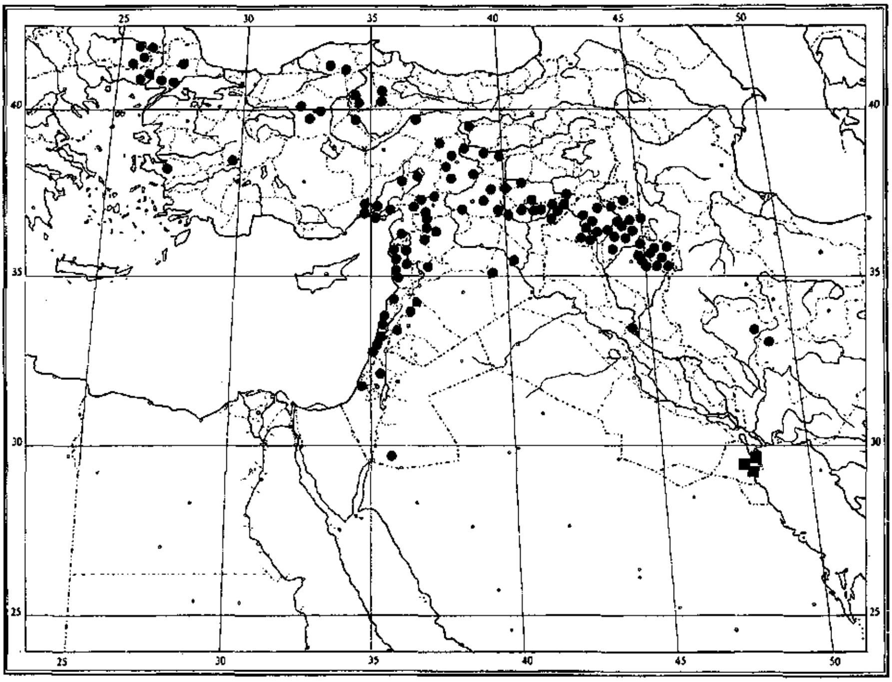


Fig. 67. Distribution of *Aegilops speltoides* var. *ligustica* in the eastern Mediterranean and western Asia. Adventive locations in Europe not shown.

occurrence is in the central-northern parts: the foothills of the Zagros mountains in Iran, in northeastern Iraq, and southeastern Turkey. The species is less common in central and western Turkey, with a few sites known in central-western Iran, east of the Fertile Crescent. The typical variety is not reported from Bulgaria, contrary to the var. *ligustica*.

Pignatti (1982: 542) reports adventive distribution of both varieties of *Ae. speltoides* in the Genoa region in Italy, but with the remark that no material has been found there since the last century. Savignone's *Agropyron tournefortii* from the Genoa regio is, of course, also an adventive, as are examined specimens from the Bouches du Rhône and the Hérault (a.o. the Port Juvénale) in France, from Luxemburg and from England. Hegi (1936: 500) cites Mannheim, Germany, and Kiesen in the Canton of Bern, Switzerland, as adventive sites of the typical variety of *Ae. speltoides*.

Ecology (Fig. 69): a species mainly found in grasslands and moderately disturbed sites such as roadsides; less frequently on edges of and within cultivation, of, e.g., barley, *durum* (Fig. 69) and bread wheat, and pomegranate, *Citrus* and olive orchards. Also found in rather open *Pinus* and *Quercus* forests. Recently recorded soil data indicate a predominance of limestone parent rock with basalt and sandstone to a much lesser extent. Soil texture consisted of clay and sandy loams, as well as more pure sands, loams and clay. Wide variation, from heavy alluvial

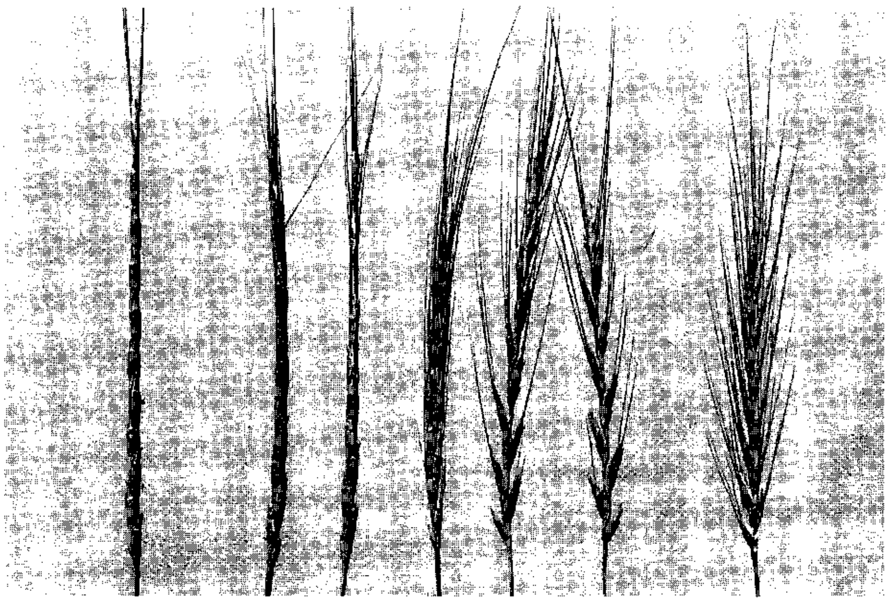


Fig. 68. Intermediate forms between the two varieties of *Aegilops speltoides*. Extreme left var. *speloides* (*van Slageren & Sweid MSFS-91048H*, ICARDA); in the centre five spikes of intermediate forms (*van Slageren & Sweid MSFS-91051H*, ICARDA); extreme right var. *ligustica* (*van Slageren & Sweid MSFS-91047H*, ICARDA).

soils to very poor and stony ones, has been observed. *Aegilops speltoides* is one of the species in the genus that shows a stronger preference for humid conditions than many others: recorded rainfall data varied between 450 and 1450 mm annually, with no records below 450 mm. Massive stands of *Ae. speltoides* are recorded on basaltic slopes in open oak park-forest along the foothills of the Zagros mountains in northeastern Iraq and adjacent southeastern Turkey, coinciding with a similar aspect made up of *Triticum monococcum* ssp. *aegilopoides* (Harlan & Zohary, 1966; Sakamoto, 1982), thus providing a rich opportunity for the natural hybridization that may have raised wild emmer wheat (*T. turgidum* ssp. *dicoccoides*). This region in the central part of the Fertile Crescent is considered the primary, more natural habitat for both species (Harlan & Zohary, 1966; Zohary et al., 1969). The reported basaltic bedrock is, however, in contrast with the limestone reported from other areas of the distribution.

The typical variety often grows together with the variety *ligustica*; intermediate forms within such mixed stands are very rare (see note 3).

Altitude: from sea level up to 2000 m. Recent collecting activities recorded a range from sea level (coastal Syria) up to 1130 m, while herbarium data extended this upward to 2000 m (only a few sites, however, from above 1450 m). The germplasm database that was the basis for the analysis of Hodgkin et al. (1992: 159 and Fig. 2b; see also Chapter 2.6) yielded a bar-diagram covering a range of 200-1600 m altitude with the great majority of the locations to be found in the range of 400-800 m.

Flowering and fruiting time: April – May (lowland and upper plains) – August (mountains: in Iraq, cf., Bor, 1968: 188, and pers. obs. in Turkey); May – June in Italy (Gismondi, 1950: 155). This species was consistently among the last to mature in an experimental field trial.

Genome: S with 2x = 2n = 14 (Chennaveeraiah, 1960: 90, sub *A. aucheri* and *A. speltoides*; Waines & Barnhart, 1992: Table 1).

Vernacular names:

Armenian: Aytzagn esbeldanman [danman = German, esbeldanman = resembling German wheat] (Gandilyan et al., 1975: 87). Covers both varieties of *Ae. speltoides*.

Kurdish: Himri (or Nimri), a'Kairah, Muwassalah [= useful for sheep grazing] (all from a collection at K: Iraq, Tal Kaif, *Mundir 3216*). Local names from northern Iraq.

Uses: this species (both varieties maybe involved as they are not mentioned) is said to be a useful forage plant for sheep in the Mosul region in northern Iraq (Bor (1968: 188), citing a questionnaire by Guest). Hence the vernacular name Muwassalah (see above).

Etymology: the final epithet is the Latin conjugation of '[looking like] spelt [wheat]', referring to the presumed similarity with this cultivated wheat group.

A geographical selection of ca 370 herbarium specimens examined:

ASIA: IRAN: Chesmashirin, Bakhtiari, *Koelz 15270, 15329* (US); Afswaer to Tchalaya, *Lenormand 12* (P, type of *Aegilops singularis*); distr. Hanikîn (Khanaqin), at Kasr-i-Sirîn (Qasr-e-Shirin), *Nábělek 3351* (SAV, type of *Aegilops aucheri* var. *schultzii* and *Triticum speltoides* var. *schultzii*).

IRAQ: Chemchemal, *Agnew & Wheeler Haines W1960* (E, K, LE); Aradin, W Amadiyah, *Al-Kaisi & Hamad 45059* (K); Qaranjir, Kirkuk to Sulaymaniyah, *Al-Rawi 21596* (K); Mindan, Mosul to Aqra, *Al-Rawi 11358* (K); S Mosul, *Anders 2763* (G); Kirkuk, *Bornmüller 1893* (B, G, JE, K, LE, P); 40 km S Rawandiz to Rayhat, *Bot. Exp. Univ. Kyoto BMUK 6-12-2-H* (K), *6-12-2-I* (US); SW Aqra to Mosul, *Chapman 26157* (K); Jebl Baykhair, near Zakho, *Field & Lazar 803* (F, G, US, W); near Kellek, NW Arbil, *Gillett 8201* (K); Huqna railway station, *Gillett 10801* (K); Mosul, near Ain Kebrid, *Handel-Mazetti 1190* (W); desert of Khabur, *Haussknecht 1060* (G-BOIS, JE); Mosul, *Kotschy 358* (K); Seri-zor, at Baba Gigik, Arbil to Rawandiz, *Nábĕllek 3361a* (SAV, type of *Aegilops aucheri* forma *hirtiglumis*); Assyria, at Mâr Jakub, above Simel (Summel), reg. Mosul, *Nábĕllek 3361* (SAV, type of *Aegilops aucheri* forma *hirtiglumis*); Assyria, at Altunköpri, Kirkuk to Arbil, *Nábĕllek 3308* (SAV, type of *Aegilops aucheri* forma *nudiglumis*); Koi Sanjaq to Arbil, *Omar & al. 49507* (K); near Tanurah, N Quoraitu, *Poore 563b* (K); E Kirkuk, *Rechinger 9991* (G); Surdash to Dokan, *Rechinger 10120* (E, G); Dohuk to Amadiya, *Rechinger 11943* (G); Mosul to Arbil, *Thurb 19652* (K).

LEBANON: Tripoli, rocks of Salftani, *Blanche 604* (BEI, G-BOIS); near Saïda (Sidon), *Blanche 2026* (G, LE, PRC), *s.n.* (BR, P); Tripoli, *Boissier s.n.* (G); valley of Nahr Beirut, *Mouterde 1244* (G); Ras Chekha, *Mouterde 12209* (G); Beitmeri, *Peyron 1516* (G); Kalmoun, Tripoli to Batroun, *Samuelsson 2212* (BM, K); 1 km below Sannine, *Stutz 3542* (BEI, NY).

PALESTINE: Haifa, Mt. Carmel, *Bornmüller 1743* (B, E, G, JE, K, LE, OXF, P, US, W, Z); near Tel-Aviv, *Eig s.n.* (L); Jaffa, *Dinsmore B 1270* (LD); Mt. Carmel, *Dinsmore B 3270* (F); N Zichron Yaakov to Haifa, *Johnson & Hall s.n.* (UCR, US); Ramleh, *Josuf s.n.* (Kneucker exsicc. 778) (B, BM, C, E, G, GAT, K, L, LE, NY, SO, TO, US, W, Z); Ain Jalud, *Meyers & Dinsmore 1381b* (LD); Ein Koudrani, Haifa to Acco, *Samuelsson 1042* (BM, LD).

SYRIA: near Aleppo, *Aucher-Éloy 2980* (G, G-BOIS, K, MPU, P, type of *Aegilops aucheri*; and P, type of *Ae. macrura*); El Ourdou, *Delbès s.n.* (hb. Gombault 3824) (P); Jezira, 40 km W Tell Kotchek, *Memeryan 10784* (US); Hassake to Derbassiye, *Pabot s.n.(369)* (G, Min.Agr.Syr.); plain of Lattakia, *Post 345* (BEI, BM, G, LY-Gandoger, US); Quadi Kandil, *Samuelsson 5838* (K, MO, NY); Lattakia, Ras Al-Shamra, Ugarit, *van Slageren & al. MSWRKA-88238aH* (ICARDA, WAG); E Kahtaniye, 35 km

Fig. 69. *Aegilops speltoides* var. *speltoides* (*van Slageren & Sweid MSFS-91038H*, ICARDA) in a durum wheat field east of Kahtaniye, east of Qamishly, NE Syria.

E Qamishly, *van Slageren & Sweid MSFS-91038H* (ICARDA); Qara Chok Dagh, Jawady to Malkiye, *van Slageren & Sweid MSFS-91042H* (ICARDA).

TURKEY: Cilicia, Ermenek, *Albaille 6455* (MPU); Içel, Plain of Mersin, *Balansa 753* (A, US), *754* (A, BM, C, E, G, G-BOIS, JE, K, L, LE, LY, LY-Gandoger, LY-Jordan, MPU, NY, P, W); Amasya, Boghazan, Ak-Dagh, *Bornmüller 462* (B, BM, G, JE, K, LD, LE, OXF, SO, W); Yozgat to Corum, *Bornmüller 1735* (B, BM, FI, G, JE, K, L, LD, LE, LY-Jordan, LY-Gandoger, NY, OXF, P, SO, W, Z, type of *Aegilops speltoides*); 16 km W Amasya, *Bot. Exp. Univ. Kyoto BMUK 5702A* (UCR, US); Hatay, Kirikhan to Haman, *Coode & Jones 580* (E); Mardin – Nusaybin, 5-10 km from Nusaybin, *Davis & Hedge 28417* (ANK, BM, E, K, LE), *28419* (ANK, BM, E, K); 30 km S Antakya, *Dinsmore 11270* (Z); Adana to Sis, *Grass 458* (BEI); Cilicia plain, *Grass 441* (BEI); Siirt, Baykan, Malabado, *Harlan 7929* (K); Urfa to Kharran, *Haussknecht 492, s.n.* (G-BOIS, JE, LE, W); Maraş, W Fevzipaşa on road Adana – Maraş, *Hennipman & al. 1385* (B, K, L, U, WAG); Elâziğ, Merkez, Hidir Baba, Asvan, *Hillman 2179, 2260b* (RNG); Adana, Beilan (Ceyhan?) in Mesgidou and Bekschedik hills, *Kotschy 50* (BM, C, G, G-BOIS, JE, K, L, LE, LY-Jordan, P, W); Asuaver and Tchalaya, *Kotschy 358* (G-BOIS); Cilicia, Ermenek, *Péronin 210* (BM, K, LD, LY, LY-Gandoger, P, US); Cilicia, Mersin, Güllek Tepe, *Siehe 477* (B, BM, E, G, JE, K, LE, MO, OXF, P); Mardin, Sihurs, *Sintenis 1070* (BEI, BR, E, G, JE, K, LD, P); Paphlagonia, Wilajet Kastambuli, Tossia, Kavak to Tchesme, *Sintenis 4543* (BR, E, G, LD, LE, P); Maraş, Suleymanli, Avçilark, *Yildiz 2659* (HUB); near Tarsus, *Zhukovsky s.n.* (WIR); E Adana, *Zohary s.n.* (UCR, US cult.); NW Elâziğ, *Zohary s.n.* (UCR).

ADVENTIVE: EUROPE: FRANCE, BOUCHES DU RHÔNE: Marseille, Lavoirs à Laine, *Blaisse & Roux s.n.* (MPU). HÉRAULT: Pérols à l'Estelle, *Sennen 4015* (BR); Port Juvénale, *Touchy 291* (LY-Gandoger, MPU, type of *Aegilops agropiroïdes*). GERMANY: Thüringen, Erfurt, *Reinecke s.n.* (JE); Hamburg, *Schmidt s.n.* (JE). ITALY: Liguria, Genoa, near La Foce, *Savignone s.n.* (BOLO-Bertoloni, type of *Agropyron tournefortii*). LUXEMBURG: Kleinbettingen, *Grzonka & Reichling s.n.* (BR). U.K., ENGLAND: Surrey, Kew, bank of Thames, *Nicholson s.n.* (JE).

Intermediate forms of the two varieties (Fig. 68):

ASIA: SYRIA: W Qamishly to Amuda, *van Slageren & Sweid MSFS-91051H* (ICARDA); 20 km W Derbasiye, *van Slageren & Sweid MSFS-91057H* (ICARDA).

Germplasm collections examined:

ASIA: SYRIA: Manbij to Jarablus, along Euphrates, *Bourgois SY-20149* (IPGRI, ICARDA); Lattakia, near Karkit, coming from Jisr Ash Shughur, *Bourgois SY-20200* (IPGRI, ICARDA); Idlib, Harem to Sarmada, *Bourgois & Witcombe SY-20167* (IPGRI, ICARDA); Aleppo, Atareb to Bab El-Hawa, *Bourgois & Witcombe SY-20157* (IPGRI, ICARDA); Qamishly, Ain Diwar, *Damania & al. DFKO-36* (ICARDA, SARD); Tartous, Tolaie – Safita road junction, *Rifaie & Witcombe SY-20276* (IPGRI, ICARDA); Tartous, S Safita, *van Slageren & Obari MSKO-89128* (ICARDA, SARD).

TURKEY: NW Elâziğ, *Güzel & al. SNM-110889-0405* (ICARDA, PGRRI); Agri, NE Doğubayazit, slope Mt. Ararat, *Metzger & Jana 79TK085-441A* (USDA); Hakkari, 21 km SW Semdinli, *Metzger & Jana 84TK566-006* (USDA); near Denizli – Asagisamli junction, *Metzger & Jana 84TK157-013* (USDA).

Notes: 1. The publication of *Agropyrum tournefortii* Savign. (a heterotypic synonym of *Aegilops speltoides* Tausch var. *speltoides*), and of *Agropyrum ligusticum* Savign. (the basionym of *Aegilops speltoides* Tausch var. *ligustica* (Savign.) Fiori), is rather obscure. While serving as secretary for the botany section of the Scientific Society of Genoa, Savignone published both species in the annual compilation of the various contributions (most of them non-botanical) to the Society. These were read during the annual session from 14 to 29 September 1846, but not published until 1847. Savignone's contribution was read in the 'Sezione di Botanica' on 28 September, and announced (by himself) as 'Two species found [by him] in the surroundings of the city of Genoa'. Maybe to give his findings wider recognition Savignone published both species later in the same year in Flora no. 35. The Genoese 'Atti' is, however, the older and valid publication of the two.

Type material of *Agropyron tournefortii* is not present in either of the Genoese herbaria, GDOR(-Chiappori) or GE, reported to hold Savignone's collections (Vegter, 1986: 829), but, contrary to *Agropyron ligustica*, part of the original material was sent to Bertoloni in Bologna where it is kept in his *Flora italica* herbarium. The label in BOLO-Bertoloni carries the text: 'Lecta Genua ad Ferritorem. Dedit Savignone sub nomine Agropyri Tournefortii sui. 1846, Genuae'. The BOLO collection now serves as the lectotype as the holotype is missing (Art. 7.5 of the ICBN). The label in BOLO also includes a handwritten note, relating to the *Flora italica* Vol. 6, page 622, item 1, where Bertoloni referred to the collection as *Aegilops caudata* ('Bertoloni', and thus 'non Linnaeus'; see at nomenclature).

2. Material of *Aucher-Éloy 2980* was (probably) sent by Boissier to Jaubert and Spach in Paris where it later served as type for their *Aegilops macrura*. Although based on the same collection the name *macrura* is not superfluous and illegitimate after *aucheri* as it is not based on the same '*...one specimen...*used by the author or designated by him as the nomenclatural type...' (ICBN, Art. 7.3; my italics). Jaubert & Spach (1851a: 21: 'Plant. exs. n° 2980, in Herb. Mus. Par.') clearly designated only the specimen in P to serve as such.

3. The varieties *speltoides* and *ligustica* are genetically closely linked and are shown to represent the extremes of a basically continuous, variation (Zohary & Imber, 1963). Also reproductive isolation is incomplete, while the difference in awning is controlled by a single gene only (Chennaveeraiah, 1962: 46). The entire dimorphism (spike length, awning, disarticulation type) is controlled by a block of closely linked genes (Zohary & Imber, 1963: 227; Waines et al., 1982: 95), with the *ligustica* characters dominant over the *speltoides* ones in the F_1 and segregating 3:1 in the F_2 (Waines et al., 1982). There is considerable similarity in the karyotypes (Chennaveeraiah, 1962: 45). In spite of this close relationship intermediate forms are rather unusual and mixed growth still enables easy distinction in most cases. All this makes the distinction of infraspecific taxa within *Ae. speltoides* similarly tenuous as in the case of *Amblyopyrum muticum* (see Chapter 11), and probably the other distinguished varieties in *Aegilops*. This notwithstanding, complete abandonment of the infraspecific taxa has never been proposed for *Ae. speltoides*; there is only agreement to unite the two forms under one species. Similar to the other cases, I have maintained these sympatric forms at variety level. Populations of *Ae. speltoides* usually show both varieties intermingled, while less frequently one of them dominates. Pure stands of the *ligustica* variety were found by me only in southeastern Bulgaria. The few intermediate forms that were found in northeastern Syria (Fig. 68) are listed separately in this Chapter.

10.16b **Aegilops speltoides** Tausch var. ('β') **ligustica** (Savign.) Fiori
Figs. 1, 65(1, 3-11), 67-68, 70

Aegilops speltoides Tausch var. ('β') *ligustica* (Savign.) Fiori, Fl. Italia 4: 33 (1907), Nuov. Fl. Italia 1: 159 (1923); Bornmüller, Beih. Bot. Centralbl. 26(2): 438 (1910); Meyer, Pflanzenbau 3: 305 (1927); Eig, Sec. contr. fl. Pal., P.Z.E. Inst. Agric. Nat. Hist., Bull. 6: 73 (1927); Hegi, Ill. Fl. Mitt.-Eur. (ed. 2) 1: 500 (1936, as 'var. *ligusticum* (Bert.) A. et G.'); Davis, Fl. Turkey 9: 236 (1985); Feinbrun-Dothan, Fl. Pal. 4: 172 (1986). See note 1.

Basionym: *Agropyron ligusticum* Savign., Atti della ottava ruinione degli scienziati italiani tenuta in Genoa dal XIV al XXIX settembre 1846: 602 (published 1847), Flora 35: 569 (1847). On the publication date, see note 1 at *Aegilops speltoides* var. *speltoides* (10.16a).

Neotype: (Italy, Liguria, Genoa) dri (tri?) colli freari la porta Montaldo presso Genova, 1847, *Savignone s.n.* (FI; isoneotype: LY-Gandoger). Here designated. See note 2.

Homotypic synonyms:

Triticum ligusticum (Savign.) Bertol., Fl. ital. 6: 622 (1847); Parlatore, Fl. ital. 1: 507 (1850); von Steudel, Syn. pl. glumac. 1: 344 (1854); de Cesati, Passerini & Gibelli, Comp. fl. ital. 1(4): 86 (1869); Nyman, Consp. fl. eur. 4: 840 (1882), suppl. 2: 342 (1890); Richter, Pl. eur. 1: 128 (1890); Gismondi, Pros. fl. ligust. 154 (1950).

Ae. ligustica (Savign.) Coss., App. fl. juv. alt., Bull. Soc. bot. France 11: 164 (1864); Eig, Feddes Repert., Beih. 55: 81 (1929a), in Hannig & Winkler, Die Pflanzenareale 4: 46 (1936); Post, Fl. Syria (ed. 2) 2: 788 (1933); Jansen, Fl. neerl. 1(2): 121 (1951); Thiébaut, Fl. Lib.-Syr. 3: 317 (1953); Chase & Niles, Index Grass Species 1: 8 (1962, see note 3); Bor in Rechinger, Fl. lowland Iraq 112 (1964); Mouterde, Nouv. Fl. Liban, Syrie 1: 153 (1966); Bor, Fl. Iraq 9: 185 (1968), Fl. Iranica 70/30: 193 (1970); Al-Rawi, Fl. Kuwait 2: 326 (1987, see at Distribution).

Triticum speltoides (Tausch) Gren. ex K.Richt. ssp. '(B. II.') *ligusticum* (Savign.) Asch. & Graebn. in Ascherson, Magyar Bot. Lapok 1(6): 12 (1902); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 712 (1902); Zimmermann, Adv. Ruderalfl. Mannheim 72 (1907, authors as '(Bert.) A. u. G.'); Thellung, Fl. adv. Montpellier 152 (1912); Chennaveeraiah, Acta Horti Gotoburg. 23: 163 (1960; as a *comb. nov.*, thus an isonym after Ascherson & Graebner in Ascherson, 1902). See notes 1 and 4.

Ae. speltoides Tausch ssp. *ligustica* (Savign.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 530 (1928); Cope, Grasses Arab. Penin., Arab. J. Sci. Res., Spec. Publ. 1: 74 (1985).

Triticum speltoides (Tausch) Gren. ex K.Richt. forma *ligusticum* (Savign.) Bowden, Can. J. Bot. 37: 665 (1959), Can. J. Gen. Cyt. 8: 133 (1966).

Aegilops speltoides Tausch forma *ligustica* (Savign.) Hammer, Feddes Repert. 91: 231 (1980b).

Triticum speltoides (Tausch) Gren. ex K.Richt. ssp./var. *ligustica* (Savign.) Kimber & Feldman, Wild Wheat 26 (1987), *comb. inval.* (Arts. 33.2 and 35.1; combination proposed as '*T. speltoides* (*ligustica*)').

Sub nom. *Ae. bicornis* auct. non (Forssk.) Jaub. & Spach (1850): Boissier, Fl. orient. 5(2): 677 (1884) *pro parte*; Fiori & Paoletti, Fl. Italia 1: 108 (1896); Post, Fl. Syria (ed. 1) 901 (1899) *pro parte*; Coste, Fl. descr. France 3: 659 (1906); Handel-Mazetti, Pteridoph. Anthoph. Mesopot. 4, Ann. k.k. naturhist. Hofmus. Wien 28: 33 (1913); Parsa, Fl. Iran 5: 827 (1952); Zangheri, Fl. ital. 1: 980 (1976). See note 5.

Sub nom. *Ae. speltoides* auct. non Tausch (1837) *pro parte*: Jaubert & Spach, Ill. pl. orient. 4: 11, 22, Tab. 316 (1850-51a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 353 (1851b); Walpers, Ann. bot. syst. 3: 789 (1852); von Steudel, Syn. pl. glumac. 1: 355 (1854); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 454, 523 (1928); Fournier, Quatre fl. France 88 (1935); Chennaveeraiah, Proc. summer school bot., Darjeeling 46 (1962; with ssp. *speltoides*, see also note 4); Guinochet & Vilmorin, Fl. France 3: 967 (1978); Dakov, Red book Bulg.; distr. threatened pl., anim. 1: 50 (1984).

Heterotypic synonyms:

Triticum (*Agropyrum*) *obtusatum* Godr., Fl. juvenalis (ed. 1, Latin) 46 (1853) / Mém. Acad. Montp., Sect. Méd. 1: 454 (1853), (ed. 2, French) Mém. Acad. Stan. (Nancy) 435 (1853 (separately published 1854), sub *Ae. tauschii* Coss.); von Steudel, Syn. pl. glumac. 1: 345 (1854); Nyman, Consp. fl. eur., suppl. 2: 342 (1890). – Type: (France, Hérault) Port Juvénale, *Touchy 292* (holo: NCY, not seen; iso: MPU). – Paratype: (France, Hérault) Port Juvénale, *Grenier s.n.* (holo: P).

Ae. aucheri Boiss. var. *polyathera* Boiss., Fl. orient. 5(2): 678 (1884, '*potyathera*'); Post, Fl. Syria (ed. 1) 901 (1896), **syn. nov.** – Syntypes: (Lebanon) in arenosis maritimis mobilibus ad Tripoli Syriae, *Blanche 47* (G-BOIS); (Lebanon) in arenosis maritimis mobilibus ad Tripoli Syriae, 21.V.1866, *Blanche 609* (BEI, E, G-BOIS, JE, P). – Homotypic synonyms: *Triticum speltoides* (Tausch) Gren. ex K.Richt. ssp. ('B. I') *polyatherum* (Boiss.) Asch. & Graebn. in Ascherson, Magyar Bot. Lapok 1(6): 11 (1902); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 712 (1902). *Ae. aucheri* Boiss. ssp. *polyathera* (Boiss.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 536 (1928). *Ae. speltoides* Tausch var. *polyathera* (Boiss.) K.Mey., Pflanzenbau 3: 305 (1927); Eig, Feddes Repert., Beih. 55: 84 (1929a); Post, Fl. Syria (ed. 2) 2: 789 (1933); Thiébaut, Fl. Lib.-Syr. 3: 316 (1953); Mouterde, Nouv. Fl. Liban, Syrie 1: 153 (1966). *Ae. speltoides* Tausch forma *polyathera* (Boiss.) Hammer, Feddes Repert. 91: 230 (1980b).

Ae. speltoides Tausch var. *muricata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 530 (1928), **syn. nov.** – Lectotype: Turkey ('North Mesopotamia'), 40 km south of Maraş vilayet, in abundance, 11.VII.1927, *Zhukovsky s.n.* (holo: WIR 981). – Homotypic synonym: *Ae. speltoides* Tausch forma *muricata* (Zhuk.) Hammer, Feddes Repert. 91: 231 (1980b).

Ae. speltoides Tausch var. *scandens* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 530 (1928); Hammer, Feddes Repert. 91: 231 (1980b). – Type: not indicated as only a few countries of distribution were mentioned by Zhukovsky. Also not found at WIR.

Ae. speltoides Tausch ssp. *submutica* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 530 (1928), **syn. nov.** – Type: (Turkey) 'Syria borealis', inter Maraş – Aintab [= Gaziantep], ad vias, *Zhukovsky s.n.* (holo: WIR). – Homotypic synonym: *Ae. speltoides* Tausch var. *submutica* (Zhuk.) Hammer, Feddes Repert. 91: 231 (1980b).

Ae. aucheri Boiss. var. *hirto-hispida* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 536 (1928); Hammer, Feddes Repert. 91: 230 (1980b, considers it a synonym of the variety *polyathera*). – Type: (Turkey) Cilicia littoralis, ad vias, *Zhukovsky s.n.* (holo: WIR, not found).

Ae. aucheri Boiss. var. *unicolor* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 536 (1928), **syn. nov.** – Type: not indicated by Zhukovsky (1928: 536) as only a few countries of distribution were mentioned. Also not found at WIR. – Homotypic synonym: *Ae. speltoides* Tausch forma *unicolor* (Zhuk.) Hammer, Feddes Repert. 91: 230 (1980b).

Ae. bicornis (Forssk.) Jaub. & Spach forma *hirtiglumis* Nábělek, Iter turc.-pers. 5, Publ. Fac. Univ. Masaryk 111: 30 (1929), **syn. nov.** – Type: (Iraq) Assyria, ad pagum Mâr Jakub supra pagum Simel dit. Mosul, in steppis, 10.VI.1910, *Nábělek 3265* (holo: BRA; iso: SAV; both not seen).

Ae. bicornis (Forssk.) Jaub. & Spach forma *nudiglumis* Nábělek, Iter turc.-pers. 5, Publ. Fac. Univ. Masaryk 111: 30 (1929); Parsa, Fl. Iran 5: 827 (1952), **syn. nov.** – Type: (Iraq) Assyria, ad pagum Mâr Jakub supra pagum Simel dit. Mosul, in steppis, 7.VI.1910, *Nábělek 3257a* (holo: BRA, not seen; iso: SAV). See note 5.

Description (Fig. 65: 1, 3-11): *inflorescence* a narrowly cylindrical spike (*Fig. 65-1a*), distichous, somewhat compressed laterally, tapering in the basal and apical parts, 7-10 cm long excluding awns, 0.3-0.6 cm wide; disarticulating wedge-type at maturity with the rudimentary spikelet or the lowest fertile spikelet remaining attached to the culm; with 7-15 fertile spikelets, rudimentary spikelets absent or 1 developed. *Lemmas* (*Fig. 65-6, 10*) of fertile florets in lateral and apical spikelets awned at the apex, awns setulose, triangular in cross section and without lateral teeth at the base, increasing in length from 2.5 cm at base of spike up to 10 cm in the apical region, of third and fourth floret less strongly developed than of the lowest 2 florets in a spikelet.

Otherwise as var. *speltoides*.

Distribution (Fig. 67): similar to var. *speltoides*. Only this variety reaches southeastern Bulgaria where it can be found growing together with wild diploid wheat (Fig. 70), a similar feature as in its main distribution area in the central-northern parts of the Fertile Crescent. *Aegilops speltoides* was found as early as 1924 around Ivailovgrad in the eastern Rodopi mountains by Stefanoff, but not mentioned in the flora of Bulgaria, which he wrote together with Stojanov and which appeared in the same year. The species is present in later editions of the Bulgarian flora (e.g., Stojanov & Stefanoff, 1948: 175; Stojanov et al., 1966: 148), but without distinction of varieties. Delipavlov (1992) cites some new locations from the Rodopi mountains (Svirachi, near Ivailovgrad) and from the Tracian plain (Raikova Mogila, near Svilengrad), and asserts that all Bulgarian material belongs

Fig. 70. Mixed growth of *Aegilops speloides* var. *ligustica* (germplasm collection *van Slageren & Zacharieva MSMZ-90237*, ICARDA) and *Triticum monococcum* ssp. *aegilopoides* (*van Slageren & Zacharieva MSMZ-90239H*, ICARDA) in a grassland north of Raikova Mogila, Bulgaria.

to the *ligustica* forms. Although locally common its rarity for the whole of the country made this variety end up in the *Red book of Bulgaria* (Dakov, 1984: 50, sub nom. *Ae. speltoides*).

Aegilops speltoides var. *ligustica* is reported by Al-Rawi (as *Ae. ligustica*, cf., 1987: 326) from Kuwait: Mina Al-Zor, *Saleh AR-720* (KTUH?); Al-Subiyah, *Al-Rawi & al. 11139* (KTUH?); Khiran, *Al-Rawi AR-289* (KTUH?). These locations would represent the most southeasterly sites of the area of distribution, and indicate a presence up to the southeastern end of the Fertile Cresent. I have, however, been unable to confirm their identity.

The variety *ligustica* is, like the typical variety, naturalized in parts of Europe with adventive distribution published from France (Coste, 1906: 659) and Italy (Genoa area, Fiori & Paoletti, 1896: 108; Gismondi, 1950: 155; Zangheri, 1976: 980). All, however, recorded under the name *Ae. bicornis*. Although doubtful about the true nature of the species, suggesting *Ae. speltoides* Tausch, Zangheri's description clearly indicates only the var. *ligustica*. Godron's (1853) *Triticum obtusatum* from the Port Juvénale in the Hérault is also an adventive, as are the type specimens of *Ae. speltoides* var. *ligustica* from the Genoa region in Italy. Reported adventive records are from near Mannheim, Germany (Zimmermann, 1907: 72; Hegi, 1936: 500), and from the Netherlands (Jansen, 1951: 121), while other specimens originated in Belgium, Spain and England.

Ecology (Figs. 1, 70), flowering and fruiting time, genome type, vernacular

names: as var. *speltoides*. The two varieties are usually found together. Rainfall and soil data are thus also similar to var. *speltoides* (see also note 3).

Altitude: from sea level up to 2400 m, but with only a few locations above 1450 m.

Etymology: the final epithet refers to the Liguria region in northern Italy where this species has been found as an adventive and described by Savignone as *Agropyron ligusticum*.

A geographical selection of ca 390 herbarium specimens examined:

ASIA: IRAN: Chesmashirin, Bakhtiari, *Koelz 15330* (US); Gaomir, Bakhtiari, *Koelz 15456* (US).

IRAQ: Dokhan – Sulaymaniyah, *Agnew & Wheeler Haines W1955, W1956* (E, K); 20 km NW Sulaymaniyah, *Al-Rawi 21722, 21722A* (K); W Chemchemal, *Al-Rawi 21674* (K); Dokhan – Sulaymaniyah road, *Batanouny & al. s.n.* (A); Shaqlawa to Arbil, *Bot. Exp. Univ. Kyoto BMUK 6-13-1-F, 6-13-1-G, 6-13-1-H* (K), *6-13-1-I* (US); 30 km SSE Arbat to Baghdad, *Bot. Exp. Univ. Kyoto BMUK 5-25-8-D* (K); near Dinarte, *Chapman 26111* (K); Hariya, *Gillett 8337* (K); N side Mirowa pass, near Shaqlawa, *Gillett 8339* (K); Mosul to Seiramum, *Handel-Mazetti 1201* (W); Jarmo, adobe ruin in camp, *Helbaek 1258* (K); field near Monat, *Helbaek 1544* (K); 70 km E Kirkuk, *Knowles K1289* (UCR); Mâr Jakub, above Simel (Summel), distr. Mosul, *Nábělek 3257a* (SAV, type of *Aegilops bicornis* forma *nudiglumis*); Mosul, *Noë 49* (LE), *182* (G-BOIS); Sulaymaniyah to Dokan, *Rechinger 10076* (G); W Salahuddin, *Springfield 69* (K, UCR), *70* (UCR); Gopala, near Taymal on Sulaymaniyah – Kirkuk road, *Thorpe 33157* (US), *33165* (MO).

LEBANON: Tripoli, *Blanche 46* (G-BOIS), *47* (G-BOIS, type of *Aegilops aucheri* var. *polyathera*), *609* (BEI, E, G-BOIS, JE, P, type of *Aegilops aucheri* var. *polyathera*); around Saïda (Sidon), *Blanche 2026* (F, FI, LE, LY, LY-Jordan, MPU, P, PI (right-hand specimen on the sheet only), US), *s.n.* (A, BM (hb. Hance 15975), E, G, JE, K, P, US); Damour, *Mouterde 9793* (G).

PALESTINE: S Yabroud, *Dinsmore 20405* (K); Kalansoui, *Jofë & Aaronsohn 338* (MPU); Ashdad to Ashqelon, *Johnson & Hall s.n.* (UCR); Haifa, *Samuelsson 1034* (B, BM, K, LD); E Ashqelon, *Zeven s.n.* (GAT cult.).

SYRIA: Deir-Atiah, *Barkoudah 246* (U); W Qatrana, *Deyroc s.n.* (G); near Nahr Abrach, Lattakia prov., *Gombault 2956* (P); Near Aleppo, *Lenormand s.n.* (P); Jezira, 40 km W Tell Kotchek, *Memeryan 10784* (US); Maaloula, *Mouterde DL232* (G); S Lattakia to Snobar, *Mouterde 11120* (G); NE lake Jabboul, near Aleppo, *Pabot s.n.* (G); Anadi Kandil, *Samuelsson 5838* (K); Lattakia, Ras Al-Shamra, Ugarit, *van Slageren & al. MSWRKA-88238bH* (ICARDA, WAG); Lattakia, Alsemeha, W Heffe, *van Slageren & al. MSWRKA-88230H* (ICARDA); E Kahtaniye, 35 km E Qamishly, *van Slageren & Sweid MSFS-91039H* (ICARDA); Qara Chok Dagh, Jawady to Malkiye, *van Slageren & Sweid MSFS-91043H* (ICARDA).

TURKEY: Ankara, near Dolapdere, *Alinoğlu s.n.* (E); Mersin plain, *Balansa 753* (C, E, G, JE, K, L, LE, LY-Gandoger, MPU, OXF, P, W), *754* (A, L); Gaziantep, Keysun to Gaziantep, *Balls B2340* (ANK, BM, E, K); Fevzipaşa, *Birand 53* (ANK); Galatia, Aladja to Corum, *Bornmüller 1734* (B, BM, G, JE, K, L, LD, LE, LY, LY-Gandoger, NY, OXF, P, SO, W, Z); at Corum, *Bornmüller s.n.* (US); Amasia, Boghazan, to Ak-Dagh, *Bornmüller 463* (B, JE, W); Amasia, Boghazan, *Bornmüller 462* (OXF); Yozgat to Corum, *Bornmüller 2560* (JE); 40 km N Elâziğ to Hozat, *Bot. Exp. Univ. Kyoto BMUK 6-30-7-I, 6-30-7-J* (K), *6-30-7-K, 6-30-7-M* (US); Tarsus, Egemen köyü, *Cetik 5318* (ANK); Adana, near Tuzla, *Coode & Jones 327* (E); Mardin – Nusaybin, 5-10 km from Nusaybin, *Davis & Hedge 28415* (ANK, BM, C, E, K); Urfa, Viranşehir to Ceylanpinar, *Davis 42389* (BM, E, K); E Luleburgaz, *Harlan 2732, 2733* (K, UCR); desert near Kharran and Surukh, Taurus Cataonicus, *Haussknecht s.n.* (G-BOIS, JE); Içel, E Mersin, *Hennipman & al. 1175* (K, L, WAG); 36 km N Malatya, *Johnson & Hall s.n.* (US cult.); Urfa and Siverek, *Kotschy 61* (G-BOIS); Ankara, Çuluk Deresi, *Krause 5500* (ANK); Antakya, cave of St. Peter, *Mouterde DL313* (G); Paphlagonia, Wilajet Kastambuli, Tossia, Kavak to Tchesme, *Sintenis 4543* (BEI, E, G, JE, LD, OXF, PR); 17 km from Tunceli, *Spencer 0403, 0406* (E); Maraş, Göksun to Elbistan, *Stainton & Henderson 5592* (E); Amasia, *Wiedemann s.n.* (G, LE); 40 km S Maraş, *Zhukovsky s.n.* (WIR 981, type of *Aegilops speltoides* var. *muricata*); between Maraş – Aintab [= Gaziantep], *Zhukovsky s.n.* (WIR, type of *Aegilops speltoides* ssp. *submutica*); 26 km W Tekirdag, *Zohary s.n.* (UCR, US cult.).

EUROPE: BULGARIA: near Ivajlovgrad, *Delipavlov s.n.* (SOA); Svilengrad to Levka, *Jordanov* *s.n.* (SO); Svilengrad, near Rajkova Mogila, *van Slageren & Zacharieva MSMZ-90237H* (IIPGR); Malyk village and Goljam Monastir, *Zacharieva s.n.* (IIPGR).

GREECE, THRACE: 'Thracia orientalis', Adrianopol, *Nejceff s.n.* (SOM); near Turkish border, *Stutz 313* (NY).

ADVENTIVE: EUROPE: BELGIUM: Ternaaien, *van der Ploeg & Jansen s.n.* (L). FRANCE, BOUCHES DU RHÔNE: Marseille, Lavoirs à Laine, *Blaisse & Roux s.n.* (G, LY, MPU, P). HÉRAULT: Port Juvénale, *Grenier s.n.* (P, type of *Triticum obtusatum*), *Touchy 292* (MPU, type of *Triticum obtusatum*), *337, 338, 345, 346* (P), *1045* (Z), *s.n.* (G, LY-Gandoger, MPU, P); Pérols à l'Estelle ('plante originaire à Egypte'), *Mandon 691* (F, G, LY, MPU, P, Z), *s.n.* (BM, C, G, GE, JE, L, LD, LE, LY, LY-Gandoger, MPU, PR, U, W, Z); Rivals, *Sennen s.n.* (Exsicc. Soc. Rochelaise 4015) (BC, BM, BR, F, FI, G, GE, JE, LD, LY, MPU). GERMANY: Erfurt, *Reinecke s.n.* (JE); Potsdam, *s.coll., s.n.* (JE). ITALY, LIGURIA: near Genoa, *Bastreri s.n.* (JE); near Genoa, valley of Lagaccio, *Savignone s.n.* (FI); near Genoa, Montaldo hills, *Savignone s.n.* (FI, LY-Gandoger, type of *Aegilops speltoides* var. *ligustica*). TOSCANA: Pisa, *Gandoger 1411* (LY-Gandoger). ISLANDS: SICILY: Messina, *Jansen & Wachter 15037-15039* (L). SPAIN: Castillia, Ibarenes, *Sennen & Elias 4276* (RNG). U.K., ENGLAND: Flintwick, *Burtt-Davy s.n.* (K); Bristol, Ashton gate, *Evans s.n.* (K); Grimsby docks, *Lousley s.n.* (K, RNG).

CULT.: EUROPE: GERMANY: Karlsruhe exp. garden, *Kneucker 779* (A, B, BM, C, E, G, GAT, K, L, LE, NY, MO, PRC, RNG, SO, TO, US, Z).

Germplasm collections examined:

ASIA: SYRIA: Aleppo reg., 10 km from Azaz, *Bourgois SY-20195* (IPGRI, ICARDA); near Saraya on Lattakia – Jisr Ash Shughur road, *van Slageren & al. MSWRKA-88244b* (ICARDA, SARD).

TURKEY: Hakkari, 21 km SW Semdinli, *Metzger & Jana 84TK566-001-01* (USDA); 29 km E Bingöl, *Metzger & Jana 84TK466-001* (USDA).

Notes: 1. Fiori & Paoletti (1896) and Fiori (1907, 1923) use only Greek symbols to denote infraspecific taxa: α, β and γ. Their interpretation is, however, given by Fiori (1923: 159) since he writes with the subdivison of *Ae. speltoides* into α *aucheri* and β *ligustica* 'come la *var.* prec.' [as the preceding variety; my italics], thus indicating that he sees them as varieties. As the indication with symbols is similar throughout Fiori's work, I have followed this interpretation in retrospect with the result that the correct author citation of the variety *ligustica* is (Savign.) Fiori, Fl. Italia 4: 33 (1907), antedating Bornmüller, Beih. Bot. Centralbl. 26(2): 438 (1910). I have found only Eig's paper on the Palestine flora coming to the same conclusion (l.c., 1927: 73).

Similarly, Ascherson & Graebner (1902, and in Ascherson, 1902) also use symbols only to denote infraspecific taxa in *Ae. speltoides*. The interpretation of the rank intended by them is, however, notoriously unclear. Thellung (1912: 152), under direct reference to Ascherson's (1902) publication, interprets 'A.' *aucheri* and 'B. II.' *ligusticum* as subspecies, which also seems logical in view of the similar typography used by Ascherson & Graebner in their *Synopsis der mitteleuropäischen Flora*, published shortly thereafter in the same year (l.c., 1902: 711-712; Ascherson & Graebner refer on these pages to Ascherson's (1902) publication). I have followed this interpretation with the result that the combinations by Chennaveeraiah (1960: 163) are isonyms (see also the nomenclature at 10.16a). Earlier in his *Flore adventice de Montpellier* Thellung (1912: 143) referred to Ascherson & Graebner's *Synopsis* for the subdivision of *Triticum ovatum* into I. *euovatum* and II. *triaristatum*, assigning subspecies rank to the 'I.' and 'II.' taxa. Thellung's interpretation is consequent, but may be conflicting with the indication of 'I.' and 'II.' as 'Rassen' by Ascherson & Graebner, which may be translated as 'varieties'. The treatment of '*triaristatum*' under *Triticum ovatum* (L.) Rasp. in the literature may serve as an example. As with Thellung, a status as 'subspecies *triaristatum* (Willd.) Asch. & Graebn.' is proposed by Stojanov & Stefanoff in the third edition of their Bulgarian flora (l.c., 1948: 174), but earlier Briquet (1910: 19) and Diapulis (1939: 167) interpret the *Synopsis* as intending varieties. [Von Hayek (1932: 224) also does this but, contrary to Briquet and Diapulis, I have decided to follow von Hayek with his varietal status as his indication 'B' (as with similar letters) is consequently used for varieties and is clearly explained in the preface to the first volume of his *Prodromus* (see note 3 at *Ae. biuncialis*, 10.2).] Stojanov & Stefanoff (1924: 168), in an earlier edition of their flora, assign varietal status to *triaristatum* under *T. ovatum* without referring to Ascherson & Graebner but to Godron & Grenier's *Flore de France* instead. With Ascherson & Graebner's 'B. I.' interpreted as a subspecies the varietal rank is then a new combination. Although Godron & Grenier's flora does not represent the basionym of the combination it is not invalid because of Art. 33.2. I am aware that the interpretation of the *Synopsis* is not 100% consequent, but nor is the *Synopsis* itself! And nearly all its names are now synonyms anyway.

2. Type material of *Agropyron ligusticum* (from Italy (Liguria, Genoa): In herbidis secus aquaeductum allo Zerbino, *Savignone s.n.*) is, similar to *Agropyron tournefortii* (see at var. *speltoides*, 10.16a, note 2), not present in GDOR or GE. After correspondence with the curators, none of the Genoese herbaria has been able to locate the holotype of *Agropyron ligusticum* Savign., nor did any of the other likely herbaria for Savignone collections (e.g., FI) yielded an isotype. A neotype has therefore been selected with a similarly adventive specimen also collected by Savignone in the same region around Genoa. The label carries, next to the location, the name '*Agropyron ligusticum* Sav.'. An isoneotype is in LY-Gandoger.

3. Chase & Niles (1962: 8) quote Cosson's (1864: 164) 'ligustica' from his *Appendix florulæ juvenalis altera* both as '*Aegilops ligustica* (Savign.) Coss.' and as '*Ae. mutica* Boiss. var. *ligustica* (Savign.) Coss.'! Cosson's layout may indeed be interpreted as the variety status (and also in retrospect following Art. 35.3 of the *Code*), but this has not been accepted by subsequent authors. Moreover, the combination of these otherwise rather different taxa seems unlikely to have been intended by a botanist like Cosson. The same holds for the apparent combination of *mutica* and *Ae. platyathera* Jaub. & Spach (which is *Aegilops crassa*, see at 10.6), also interpreted as a variety by Chase & Niles (l.c., 1962: 8). See also note 1 at *Ae. crassa*, 10.6.

4. Chennaveeraiah (1960: 163; 1962: 45-46) causes confusion about the subdivision of *Ae. speltoides*. When treating *Triticum* (l.c., 1960: 163) he subdivided it into the subspecies *speltoides*, *ligusticum* and *aucheri*, thus maintaining distinction between the typical subspecies and *ligusticum* and *aucheri*. Later (1962: 45) he changed his mind and united the ssp. *speltoides* with *ligustica*, this time again in *Aegilops*, and separated the ssp. *aucheri* from it by stating that '...*Ae. aucheri* Boiss. differs...in having only the apical spikelet with awns...'.

5. *Ae. speltoides* var. *ligustica* can easily be confused with the allopatric *Ae. bi-*

cornis. Both taxa disarticulate wedge-type and have distichous, laterally compressed spikes. Notable differences are keyed out as follows:

Apex of glumes of lateral spikelets truncate with a thick rim and a mucronate tooth; mature plants 30-75 cm tall .... **speltoides** var. **ligustica**
Apex of glumes of lateral spikelets with two triangular teeth and a hyaline depression between them; mature plants (10-)20-40 cm tall .... **bicornis**

Due to this confusion of taxa the distribution area of *Ae. bicornis* showed unrealistic extensions. Nábělek (1929: 30; coll. *Nábělek 3257a* from Mosul distr., Iraq), for instance, misidentified *Ae. speltoides* var. *ligustica* from northern Iraq as *Ae. bicornis*. Probably the same mistake was made by Handel-Mazetti (1913: 33; see note at 10.1a, *Ae. bicornis* var. *bicornis*). Exsiccates from Mardin, Turkey (*Balansa 753*) and Saïda (Sidon), Lebanon (*Gaillardot s.n.*) have been published as *Triticum bicorne*, but again belong to *Ae. speltoides* var. *liPustica* (Bornmüller, 1910: 438). The two taxa are predominantly allopatric (compare Figs. 16 and 67), with sympatric occurrence in coastal Palestine. Confusion in the field is thus theoretically possible.

6. Only the right-hand specimen of the Lebanese collection *Blanche 2026* from PI represents *Ae. speltoides* var. *ligustica*. The left-hand specimen is the holotype of *Ae. notarisii* Clem., a heterotypic synonym of *Ae. uniaristata* (see at 10.20).

10.17 **Aegilops tauschii** Coss. **Figs. 38, 71-75**

[For pre-Linnaean descriptions and literature, see Chapter 3.1 at 3.1.3.]

Aegilops tauschii Coss., Notes pl. crit. 1(2b): 69 (1850); Nyman, Consp. fl. eur. 4: 839 (1882); Bor, Grasses India, Burma, Ceylon, Pakistan 654 (1960), Fl. Iraq 9: 188 (1968), Fl. Iranica 70/30: 195 (1970); Bor in Rechinger, Fl. lowland Iraq 111 (1964); Stewart, Cat. vasc. pl. W Pakistan, Kashmir, in Nasir & Ali, Fl. W Pakistan 170 (1972); Takhtajan & Fedorov, Fl. erevana (ed. 2) 366 (1972); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973, with ssp. *tauschii*), in Fedorov, Fl. part. Eur. URSS 1: 155 (1974), Zlaki SSSR 157 (1976, Russian; with ssp. *tauschii*) / 225 (1984, English; with ssp. *tauschii*); Hammer, Feddes Repert. 91: 233 (1980b, with ssp. *tauschii* var. *tauschii* forma *tauschii*); Cope in Nasir & Ali, Fl. Pakistan 143: 595 (1982); Davis, Fl. Turkey 9: 238 (1985, with ssp. *tauschii*); Nikitin & Geldykhanov, Opredelitel rastenich Turkmenistana [Key to Turkmenistan

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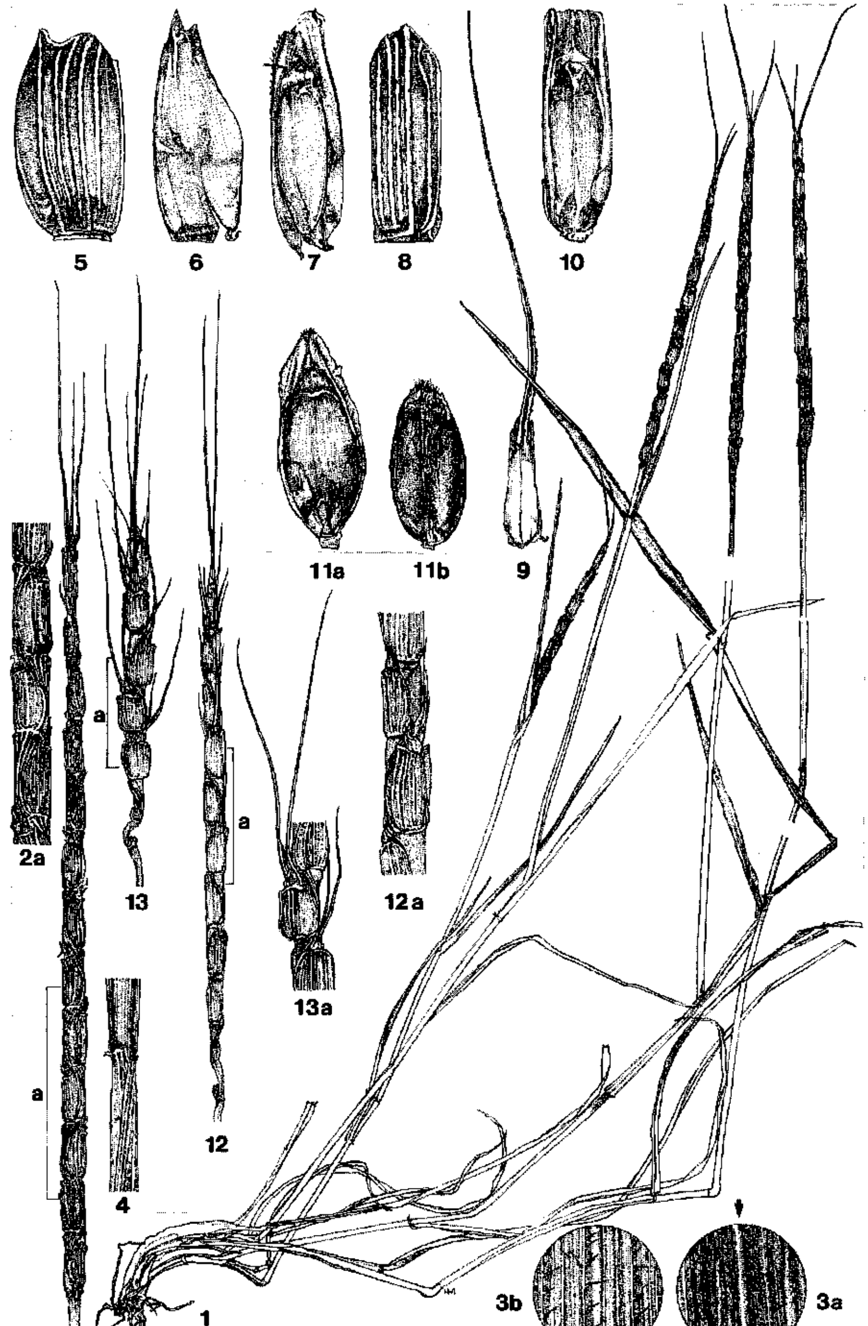
Fig. 71. *Aegilops tauschii*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlarged part of spike, showing spikelets in situ (x 2); 3a, abaxial leaf surface, midway (x 2); 3b, adaxial surface of 3a (x 2); 4, leaf sheath, ears and leaf blade (x 2); 5-7, lowest floret of spikelet in centre of spike: 5, glume, 6, lemma, 7, palea and seed (5-7 all x 5); 8-10, lowest floret of apical spikelet: 8, glume (x 5), 9, lemma (x 21/2), 10, palea with immature seed, dorsal surface (x 5); 11a, palea and dorsal surface of mature seed (x 5); 11b, ventral surface of mature seed (x 5); 12, mature spike, showing slender, linear outline (former variety *meyeri*; compare with figs. 2-2a and 13-13a) (x 1); 12a, enlarged part of 12, showing spikelets in situ (x 11/2); 13, mature spike, showing coarse spikelets (former variety *strangulata*; compare with figs. 2-2a and 12-12a) (x 1); 13a, enlarged part of 13, showing spikelets in situ and thick apical rim of glumes (x 11/2). (1-11. *Elings & al. ID-308*; 12. *Bot. Exp. Kyoto Univ. KUSE 2086*; 13. *Bot. Exp. Kyoto Univ. KUSE 2133*; all cultivated at ICARDA from germplasm accessions.)


5
6
7
8
10
11a
11b
9
2a
13
a
a
12a
13a
a
4
12
1
2
3b
3a

plants] 46 (1988); Gandilyan in Kazarjan, Red data book Armenian SSR 248 (1990).

Basionym: *Triticum aegilops* P.Beauv. ex Roem. & Schult., Syst. veg. 2: 769 (1817); Hooker, Fl. Brit. India 7: 367 (1896); Fedtschenko & Fedtschenko, Consp. fl. Turkest. Kirgh., Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 38(1): 149 (1924); Bowden, Can. J. Bot. 37: 667 (1959). – Based on: *Triticum aegilops* P.Beauv., Ess. Agrostogr. 180 (1812), *nom. nud.* (see Chapter 12, Nomina nuda). See note 1.

Lectotype (*nov.*): the illustration of Tab. 50, fig. 1 in Buxbaum's (1728) *Plantarum minus cognitarum Centuria* 1. See note 1.

Homotypic synonyms:

Triticum tauschii (Coss.) Schmahlh., Fl. ssredn. jushn. Rossii [Fl. central and southern Russia] 2: 662 (1897); Fedtschenko & Flyorov, Fl. Eur. Russia 148 (1910); Bowden, Can. J. Gen. Cyt. 8: 133 (1966); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 66 (1987).

Sub nom. *Ae. squarrosa* auct. non Linnaeus (1753): Linnaeus, Sp. pl. (ed. 1) 2: 1051 (1753), (ed. 2) 2: 1489 (1763) *pro parte*; von Schreber, Beschr. Gräs. 2: 44, Tab. 27, fig. 2 (1772); Marschall von Bieberstein, Fl. taur.-caucas. 1: 434 (1808); Aiton, Hortus kew. 5: 433 (1813; excl. ref. to von Willdenow; the nature of the plants in the *Hortus* is 'of the Levant'); Kunth, Enum. pl. 1: 458 (1833, see note 2 at *Ae. ventricosa*, 10.22); Richter, Codex bot. linn. 999 (1835-39); Tausch, Flora 20: 108 (1837); Jaubert & Spach, Ill. pl. orient. 4: 12, Tab. 310 (1850), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 354 (1851b); Walpers, Ann. bot. syst. 3: 789 (1852); Grisebach in von Ledebour, Fl. ross. 4: 326 (1852); Boissier, Fl. orient. 5(2): 676 (1884); Post, Fl. Syria (ed. 1) 900 (1896), (ed. 2) 2: 787 (1933); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 451, 549 (1928); Eig, Feddes Repert., Beih. 55: 88 (1929a); Jansen & Wachter, Nederl. Kruidk. Arch. 130 (1931); Nevski in Komarov, Fl. URSS 2: 671 (1934, Russian) / 534 (1963, English); Kolakovski, Fl. Abkhazia 1: 183 (1938, err. with author Host); Grossheim, Fl. Kavkaza (ed. 2) 1: 351 (1939), Opredelitel rastenich Kavkaza [Key to Caucasus plants] 719 (1949); Karjagin, Fl. Azerbaijana 1: 335 (1950); Jansen, Fl. neerl. 1(2): 122 (1951); Parsa, Fl. Iran 5: 825 (1952); Ovczinnikov, Fl. Tadzhikistan SSR 1: 336 (1957); Kihara & Tanaka, Preslia 30: 241-251 (1958, see note 4); Ahmad & Stewart, Grasses West Pakistan (ed. 1) 2: 321 (1959); Chennaveeraiah, Acta Horti Gotoburg. 23: 166 (1960); Chase & Niles, Index Grass Species 1: 11 (1962; with ssp. *squarrosa* but erroneously with authors of the subspecies as '(L.) Kihara & Tanaka', see note 4); Mouterde, Nouv. Fl. Liban, Syrie 1: 152 (1966); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 481 (1969); Goloskokov, Ill. key to Kazakhstan pl. 1: 124 (1969).

Sub nom. *Triticum squarrosum* (L.) Rasp., Ann. Sci. Nat., Sér. 1(5): 435 (1825): Aitchison, Trans. Linn. Soc., Ser. 2(3): 127 (1888; author as 'Roth', see below), *nom. illeg.* (Art. 64.1), non *T. squarrosum* Roth, Neue Beytr. Bot. 128 (1802), q.e. *Eremopyrum bonaepartis* (Spreng.) Nevski ssp. *bonaepartis* (fide Melderis in Davis, Fl. Turkey 9: 228 (1985)), nec *T. squarrosum* Banks & Sol. ex Hook.f., London J. Bot. 3: 417 (1844), q.e. *Elymus scabrus* (R.Br.) Á.Löve, a later homonym. – Note: although Aitchison directly refers to the basionym *Ae. squarrosa* L. (in the sense of *Ae. tauschii*) the author of his combination is cited as 'Roth', thereby confusing the *Aegilops* with the *Eremopyrum* species.

Patropyrum tauschii (Coss.) Á.Löve, Feddes Repert. 95: 493 (1984, with ssp. *tauschii*).

Heterotypic synonyms:

Ae. squarrosa L. var. β *meyeri* Griseb. ex Ledeb., Fl. ross. 4: 326 (1852, '*Meyeri*'); von Regel, Descriptiones plantarum novarum 8, Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 7: 576 (1881, as '*Meyeri* Trev. in Ledb.'); Boissier, Fl. orient. 5(2): 677 (1884); Fedtschenko & Fedtschenko, Consp. fl. Turkest. Kirgh. 1, Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 38(1): 149 (1924); Eig, Feddes Repert., Beih. 55: 90 (1929a); Grossheim, Fl. Kavkaza (ed. 2) 1: 352 (1939); Karjagin, Fl. Azerbaijana 1: 336 (1950); Parsa, Fl. Iran 5: 825 (1952); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 481 (1969), **syn. nov.** – Type: (Azerbaijan) in campis aridis subsalsis prope Sallian, *C.A. von Meyer s.n.* (holo: LE, not seen). – Homotypic synonyms: *Ae. squarrosa* L. ssp. *meyeri* (Griseb. ex Ledeb.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 549 (1928, '*Meyeri*'); Chennaveeraiah, Acta Horti Gotoburg. 23: 166 (1960, as a *comb. nov.*, thus an isonym). *Ae. tauschii* Coss. var. *meyeri* (Griseb. ex Ledeb.) Tzvelev, Zlaki SSSR 157 (1976, Russian) / 225 (1984, English); Hammer, Feddes Repert. 91: 233 (1980b). See note 2.

Ae. squarrosa L. var. ('γ') *pubescens* Regel, Descriptiones plantarum novarum 8, Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 7: 577 (1881), **syn. nov.** – Type: (Uzbekistan / Tajikistan) valley of the river Sarawschan (= Zeravshan), Luz (= Ulus, Uluss) to Dzhan (= Djam), 20.III.1869, *O. Fedtschenko s.n.* (holo: LE; iso: G). See note 3.

Ae. squarrosa L. var. *albescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923); Hammer, Feddes Repert. 91: 233 (1980b, considers this the typical form of the species). – Type: (Uzbekistan) 'Turkestan', Samarkand, Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*.

Ae. squarrosa L. var. *brunnea* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923), **syn. nov.** – Syntypes: (Uzbekistan) 'Turkestan', Samarkand, Syr-Darja, *Popova s.n.* (LE/TASH/WIR?, not found); (Iran) Persia, Hamadan, *Vavilov s.n.* (WIR, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonym: *Ae. tauschii* Coss. forma *brunnea* (Pop.) Hammer, Feddes Repert. 91: 233 (1980b).

Ae. squarrosa L. var. *ferruginea* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923), **syn. nov.** – Type: (Uzbekistan) 'Turkestan', Samarkand, Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonym: *Ae. tauschii* Coss. forma *ferruginea* (Pop.) Hammer, Feddes Repert. 91: 233 (1980b).

Ae. squarrosa L. ssp. *salinum* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 549 (1928); Hammer, Feddes Repert. 91: 234 (1980b, in syn. of *Ae. tauschii* var. *meyeri*). – Type: (Azerbaijan) in campis aridis subsalsis prope Sallian, 30.IV.1830, *Hohenacker s.n.* (holo: WIR 2726). See also Chapter 12, Nomina nuda, at *Ae. caudata* auct. non L. – Homotypic synonym: *Patropyrum tauschii* (Coss.) Á.Löve ssp. *salinum* (Zhuk.) Á.Löve, Feddes Repert. 95: 493 (1984).

Ae. squarrosa L. var. *anathera* Eig, Feddes Repert., Beih. 55: 90 (1929a); Grossheim, Fl. Kavkaza (ed. 2) 1: 352 (1939); Karjagin, Fl. Azerbaijana 1: 336 (1950); Chase & Niles, Index Grass Species 1: 10 (1962; err. with authors of the var. as 'Kihara & Tanaka', see note 4), **syn. nov.** – Syntypes (four collections cited by Eig, 1929a; inspected ones listed): (Russia) Daghestan, 1898, *Alexeenko s.n.* (LE); (Turkey) Cataonian Taurus, 1865, *Haussknecht s.n.* (G-BOIS). – Homotypic synonym: *Ae. tauschii* Coss. var. *anathera* (Eig) Hammer, Feddes Repert. 91: 234 (1980b).

Ae. squarrosa L. var. *strangulata* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 328 (1928a); Grossheim, Fl. Kavkaza (ed. 2) 1: 352 (1939); Karjagin, Fl. Azerbaijana 1: 336 (1950), **syn. nov.** – Syntypes: (Iran) ('Côtes du golfe d'Astrabad, Perse') Gorgan (Asterabad), *s.coll., s.n.* (LE, P); (Azerbaijan) Apcheron peninsula, *s.coll., s.n.* (ex hb. Fischer) (LE). – Homotypic synonyms: *Ae. squarrosa* L. ssp. *strangulata* (Eig) Eig, Feddes Repert., Beih. 55: 90 (1929a); Chase & Niles, Index Grass Species 1: 11 (1962; err. with authors of the ssp. as 'Kihara & Tanaka', see note 4). *Ae. tauschii* Coss. ssp. *strangulata* (Eig) Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973), Zlaki SSSR 157 (1976, Russian) / 225 (1984, English); Hammer, Feddes Repert. 91: 234 (1980b). *Patropyrum tauschii* (Coss.) Á.Löve ssp. *strangulatum* (Eig) Á.Löve, Feddes Repert. 95: 493 (1984). *Aegilops strangulata* (Eig) Tzvelev, Bot. Zhurn. 78(10): 88 (1993; with incorrect bibliographic citation, but not invalid because of Art. 33.2).

Ae. tauschii Coss. convar. *paleidenticulata* Gandilyan, Biol. J. Armenia 26(2): 90 (1973), **syn. nov.** – Type: (Armenia) RSS Armenia, in angustiis fl. Rasdan (prope opp. Erevan), VII.1969, *Gandilyan s.n.* (holo: WIR – N 1554, not seen; iso: YAI). – Homotypic synonym: *Ae. tauschii* Coss. var. *paleidenticulata* (Gandilyan) Hammer, Feddes Repert. 91: 234 (1980b).

Diagnostic characters: tufted, usually many-tillered annuals, (15-)20-45 cm tall excluding spikes; spikes narrowly cylindrical, 4-8(-10) cm long excluding awns, with 6-12 spikelets, rudimentary spikelets absent, rarely 1 developed; glumes truncate with thickened apical rim and 1 adaxial mucro; apex of lemmas thickened, with an adaxial mucro which may develop into an awn of up to 4 cm long, apex of third floret with a shorter awn when 1st and 2nd florets are awned, apex of apical lemmas with awns up to 5.5 cm long, with or without apical teeth at the base; caryopsis adherent.

Description (Figs. 71, 74-75): tufted *annuals* (*Fig. 71-1*) with few to (usually) many tillers. *Culms* geniculate at base, then ascending, (15-)20-45 cm tall excluding spikes; foliage ± evenly distributed, sparse, more dense at base of culm. *Leaf*

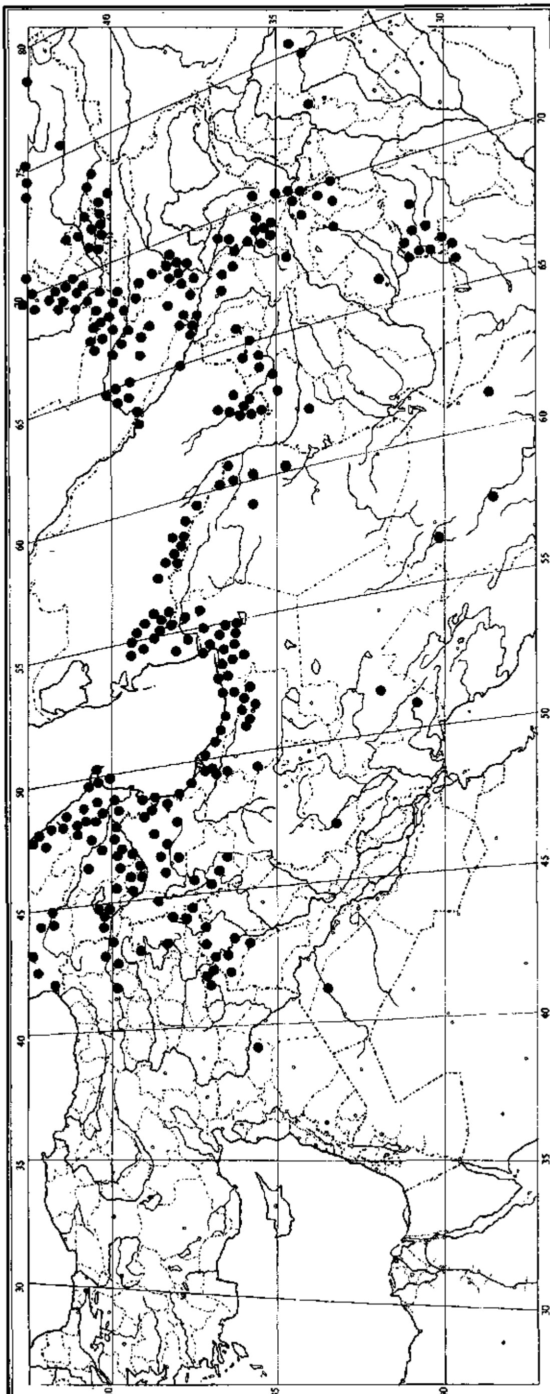


Fig. 72. Distribution of *Aegilops tauschii* in western and central Asia. Adventive locations in Europe not shown. For adventive distribution in the U.S.A., see Fig. 38.

blades linear-acuminate, 6-20 cm long, 0.3-0.6 cm wide; margins of sheaths hyaline, ciliate mainly in basal part of culms (*Fig. 71-4*). *Inflorescence* (*Fig. 71-2*) a narrowly cylindrical spike, slightly tapering towards the apex, 4-8(-10) cm long excluding awns, 0.3-0.5 cm wide; disarticulating barrel-type at maturity (*Fig. 74*) with the lowest spikelet or the rudimentary spikelets remaining attached to the culm; with 6-12 spikelets, rudimentary spikelets usually absent, sometimes 1 developed; rachis sinuate, spike sometimes constricted between the spikelets (former variety *strangulata*; *Fig. 71-13; Fig. 75*). *Spikelets* sessile, rectangular-cylindrical (7-8 mm long, around 4 mm wide) to quadrate-cylindrical (around 6 mm long and 4 mm wide); spikelet length roughly equalling that of the supportive rachis internode; with 3-5 florets, the upper 2 sterile. *Glumes* (*Fig. 71-5*) 2, coriaceous (but the lateral margin partly hyaline), broadly ovate-rectangular to ovate-quadrate, 5-7 mm long, green to purplish-green, the surface scabrid, the apex truncate with a thickened rim and a mucro on the adaxial side, the rim scabrous with a narrow, hyaline, membraneous margin beyond it; veins unequally wide, sunk into the surface, green, usually yellowish and lighter, sometimes purplish and darker than the glume surface; the apical glume (*Fig. 71-8*) ovate-rectangular, the apex obtuse, the central vein ending in a small mucro, sometimes indistinct. *Lemmas* (*Fig. 71-6, 9*) of fertile florets narrowly exserting the glumes, 6-8 mm long, narrowly ovate-elliptical, boat-shaped, coriaceous in the exserting upper part; the apical part folded, the apex with a thickened rim similar to the glumes and with a mucro on the adaxial side that may develop into a 4 cm long, setulose awn, awn, if developed, then accompanied by a small, second tooth on the abaxial side of the lemma apex; apex of third floret lemma extending into a shorter awn when first and second floret lemmas are also awned; lemmas of apical spikelet as of the lateral ones, apical awns up to 5.5 cm, one from a fertile floret, one from a sterile one and usually somewhat shorter, with or without small, lateral teeth at the base; inner surface of apical region velutinous. *Paleas* (*Fig. 71-7, 10-11a*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 71-11b*) 5-6 mm long, adherent to lemma and palea.

Variation (Figs. 71, 75): in length of the spike: 4-8(-10) cm; number of spikelets: 6-12, and in development of apical lemma awns: from a mucro only up to a 5.5 cm long awn. The most conspicuous variation is in the spike outline: from narow and slender (former variety *meyeri*; *Fig. 71-12*) to awnless (former variety *anathera*) to stout with sinuate rachis and square spikelets (former variety *strangulata*; *Fig. 71-13; Fig. 75*). See also note 5 below.

Distribution (Figs. 38, 72-73): a Western Asiatic element occurring almost exclusively east of the 40^0 degree longitude. Its centre of distribution is along the southern shores of the Caspian Sea and in Azerbaijan, and it is here that the introgression of *Ae. tauschii* into cultivated tetraploid (emmer) wheat that ultimately raised hexaploid bread wheat is considered to have taken place (Yamashita, 1980: 124).

This species is the only diploid *Aegilops* that has spread mainly eastwards from the centre of origin of the genus (see Chapters 4.3 and 6.1.1). To the east it is present from the Kopet Dag mountains of Turkmenistan in a broad 'band' northeast-

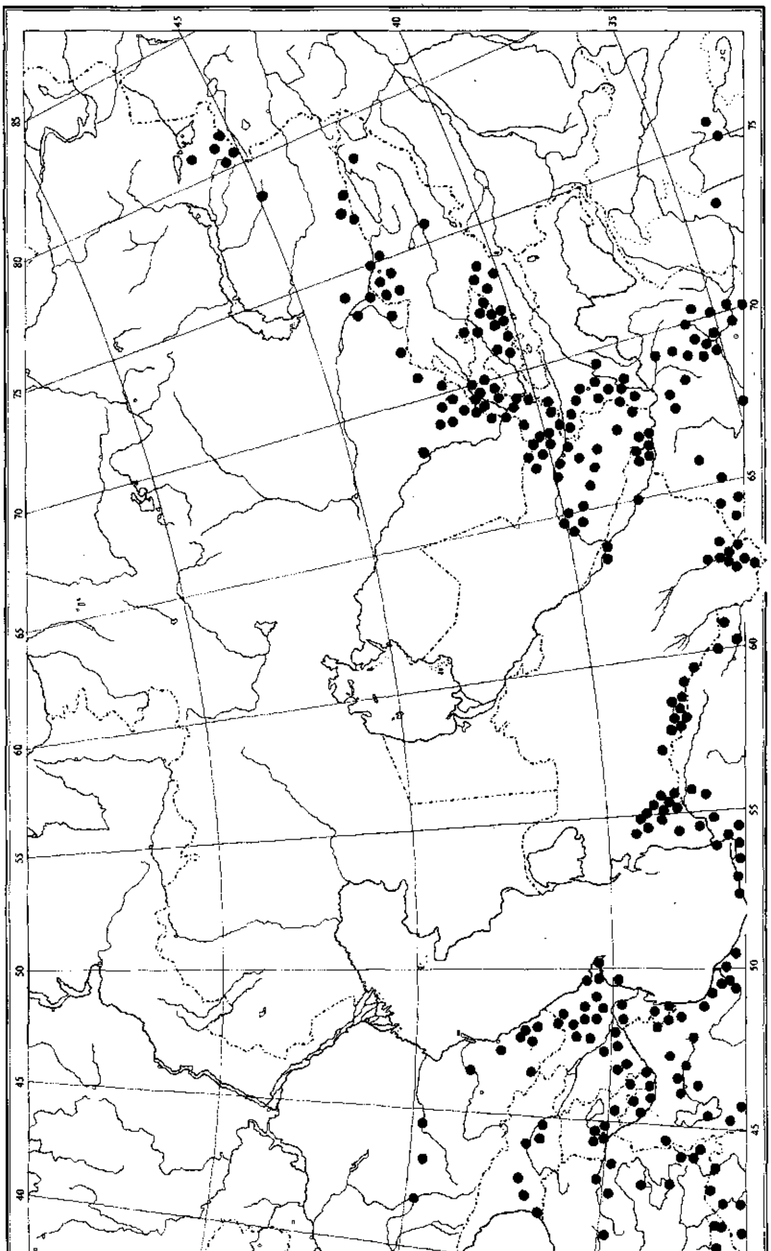


Fig. 73. Distribution of *Aegilops tauschii* in central Asia.

wards up to the Alma Ata region of Kazakhstan (Figs. 72-73). Its presence is bordered by the Tian Shan mountain ranges on one side and the steppes of Turkmenistan, Uzbekistan and Kazakhstan on the other, and limited probably because of the general drought and coolness of the continental, central Asian climate. Further, limited distribution is into the mountains of Afghanistan and Pakistan. Its spread westwards is only into the Caucasus, eastern Turkey, and the northern and eastern parts of the Fertile Crescent. The 'band', including the southern shores of the Caspian Sea, is designated the 'primary habitat' of the species by Zohary et al. (1969: 62), who suggest that outside localities in e.g., Afghanistan, Armenia, Iraq and Syria are 'secondary' in being always associated with weedy growth, often in (irrigated) wheat fields. Recent germplasm collections from south of Raqqa, central Syria (*Elings & al. ID-308*, ICARDA, SARD) represent the westernmost sites, known with certainty. Post's (1896; 1933) correct description and illustration of *Ae. tauschii* from El Masna'a in the Antilebanon mountains on the Lebanese-Syrian border would otherwise be the westernmost locality but was not found in his herbarium (BEI). [The specimen involved (*Peyron 1646*), however, was located in G and was identified as *Ae. searsii* by Feldman & Kislev (1977: 196), which is now confirmed; see specimens seen at 10.14).] Uncommon throughout most of its range but locally common.

Aegilops tauschii is the only species known with certainty from China. Yen et al. (1983: 55) report Chinese locations, found for the first time in 1955 from the provinces of Shaanxi (around Xi'an, approx. 109^0E, $34^030'$N), and Henan (around Xingyang, west of Zhengzhou, approx. 114^0E, 35^0N). These locations are in the vicinity of the Yili river (also know as the Yellow River or the Huang He). Further material seen originates also from Henan province (e.g., from Lushi (= Wuzhi?), Xingxiang and Chengguan; see examined germplasm collections). Most probably *Aegilops tauschii* was introduced to China with (emmer-) wheat (Yen et al., 1983: 58) that was carried by farmers along the so-called Silk Route. This Route leads from *Ae. tauschii*'s natural habitats in, amongst others, Iran and Central Asia eastwards through Xinjiang (Sinkiang) and the so-called Ganshu corridor to the main wheat-growing region of China in the Shaanxi and Henan provinces. See also at Ecology.

Adventive presence is reported from the U.S.A. (New York area; see Fig. 38) and in various countries in Europe, such as Croatia, France, Germany, Greece, Italy, and the Netherlands (in Rotterdam, Jansen, 1951: 122). A collection from Tibet (*von Hügel 1299* in W) is probably also adventive.

Ecology: a species of wide ecological amplitude, known from dry grasslands, fallow, steppes, and moderately disturbed sites such as wastelands, roadsides, and edges of and within cultivation of, e.g., barley, bread wheat, and fruit trees. But also found in woodlands and marginal forests, degraded conifer forests, *Cupressus* vegetations, and on stony slopes. Even to be found in irrigated fields and river valleys, as well as in the famous, very humid Hyrcanian forests along the southern belt of the Caspian Sea (Zohary et al., 1969: 63). [My personal observation in the small band of Hycanian forest, though, is that the species does occur, but is quite rare, especially when compared with the Iranian plateau and its bread wheat fields nearby.]

Its capacity for weedy growth (especially in wheat fields) accounts for its successful spread, sometimes (as near Pol-i-Khomri, Afghanistan) in populations 'stretching as far as the eye can reach' (Kihara & Tanaka, 1958: 244). Often growing together with other *Aegilops* species (e.g., *biuncialis*, *crassa*, *neglecta*, *triuncialis*). The parent rock is predominantly basalt, less frequently sandstone (this being based on a limited number of records, however); the soil texture is mainly loam, sandy loam, clayloam or sandy clay, less frequently sand, clay or gravel. *Aegilops tauschii* is able to grow on silty soils. It is also a drought-tolerant species, adapted to both cool and hot, but especially dry continental climates: rainfall data indicated a range of 150-350 mm annually, sometimes even below 100 mm. See also Chapter 6.1.1.

In China, Yen et al. (1983: 55-56) report *Ae. tauschii* to be of the weedy type, which is less prostrate and more adapted to growth in or very close to cultivation. The species must have spread over the years to more natural habitats as it is reported to be a '...native species which grows in natural vegetations of this region...' (l.c., 56). In semi-desert lowlands it grows together with e.g., *Bromus*, *Phleum*, and *Artemisia* species. In uplands (1420 m is mentioned) *Aegilops tauschii* becomes taller and forms dense steppe communities with *Bromus gedosianus* that may stretch over several hundred hectares and '...looks quite like an immense piece of cultivated wheat field...' (sic). Spike colour varies from brown-black to yellow, which is similar to the variation found in its natural distribution area, and, in addition, no chromosome differences are reported.

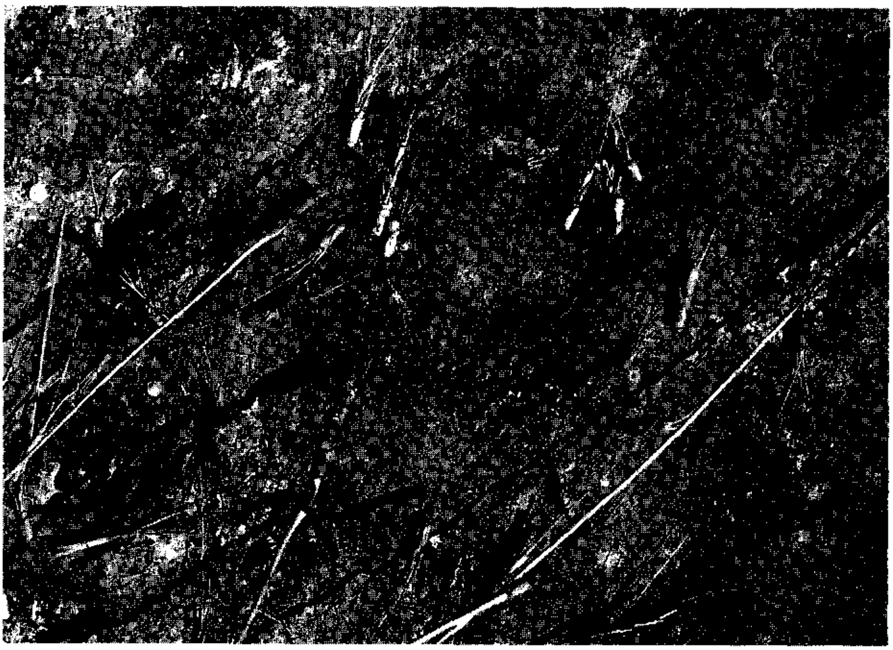


Fig. 74. Shattering *Aegilops tauschii* near Shevlan-Baba, SE Kara-Kala, Turkmenistan (germplasm collection *van Slageren & al. MSPGZK-91085*, ICARDA).

Altitude: from sea level up to 2700 m. In China at (600-)900-1650 m (Yushen & Ganyan, 1985: 8). Hodgkin et al. (1992: 158 and Fig. 3b) indicate even distribution over an altitudinal gradient of 200-1800 m. Germplasm data confirm this, and only a few sites are from the range of 1800-2700 m.

Flowering and fruiting time: April – July.

Genome: D with 2x = 2n = 14 (Chennaveeraiah, 1960: 90, sub *A. squarrosa*; Waines & Barnhart, 1992: Table 1, sub *Ae. tauschii*).

Vernacular names:

Armenian: Aytzagn tztzamagh [magh = sieve, but the whole word tztzamagh is unclear] (Gandilyan et al., 1975: 86).

Azeri: Vyzvyz bugdayiot (Karjagin, 1950: 338, sub *Ae. squarrosa* auct.).

English: Rough-spiked Hard-grass (Aiton, 1813: 433; sub *Ae. squarrosa* auct.).

German: Kurzgranniges Bartgras [= beardgrass with short awns] (von Schreber, 1772: 44, sub *Ae. squarrosa*); sparriger Walch [Sparre = uneven, irregular, abnormal; but also a name for the supporting, wooden beams of a roof] (von Willdenow, 1806: 944).

Kurdish: Agaida. Found on specimen in K from near Mosul, Iraq (*Al-Rathi 5569*). Compare with a'Kaira at *Ae. speltoides*.

Pushtu: Ghanamraugah [ghanam or ganam = wheat; raugah is a name of a variety of wheat (M. Tahir, pers. comm.)]. This language is spoken in parts of the North West Frontier Province and Balochistan in Pakistan, and in adjacent parts of Afghanistan. Name found on specimen from the Balochistan region in Pakistan, *Lace 3779* (E, K).

Russian: *Aegilops* rastoperenni [= spreading-out *Aegilops*] (Kovalevskaja, 1968: 183). Referring to the growth habit of this species.

Turkmenian: Gabarchan bogdayli-tchair [gabarchan = spreading] (Nikitin & Kerbabajev, 1962: 141).

Uses: a label in herb. US of a collection from Afghanistan (10 mi. NW Haibak, *Reading Univ. Bot. Exp. s.n.*) mentions: 'Wild and mixed with wheat. Used (as) chaff for cattle food.'.

Etymology: the final epithet refers to I.F. Tausch (1793-1848), Bohemian botanist and extraordinary professor of economic and technical botany (1816) at the University of Prague and associated with the garden of Joseph von Canal (the 'Hortus Canalius', where specimens on which both *Aegilops speltoides* and *ventricosa* are based may have been cultivated).

A geographical selection of ca 825 herbarium specimens examined:

ASIA: AFGHANISTAN: Kurram valley, Alikhel, *Aitchison 560* (A, BM, G-BOIS, K, LE, P); Badghis, *Aitchison 1146* (A, BM, FI, G, K, LE, PH), *461* (BM, FI, K); Bamian prov., Ajar valley, near Darband, *Anders 6273* (G); Kunduz prov., Surkhab valley, near Qezel Say, Baghlan – Kuduz road, *Anders 6133* (G); Paktia prov., Nadershak Kot, W Matum Khost, *Anders 8931* (G); Hindukush Mts., Kerstan, *Baschant s.n.* (B); Qataghan prov., N Doshi, *Furse 5972* (K, LE); near Maimana, *Hedge & Wendelbo W3818* (E, K); Qataghan, near Dushi, *Hedge & Wendelbo W3508* (E); Tisin, on road Kabul – Jalalabad, *Kerstan 591* (BM); Gardez, *Koelz 11973* (US); Khwaja, *Köie 3794* (BM, C); near Kandahar, Pirzada, *Köie 2072* (B, C, E, K); 55 km S Herat, *Köie 3824* (C); Habrak, *Meinertzhagen s.n.* (BM); Samangan prov., Aysabad, 20 km NW Aybak to Tash-Kurgan, *Podlech 20467* (G); NW Haibak, *Reading Univ. Bot. Exp. s.n.* (US); Mazar-i-Sharif, Shibaghlu, 34 km E Tash-Kurgan, *Rechinger 34288* (G); Qataghan, Pol-i-Khomri to Ribat, *Rechinger 33835* (B, E, G); 34 mi. N Sapista, 44 mi. S Baghlan, *Sem-*

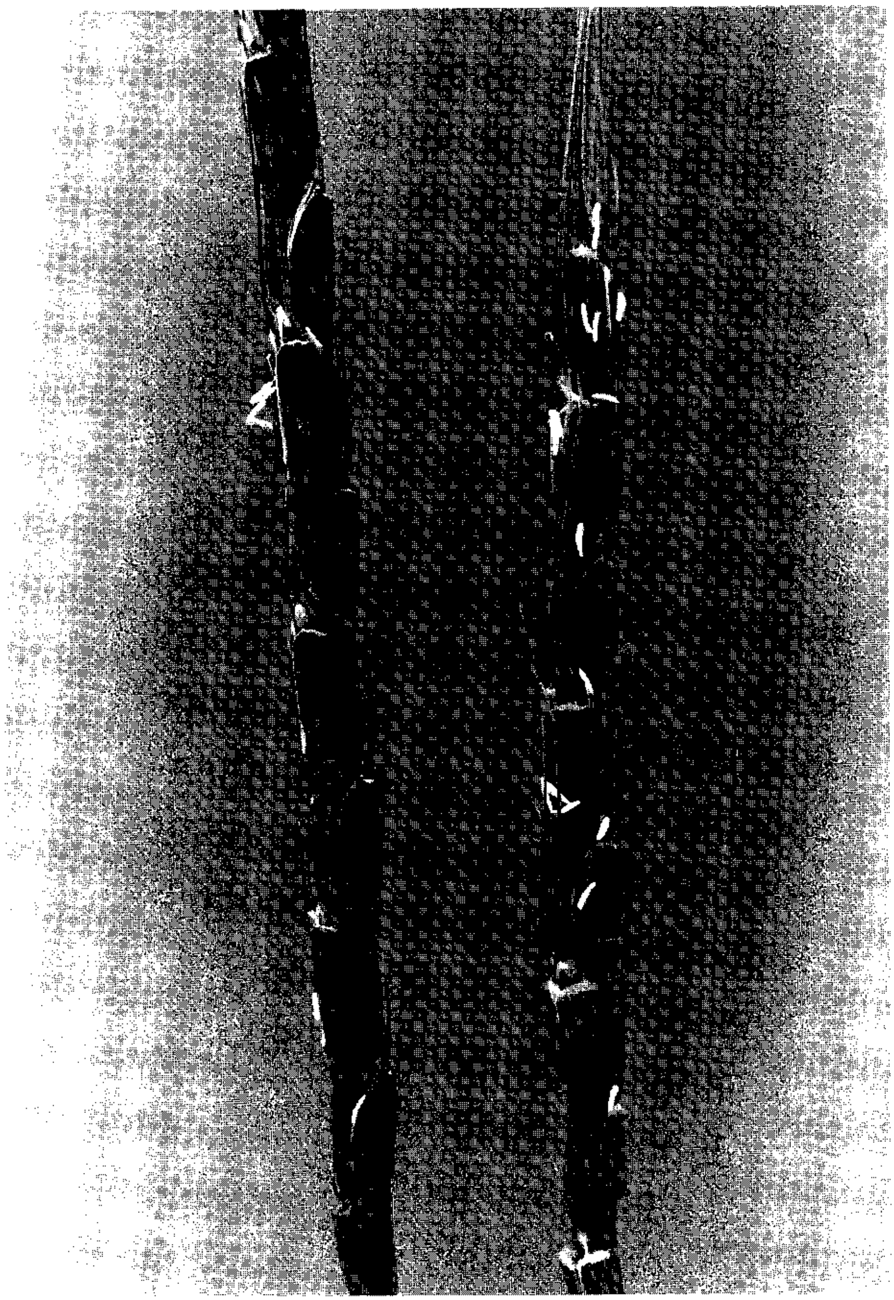


Fig. 75. Variation in spike morphology in *Aegilops tauschii*. Left: typical form (Quetta to Chaman, Pakistan, *Bot. Exp. Kyoto Univ. KUSE 2006*, KYOTO); right stout form, described as var. *strangulata* Eig (unknown origin, B*ot. Exp. Kyoto Univ. KUSE 2140*, KYOTO). Material cultivated at ICARDA from germplasm accessions, received form KYOTO.

ple 402 (US); Tengi-Gharu, near Kabul, *Scheibe Sch. 60* (BM); S Maimana, *Smith 545* (K); Kunduza to Mazar-i-Sharif, *Smith 475* (K); Kaskar, Pol-i-Khomri, *Volk 2662A* (US); Sarobi, *Volk 2574* (US).

INDIA: near Srinagar, *Duthie 10845* (K, US); Sambal Nalla, Srinagar, *Gammie s.n.* (K).

IRAN: Mahmudieh, N Tehran, *Aellen 1883* (K); 60 km S Chalus, *Andersen & Petersen 199* (C, E, K); Mazanderan, S Amol, *Archibald 2268* (E, US); Damghan-Semnan prov., C Elburs Mts., Kuh-i-Nizwa, N Djaschm, *Behbudi & Aellen 1969* (K); Kerman, Dhihupar, *Bornmüller 4876* (B); Sefid Rud valley near Rudbar, *Bornmüller 8462* (B, BM, G, K, P); Rudbar to Rustamabad, *Bornmüller 8463* (B); Mazanderan, near Hasan-Kif, Kalardasht, *Braune & Kürschner VO2593* (TUB); Tehran, Kasr-Kadjar, *Bruns 592* (B, US); Tehran, near Irissufabad, *Bruhns 893* (B); s.loc.('borealis'), *Buhse s.n.* (G-BOIS); Semnan prov., Touran, S Shahrud, Shesh valley, *Freitag 14935* (B); N Sari on shore Caspian Sea, *Furse 7131* (K, LE); Karaj, *Gauba 37, 38* (B); Mazanderan prov., Pol-e Zoghal, *Gauba G-6* (US); N Gombad, E of Aï Temar, S of Hottan, Toroghli, *Hewer H 3784* (K, P); N Gombad, Toroghli, E Ajtemar, *Hewer H3734* (E); Khorasan, Shabroud, *Iranshahr 10282E* (K); 108 km from Chalus, *Jacquemart 98/18* (BR); Mazanderan, Shahkuh, *Koelz 16446* (US); 124 km from Chucan, *Kuckuck 331* (K); Azerbaijan, Dasht-e-Moghan, 46 km E Parsabad to Bilehsavar, *Lamond 3136* (E, G); Guilan, Lahijan, *Lindsay 943* (BM, K); Azerbaijan, Ahar – Mesqhinshahr road, *Merton 3457* (K, LE, W); Khorasan, near Chakhudar, W Sarakhs, *Merton 3881* (K); Gorgan (Asterabad) prov., E Gumbed, Kara-Balkan, *Michelson 642* (LE); Gjurgen river, near Ak-Tegish, *Michelson 343* (LE); Gorgan (Asterabad) prov., near Kara-Su river, *Michelson 204* (LE); W Behbahan, *Pabot 628* (E, G); Mazanderan, E Sari, *Predjechenski 161* (LE); Elburs Mts., near Keredj, *Rechinger 537b* (BM); Khorasan prov., Turbat-e Haidari, *Rechinger & al. 4342* (US); Gorgan prov., Gombad-e-Ghabus, *Sharif 438* (US); Kalardasht, *Sheard 33* (K, LE, US); Azerbaijan, lake Urumiyeh, island Kojun-dagh, *Shelkovnikov & Shipczinski 16* (LE); Torgan to Tombad, *Sohariq 1904* (K); prov. Baluchistan, Gúsheh, at foot of Kúh-e Taftán Mt., *Soják 2569* (PR); prov. Kermán, Jirzoft to Gáv Koshi, *Soják 4269* (PR); Gorgan (Asterabad), shore Caspian sea, Ashref, *Tscherjnakovskaja 40* (LE); Liaret, *von Bunge s.n.* (G-BOIS, P); Mazanderan, Haraz valley, near Mamgol, *Wendelbo 569* (K); Elburz Mts., 28 km S Chalus, *Zohary s.n.* (UCR); Moghan, N Saraband, *Zohary s.n.* (UCR); Ramsar, *Zohary s.n.* (UCR); Sari-Gorgan, Neka to Behshahr, *Zohary s.n.* (UCR); Gorgan (Asterabad), *s.coll., s.n.* (LE, P, type of *Aegilops squarrosa* var. *strangulata*).

IRAQ: Ga'ara, *Alizzi & Husain 34073* (US); near Mosul, *Al-Rathi 5569* (K); Almassad, near Srob Rutha, *Al-Rawi & al. 32862* (K); N Rutbah, *Al-Rawi 31170* (K); Jebl Golat, Ain Tellawi to Balad Sinjar, *Field & Lazar 423* (F, G, US); foot of Jebl Sinjar, near Kursi, *Gillett 10866* (K); W wadi Thirthar, *Gillett & Al-Rawi 7131A* (K); E Balad Sinjar, *Gillett 11154* (US); N foot Jebl Sinjar, near Kursi, *Gillett 10866* (US); desert of Khabur river, *Haussknecht s.n.* (W).

KAZAKHSTAN: Semireychensk, Verni reg., Kurtu river, *Abolin 1635* (TASH); S Kazakh., Buzai Mt., *Asherov 3* (LE); Alma-Ata, sta. Sofieskaya, *Bogolubov 358* (LE); Tchusk reg., Sumkar Mt., *Drobow & Gomolitski 640* (LE, TASH); Tungarski (Dzhungarski) Ala-Tau, Czatyrbai Mt., Topolevka, *Goloskokov 4307a* (A, BM, C, E, ERE, G, K, LD, LE, MO, NY); Ala-Tau Mts., river Lebsk, near Antonevka, *Goloskokov 1* (LE); Kirgisky Mts., Lugovoy to Dzhambul, *Goloskokov s.n.* (LE); Muyunkum desert, Kirgiski-Alatau Mts., sta. Akur-Tsebe, *Igolkin 17* (LE); Chimkent reg., *Jarmolenko 162* (LE); Chimkent reg., Uzun-Bulak, *Knorring 81* (LE); Dzhambul reg., *Krause s.n.* (LE); Chimkent, Beklar-Bek, *Lipski 908* (LE); Sasyk-Sai, *Minkwitz 220* (LE); Chimkent, Tamerlan gorge, *Minkwitz 432* (LE); Chimkent, Chubarovka, *Minkwitz 375* (LE); Alatau Mts., Morikuduh to Beltau, Kuzukum desert, *Nikitin & Michajlova 102* (LE); Karatau, Vannovskoje, *Pavlov 58* (TASH); Alma-Ata, *Pavlov 45* (LE); near Alma-Ata, sta. Lubovny, *Schichkin s.n.* (LE); Semiryechensk, Vyernyi, *Sokalskij 299* (BM); Verni, Kebin river, near Samsonovskaya, *Sovietkina 255* (TASH); river Tchu, lake Kara-Kul, near sta. Novotroitsky, *Sovietkina & Tchausova 977* (LE); near Verni, Alamatinski, *Titov 262* (TASH); Tungarski Mts., *von Regel 77* (LE); Kulatchek Karatau, *von Regel 257* (LE).

KYRGYZSTAN: Semireychensk, Verni, Ala-Tau, *Abolin 56, 1485, 1944, 7073* (TASH); Bishkek, Tchu valley, *Dingilstatt 128* (LE); Kuldzja-Basi Mts., Anarchai, *Goloskokov s.n.* (LE); Kirgisky Alatau Mts., near Chumbulak canyon, *Igolkin 311* (LE); S Taskumar, *Kamelin & al. 878* (LE); Osh reg., Ak-Dusar to Katchbar-Ata, *Knorring 305* (LE); Ala-Tau Mts., near Aoumi-Bulak, *Massagetov & Massalski 19-51* (LE); Bishkek, Belovitski to Sukuluk, *Michelson 583* (LE); Bishkek, Tchuskaya valley, *Nikitin & Vychotshev s.n.* (LE); Przhwalsk, Kabu-Sai, Belevode, *Roshevitz 30* (LE); Bishkek, Semireychensk reg., Alamedin river, *Savinkova 124* (TASH); Bishkek, Alamedin plain, Bogary reg., *Savinkova & Uchnarenko 1* (TASH); Taldy-Kurgan, Dchetysu, *Schipczinsky 429* (LE); Bishkek, Alexander Mts., rivers Noot-Bulak and Buran, *Schischkin s.n.* (LE); Bishkek, Dzhul-Aryk, *Schischkin & Genina 513* (LE); Semireychensk reg., Bishkek, *Sinserlink 472* (TASH); Bishkek, river Kebin, near Samsonovkaya, *Sovietkina 955* (LE); Ala-Tau Mts., Chekule, *Sovietkina 40* (TASH); Osh reg., near Guluza, *Tranzschel s.n.* (A, LE); Dzahalabad region, *Vipper 108* (A); Bishkek, Baybarik canyon, *Zitov 34* (LE).

PAKISTAN: Abbottabad, *Abedin 2919* (K); Baluchistan: Ziarat, *Crookshank 256* (K); Quetta, *Jafri & Akhbar 1708* (C); Urak valley, *Lace 3779* (E, K); Quetta, Sariab road, *Lamond 941* (E, K); Shebo, *Wingate s.n.* (K). Kashmir: Manasbal, *Ludlow & Sherif 8121* (BM, E).

SYRIA: Tell Khodor, Wadi Er Radd, Jezire, *Pabot s.n.(359, 367, 368)* (G, Min.Agr.Syr.); Abu Hareira, Euphrates, *Mouterde 5054* (G); 40 km W Tell Kotchek, *Nemarian 10782* (K, US).

TAJIKISTAN: Pamir-Alai, Laoersk valley, E Pailan-Abad (Telanabad), *Arifkhanova 128* (LE, TASH); Pamir-Alai, Babatak Mts., *Bukasov 180* (TASH); Pamir-Alai, Rengan-Tau Mt., Burma, *Demorina 83* (TASH); Gissar reg., Mogian, *Drobow 226* (LE); Alai Mts., Lengar to Chigirchik, *Fedtschenko s.n.* (LE); canyon Obiodnikuk, *Fedtschenko 374* (LE); Pamir-Alai, Guzar vill., Kara-Tash, *Gnezdillo 73* (TASH); Pamir-Alai, Guzar, near Kizyl-Chi, *Gnezdillo 25* (TASH); Baba-Tak Mts., Gissar plain, *Gomolitski & Fedorov 44, 195* (TASH); valley Tand-Zu, near Chakha-Amma, *Gontscharow & al. 72* (LE); Pamir-Alai, Kashka-Dary(a), SE Yakabaga, *Grannitov 895* (TASH); Varzob river, near Puguz, *Kamelin 164* (LE); Zeravchan valley, near Pendzhikent, *Komarov s.n.* (LE); near Dugilar, Si-Doryenko, *Konnev & al. 393* (LE); Karategin reg., Garni to Namui, river Surchob, *Korshinsky 5793* (LE); Gissar reg., Karatak-Darya, *Kudrjachev 249* (TASH); Zjelekul, *Linczevski & Maslennikova 30* (LE); Kurgan-Tepe, along river Wachsch, *Mussa s.n.* (LE); foot Gardani-Uztze, near Churpun-Bash, *Nepli 907* (LE); Koiky-Tau Mts., *Nikitin 184* (LE); Gissar Mts., near Rochati, *Ovczinnikov & Zaprjagejeva 206* (LE); Zeravchan Mts., near Gissar vill., *Ovczinnikov & Slobodov 240* (LE); Pamir-Alai, SE Guzar, *Pasich s.n.* (TASH); Ayni to Shakhristan, N of Turkestan Mts., *van Slageren & al. MSPGAP-91181H* (ICARDA); Gissar Mts., near Gasi-Mailik, *von Regel s.n.* (LE); Gissar, Chorchbulak, between Kafirnigan and Wachsch rivers, *von Regel s.n.* (LE); Zeravchan, Gissar to Kchtut, *von Regel s.n.* (LE); Baldchuan, *von Regel s.n.* (LE); Gissar, Kizyl-Tush-Chuk, near Tupolan, *Zaprjagaev 156* (LE); Alai Mts., near Chaid vill., *Zhukavina & al. 85* (LE).

TURKEY: 'Mesopotamia', Surug, *Haussknecht s.n.* (JE, W); Cataonian Taurus, *Haussknecht s.n.* (G-BOIS, type of *Aegilops squarrosa* var. *anathera*); Erzurum, *Zorab 460* (K).

TURKMENISTAN: Deder, vill. Nochur, *Amirova s.n.* (ASH); Karluk reg., Kugitangh Mts., Chodzja-Karaol pass, *Androssov s.n.* (ASH); Amu-Darya, Farab, *Androssov 4307b* (A, BM, C, E, ERE, G, K, LE, MO, NY); Kjuren Dag, Kuylar spring, *Ataeva s.n.* (ASH); Kizyl-Arvat, *Becker 8* (LE); Tachta-Bazar, *Belolov s.n.* (ASH); Karabil, Tek-Tek spring, *Berdyev s.n.* (ASH); Karabil, Kara-Baba, *Berdyev s.n.* (ASH); Karabil, Chodzja-Gurdek to Tek-Tek, *Berdyev s.n.* (ASH); Karabil, Tauzen-Bek, *Berdyev s.n.* (ASH); Karabil, Darwaza-Kem, foot Kuri-Chorch, *Berdyev s.n.* (ASH); Bazar-Tepe, near Kugitangh Mts., *Bobrov 1364a* (LE); Balkhane Mts., *Bobrov & Jarmolenko 22* (LE); Badghis, near spring Kerlek, *Botschantzev 415* (LE); Gaudin Mt., near Ashkhabad, *Borissova 39* (LE); C Kopet Dag, Kurt-Su, Gara-Asema canyon, *Chepanov & Seifulin s.n.* (ASH); Tachta-Bazar, Kuchka Mt., Kara-Chop, *Chepanov & Ataeva s.n.* (ASH); Kugitangh Mts., NE Chodzja-Pil, *Chepanov & Ataeva s.n.* (ASH); Geok-Tepe, Babarap vill., *Chepanov s.n.* (ASH); Kazandchik, Kjuren-Dag, *Chepanov s.n.* (ASH); Bacharden reg., near Arvaza, Kone-Kesir, *Chepanov s.n.* (ASH); near Tachta-Bazar, *Chepanov s.n.* (ASH); Turkestan Mts., Zanin to Zanzar rivers, Djal-Aliz, *Emme 29* (LE); Kizyl-Arvat to sta. Kameshly, *Fedtschenko 28* (LE); Kopet Dag, canyon Ay-Dere-Su, *Fedtschenko & al. 258* (LE); Kara-Kala to Zhalyl, *Fedtschenko 36, 123* (LE); Badghis, Kushka reg., *Garbunova s.n.* (ASH); Nazar-Yekerem, Balchoi-Balchani, *Iankova s.n.* (ASH); SE foot of Baba-Durmaz *Ichenko s.n.* (ASH); Kazanchik reg., N Bebikent, Adji-Kuju well, *Ichenko s.n.* (ASH); Auli-Ata, river Talas, Utch-Kurgan, *Knorring 82* (LE); Auli-Ata, near Tas-Tjube, *Knorring 166* (LE); Navruz-Abad, *Korshinsky 5809* (LE); Tachta-Bazar, *Korovin s.n.* (TASH); Kachkin reg., E Deicha, *Kurachov s.n.* (ASH); C Kopet Dag, W Sarem-Sakli, *Kurbanturdeev s.n.* (ASH); Badghis, Kushka, Margonovka, *Linczevski 575* (LE, TASH), *582, 626* (TASH); Auli-Ata, Akur-Tepe to Podgorny, *Lipsky 921, 922* (LE); near Ashkhabad, *Litwinov 913, 2186, 2296* (LE); near Ashkhabad, *Litwinov 217* (B, G, JE, L, P); Auli-Ata, Merke-Chaldvar, *Michelson 965* (LE); Chardzhou, Amu-Darya, *Michelson 149* (LE); near Kara-Kala, *Michelson 2798* (LE); Iol-Dere, *Michelson 3066* (LE); Ashkhabad, Bagir, *Michelson 1111* (GAT, LE); Kara-Aghaz, *Micherjakov s.n.* (LE); Abruchev steppe, Ichkala, *Molosov s.n.* (ASH); Kizyl-Atrek reg., Mt. Gudri-Olom, *Nardina s.n.* (ASH); Khatab pass, *Nichajeva & Silajev s.n.* (ASH); Ashkhabad area, Komarovskogo, *Nikitin & Zhilenko s.n.*

(GAT, LD, MO); Kara-Kala, Iol-Dere, *Orazmuchommedov & al. s.n.* (ASH); Kerki, *Paulsen 263* (C); W Kopet Dag, Danata, *Pjataeva 129, 208* (TASH); Kopet-Dagh Mts., near Kara-Kala, Sumbar river valley, *Proskuryakova & Belianina s.n.* (BC, ERE, LD, MO, RNG, TASH); Kopet Dag, Chodzja-Kala, *Rodin & Raikova 1862* (LE); Karadzha-Batyr, *Rodin & al. 375* (LE); Gjaz-Gjadik Mt., near Rachnatur, *Seifulin & al. s.n.* (ASH); Ashkhabad, Mekrowa, *Sintenis 314* (BM, E, G, K, LD, LE, MO, P, PRC, US, Z), *2233* (LD); Kara-Kala, Iol-Dere, *Sintenis 2244* (LD); Kara-Kala, river Parbai, *Tschernjakovskaja 679* (LE); Bezmein, Ashkhabad to Kizyl-Arvat, *van Slageren & al. MSPGZK-91078H* (ICARDA); Kara-Kala reg., Ti-Amil, near Yarti-Kala, in valley of Chander, *van Slageren & al. MSPGZK-91095H* (ICARDA); Kara-Kala reg., Seiwan farm, near Sakar, *van Slageren & al. MSPGZK-91123H, 91126H* (ICARDA).

UZBEKISTAN: Syr-Darya, Keles river, Kaplanbek, Krasnochinsk, *Abolin 7608* (TASH); Fergana, Ak-Tjube, *Achrapjelski s.n.* (TASH); Tashkent, Ak-Kawan, *Alexandrova s.n.* (TASH); Bukhara reg., near Faraba, *Androssova 228* (TASH); near new Bukhara, *Balabajev s.n.* (TASH); Chadzjent reg, near Samarkand, *Bodugoski 73, 142* (LE); Namangan, *Demorina 84* (TASH); Margelan, Utch-Tjube vill., *Dessiatov 452* (LE); Galodna steppe, Zale-Uz, *Dimo & al. 556* (LE); As-Sai, *Dingilstatt & Sovietkina 201* (TASH); Skobelev, near Chiman sovchoz, *Dolenko 354* (LE); Bukhara, near Kulap, *Dzivnovgorskaja 201* (LE); Samarkand, Kitab to Kainas, *Fedtschenko 508* (LE); Surchandarinsk reg., Surchan river, *Gomolitski 36* (TASH); Angren plain, Oktoberskaja, *Gomolitski 33c, 143* (TASH); Kurama Mt., Angren basin, Pskent, *Grannitov & Mironov 19* (TASH); Maili-Chetsk reg., W Sari-Kurgi Mt., *Joffe 448* (TASH); Fergana, Utch-Kurgan, *Joffe 83* (TASH); Namangan, Kizyl-Rawat, *Joffe 217* (TASH); Fergana reg., Uzbek-Gawa, Ak-Tek canyon, *Kazachkov s.n.* (TASH); Andizhan, Shura, near Dchilandi, *Knorring & Minkwitz 585a* (LE); Koi-Tash, *Kobrachova 481* (TASH); Dzhizak reg., *Kochornikov 80* (TASH); Bukhara, Kabat, Baba-Dag Mt., *Korshinsky 566* (LE); Bukhara, Guzar vill., *Korshinsky 106* (LE); Kashka-Darya valley, Tosh-Ghaz, near Kara-Kuzi, *Kudrjachev 278* (LE); Bukhara, Baba-Tau Mt., *Kultiasow 380* (TASH); Bek-Budi, road Maimazak – Kasan, *Kultiasow & Grannitov 83* (TASH); Bukhara reg., Bischkent plain, *Kultiasow s.n.* (TASH); Baysun reg., Galea-Kutan, *Lepeshkin s.n.* (TASH); Dalversinsk steppe, *Lepeshkin s.n.* (TASH); Tashkent reg., Sary-Agatch, *Lipsky 79* (LE); Djelani-Tau Mts., Balchuan to Kangurt, *Michelson 1677* (LE); Tashkent, Dzhilzha sta., *Minkwitz 361* (LE); Keles river, near Kara-Kamish, *Nazarenko s.n.* (TASH); Sherabad valley, near Duai, *Neustrüv 292* (LE); Syr-Darya, Kurdish-Kura road, at Uchuk-Chu, *Pasich 73* (TASH); Galodna steppe, *Pasich 35* (TASH); Tashkent, *Percival 864* (BM, K); Perovski reg., Tar-Tugai, *Piltz 555* (LE); Kugitangh Mt., Kizyl-Alma, *Popov 462* (LE); Mogul-Tau Mts., Dalversinsk steppe, *Popov 977* (LE); Bukhara, Guzar to Gumbulak, *Popov 1457b* (LE); Kaplanbek, near Tashkent, *Radkewicz s.n.* (G, PR); Tashkent reg., near Tchenar, *Raikova 36* (TASH); Kurgan-Tepe, *Roshevitz 339* (G, LE, LY); Bukhara, Baba-Tak Mts., *Roshevitz 686* (LE, W); Fergana, near Skobelev, Margelan, *Sarvaldi Apsalam 1272* (LE); Syr-Daya, Daobatak vill., *Simenov 290* (TASH); Syr-Darya, Gimcherski vill., *Simenov 292* (TASH); Alai Mts., Kara-Kazyk, Shachimardan, *Sovietkina 3* (TASH); Galodna steppe, Birgowat, *Spiridonov s.n.* (LE): Kizyl-Kum desert, Baybak-Kok-Dash, *Spiridonov s.n.* (LE); Dzhizak, Nura-Tau Mts., *Spiridonov s.n.* (LE); Tashkent, *Townsend 69/196* (K, US); E Fergana, Kizyl-Dzhar reg., *Uspenskaja 394* (TASH); Tian Shan, Chatalski Mts., E Gazalkent, *Vašák s.n.* (G); Galodna steppe, near Murzarabad, *von Regel s.n.* (LE); Salar and Boz-Su rivers, *Vvedensky 937, 940* (TASH); Syr-Darya, Kaufmansk sta., Chirchik vill., *Vvedensky 1162* (TASH); Chulbaier, Sina vill., *Vvedensky 222* (TASH); W of Tian Shan reg., Boz-su, near Tashkent, *Vvedensky 542* (B, BC, C, E, G, K, LE, MO, NY, P); Samarkand, Nuta-Tau Mt., Gama-Sai, *Zaprachetova & Nikitin s.n.* (LE).

UZBEKISTAN/TAJIKISTAN: Zeravchan valley, Luz (Ulus) to Dzhan (Djam), *O. Fedtschenko s.n.* (G, LE, type of *Aegilops squarrosa* γ *pubescens*).

EUROPE: ARMENIA: Erebuni reserve, *Arutyunyan s.n.* (ERE, YAI); Megri reg., Aravnakazor, *Arutyunyan s.n.* (YAI); Goriz to Sisian, *Arutyunyan s.n.* (ERE); Abovyan reg., Dzhervesh, *Arutyunyan s.n.* (ERE); Abovyan reg., Arindzj, *Arutyunyan s.n.* (ERE, YAI); Abovyan reg., Dzhervesh to Shorpulagh, *Arutyunyan s.n.* (ERE, YAI); Yekhegnadzor reg., Rind, *Arutyunyan s.n.* (ERE, YAI); Kaphan reg., Kadzharan, *Arutyunyan s.n.* (ERE); Ararat reg., Shagab, *Arutyunyan s.n.* (ERE, YAI); river Megraget, near Vagravar and Gudemiz, *Aslanian s.n.* (LE); Vokhchabert to Shorbulak, *Avakjan s.n.* (ERE); Vaik reg., Alajaz canyon, *Avetissjan & al. s.n.* (ERE); plateau of Cicernakaberd, *Buhl 11326* (GAT); Vedi reg., Araradjan to Kjarki, *Gabrieljan s.n.* (ERE); Erevan, Rasdan river canyon, *Gabrieljan s.n.* (ERE); Artachatz reg., Mt. Yeranoz, *Gabrieljan s.n.* (ERE); Rasdan river, near Erevan, *Gandilyan s.n.* (YAI, type of *Aegilops tauschii* convar. *paleidenticulata*); Megri, Kartchevan to Vargavar, *Grossheim s.n.* (ERE); Goriz reg., Tateev to Anapat, *Manakian s.n.* (ERE); near Chanachlar, *Kolenati s.n.* (LE); Erevan to Agbash, *Mulkidjanian s.n.* (ERE); Erevan, *Oganeash s.n.* (W); Megri to Legvas, *Shelkownikow & Kara-Murza s.n.* (ERE); Daralagjaz, Kotor, *Takhtajan s.n.* (ERE); Abovyan, Shoragpur, *Takhtajan s.n.* (ERE); Artachatz reg., Bozburun, *Takhtajan s.n.* (ERE); Paravakar, *Takhtajan s.n.* (ERE); Vokhtch-abert, *Tranzschel s.n.* (LE); Erevan, Dzhabatlu, *Tamamschjan & Araratian s.n.* (ERE); Etchmiazin, Parakar, *Vartapetyan s.n.* (ERE); Megri, near Vardanaouzor, *Yegorova & al. 1500* (LE). NAGORNO-KARABACH: Karchor-Tchai, *Kalinin 132* (LE); Stepanakert, *Lovelius s.n.* (LE); Karabach, *Vvedensky 17* (LE); Uzun-Kluderi, *Woronow 124* (LE).

AZERBAIJAN: Sumgait, Chi-Dag, Sumgait-Chai river, *Alexeenko 1253* (LE); Baku, Geokczai, Mäsüsli, *Alexeenko 1615* (LE); Baku, Geokczai river, Karamarjan, *Alexeenko 1600* (LE); Kuba, near Kusary, *Alexeenko 268* (LE); Sabirabad, Mil steppe, near Agamalar and Imischli, *Beideman s.n.* (LE); Nadzhaf vill., Kuli Begli to Agamalar, *Beideman s.n.* (LE); Astarinski reg., NW Pencer, *Bobrov & Tzvelev 98* (LE); island Swatoï in Caspian sea, *Bruhns s.n.* (BM, P); Kuba, Kusary forest, *Gregoriev 3* (LE); village Gej-Tschaj, *Grossheim s.n.* (B, GAT); Zangelan reg., near Pirchevan and Akera, *Grossheim & al. s.n.* (LE); near Sallian, *Hohenacker s.n.* (WIR 2726, type of *Aegilops squarrosa* ssp. *salinum*); near Elisabethpol (= Kirovabad), *Hohenacker s.n.* (BM, E, G, G-BOIS, JE, K, L, NY, OXF, P, P-CO, PRC, TUB, US, W); ibid., *Kolenati 1449, s.n.* (LE); Baku prov., Shemakha distr., Nawaghi, *Holmberg 605* (K, LD, W), *606* (LD); Baku, *Holmberg 357* (LD, W), *358, 418* (LD); Baku, Langatchal, *Holmberg 538* (LD); Baku, Sikh, *Holmberg 458, 459* (LD); Baku, Balakhany, *Holmberg 317* (LD); Kjurdamir reg., *Isajev s.n.* (LE); near Achsu, *Jakubziner s.n.* (WIR 39098); Shirvan, Kara-Tchala, *Jaroschenko s.n.* (LE); Arablinski vill., *Karbalajev s.n.* (LE); Kuba, Kusar reg., *Karjagin s.n.* (LE); Baku reg., Karabek, *Levandovski s.n.* (LE); Lerik, Wolchi-Worota, *Menitzky & Popova 8* (LE); Kusar reg., Urva, *Mussajev s.n.* (LE); Bakish, Dzhevat, Mil steppe, Bsikchapli, *Popov 126* (LE); Baku, Saljany, Mil steppe, Kardalach to Kjabirly, *Prilipko s.n.* (G, LD); Baku, Shemakha, Sebet-Djuzi valley, *Sachokia s.n.* (LE); Shemakha, Shumbar to Nachir Dag, *Sachokia s.n.* (LE); near Lenkoran, *Shipzhinsky 117* (NY); Baku, Dzhevat, Mugan steppe, *Sosnowsky 12* (LE, NY); near Lenkoran, *von Meyer s.n.* (LE); Shakhagatch, *von Radde 346* (LE); Tchai-Tumas, *Vvedensky 15* (LE); near Maritchu, Agamu, Sirogo and Bankogo, *Vvedensky 19b* (LE); Bakish, Dzhevod, Mil steppe, *Woronow 125* (LE); Elisabethpolis (= Kirovabad), Shushin, Mil steppe, Akdapabedva, *Woronow 127* (LE); Achsu, *Zacharieva s.n.* (IIPGR); Ismaeli, *Zacharieva s.n.* (IIPGR); Apcheron peninsula, *s.coll., s.n.* (ex hb. Fischer) (LE, type of *Aegilops squarrosa* var. *strangulata*). NAKHICHEVAN: Ordubad, Paraga, *Arutyunyan s.n.* (ERE); Norachen, Kabach-Yal Mt., river Arpa-Tchai, *Grossheim & al. s.n.* (LE); Norachen, Diza, Arpa-Tchai, *Grossheim & al. s.n.* (LE); Aznaburt, Karauch, *Manakian s.n.* (ERE); Chachbuz, Karabaglar, *Tzvelev & Chepanov 191* (LE); Ordubad reg., Vanand-Tchai, Dasta and Dariche, *Yegorova & al. 1075* (LE).

GEORGIA: Kutaisi reg., Rioni, *Alexeenko 1585* (LE); Batumi, river Czoroch, *Alexeenko & Woronow 1579* (LE); Tbilisi, Kara-Jazy, *Alexeenko s.n.* (LE); Tblisi, Mishket, *Holmberg 1088, 1089* (LD); Tblisi, Wera river, *Grossheim s.n.* (ERE); Iberia Caucasia, *Hohenacker 1147* (LE), *s.n.* (BM); Batumi, *Massalski s.n.* (LE); Tblisi, *Schischkin s.n.* (BM); ibid., *von Radde s.n.* (G-BOIS); Tblisi, Saguramo, *Schischkin s.n.* (ERE); Netirchitz, W Tblisi, *Schmiedeknecht 836* (GAT); Gori reg., Tana river, near Ateni, *Woronow s.n.* (LE).

RUSSIA, 'CAUCASUS': Terek river, Pjatigorsk, Muchut Mt., *Gordjaghin 771* (LE); Stavropol, Kurski reg., lake Abalova, *Kononov s.n.* (LE); Helenendorff, *von Meyer s.n.* (LE); s.loc., *von Radde s.n.* (G-BOIS), *Wilhelms s.n.* (LE); Checheno-Ingushetia, *s.coll., s.n.* (G-BOIS). DAGHESTAN: Kaitag-Tabaseran, Mamed-Kala, *Alexeenko s.n.* (LE); s.loc., *Alexeenko s.n.* (LE, type of *Aegilops squarrosa* var. *anathera*); Korinsk reg., Belidzhi, *Alexeenko 1242* (LE); Temir-Chan-Chura, SW Petrovsk, *Alexeenko 1258* (LE); Derbent, *Becker s.n.* (LE); Makhachkala, Adharka, *Prokhanov 180, 331/549* (LE); Kizlyar, Erlachi, *Roshkova s.n.* (LE); Khutchni, *Zacharieva s.n.* (IIPGR).

UKRAINE, CRIMEA: Sudak, *s.coll., s.n.* (LE).

ADVENTIVE: AMERICA: U.S.A., NEW YORK: Yonkers, Yonkers wood mill, *Bicknell s.n.* (NY). ASIA: CHINA: Tibet, *von Hügel 1299* (W). EUROPE: CROATIA, DALMATIA: s.loc., *Bür s.n.* (JE). FRANCE, MAINE-ET-LOIRE: Vernoil ('plante de Siberie'), *Chaffanjon 597* (G). GERMANY: Prenslau, Hindenburg, *Garantzour s.n.* (W). GREECE, ISLANDS: CRETE: Kissamos, *von Heldreich s.n.* (K). ITALY, PIEMONTE: Aosta, *Thoney s.n.* (BM).

Germplasm collections examined:

ASIA: AFGHANISTAN: Jaldak to Ghasni, *Bot. Exp. Univ. Kyoto KUSE 2016* (ICARDA, KYOTO); Andkhui, Maimana, *Bot. Exp. Univ. Kyoto KUSE 2086* (KYOTO, USDA-PI-476874, UCR G-3489); W Badakshan prov., terrace of Amu-Darya river at Al Khanoum, *Willcox 93* (ICARDA).

IRAN: 32 km SW Astara to Ardabil, *Bot. Exp. Univ. Kyoto KUSE s.n.* (ICARDA, KYOTO); SW Ardabil to Surab, *Bot. Exp. Univ. Kyoto KUSE 2112* (ICARDA, KYOTO); Khvoy, *Bot. Exp. Univ. Kyoto KUSE 2118* (ICARDA, KYOTO); 50 km NW Mahabad, *Bot. Exp. Univ. Kyoto KUSE 2115* (ICARDA, KYOTO); suburbs of Mahabad, *Bot. Exp. Univ. Kyoto KUSE 2113* (ICARDA, KYOTO); Gorgan to Khoshyailagh, SW Firuzkuh, *Bot. Exp. Univ. Kyoto KUSE 2086* (ICARDA, KYOTO); Ramsar, Chalus to Rasht, *s.coll., s.n.* (KYOTO); E Behshahr to Gorgan, *s.coll., s.n.* (KYOTO).

PAKISTAN, BALOCHISTAN: Quetta to Chaman, *Bot. Exp. Univ. Kyoto KUSE 2006* (ICARDA, KYOTO); Kach, 52 km W Ziarat, *Humeid & al. 1252-1* (ICARDA, PARC); 30 km E Qila Saifullah, *Humeid & al. 1260-1* (ICARDA, PARC); Sariab, Agr. Inst., S Quetta, *Humeid & al. 1212-1* (ICARDA, PARC); Mangnchar, 40 km N Kalat, *Humeid & al. 1250-1* (ICARDA, PARC); Loar Mawali, 25 km NE Pishin, *Humeid & al. 1233-1* (ICARDA, PARC); Khad Kocha, 31 km S Mastung, *Humeid & al. 1249-1* (ICARDA, PARC).

SYRIA: Raqqa, 12 km S Rasafa, *Elings & al. ID-308* (ICARDA, SARD).

TURKEY: Hakkari, S Semdinli, *Metzger & Jana 79TK057-317* (USDA); Kars, 35 km W Tuzluca, *Metzger & Jana 79TK091-454* (USDA); Hakkari, NNW Semdinli to Yuksekova, *Metzger & Jana 79TK061-342* (USDA); Erzurum, 24 km Kazigman-Igdir-Erzurum road junction, *Metzger & Jana 79TK093-471* (USDA); Hakkari, 37 km NE Yuksekova, *Metzger & Jana 79TK064-354* (USDA); Van, 42 km SE Ercis to Bakimevi, *Metzger & Jana 79TK075-405* (USDA); SW Van, *Metzger & Jana 84TK501-003* (USDA); Kars, SW Kazigman to Karakut, *Metzger & Jana 84TK666-002* (USDA).

EUROPE: ARMENIA: Yekhegnadzor to Vaik, *Gandilyan s.n.* (AAI); Goris reg., Khndzhoresk, *Gandilyan s.n.* (AAI). NAGORNO-KARABACH: Stepanakert reg., Dagdagan, *Dorofeev s.n.* (USDA, VIR).

AZERBAIJAN: Kutachen reg., Getgashena, *Dorofeev s.n.* (USDA, VIR).

ADVENTIVE: CHINA: Yili (Huang He) river, *Everson s.n.* (UCR G 5784-5792); Shaanxi prov., Xi'an, Yili (Huang He) river, Big Goose Pavilion, *Everson s.n.* (UCR G-5793); Wugon, *Everson s.n.* (UCR G-5794); San Men Gorge, *Everson s.n.* (UCR G 5795-5796); Henan, Lushi (= Wuzhi?), *Everson s.n.* (UCR G-5797); Henan, Xinxiang, *Everson s.n.* (UCR G-5798); Henan, Chengguan commune, *Everson s.n.* (UCR G-5799); Shaanxi prov., Xi'an, *Everson s.n.* (UCR G-5801).

Notes: 1. Tausch (1837: 108) noted that Linnaeus' (1753) description of *Aegilops squarrosa* applied to three species. He redescribed *Ae. squarrosa* in a more strict sense and described *Ae. speltoides* and *Ae. ventricosa* to cover other parts of the initial taxon (see also notes 1 and 2 at *Ae. ventricosa* (10.22). The designation by Bowden (1966: 133) of the type (LINN 1218.9, with '*squarrosa 3*' in Linnaeus' handwriting), connected with the epithet *squarrosa*, however, has put *Ae. squarrosa* L. under *Ae. triuncialis* (see at 10.18a, note 3). However, Tausch maintained the epithet *squarrosa* but in a more narrow definition. He cited various elements under his redefined *squarrosa*, but did not choose any of them to serve as the type. The relevant ones are: (1) Buxbaum's (1728) phrase-description and plate; (2) von Schreber's (1772) plate, and (3) *Ae. squarrosa* as presented in the second edition of the *Species plantarum* (through its page number '1489', and *pro parte*).

Later, Cosson (1850: 69) renamed Tausch's *squarrosa* as *Ae. tauschii*. He, too, cited various elements (his literature references are commented upon at note 2 at 10.22, *Ae. ventricosa*), as follows: (1, 2) in Iberia, *Buxbaum*, *Wilhelms*; (3) in Tauria, *Tausch*; and (4) in graminosis et aridis prope Elisabethpol Georgiae Caucasicae, 1834, *Hohenacker*. All these collections were cultivated in the botanical garden in Paris ('In horto Parisiensi culta'). But Cosson, too, did not select any element as the (lecto)type.

Before Tausch and Cosson, Roemer & Schultes (1817: 769) validated a *nomen nudum* from Palisot de Beauvois' (1812) *Essai d'une nouvelle agrostographie* as *Triticum aegilops* P.Beauv ex Roem. & Schult. However, they too, did not choose a type to be connected with their name, which is based on several elements: (1) *Ae. squarrosa* as presented by von Willdenow in the fourth edition of *Species plantarum* (which contains part '*squarrosa*' part *ventricosa*; see note 2 at 10.22); (2) von Schreber's (1772) description and plate, and (3) Buxbaum's (1728) plate from his *Centuria I*.

When Tausch (1837: 108) redescribed *Ae. squarrosa* he mentioned 'Habitat in Iberia (Buxb.) specimina mea e Tauria' with it. Without designating it as the type, the first part of this notation, 'In Iberia', with or without Buxbaum, is cited at 'Type/Typus' of *Ae. tauschii* Coss. by, e.g., Tzvelev (1974: 155), Cope (1982: 595), and Bor (1970: 195). Davis (1985: 238), however, cited all elements from Cosson (see above) as the syntypes, thus indicating that he did not regard the notation from Cope and Bor as a lectotypification of the name.

It thus appears that *Ae. tauschii* has not been lectotypified thus far. The choice as lectotype of the illustration from Buxbaum's *Centuria* is in accordance with Art. 7.5 of the *Code*, being original material from the treatments by Roemer & Schultes, Tausch and Cosson. Any lectotype must therefore be an element already cited by Roemer & Schultes; thus some well-documented and distributed collections, cited by Cosson (such as the one from Hohenacker 'prope Elisabethpol, Georgiæ Caucasicæ') cannot be used. It is clear that traditional usage of the taxon *Ae. tauschii* can thus be maintained, an objective of the *Code*. As the typification of *squarrosa* makes this epithet unavailable, and, as the epithet of *Triticum aegilops* cannot be transferred to *Aegilops* (the name then becomes a tautonym, invalid because of Arts. 23.4 and 55.1*(a)*), the name *Aegilops tauschii* is now the earliest available one for this taxon. This name is in fact a *nom. nov.* for Roemer & Schultes' *T. aegilops* when transferred to *Aegilops*. Summarizing chronologically, and with reference to note 2 at 10.22, *Ae. ventricosa*, the development is as follows:

Aegilops squarrosa L., Sp. pl. (ed. 1) 2: 1051 (1753) – containing three taxa: '*squarrosa*' (*sensu stricto*), *speltoides*, and *ventricosa*.

Aegilops squarrosa redescribed by von Willdenow in the fourth edition of the *Species plantarum*, vol. 4(2): 944 (1806) in the sense of *ventricosa* under exclusion of the reference to von Schreber (1772).

Triticum aegilops P.Beauv. ex Roem. & Schult., Syst. veg. 2: 769 (1817) – validation of a name from Palisot de Beauvois; citing Buxbaum illustration as an element. Oldest name for *Ae. tauschii*, and to be used when under *Triticum*.

Aegilops squarrosa sensu Tausch, Flora 20: 108 (1837) – split-up of the Linnaean *squarrosa* into three elements: *Ae. squarrosa* (*sensu stricto*) with Buxbaum and von Schreber illustrations cited as elements, and ***Ae. speltoides*** and ***Ae. ventricosa***; the latter two valid taxa, now neotypified (see 10.16 and 10.22).

Aegilops tauschii Coss., Notes pl. crit. 1(2b): 69 (1850) – renaming of Tausch' (1837) *squarrosa*, citing Buxbaum and von Schreber as elements, and oldest available name to replace the '*squarrosa*' part from Linnaeus' initial taxon; now to be used. Cosson maintained '*squarrosa*' for Tausch' new *ventricosa* under citation of von Willdenow (1806) and many other cases of (mistaken) use of the former name for the latter taxon.

Aegilops squarrosa L. lectotypified by Bowden (1966: 133) on LINN 1218.9 = *Ae. triuncialis*. Epithet *squarrosa* cannot be used anymore in the sense of '*tauschii*', which now replaces it.

2. *Aegilops squarrosa* L. β *meyeri* Griseb. ex Ledeb. is a variety following Art. 35.3 of the *Code*. Next to the type collection from von Meyer three collections were added by Boissier (1884: 677), which are erroneously considered as (syn)types in G-BOIS: (Georgia) Tblisi, *von Radde s.n.*; (Russia?) Caucasus, *von Radde s.n.* (G-BOIS); Persia (borealis), s.loc., 1847, *Buhse s.n.*.

3. *Ae. squarrosa* L. γ *pubescens* Regel is a variety following Art. 35.3 of the *Code*. The Zeravchan river flows from Tajikistan into Uzbekistan. E. von Regel (1881: 577) mentions 'In valle fluvii Sarawchan in deserto inter Katti-Kurgan et fl. Uluss'. Katti-Kurgan (= Kattakurgan) is in Uzbekistan, but the river Uluss (or Ulus / Luz) as well as the Dzhan (or Djam), both mentioned on the type and isotype labels, could not be found. In view of the local topography the indication 'in deserto' by von Regel most likely points at an Uzbekistan location.

4. Kihara & Tanaka (1958) present a detailed account of the morphological and genetic variation of *Ae. tauschii*. They adopt Eig's (1929a) infraspecific classification of *Ae. squarrosa* auct. with two subspecies, *squarrosa* and *strangulata*, and three varieties within ssp. *squarrosa*: *typica*, *meyeri* and *anathera*. Their use of ssp. *squarrosa* instead of Eig's ssp. '*eusquarrosa* Eig' may have been the reason that Chase & Niles (1962: 10-11) note ssp. *squarrosa* '(L.) Kihara & Tanaka' for the typical subspecies, and ssp. *strangulata* 'Kihara & Tanaka' for the second subspecies, as well as var. *anathera* 'Kihara & Tanaka'. A similar notation for the variety *meyeri* is, however, not presented.

5. The wide morphological variation of *Ae. tauschii* has led to the frequent distinction of forms, mainly following Eig (1929a), of which the correct names would be as follows: a typical subspecies *tauschii* with varieties *tauschii*, *anathera*, and *meyeri*, all characterized by elongated, cylindrical spikelets, and a second subspecies *strangulata* with more quadrate spikelets, equally long as wide (see Fig. 71-2, 12, 13). Kihara & Tanaka (1958) describe variation in the 'typical' group, however, as showing: (1) many intermediates between '*typica*' and *anathera*, and (2) *meyeri* being an intermediate type 'between the two' (that is *typica* and *anathera*) (l.c., 248). Only *strangulata* is more distinct, and its occurrence limited to a narrow stretch on the southeastern shores of the Caspian Sea near Gorgan (Iran) (see Kihara & Tanaka, 1958: 242, Fig. 1). Zohary et al. (1969: 63), however, place *strangulata* from northern Iran *next* to the occurrence of 'robust types with large, thick spikes', and associate all robust types with segetal growth.

A recent study by Kim et al. (1992) also cites *strangulata* from Armenia, Azerbaijan and Turkmenistan, and pointed out that intermediate forms exist among all morphologically distinguished forms. A ribosomal-DNA genotype from Armenia was found to be different from other *strangulata* genotypes and similar to (unspecified) genotypes of the *tauschii* group. They considered an intraspecific classification of *Ae. tauschii* on morphological grounds inadequate, but apparently also on molecular grounds, concluding only that the three *strangulata* accessions analysed indicate 'genomic diversity' in *Aegilops* species (l.c., 514). Thus it seems justified for the moment not to classify the observed infraspecific variation of *Ae. tauschii*.

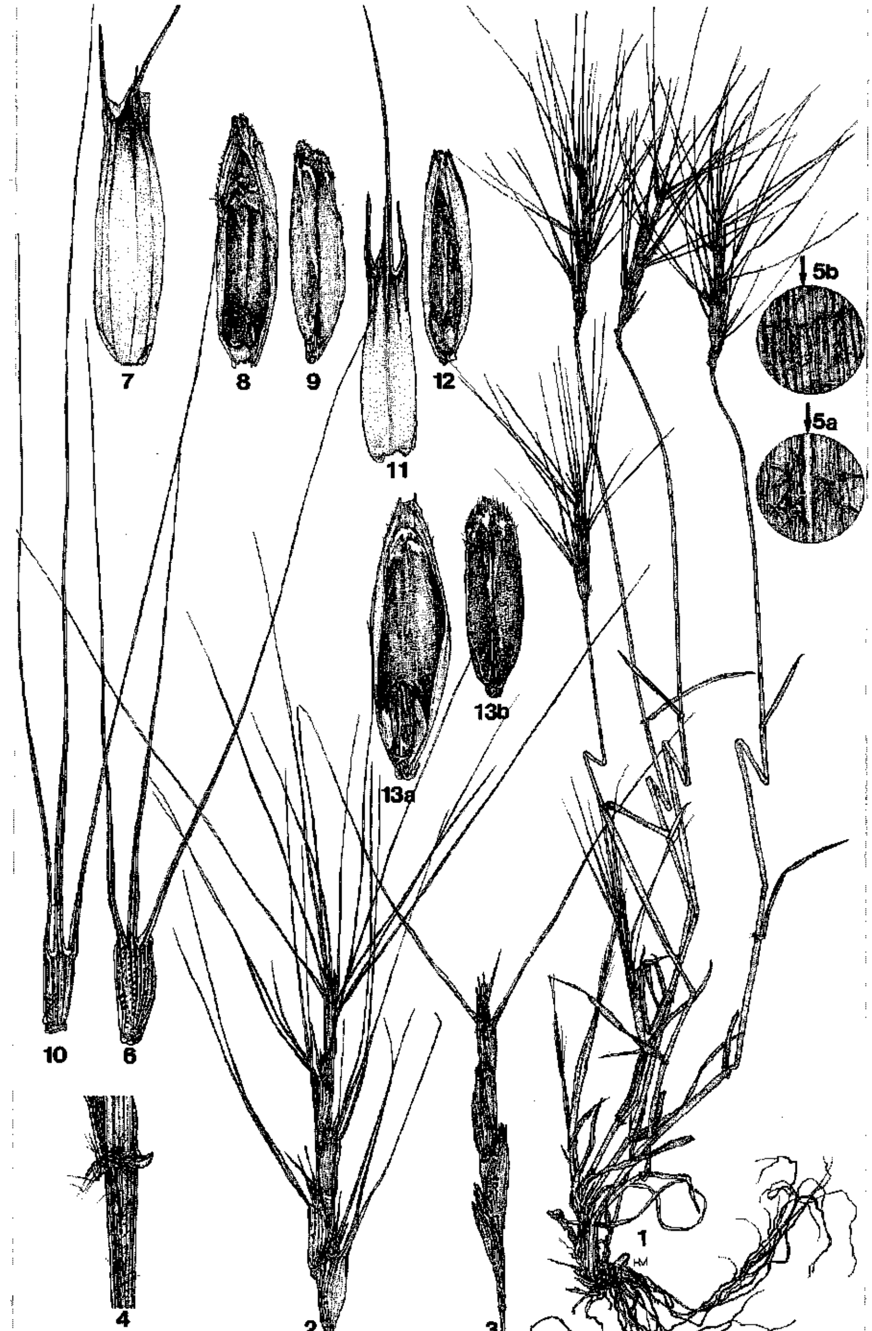
6. A germplasm collection from the Kyoto University scientific expedition to the Karakoram and Hindukush regions (no. *2086*, from Andkhui-Maimana, Afghanistan; with duplications in, among others, USDA (PI-476874) and UCR (G-3489)) was later found to possess a tough rachis (Waines et al., 1982: 97). This is the only reported finding of this kind in any of the wedge- or barrel-type disarticulating species of *Aegilops*, although Dr G. Waines informed me that it is probable that populations in China (see at Distribution and Ecology) also possess this character.

10.18 **Aegilops triuncialis** L. **Figs. 38, 76-84**

[For pre-Linnaean descriptions and literature, see Chapter 3.1 at 3.1.4.]

Aegilops triuncialis L., Sp. pl. (ed. 1) 2: 1051 (1753), (ed. 2) 2: 1489 (1763); Gouan, Fl. monsp. 132 (1765); Allioni, Fl. pedem. 2: 262 (1785); Villars, Hist. Pl. Dauphiné 2: 179 (1787); Roth in Usteri, Ann. Bot. 2(4): 42 (1793); Desfontaines, Fl. Atlantica 2: 384 (1799); Host, Icon. descr. gram. austriac. 2: 6, Tab. 6 (1802), Fl. austriac. 1: 175 (1827); Persoon, Syn. pl. 1: 107 (1805); von Willdenow, Sp. pl. (ed. 4) 4(2): 943 (1806); de Lamarck & de Candolle, Fl. franç. (ed. 3) 3: 79 (1805, reissue 1815); Roemer & Schultes, Syst. veg. 2: 772 (1817); Gussone, Fl. sicul. syn. 1: 54 (1843); Duby, Bot. gall. (ed. 2) 1: 528 (1828); Reichenbach, Fl. Germ. excurs. 17 (1830); Alschinger, Fl. jadr. 23 (1832); Kunth, Enum. pl. 1: 458 (1833), Suppl. tomi primi 371 (1835); Bertoloni, Fl. ital. 1: 790 (1834); Tenore, Fl. Napol. 5: 288 (1835) *pro parte*; Richter, Codex bot. linn. 998 (1835-39); Mutel, Fl. franç. 4: 154 (1837), Atlas, Tab. 92, fig. 647 (1837); de Visiani, Fl. dalmat. 1: 90 (1842); Boissier, Voy. bot. Espagne 2: 682 (1844a), Fl. orient. 5(2): 674 (1884); Grisebach, Spic. fl. rumel. 2: 548 (1846), in von Ledebour, Fl. ross. 4: 327 (1852); Heynhold, Alph. Aufz. Gew. / Nom. bot. hort. 2: 10 (1846); Parlatore, Fl. ital. 1: 512 (1850); von Steudel, Syn. pl. glumac. 1: 354 (1854); Cosson & Durieu de Maisonneuve, Expl. sci. Algérie 2: 212 (1855); Clementi, Sert. Orient., Mém. Acad. Sci. Torino, Sér. 2, Vol. 16: 336 (1857); Tchichatscheff, Asie min., Bot. 2: 582 (1860); Lange, Pug. pl. hispan. 1: 56 (1860); Willkomm & Lange, Prod. fl. hispan. 1: 107 (1861); Schlosser von Klekovski & Vukotinovič, Fl. croat. 1294 (1869); del Amo y Mora, Fl. fan. Penins. Iberica 1: 255 (1871); Loret & Barrandon, Fl. Montpellier (ed. 1) 2: 770 (1876), (ed. 2) 577 (1886); von Regel, Descriptiones plantarum novarum 8, Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 7: 577

Fig. 76. *Aegilops triuncialis*. 1, habitus (x 1/2); 2, spike (x 1); 4, stem, leaf sheath, ears and leaf blade (x 2); 5a, abaxial leaf surface, midway (x 5); 5b, adaxial surface of 5a (x 5); 6-9, lowest floret of spikelet in centre of spike: 6, glume (x 2), 7, lemma (x 4), 8, palea and immature seed (x 4), 9, seed ventral surface (x 4); 10-12, apical spikelet: 10, glume (x 2), 11, lemma (x 4), 12, palea (x 4); 13a palea and dorsal surface of seed (x 4), 13b, ventral surface of mature seed (x 4). *Aegilops triuncialis* var. *persica*. 3, spike (x 1). (1. *Tüten & al. CNM-280689-0603H*; 2. *Tüten & al. CNM-290689-0202H*; 3. *van Slageren et al. MSLGAD-89111H*; 4-12. *Tüten & al. CNM-190689-0403H*; 13. *Tüten & al. CNM-270689-0202*, cultivated at ICARDA from germplasm accession.)



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(1881); Battandier & Trabut, Fl. Alger 108 (1884), Fl. Algérie 1(2): 241 (1895), Fl. Algérie Tunisie 393 (1905); Schlechtendal et al., Fl. Deutschl. ed. 5, vol. 8: 221 (1881); Nyman, Consp. fl. eur. 4: 839 (1882), suppl. 2: 342 (1890); Velenovský, Fl. bulg. 627 (1891); Gandoger, Fl. Eur. 25: 6 (1892); Fiori & Paoletti, Fl. Italia 1: 109 (1896); Lázaro é Ibiza, Comp. fl. Españ. (ed. 2) 1: 657 (1906), (ed. 3) 2: 72 (1920); Post, Fl. Syria (ed. 1) 899 (1896), (ed. 2) 2: 784 (1933); de Marchesetti, Fl. Trieste 656 (1897); Haussknecht, Symb. fl. graec., Mitt. Thür. Bot. Ver., Neue Folge 13: 61 (1899); von Halácsy, Consp. fl. graec. 3: 431 (1904); Coste, Fl. descr. France 3: 658 (1906); Koch, Syn. deut. schweiz. Fl. (ed. 3) 3: 2799 (1907); Albert & Jahandiez, Cat. pl. vasc. Var 561 (1908); Hegi, Ill. Fl. Mitt.-Eur. (ed. 1) 1: 390 (1908), (ed. 2) 1: 500 (1936); Lojacono, Fl. sicul. 3: 369 (1908-09); Bornmüller, Beih. Bot. Centralbl. 26: 438 (1910); Durand & Barratte, Fl. libyc. prodr. 276 (1910); Muschler, Man. Fl. Egypt 1: 155 (1912); Rouy, Fl. France 14: 333 (1913); Fiori, Nuov. Fl. Italia 1: 161 (1923); Jávorka, Magyar fl. 1: 114 (1924); Eig, Sec. contr. fl. Pal., P.Z.E. Inst. Agric. Nat. Hist., Bull. 6: 70 (1927); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 449, 491, 500 (1928, with ssp. *typica*); Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 322 (1928a, with var. *typica*), Feddes Repert., Beih. 55: 130 (1929a, with ssp. *eu-triuncialis* var. *typica*); Nábělek, Iter turc.-pers. 5, Publ. Fac. Sci. Univ. Masaryk 111: 30 (1929, '*triuncinalis*'); Pampanini, Prodr. fl. ciren. 135 (1930); Jahandiez & Maire, Cat. pl. Maroc 1: 89 (1931, with ssp. *eu-triuncialis* var. *typica*); Jansen & Wachter, Nederl. Kruidk. Arch. 143 (1931); Douin in Bonnier, Fl. ill. France 12: 63 (1934); Nevski in Komarov, Fl. URSS 2: 672 (1934, Russian) / 536 (1963, English); Fournier, Quatre fl. France 88 (1935); Hitchcock, Gen. grasses U.S. (ed. 2), USDA Bull. 772: 91 (1936), Man. Grasses U.S., USDA Misc. Publ. 200: 246 (1935), (ed. 2, rev. Chase) 245 (1951); Cadevall y Diars, Fl. Catalunya 6: 272 (1936); Kolakovski, Fl. Abkhazia 1: 183 (1938); Grossheim, Fl. Kavkaza (ed. 2) 1: 353 (1939), Opredelitel rastenich Kavkaza [Key to Caucasus plants] 720 (1949); Oppenheimer & Evenari, Florul. Cisiord. 171 (1941, also includes var. *typica*); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 767 (1943); Gismondi, Pros. fl. ligust. 153 (1950); Karjagin, Fl. Azerbaijana 1: 336 (1950); Jansen, Fl. neerl. 1(2): 123 (1951); Parsa, Fl. Iran 5: 819 (1952); Thiébaut, Fl. Lib.-Syr. 3: 318 (1953); Cuénod et al., Fl. Tunisie 156 (1954); Maire & Weiller, Fl. Afrique nord 3: 362 (1955, with ssp. *eu-triuncialis* var. *typica* on p. 364); Ovczinnikov, Fl. Tadschikistan SSR 1: 339 (1957); Ahmad & Stewart, Grasses West Pakistan (ed. 1) 2: 321 (1959); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960, with ssp. *triuncialis*); Bor, Grasses India, Burma, Ceylon, Pakistan 655 (1960); Quézel & Santa, Nouv. fl. Algérie rég. dés. mérid. 1: 158 (1962, with 'ssp. *eu-triuncialis*', see note 1); Bor in Rechinger, Fl. lowland Iraq 113 (1964); Keith, Checklist Libyan Fl. 198 (1965); Mouterde, Nouv. Fl. Liban, Syrie 1: 147 (1966); Stojanov et al., Fl. Bulg. (ed. 4) 1: 146 (1966); Domac, Eksk. fl. Hrvatske [Croatia] 516 (1967); Munz & Keck, California Fl. and Suppl. 1507 (1968); Bor, Fl. Iraq 9: 190 (1968), Fl. Iranica 70/30: 198 (1970); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 484 (1969); Goloskokov, Ill. key to Kazakhstan pl. 1: 124 (1969); Rubtsova, Opredelitel vysschich rastenich Kryma [Key to higher pl. Crimea] 68 (1972); Takhtajan & Fedorov, Fl. erevana (ed. 2) 366 (1972); Stewart, Cat. Vasc. Pl. W Pakistan, Kashmir, in Nasir & Ali, Fl. W Pakistan 171 (1972); Osorio-Tafall & Seraphim, List Vasc. Pl. Cyprus 10 (1973); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973, with ssp. *triuncialis*), in Fedorov, Fl. part. Eur. URSS 1: 155 (1974), Zlaki SSSR 158 (1976, Russian) / 227 (1984, English); Guinea Lopez & Ceballos Jiménez, Elenco Fl. Vasc. Españ. 357 (1974); Crampton, Grasses California 78 (1974); Zangheri, Fl. ital. 1: 979 (1976); Josifovic˘, Fl. rep. soc. serbie 8: 443 (1976); Sljusarenko in Prokudin et al., Zlaki Ukrainy 93 (1977); Bonafé, Fl. Mallorca 1: 217 (1977); Guinochet & Vilmorin, Fl. France 3: 967 (1978); Hammer, Feddes Repert. 91: 238 (1980b, with ssp. *triuncialis* var. *triuncialis* forma *triuncialis*); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980); Demiri, Fl. ekskur. shqip. (Albania) 80 (1981); Pignatti, Fl. italia 3: 543 (1982); Cope in Nasir & Ali, Fl. Pakistan 143: 596 (1982), Key Grasses Arab Penin., Arab J. Sci. Res., Spec. Publ. 1: 74 (1985); Meikle, Fl. Cyprus 2: 1823 (1985); Davis, Fl. Turkey 9: 241 (1985, with ssp. *triuncialis*); Feinbrun-Dothan, Fl. Pal. 4: 176 (1986); Thiébaud & Deschatres in Jeanmonod et al., Not. Fl. Corse, Candollea 41: 58 (1986); Talavela in Valdés et al., Fl. Vasc. Andal. Occ. 3: 377 (1987); Sagredo, Fl. Almeria 49 (1987); Al-Rawi, Fl. Kuwait 2: 324 (1987); Nikitin & Geldykhanov, Opredelitel rastenich Turkmenistana [Key to Turkmenistan plants] 46 (1988); Sherif & Siddiqi in El-Gadi, Fl. Libya 145: 106 (1988); Hess et al., Fl. Schweiz 1: 382 (1967); Arutyunyan & Gandilyan, Biol. J. Armenia 43(9): 748 (1990, with ssp. *triuncialis* with convars. *triuncialis* and *biaristatum* and numerous varieties; see note 2 and Chapter 12, Nomina nuda).

Lectotype: (Spain) Hispania, 701 *β*, *Loefling* (holo: LINN 1218.8). Designated by Bowden (1959: 675).

Homotypic synonyms:

Ae. elongata Lam., Fl. franç. 3: 632 (1779), *nom. illeg.* (Art. 63.1).

Ae. triaristata Req. ex Bertol., Fl. ital. 1: 789 (1834), *nom. illeg.* (Art. 64.1), non von Willdenow (1806).

Triticum triunciale (L.) Rasp., Ann. Sci. Nat., Sér. 1(5): 435 (1825); Grenier & Godron, Fl. France 3(2): 602 (1856); de Cesati, Passerini & Gibelli, Comp. fl. ital. 1(4): 86 (1869); Aitchison, Trans. Linn. Soc., Ser. 2(3): 127 (1888, as a *comb. nov.* of Aitch. & Hemsl., thus an isonym); Richter, Pl. eur. 1: 128 (1890); Durand & Schinz, Consp. fl. afric. 5: 940 (1894); Schmahlhausen, Fl. ssredn. jushn. Rossii [Fl. central and southern Russia] 2: 662 (1897); Bubani, Fl. pyren. 4: 396 (1901-02); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 706 (1902); Zimmermann, Adv. Ruderalfl. Mannheim 72 (1907); Fedtschenko & Flyorov, Fl. Eur. Russia 148 (1910); Stojanov & Stefanoff, Fl. Bulg. (ed. 1) 1: 168 (1924), (ed. 3) 174 (1948); von Hayek, Prod. fl. pen. Balcan. 3: 225 (1932); Coutinho, Fl. Portugal (ed. 2) 117 (1939); Diapulis, Syn. fl. graec. 167 (1939); Bowden, Can. J. Bot. 37: 675 (1959), Can. J. Gen. Cyt. 8: 134 (1966); Webb, Fl. Eur. Turkey, Proc. Roy. Irish Acad., Sect. B, 65: 79 (1966); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 60 (1987).

Aegilopodes triuncialis (L.) Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 501 (1984, with ssp. *triuncialis*), *comb. incorr.* (Art. 68.1: illegitimate generic name; see Chapter 7).

Ae. triuncialis L. [ssp. *triuncialis*] convar. *triaristatum* Arut. & Gandilyan, Biol. J. Armenia 43(9): 747, 748 (1990; on p. 748: 'convar. *triuncialis* (= convar. *triaristatum* m.)'), *nom. inval.* (Art. 36.1: Russian descr. only), **syn. nov.** Also a superfluous renaming of the typical convariety. See note 2.

Ae. triuncialis L. convar. *biaristatum* Arut. & Gandilyan, Biol. J. Armenia 43(9): 747, 748 (1990, authors as 'm.'), *nom. inval.* (Arts. 34.1*(d)* and 36.1), **syn. nov.** See note 2.

Heterotypic synonyms:

Ae. squarrosa L., Sp. pl. (ed. 1) 2: 1051 (1753), (ed. 2) 2: 1489 (1763); Bowden, Can. J. Gen. Cytol. 8: 133 (1966, sub *T. tauschii*). – Lectotype: ('in Oriente'?) squarrosa 3, *s.coll.*, *s.n.* (holo: LINN 1218.9). Designated by Bowden (1966: 133). See note 3.

Ae. echinata C.Presl, Cyper. Gramin. sic. 47 (1820); Gussone, Pl. rar. 373 (1826); Tenore, Fl. napol., Vol. 5: 288 (1835); von Steudel, Syn. pl. glumac. 1: 354 (1854). – Type: (Italy, Sicily) in arvis aridis Messina, VII.1817, *C. Presl s.n.* (holo: PRC).

Ae. croatica Gand., Österr. Bot. Zeitschr. 31: 81 (1881), Contr. fl. terr. slav. merid. 36 (1883), **syn. nov.** – Type: (Croatia, Dalmatia) in siccis ad Fiume (= Rijeka), Martinsčica, *Rossi 6046* (holo: LY-Gandoger; iso: BC, ERE, GE, JE, L, PRC, SO, W).

Ae. triuncialis L. var. *breviaristata* Hack. in Groves, Nuov. Gior. Bot. Ital. 19: 212 (1887), **syn. nov.** – Type: (Italy) Gallipoli, *Groves s.n.* (holo: FI (probably), not found; iso: BM, GE, LE, LY-Gandoger, OXF). – Note: probably also in W (Hackel's herbarium).

Ae. triuncialis L. var. *albescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923); Hammer, Feddes Repert. 91: 238 (1980b, considers this the typical form of the species). – Syntypes: (Iran) Persia, *Vavilov s.n.* (WIR?, not found); (Kazakhstan / Uzbekistan), Syr-Darja, *Popova s.n.* (LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonym: *Ae. triuncialis* L. (var.?) *arnual* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl.* – Note: Arutyunian & Gandilyan consider the var. *albescens* Pop. identical with the typical form of the var. *triuncialis*. See note 2.

Ae. triuncialis L. var. *brunnea* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Type: (Turkmenistan?) 'Turkestan', Turkomania, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonyms: *Ae. triuncialis* L. forma *brunnea* (Pop.) Hammer, Feddes Repert. 91: 238 (1980b). *Ae. triuncialis* L. (var.?) *arnuni* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl.* See note 2.

Ae. triuncialis L. var. *ferruginea* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonyms: *Ae. triuncialis* L. forma *ferruginea* (Pop.) Hammer, Feddes Repert. 91: 238 (1980b). *Ae. triuncialis* L. (var.?) *arnuru* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl.* See note 2.

Ae. triuncialis L. var. *flavescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 475 (1923); Eig, Sec. contr. fl. Pal., P.Z.E. Inst. Agric. Nat. Hist., Bull. 6: 71 (1927), **syn. nov.** – Syntypes: (Iran) Persia,

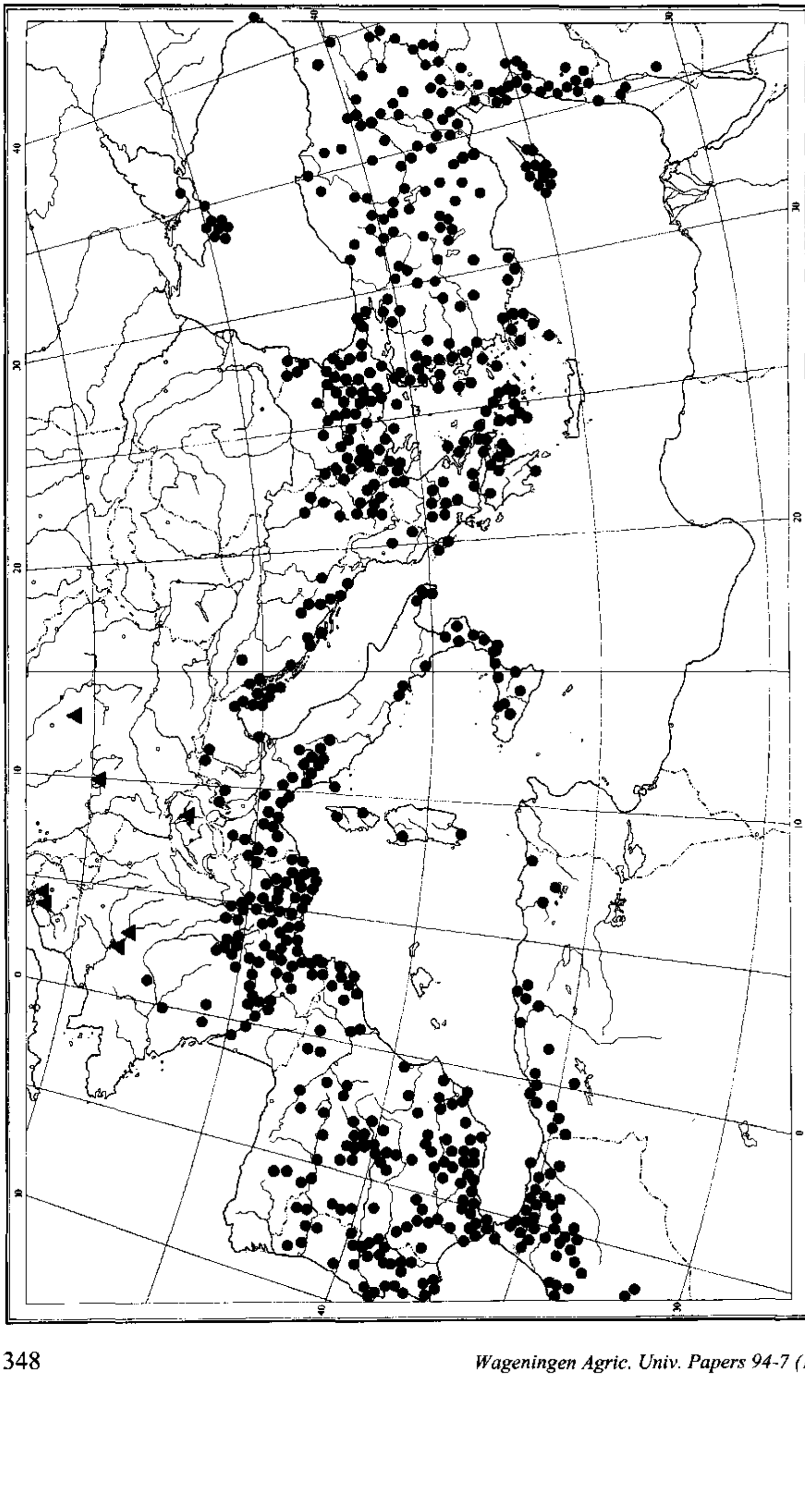

Fig. 77. Distribution of *Aegilops triuncialis* var. *triuncialis* in the Mediterranean area and in western Asia. ● = locations; ▲ = adventive locations (not shown for the U.K.). For adventive distribution in the U.S.A., see Fig. 38.

Hamadan, *Vavilov s.n.* (WIR, not found); (Uzbekistan) 'Turkestan', Turkomania, Syr-Darja, Samarkand, *Popova s.n.* (LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonyms: *Ae. triuncialis* L. forma *flavescens* (Pop.) Hammer, Feddes Repert. 91: 238 (1980b). *Ae. triuncialis* L. (var.?) *arpual* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl. Ae. triuncialis* L. (var./forma?) *luarpual* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl.* See note 2.

Ae. triuncialis L. var. *nigro-albescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Syntypes: (Iran) Persia, *Vavilov s.n.* (WIR, not found); (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonyms: *Ae. triuncialis* L. forma *nigro-albescens* (Pop.) Hammer, Feddes Repert. 91: 238 (1980b). *Ae. triuncialis* L. (var.?) *narnual* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl.* See note 2.

Ae. triuncialis L. var. *nigro-ferruginea* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonyms: *Ae. triuncialis* L. forma *nigro-ferruginea* (Pop.) Hammer, Feddes Repert. 91: 238 (1980b). *Ae. triuncialis* L. (var.?) *narnuru* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl.* See note 2.

Ae. triuncialis L. var. *nigro-flavescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 475 (1923), **syn. nov.** – Syntypes: (Iran) Persia, Hamadan, *Vavilov s.n.* (WIR, not found); (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonyms: *Ae. triuncialis* L. forma *nigro-flavescens* (Pop.) Hammer, Feddes Repert. 91: 238 (1980b). *Ae. triuncialis* L. (var.?) *narpual* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl.* See note 2.

Ae. triuncialis L. var. *nigro-rubiginosa* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 476 (1923), **syn. nov.** – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonyms: *Ae. triuncialis* L. forma *nigro-rubiginosa* (Pop.) Hammer, Feddes Repert. 91: 238 (1980b). *Ae. triuncialis* L. (var.?) *narpuru* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl.* See note 2.

Ae. triuncialis L. var. *rubiginosa* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 475 (1923), **syn. nov.** – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). See note 3 at 10.6, *Ae. crassa*. – Homotypic synonyms: *Ae. triuncialis* L. forma *rubiginosa* (Pop.) Hammer, Feddes Repert. 91: 238 (1980b). *Ae. triuncialis* L. (var.?) *arpuru* Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), *nom. superfl.* See note 2.

Ae. triuncialis L. var. *nigriaristata* Flaksb., Bull. Appl. Bot., Gen. & Pl. Breeding 13: 484 (1923); Hammer, Feddes Repert. 91: 238 (1980b), **syn. nov.** – Type: (Turkmenistan) Prov. Transcaspica, distr. Aschabad, in jugo Kopet-Dagh, Tchuli, 28.V.1914, *Golbeck s.n.* (holo: LE, not found). – Note: Hammer considered this variety as probably similar to the variety *brunnea* Pop.

Ae. triuncialis L. var. *glabrispica* Eig, Sec. contr. fl. Pal., P.Z.E. Inst. Agric. Nat. Hist., Bull. 6: 71 (1927); Post, Fl. Syria (ed. 2) 2: 784 (1933), **syn. nov.** – Syntypes: (Lebanon / Syria) Mt. Hermon, plain of Ein-Jinneh, about 1500 m, 21.VII.1924, *Eig s.n.* (HUJ, not seen); (Lebanon / Syria) summit of Mt. Hermon, 18.VI.1924, *Eig s.n.* (HUJ, not seen).

Ae. triuncialis L. var. *pubispica* Eig, Sec. contr. fl. Pal., P.Z.E. Inst. Agric. Nat. Hist., Bull. 6: 72 (1927), **syn. nov.** – Syntypes: (Lebanon / Syria) Mt. Hermon, plain of Ein-Jinneh, about 1500 m, 21.VII.1924, *Eig s.n.* (HUJ, not seen); (Syria) east of Banias, 10.V.1911, *Meyers & Dinsmore 1801* (E, HUJ (not seen)).

Ae. triuncialis L. var. *assyriaca* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 323 (1928a), Feddes Repert., Beih. 55: 134 (1929a); Mouterde, Nouv. Fl. Liban, Syrie 1: 148 (1966); Hammer, Feddes Repert. 91: 239 (1980b), **syn. nov.** – Syntypes: (Iraq) Kurdistan, Erbil reg., Kuh-Sefin Mt., Shaqlawa, 4.VI.1893, *Bornmüller 1899* (G, JE, LE, US, W, Z); (Iraq) Assyria, ad Kerkuk, 26.IV.1893, *Bornmüller 1900* (B, JE, K), *1903* (B).

Ae. triuncialis L. ssp. *caput-medusae* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 499 (1928), **syn. nov.** – Lectotype: Turkey, Lydia, Boz-Dagh, *Zhukovsky s.n.* (holo: WIR 1328).

Ae. triuncialis L. ssp. *fascicularis* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 499 (1928), **syn. nov.** – Lectotype: Spain, 1927, *Vavilov s.n.* (holo: WIR 1372).

Ae. triuncialis L. var. *prima* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 500 (1928), **syn. nov.**, *nom. inval.* (art. 23.6*(b)*). – Voucher: Spain, *Vavilov s.n.* (holo: WIR, not found).

Ae. triuncialis L. var. *secunda* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 500 (1928), **syn. nov.**, *nom. inval.* (art. 23.6*(b)*). – Voucher: Spain, *Vavilov s.n.* (holo: WIR, not found).

Ae. triuncialis L. var. *hirta* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 500 (1928); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 483 (1969), **syn. nov.** – Type: not indicated. – Homotypic synonym: *Triticum triunciale* (L.) Rasp. forma ('γ') *hirtum* (Zhuk.) Hayek, Prod. fl. pen. Balcan. 3: 225 (1932).

Ae. triuncialis L. var. *muricata* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 500 (1928); Hammer, Feddes Repert. 91: 238 (1980b; considers this the typical form of the species), **syn. nov.** – Type: not indicated. – Homotypic synonym: *Triticum triunciale* (L.) Rasp. forma ('β') *muricatum* (Zhuk.) Hayek, Prod. fl. pen. Balcan. 3: 225 (1932).

Ae. triuncialis L. ssp. *typica* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 500 (1928), *nom. inval.* (Art. 26.1, thus also Art. 32.1), **syn. nov.** – Voucher: Spain, vicinity of Madrid, in abundance on barren land, 9.VI.1927, *Vavilov 58592* (holo: WIR 1283).

Ae. triuncialis L. var. *constantinopolitana* Eig, Feddes Repert., Beih. 55: 133 (1929a); Hammer, Feddes Repert. 91: 238 (1980b), **syn. nov.** – Type: (Turkey) insula Chalki, 1876, *Murmann s.n. (117?)* (holo: G-BOIS; iso: G).

Ae. triuncialis L. forma *hirsuta* H.Lindb., Itin. medit. 9 (1932), **syn. nov.** – Syntypes: (Spain) Sierra Nevada, Jollos del Purche supra oppidum Granada, in colle sicco, *H. Lindberg s.n. (?)* (H, not seen); Morocco, Atlas major, in convalle fluminis Reraia, in declivibus calcareis aridissimis contra deversorium La Bonne Auberge prope pagum Asni, 6.VI.1926, *Lindberg 3680* (CAI, H (not seen), K, LD, MPU, W). – Homotypic synonym: *Ae. triuncialis* L. subvar. *hirsuta* (H.Lindb.) Jahand. & Maire, Cat. pl. Maroc 3: 867 (1934); Maire & Weiller, Fl. Afrique nord 3: 364 (1955).

Ae. triuncialis forma *subglabra* H.Lindb., Itin. medit. 9 (1932), **syn. nov.** – Type: Morocco, Atlas medius, prope pagum Azrou, in siccis in valle Tioumliline, *Lindberg s.n.(?)* (holo: H, not seen). – Homotypic synonym: *Ae. triuncialis* L. subvar. *subglabra* (H.Lindb.) Jahand. & Maire, Cat. pl. Maroc 3: 867 (1934); Maire & Weiller, Fl. Afrique nord 3: 364 (1955).

For literature, typification and synonyms referring specifically to the varieties, see under there.

Key to the varieties:

Glumes of lateral spikelets with 2 teeth or 1 tooth and 1 short, up to 1.5 cm long, awn only; – apical glumes with a well-developed central awn, 2-5 cm long, and 2 short lateral awns, 1-2 cm only, or lateral awns reduced to teeth .... var. **persica**

Glumes of lateral spikelets with 2-3 well-developed, 1.5-6 cm long, awns; – apical glumes with a well-developed, central awn of 5-8 cm that is the longest awn of the spike, and 1-3 cm long lateral awns .... var. **triuncialis**

10.18a **Aegilops triuncialis** L. var. **triuncialis** **Figs. 38, 76(1-2, 4-13), 77-82**

Diagnostic characters: tufted, many-tillered annuals, (15-)20-40(-60) cm tall excluding spikes; spikes subcylindrical, 2.5-6 cm excluding awns, the lower part narrowly ellipsoid, upper part subcylindrical, with (2-)3-5(-7) fertile and (2-)3 rudimentary spikelets; glumes with 2-3 awns, 1.5-6 cm long, with apical spikelets always 3, the central one 5-8 cm and the longest of the spike, erecto-patent; lemmas with 2-3 teeth/awns, shorter than those of the glumes; caryopsis free.

Description (Fig. 76: 1-2, 4-13): tufted *annuals* (*Fig. 76-1*), usually with many tillers. *Culms* geniculate and semi-prostrate at base, then erect, (15-)20-40(-60) cm tall excluding spikes; foliage ± evenly distributed, more dense at base of culms.

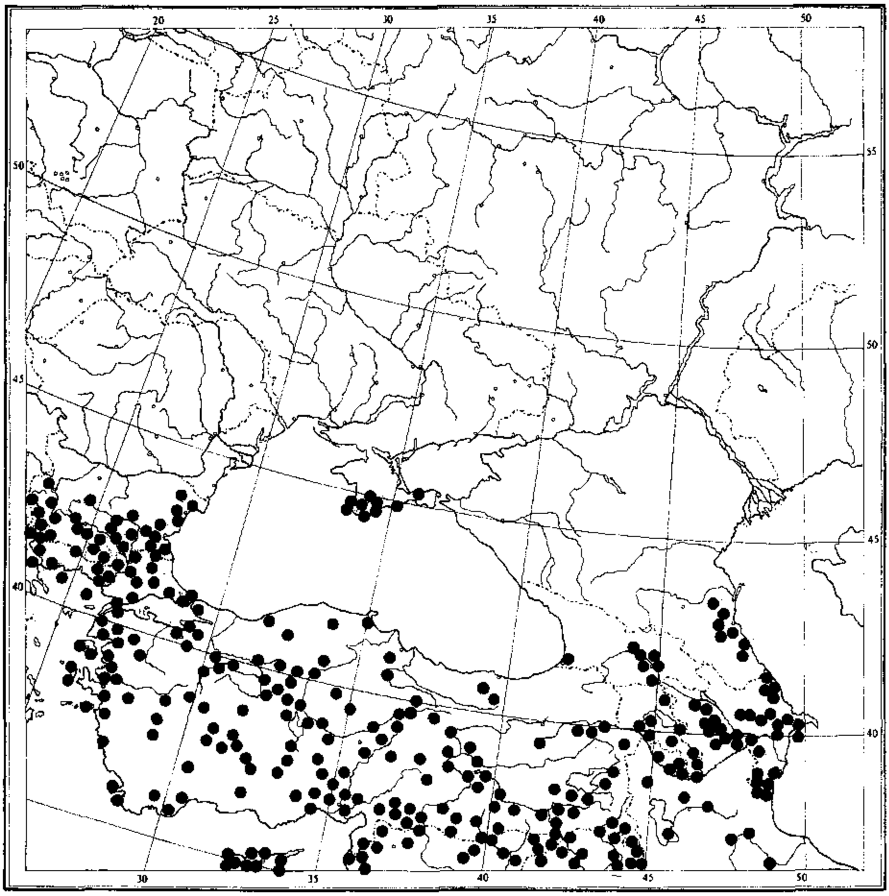

Fig. 78. Distribution of *Aegilops triuncialis* var. *triuncialis* in the Black Sea region.

Leaf blades linear-acuminate, 1.5-7 cm long, 0.2-0.3 cm wide; sheath margins hyaline, ciliate mainly in lower part of culm (*Fig. 76-4*). *Inflorescence* (*Fig. 76-2*) a subcylindrical spike, 2.5-6 cm long excluding awns, 0.4-0.5 cm wide in the lower, narrowly ellipsoid part, only around 0.2 cm wide in the upper, subcylindrical part; disarticulating as one unit at maturity with the rudimentary spikelets remaining attached to the culm; with (2-)3-5(-7) fertile spikelets and (2-)3 rudimentary spikelets. *Spikelets* sessile, the lower 2-3 ellipsoid and well-developed, 0.7-1.3 cm long excluding awns, 0.3-0.4 cm wide, the upper ones more reduced, subcylindrical, 0.7-0.9 cm long excluding awns, around 0.2 cm wide; lower spikelet length around 1.3 times the length of the supporting rachis internode, decreasing to 0.7 times in the apical part of the spikelet; with 3-5 florets, the lower 1-2 fertile. *Glumes* (*Fig. 76-6*) 2, coriaceous (but the lateral margins at least partially hyaline), obovate-elliptical, 6-10 mm long excluding awns, of the apical spikelet obtrapezoid, 6-8 mm long; surface glabrous, scabrid or adpressed- velutinous, green, often

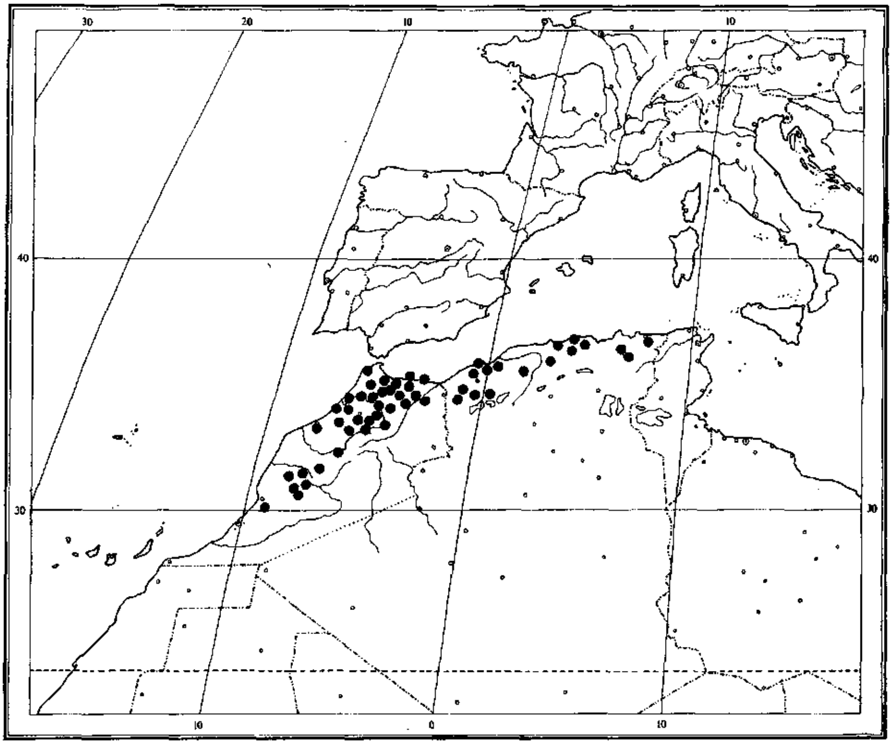

Fig. 79. Distribution of *Aegilops triuncialis* var. *triuncialis* in northern Africa.

purplish-green; venation unequal in width, flattened, sunk into the surface, unequally spaced but this more regular in the upper spikelets, usually more yellowish and lighter in colour than the rest of the glume surface; the truncate apex extending into 2-3 diverging, setulose awns, widely varying in length: 1.5-6 cm, generally longer towards the apex of the spike, the central one often short or reduced to a sharp tooth; glume of apical spikelets (*Fig. 76-10*) with 3 awns, the central one 5-8 cm and the longest awn of the spike, erecto-patent, the 2 lateral ones shorter and less diverging; inner surface of base of awns sometimes velutinous. *Lemmas* (*Fig. 76-7*) of fertile florets slightly exserting the glumes, 7-11 mm long, narrowly-elliptical, boat-shaped; apex with 2-3 sharply acute teeth, 1-2 of which may develop into short, up to 1 cm long awns, when 3 teeth/awns the central one the longest; lemma of apical spikelet (*Fig. 76-11*) with central apical awn of up to 2 cm long and more diverging than the lateral, shorter awns in a way similar to the apical glume awns; inner surface of apical region velutinous, outer surface sometimes setose. *Palea* (*Fig. 76-8, 12*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 76-9, 13*) 5-8 mm, free from lemma and palea.

Variation: in spike length: 2.5-6 cm; number of spikelets: (2-)3-5(-7), and in length of the glume awns: 1.5-6 cm.

Distribution (Figs. 38, 77-80): a widespread Mediterranean / Western Asiatic / Circumboreal element occurring all over southern Europe (Fig. 77) and the Near East (Fig. 80), extending eastwards into central Asia, Pakistan and Afghanistan, and well-represented along the entire Fertile Crescent arc (Fig. 80). Also found on Cyprus and the southern Crimea as well as in Ciscaucasia, but there predominantly in the eastern parts along the Caspian Sea (Fig. 78). Its spread northwards appears to be limited by the 45^0 latitude, and only in France, Italy, Slovenia and Croatia does it extend beyond it (Fig. 77). In Africa remarkably absent east of Algeria, and confined to the Atlas mountain ranges (Fig. 79). Common throughout its range.

Introduced in the U.S.A. (Fig. 38) and a troublesome weed on rangeland in California and Pennsylvania (Hitchcock, 1951: 246). In Europe found as an adventive in Belgium, France, Germany and Switzerland (Hegi, 1908: 390; Hess et al., 1967: 382), the Netherlands (Jansen, 1951: 123), and the United Kingdom.

Ecology (Figs. 81-82): locally abundant in generally dry, somewhat disturbed habitats, such as fallow, roadsides (Fig. 81), wastelands (Fig. 82), sandy wadis (dry riverbeds), and dry rocky slopes of hills and mountains. Also present on edges of and within cultivation such as olive groves, vineyards, sugarbeet, fruit tree plantations, and cereal crops such as maize, barley and wheat (with which it may form natural hybrids, see Chapter 4.2 and at 4.2.2.3). Vegetation types include garrigue, maquis, grassland (frequently including other *Aegilops* species), shrub- and woodlands, (open) forests and scrubs, e.g., of *Acacia*, *Quercus*, *Pinus*, *Juniperus*, and of cultivated *Pistacia*, Carob (*Ceratonia siliqua*), and *Liquidambar* trees. Also found in the steppe up to the margin of the desert, but, more rarely, also in humid pastures, river terraces, and even at the seaside, apparently tolerating saline conditions. Bedrock is predominantly limestone and basalt, but shales, pillow lava, silicate, Mediterranean terra rosa, karst, schist, and sandstone are also reported. Soil texture also varies widely: often on clay- and sandy loam, (sandy) clay, and gravel; more rarely on löss, pure sands, and marly soils. *Aegilops triuncialis* can grow on very stony and rocky soils, and has been found on the side of streets and on city walls.

As a typical colonizer the species can be found in massive stands (up to many hectares) and dominate a vegetation. This holds both for more-or-less protected areas and for regularly disturbed places such as roadsides (see Fig. 81 and Chapter 6.1.4).

Together with *Ae. geniculata* this is the most widespread species of the genus and grows under a similarly wide annual rainfall amplitude, varying from 125 mm up to 1400 mm. Most data are, however, from the range 350-700 mm.

In the U.S.A. this species is locally common, and found on wastelands, in grassland and pastures, on open slopes, in yellow pine – oak woodlands, and on roadsides. Soil type indications are scarce: only 'red terraced soil', 'serpentine soil', and 'adobe soil' were mentioned on labels. The latter is an alluvial clay from desert or arid regions.

Altitude: from sea level up to 2700 m (coll. *Jury & al. 8854* from Morocco in BM, RNG), but only a few records are known from above 1900 m. In the U.S.A. present between 80 and 850 m, but data are scarce.

Flowering and fruiting time: April – July (- August in mountainous regions).

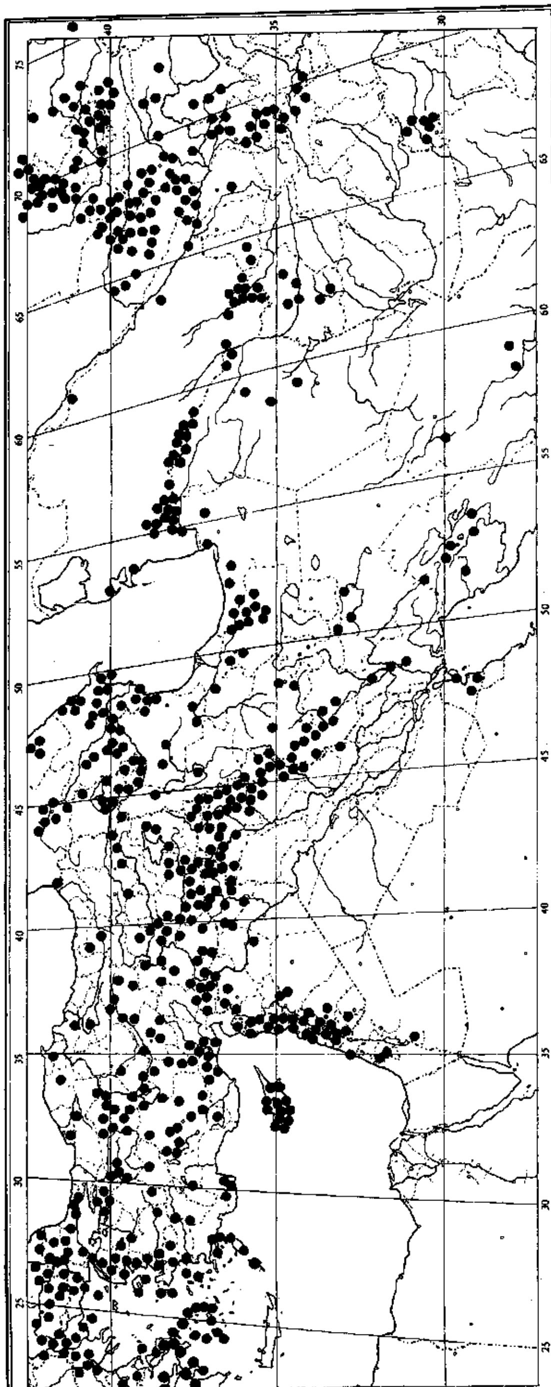

Fig. 80. Distribution of *Aegilops triuncialis* var. *triuncialis* in the eastern Mediterranean, and west and central Asia.

Varies through parts of the distribution area: April – May in Sicily (Lojacono, 1908-09: 370); April – June in Libya (Durand & Barratte, 1910: 276); May – June in Istria, Croatia (Schlechtendal et al., 1881: 221) and Italy (Gismondi, 1950: 153); May – July in Spain (del Amo y Mora 1871: 255; Sagredo, 1987: 49), Portugal (Coutinho, 1939: 117), and southern France (dept. Var, cf., Albert & Jahandiez, 1908: 561).

Genome: UC (female parent 'U' x male parent 'C') with 2x = 4n = 28 (Chennaveeraiah, 1960: 91, sub *A. triuncialis*; Waines & Barnhart, 1992: Table 2; sub *Ae. triuncialis* ssp. *triuncialis*). – Note: in his 'analyser' paper, Kihara (1954: 342, Table 3) included the genome of *Ae. persica* in *Ae. triuncialis*, correcting Senjaninova-Korczagina (1930: 455; 1932: Table 15) who treated the var. *persica* earlier as a separate species, *Ae. persica* Boiss., and who presented a different karyotype. In 1940, Kihara pointed out that karyotype analysis and genome analysis may lead to different results, but did not include *persica* under *Ae. triuncialis* in his overview of the genus (l.c., 1940: 61 and Table 12). Based on more extensive crossing experiments Waines & Barnhart (1992: 210-211) recently suggested that *Ae. umbellulata* is the female parent of the typical subspecies, while *Ae. caudata* is the female parent of the ssp. *persica* of which the genome notation then becomes 'CU' (see at 10.18b).

Vernacular names:

Albanian: Halmuca tregishtëshe [tre = three, gisht/gishtër = finger] (Demiri, 1981: 80).

Arabic: Abu sharîb [abu = father; sharîb = moustache. The name to be interpreted as 'moustache grass']. Local name from Kuwait (Bor, 1968: 192; Al-Rawi, 1987: 324; both quoting Dickson, 1955). Medadath (Muschler, 1912: 155).

Armenian: Aytzagn yermadnya [yer = three, mad = finger] (Gandilyan et al., 1975: 87).

Azeri: Uchduimeli bugdayiot [uch = three; duim = awn; compare with Turkmenian uchdumlik)] (Karjagin, 1950: 336).

Basque: Olo-soilkia [olo = oloa = oats; soilkia = a thing that falls down] (Guinea Lopez, 1949: 98). The 'thing that falls down' refers to the spike of the species, falling entirely after breaking at its base. This name is also used at generic level (see Chapter 7).

Catalonian: Blat bord [blat = bled = wheat; bord = ?], Blat de perdiu [perdiu = perdrix = partridge] (both Cadevall y Diars, 1937: 272). Also found with *Ae. geniculata* (see 10.8).

Czech: Mnohoštetnik ježatý [ježatý = with spines] (Presl, 1820: 47, sub *Ae. echinata*).

English: Barb Goatgrass (Hitchcock, 1935: 246).

French: Égilope allongé ('alongé') [= elongated *Aegilops*] (e.g., at de Lamarck & de Candolle, 1805 (reissue 1815): 79; Tenore, 1835: 288; Mutel, 1837: 154; Cosson & Germain, 1861: 853; Gillet & Magne, 1868: 505; Douin in Bonnier, 1934: 63); Froment de trois pouces [= wheat of three inches] (Acloque, 1904: 718); Égilope divariquée [= *Aegilops* (that is) divaricated / spread apart / (or that has) split off branches] (Tenore, 1835: 288, sub *Aegilops echinata*); Egilops à trois arêtes [= *Aegilops* with three awns] (Bouchard, 1977: 49).

German: Langähriges Hartgras [= long-spiked hard grass] (Heynhold, 1846: 10); Langranniger Walch [= long-awned Walch] (Schlechtendal et al., 1881: 221; Koch, 1907: 2799); Dreizölliger Walch [= three-inch Walch] (von Willdenow, 1806: 943; Hess et al., 1967: 382).

Hungarian: Három hüvelyknyi kalászbojt [három = three; hüvelyk = thumb (in the sense of its length, thus also meaning: inch); nyi = (referring to the) length of]. On label of coll. *von Degen 96* from Fiume (= Rijeka), Croatia.

Italian: Egilope a lunghe barbe [= *Aegilops* with long hair / with a beard] (Tenore, 1835: 288). Fenice di lunghe barbe [= Fenice with long hair / with a beard. Fenice probably referring to Phenice or Phoenicia, the country now more or less equivalent to Lebanon] (Bertoloni, 1834: 791). Grano selvatico sottile [= wild, thin wheat] (de Marchesetti, 1897: 656). This name appears with Bertoloni (1834: 790) under *Ae. triaristata* Req. ex Bertol. non Willd., a misapplied name for *Ae. triuncialis*. Egilope echinata (Tenore, 1835: 288; referring to *Aegilops echinata*). Cerere allungata [allungata = elongated] (Pignatti, 1982: 543).

Kurdish: Jaresk / Giya resk (on collection in K: *Al-Rawi 8461* from Asi, near Zakho, northern Iraq); Ganma jia [= wheat (which is like) barley; S. Al-Kaisi, pers. comm.] (on collection in K: *Gillett & Al-Rawi 7383* from Kifri near Kirkuk, Iraq). All local and unconfirmed names according to Bor (1968: 192). The name 'Ganma jia' is thought by Bor to be related to 'Jaganma', a name for *Ae. crassa* (see 10.6). Abu Sharîb [= moustache grass], a name from Kuwait, quoted by Bor from a book by Dickson (1955).

Fig. 81. *Aegilops triuncialis* (germplasm collection *van Slageren & al. MSPGZK-91086*, ICARDA) mixed with *Ae. tauschii* (centre and right) in a grassy roadside near Shevlan-Baba, SE Kara-Kala, Turkmenistan.

Fig. 82. Mixed growth of *Aegilops cylindrica* (germplasm collection *van Slageren & al. MSPGAP-91208*, ICARDA) and *Ae. triuncialis* (germplasm collection *van Slageren & al. MSPGAP-91209*, ICARDA) on a roadside between Angren and Sarydala, Uzbekistan.

Russian: *Aegilops* trjochdumowe [trjoch = three, duma = awn] (Kovalevskaja, 1968: 185).

Spanish (equivalent with Castilian): Rompesacos [= sack breaker = (making a) hole (in a) sack or bag] (Lázaro é Ibiza, 1906: 657; Cadevall y Diars, 1937: 272; Caballero, 1940: 613, sub *Triticum triunciale*). This name is also found with x *Aegilotriticum triticoides* (see Chapter 4.2) and with *Ae. geniculata* (see 10.8) and most probably refers to the stiff awns of the species that can pierce through cloth bags. Trigo morisco pinchudo [= sharp wheat (of the) Moors] (Caballero, 1940: 613). A name referring to the Moors, who were Arab and Berber conquerors of Spain. Egilope o avena estéril [= *Aegilops* or sterile oat] (Guinea Lopez, 1949: 98). This name is also used at genus level (see Chapter 7).

Turkish: Ak buğdaylik [ak = white; buğdaylik = wheat], Kaz otu [kaz = goose; otu = grass], Üc kulciki buğday otu [üc = three; kulciki = awn] (all from Sabanci, 1984: 1); Sakalotu [saka = beard; otu = grass] (Bischof, 1978).

Turkmenian: Uchdumlik bogdayli-tchair [uch = three, dum = a long thin object, i.c. awn] (Nikitin & Kerbabajev, 1962: 141).

Uzbek: Khasmaldokh (Kovalevskaja, 1968: 185). Also used for *Ae. crassa* (see 10.6).

Uses: Bor (1968: 192) and Al-Rawi (1987: 324), both quoting Dickson (1955), mention this species being eaten by many animals as hay during summer in Kuwait.

Etymology: the final epithet is derived from the Latin 'tri' [= three] and 'uncia' [= twelfth part of something, i.e., [the length of] one foot, thus an inch]. The epithet thus refers to 3 x 1/12 foot = 3 inch, an obvious reference to a commonly attained length of the spike.

A geographical selection of more than 2900 herbarium specimens examined:

AFRICA: ALGERIA: Mostagenem, *Balansa s.n.* (L, P); Zaccas de Miliana, *Battandier s.n.* (MPU); Constantine, *Choulette 595* (P); N Tlemcen, near Lalla Setti, *Davis 58901* (BM, E); Bouijareali, *de Barau s.n.* (P); Oran, Zédélès, *Doumergue s.n.* (LY); Tlemcen to Terny, *Faure 584* (LY-Gandoger); Terny, at Aïn Ghoraba, *Faure s.n.* (LD, MPU, Z); Saïda dept., Tiffrit, *Faurel s.n.* (MPU); Constantine, *Meyer s.n.* (FI); Teniet-el-Had, *Trabut s.n.* (MPU); Djurdjura, Aït Koufi, *Trabut s.n.* (MPU); Tlemcen to Terni, *Trabut s.n.* (MPU); prov. Algiers, Mts. of Ouaransenis, *Trabut s.n.* (MPU, P); Algiers, Frianda, *Vavilov s.n.* (WIR 1302-1310).

MOROCCO: Marrakech to Taddert at Ait Ourir, *Alexander & Kupicha 508* (BM, E, MO); Sker, N Taoumate, *Dahlgren & al. M79-38* (LD); few km S of Oukaimeden, *Davis 55471* (BM, E, MO); W Targuist, *de Wilde & Dorgelo 3030A* (WAG); SSE Rabat, valley of the Oued Akrech, *de Wilde & Dorgelo 2367* (L, WAG); N Tanouate, S part of Rif, *Dobignard 3481* (G); forest of Mamora, *Durbey s.n.* (RAB); Ras Foughal, *Faure s.n.* (MPU); above Bab Taza, El Ajmas, *Font Quer 87* (BC, BM, MPU, Z); Targuist, *Font Quer 95* (FI, MPU); Berda, *Gandoger s.n.* (L, LE, MO); Jebl Iziren, *Gandoger s.n.* (L, LE, MO); Beni Mellal, above Zaouite, Oued Bougmez, *Harley & Lancaster 10* (BM); Reraïa, Toufsirine, *Jahandiez 577* (BC, RAB); Oukaimeden, 72 km S Marrakech, *Jury & al. 8854* (BM, RNG); Temara, *Lewalle 9070* (BM); Azzou, Moyen Atlas, *Lewalle 8476* (BR); Atlas major, near Asni, *Lindberg 3680* (CAI, H, K, LD, MPU, W, type of *Aegilops triuncialis* forma *hirsuta*); Casablanca to Mazagan, *Maire s.n.* (RAB); Daya Chiker, near Taza, *Maire s.n.* (MPU, RAB); above Bab Taza, *Maire s.n.* (LE, MPU, RAB); Anti Atlas, Tifernit, *Maire & Weiller 126* (MPU); Zaiave, Talionine, *Mathez 4253* (MPU), *6903* (MPU, RAB); W Mtourzgane, *Mathez 873* (MPU); Sidi Hassine, Amelou-n-Fez, *Mathez 3057* (MPU); Haut Beth, N Tafgout, near Ifrane, *Mathez 6372* (MPU); Bordj, S Fez, *Mouret 2070* (P); Asni to Oukaimeden, *Reading Univ./BM Exp. 702* (BM, E, RNG); Rif, top of Jebl Outka, Sauvage *6549, 14858* (RAB); Tanger, *Schousbou s.n* (P); Targuist to Bab-Izugau, *Sennen & Mauricio s.n.* (BM, RAB); Taourirt – Ighil, *Trabut s.n.* (MPU).

ASIA: AFGHANISTAN: Badghis, *Aitchison 495* (A, BM, C, FI, K, LE, P); Hadjen – Durbar, *Bukinich 145* (WIR 1367, 2735); Begram near Charikar, *de B. Codrington 31* (BM); Barak distr., *Furse 6426* (K, LE, US); Kataghan prov., Baghlan, *Furse 6026* (LE); Badaghshan prov., NE Keshim, *Gentry 12819* (UCR); Balkh, W Mazar-i-Sharif to Charar Mahalla, *Grey-Wilson & Hewer 892* (E); near Maymana, *Hedge & Wendelbo 3612* (E); Jalalabad, Achinsky reg., *Kalinika & Moreva s.n.* (LE, US); road Kabul – Jalalabad, Seh-Baba to Nimla, *Kerstan 615* (German Hindukush Exp. 1935) (BM); Herat, *Köie 2275* (Danish Exp. C Asia) (BM, C), *2275b* (C), *4250* (C); Ardewan, *Köie 2255b* (C); Kabul, *Kozhenikov s.n.* (WIR); Baghlan, N Narin to Eshkamesh, *Podlech 21623* (LE); Takhar, Mughul, NW Taluqan, *Podlech 11382* (LE); Baghlan, Pul-i-Khumri, *Podlech 12804* (E, LE); Parwan prov., N Jabalussaraj to Salang pass, *Podlech 18033* (E); Salang, *Rechinger 31703* (LD, US); road Kabul – Jalalabad, Seh-Baba to Nimla, *Scheibe Sch. 69* (BM); Kataghan, Baghlan to Kunduz, *Smith 417* (UCR); Kunduz to Mazar-i-Sharif, *Smith 476* (UCR); SW Maimana, *Smith 548, 549* (UCR).

IRAN: Khorasan, Meskhed to Shakrud, *Aellen & Esfandiari 5278* (US); Mamudieh, N Tehran, *Aellen 1865, 1871, 1872, 1875, 1876, 1877, 1878, 1889, 1911, 1913* (K); Mazanderan, Evin, *Alava 10418* (E, TUR, WIR); Nosartabad, N Karaj, *Amin-Bazargan 19289* (K); Neza, N Karaj, *Andersen & Petersen 147* (C, E, K); Lorestan, W Khorramabad, *Archibald 1687* (E); 40 km Qazvin, Tlaghan Mts., *Braune & Kürschner VO2595* (TUB); Gulestan forest, E Gombad-e-Kavus, *Furse 7269* (K, LE); NE Ahwaz, *Gentry 14600* (K); Abe-e Gonji, Ahwaz to Shustar, *Gentry 14604, 14605* (UCR); Kurdestan, S Sanandai, *Grant 16030* (MO); Tabriz prov., Sofian vill., *Grossheim s.n.* (ASH, LE); Behistum Mts., E Kermanshah, *Harlan 63* (UCR); Kermanshah, Radjah – Sarabé, Eskander, *Iranshahr 10366, 10367* (K); 28 km from Mianeh, *Jacquemart 77* (BR); Sarbesha, Bakhtiari, *Koelz 14989, 14993* (US); 50 km from Khorramabad, *Köie 1045* (C, LE); 60 km from Dezful, *Köie 300* (C, LE); Sabst-Bushom Mt., near Shiraz, *Kotschy 366* (G-BOIS, LE, P); near Dalechi, Abushir (Bushire) (Bushire) to Shiraz, *Kotschy 152* (K, L); Caspian shore, rivers Chandir and Sumbar, *Michelson 788* (LE); distr. Hanikîn (Khanaqin), in Rezâb, distr. Kasr-i-Sirîn (Qasr-e-Shirin), *Nábělek 3345* (SAV); Elwend Mt., above Haidere, *Pichler*

1709 (E, LE, US); Central Elburz Mts, village Keredj, *Rechinger 227* (B), *440* (LD, NY), *537* (BM, K, LD, US); prov. Khorasan, Turbat-e Haidari, *Rechinger & al. 4324* (C, E, LD, LE, MO, US); Dasht-e-Arzhan, *Soják 5719, 5744, 5745, 5748, 5759, 5762* (PR); Azerbaijan, NE Zanján, *Soják 7575* (PR); prov. Fars, near Mián Jangal, *Soják 5113* (PR); Hamadan, Elwend Mts., *Strauss s.n.* (E, JE, LD); Azerbaijan, Seidhadzi, distr., Khvoy, *Szovitz 463* (G-BOIS, LE, NY, P); Tehran, Karaj, Eshtehard, Kuk Djarou, *Termé 10335E* (K); Tehran, *von Bunge 2* (G-BOIS, K, LE, P); lake Urumiyeh, Espire island, *Wendelbo & al. 12009* (LE); Khuzestan, N Ahwaz, *Wendelbo 15* (E); Lorestan, S Bagh-i-Sarab, *Wright 418/207* (LE).

IRAQ: Khanzad pass, Arbil to Salahuddin, *Agnew & al. s.n.* (A, BUA, C, CAI, E, F, LE, MO, NY, RNG, US); SE Zurbatiya, *Al-Kaisi & Al-Khayat 50636* (K); N Suara Tuka, *Al-Khayat & al. 51001* (K); Balcha, W Tawela, *Al-Rawi 21854* (K); Mosul, Aqra, *Al-Rawi 11457* (K); N Kirkuk to Koi Sanjaq, *Al-Rawi & al. 27990* (K); Chena Rash, NE Ranya, *Al-Rawi & al. 28455* (K); Khantur Mt., NE Zakho, *Al-Rawi 23285, 25253* (K); Mela Kowa, on Sulaymaniyah – Penjwin road, *Al-Rawi 22445* (K); E Tawela, *Al-Rawi 22376* (K); Tasluga, *Al-Rawi 22760* (K); Kirkuk, at Altunköpri, *Barkley & al. 1446* (US); at Kirkuk, *Bornmüller 1695* (JE, K), *1899b* (B, BR, JE, K), *1900* (B, JE, K, type of *Aegilops triuncialis* var. *assyriaca*), *1903* (B, type of *Aegilops triuncialis* var. *assyriaca*); Kurdistan, Erbil reg., Kuh-Sefin Mt., Shaqlawa, *Bornmüller 1899* (G, JE, LE, US, W, Z, type of *Aegilops triuncialis* var. *assyriaca*); desert near Kirkuk, *Bornmüller 1897* (JE); Sersang, WSW Amadiyah to Dahuk, *Bot. Exp. Univ. Kyoto BMUK 6-16-7-Q, 6-16-7-U* (K), *6-16-7-R* (US); Suara Tuka, before Ispindari, *Chapman 26360* (K); N Mirowa pass, *Gillett 8342* (K); Kirkuk, Kifri, *Gillett & Al-Rawi 7382, 7383, 7385* (K); Mosul, Jebl Makhul, near Ain Dibs, *Gillett & Al-Rawi 7209, 7210* (K); Gwaija Dagh, *Gillett & Al-Rawi 11695* (K, US); Kursi, Jebl Sinjar, *Gillett 10895* (K); Jarmo, south facing slope and wadi, *Helbaek 1029, 1046, 1048* (K); Hafna, S Mosul, *Hossain & Soofaji 141* (C); Dahuk, *Loza 3378* (K); distr. Sérizor, Dêr Harîr to Baba Gigik (Arbil – Rawandiz), *Nábělek 3143a* (SAV); Assyria, Mâr Jakub, near Simel (Summel), distr. Mosul, *Nábělek 3394* (SAV); Sersang, WSW Amadiyah to Dahuk, *Omar 37693* (C, K); Qaranjir, 30 km W Kirkuk, *Rechinger 10024* (E); 37 km E Kirkuk, *Rechinger 10047* (G, K); W Salahuddin, *Springfield 66, 67, 69* (K); Gopala, near Taynal, Sulaymaniyah – Kirkuk, *Thorpe 33163* (MO), *33164* (WAG), *33165* (K, US); Sersang, WSW Amadiyah to Dahuk, *Wheeler Haines W1708* (E, K), *W1709* (E, K, LE); Diyala, *Wheeler Haines W1640* (K).

KAZAKHSTAN: Syr-Darya, Chimkent, Chakpak Mt., *Aristandy & al. 47a* (TASH); Karatau Mts., Auli-Atinsk, Bek-Kara river, *Drobow 177* (TASH); Zailiski-Alatau, Suaima canyon, *Goloskokov s.n.* (LE); Chimkent, Sari-Agatch, *Jarmolenko 75* (LE); Chimkent reg., Uzun-Bulak, *Knorring 80* (LE); Auli-Ata, canyon Bir-Kara, *Knorring 256, 318* (LE); Syr-Darya, Auli-Ata, *Korshinsky 81* (LE); Chimkent, Beklar-Bek, *Lipsky 894* (LE); Kara-Gelitch-Tau, *Massagetov 9-103* (LE); Karatau, Vanovskoye vill., *Pavlov 126* (LE); Kara-Tau, river Pjanch, *Tichenko & Ferchau 730* (TASH); Tian Shan, Kazykurt, Chimkent distr., Turbat, *Vašák s.n.* (BR); Kulotchek, Karatau, *von Regel 257* (LE).

KYRGYZSTAN: Osh reg., Ala-Bukha, near Chekafter, *Bukeeva s.n.* (LE); near Kizyl-Kia, *Fedossejew s.n.* (LE); Kirgisky Mts., canyon Almali-Sai, *Goloskokov s.n.* (LE); Rangan-Tau, Kok-Tash to Dagana-Keek, *Grannitov 27* (LE); Konstantinovsk to Akdhzar, *Lipsky 430* (LE); Dzhalal-Abad reg., river Aslan-Bab, *Mareeva s.n.* (LE); C Tian Shan, Verchne-Talski reg., Itchkele-Tau Mt., *Sovietkina & Uspenskaja 74* (TASH); Dzhalal-Abad reg., canyon near Djangi-Dzhal, *Tzvelev s.n.* (LE).

KUWAIT: Sobiyah, *Al-Rawi & El Kholy 12297* (CAI); Al Khiran, *Al-Rawi 11673* (US); Az Zor escarpment, *Maksad 263* (CAI).

LEBANON: Rachaya, *Aaronsohn s.n.* (WIR 1346); Jebl Liban, Aïn Zehalteh, *Ball 2258* (E); Tripoli to Hama, at Katat el Hossein, *Blanche 3941* (JE); Beirut, Bou Dikhan to Rumpat, *Blanche s.n.* (BEI); Kfar Zubian, *Edgecombe A-1467* (BEI); Alamuddin estate, Jezzine to Nabatiyeh, *Edgecombe B-586(1)* (BEI); Damascus to Saïda (Sidon) at Boghaz Yauttra, *Gaillardot 510* (G-BOIS, P); Zahlé, *Gombault 987* (P); Brummana, *Leatherdale 19* (BM); Deir el Ahmar to Yamouni, *Letourneux s.n.* (P); Dhour Choueir, *Mouterde 11902* (G); Tell Amara, Rayak, *Pabot s.n.* (G); Antilebanon, La Citerne (= Masna'a), *Peyron 53927* (P); Beirut, *Post s.n.* (E, NY); Ain el Hasamiyah, *Post 612* (BEI); above Beirut, Mronj, *Samuelsson 5674* (BM, K); Baita, near Mayrouba, *Samuelsson 2062* (BM, K, MO, NY).

PALESTINE: Jerusalem, *Johnston 2005* (K); Kubab, *Meyers & Dinsmore 1253b* (WIR 1357); castle of Subebeh, *Meyers & Dinsmore G1801* (K), *724b* (L).

PAKISTAN: Baluchistan, Hanna valley, Urak, *Jafri & Akbar 1660* (C); Baluchistan, *Stock 986* (G-BOIS).

PAKISTAN/INDIA/CHINA: Himalaya, *Griffith 6698* (K, LE), *6699* (W).

SYRIA: May Saloun, 30 km W Damascus, *Barkoudah & Sanadiki s.n.* (ACSAD); Wadi El Azib, 90 km E Salamie, *Batikah s.n.* (ACSAD 3462); Qalaat el Hosn, near Homs, *Blanche 3941* (G-BOIS); Hama, Jebl Abiad, *Blanche 3942* (P); Bludan, *Dinsmore 12975* (K); Qatna, *Fre. Louis s.n.* (hb. Gombault 6297) (P); near Bir-Gharan ruins, *Handel-Mazetti 1745* (W); E Banias, *Meyers & Dinsmore 1801* (E, type of *Aegilops triuncialis* var. *pubispica*); S Deirik, *Mouterde P496/196* (G); Massaade, near Quneitra, *Pabot s.n.(352)* (G, Min.Agr.Syr.); Deir-ez-Zor to Hassake, *Post s.n.(5210)* (Min.Agr.Syr.); Wadi Er Radd to Tell Aalo, *Pabot s.n.* (G); Mt. Sis, Hamad, 60 km E Damascus, *Sanadiki s.n.* (ACSAD 769); Damascus, before Maddaya towards Zabadani, *van Slageren & al. MSGMKO-88111H* (ICARDA, U, WAG); Sweida, Raha to El-Kafer, *van Slageren & Mir-Ali MSGM-88101H* (ICARDA, WAG); Hassake, N Jebl Abd-el-Aziz, coming from Tall Tamr, *van Slageren & Sweid MSFS-91028H* (ICARDA); E Khatouniye, 35 km E Qamishly, *van Slageren & Sweid MSFS-91040H* (ICARDA); NE Malkiye to Ain Diwar, *van Slageren & Sweid MSFS-91046H* (ICARDA).

TAJIKISTAN: Mt. Chodza-mumin, *Czukavina & Czevtaeva s.n.* (ERE, NY, SOM, TASH); Pamir-Alai, N Rangan-Tau Mt., S Bursha, *Demorina 49, 102, 158* (TASH); Zeravchan Mts., Ak-Kutal, *Drobow 391* (TASH); Baysun reg., near Vardob, *Fedtschenko & al. 498* (LE); SE Gissar, *Gnezdillo 25* (TASH); Babatag Mts., valley of Kafirnigan, *Gomolitski & Fedorov 367* (LE); Gissar, Chanaka and Karatak-Darya rivers, *Kudrjachev 514* (TASH); W Pamir-Alai, near Pistali in Tachta Karacha Mts., *Pjataeva & Abdullaev 294* (TASH); W Alai, near Wuadil, *Shonazarov 520* (TASH); SE Gissar, near Kizilin, *Slovenski 1210* (TASH); Ayni to Shakhristan, *van Slageren & al. MSPGAP-91180H* (ICARDA); Tian-Shan, Dushanbe, Perzardolu to Nurek, *von Meyer 14618* (JE); Pamir, 20 km E Dushanbe, near Fakhrabat, *Vašák s.n.* (BR, G).

TURKEY: Aksehir, Sultan Daglari, Tekke Yolu, *Akman 13870* (ANK); Ankara, Sivrihisar, *Akman 13018* (ANK); Denizli, Pamukkale, *Alava & Bocquet 5285* (E); Gaziantep, Keysun, *Balls B2345* (K); Ankara, Beypazari, Aladag, *Baytop 929* (ANK); Sarayönu, 66 km Güneyinde, *Birand & Zohary 2351* (ANK); Anatolia, Amasya, *Bornmüller 464* (JE, LE, SO), *464b* (BM), *470* (E, K); Ankara (Galatia), valley of Kawakli-Dere, *Bornmüller 14747* (A, BM, K, LD, LE, P, PR, W, Z); Çankiri, valley of Cakmakli dere, *Bornmüller 14735* (A, LE, Z), *14744* (A, BM, E, K, LD, LE, PR, US, W, Z); Lycia, Elmalu, *Bourgeau 278* (C, G-BOIS, K, LY-Gandoger, LY-Jordan, P); Diyarbakir, Meriner, *Brown 2549* (K); Melikhanli, Islahiye, *Brown 268* (K); Muğla, N Marmaris, *Carlström 11270, 11357, 12319* (LD); Altalya, Side, *Casey 1776* (K); Sartavul gedici, Anakaya, Kalker, *Cetik 3701* (ANK); Altinova, Devlet üretme, Ciftligi, *Cetik 24* (ANK); Siirt, W Bekirhan, *Cheese ACW1140* (K); Istanbul region, *Clementi s.n.* (BM, E, FI, G-BOIS, K, LE, LY-Gandoger, LY-Jordan, OXF, P, PI, TO); Ankara to Çankiri, *Coode & Jones 2134A* (E); Mardin, Gerçüş to Hasankeyf, *Davis 43046* (E, ERE, K, SOM, US); Niğde, Hasan Dag, Taspinar Yayla, *Davis & Cetik 18800* (ANK), *18880* (BM, E, K); Van, Erçek lake, *Davis 44266* (E, K); S Diyarbakir, *Davis & Hedge 28752* (BM, C, E, K); Elâziğ – Hasar Gol, *Davis & Polunin 22094* (ANK, BM, E, K); Gaziantep, Nisib – Bireçik, near Euphrates, *Davis & Hedge 27961* (ANK, BM, C, E, K); 8 km from Mardin to Nusaybin, *Davis & Hedge 28509* (ANK, BM, E, K); Mardin, Savur, *Davis & Hedge 28555* (ANK, BM, E, K); Seyhan (Adana), distr. Feke, Sencan Dere, Gurumze to Suphan dere, *Davis & al. 19596* (ANK, BM, E, K), *19426* (ANK, E); Konya, Yavsan Memlehasi, near Tuz Gölü, *Davis & Dodds 18714* (BM, E, K); Karabuk – Safranbolu, *Demirörs 1459* (ANK); Konya, SW Alibey, Hüyügü, *de Wit 36* (WAG); Konya, Ermenek, *Doğan 119, 125* (E); Yarmanarlar, *Dudley 34899* (K); Yozgat, Akdagmadeni, *Ekim & Düzenli 5471* (ANK); Eskişehir, Türkmen dagi, *Ekim 2221* (ANK); Elâziğ, Haroglu dagi, *Evren 112* (ANK); Ankara, Incesu Derezi, *Gassner 467* (ANK); 40 km S Ankara, Ahiboz valley, *Godfrey 516* (US); Hakkari, Zap gorge, *Harlan 7883* (K, US); Elâziğ, Karakocan Deresi, *Harlan 8000* (K); near Edirne, *Harlan 2647* (K); S Çanakkale, *Harlan 2935* (K, UCR); Babaeski, Kirklareli, *Harlan 2634* (UCR); Bireçik to Urfa, *Haussknecht 490* (JE); Küçük Köy, *Helbaek 2591* (C, K); S Maden, Elâziğ to Ergani, *Hennipman & al. 1523* (ANK, K, L, U, WAG); SW Ahlat, *Johnson & Hall s.n.* (UCR); Ankara, Baraj Yolu, *Kasapligil s.n.* (MO); Taurus Mts., *Kotschy 543* (LY-Gandoger, P), *545* (E, K, LE, LY-Gandoger, PR); Yenişehir, *Kotte 219* (ANK, K); Nevşehir, Kirşehir to Gulşehir, *McNeill 379A* (E, K); Urfa, Samsat, Cümcüme, *Miller 878* (K, MO); Chalki island, *Murmann s.n. (117?)* (G, G-BOIS, type of *Aegilops triuncialis* var. *constantinopolitana*); Shandûk, Hasankeyf to Siirt at the Tigris, *Nábělek 3367* (SAV); Istanbul region, *Noë 162* (BM, BR, MO, P, Z); Burdur, Yeşilova to Acipayam, bank of Salda Gölü, *Nydegger 16208* (G); Bitlis, Totvan, near lake Van, *Peşmen 3115* (ANK, HUB); Sazova, Eskişehir, Pursek Tchai, *Scheibe 1268* (JE); Egin, Szanduk, *Sintenis 2646* (JE, K, LE, P); Çanakkale, Dardanelles, in Rhodi valley, *Sintenis 907* (BM, E, K, LD, LE, P); Hekimhan – Malatya, *Stainton & Henderson 5451* (E, K, US); Anatolia, Hafis Pascha, *Tengwall 285b* (LD), *725* (A, K), *757* (K); Sinop, Osmancik to Kargi, *Tobey 2674* (E); Zonguldak, Safranbolu, *Tobey 1937* (E); Balikesir, S Balya, *Tüten & al. CNM-210689-0801* (ICARDA, IZ); E Bursa, *Tüten & al. CNM-230689-0104* (ICARDA, IZ); Mardin, Derek'ter to Mazidag, *van der Maesen 2094* (ANK); Konya, Karaman, Agacyurdu, *Vural 1631* (ANK); Antalya, Gülük Dag, Termessos, *Wängsjö 2683* (LD); Anatolia, Amasya, *Wiedemann 10* (K); Erzincan, Nig, Yakuplu köyü, *Yildirimli 1873* (ANK, HUB); Maraş, Süleymanli, Avçilark, *Yildiz 2644* (HUB); Adana, Karsanti, Menengicli, *Yurdakul 2* (ANK); Lydia, Aiaslug, *Zhukovsky s.n.* (WIR 1325, 1370-1371, 2732); Efes valley, Zhukovsky *461* (WIR 1324); Çankaya, *Zhukovsky s.n.* (WIR 1318-1321); Lydia, Boz-Dagh, *Zhukovsky s.n.* (WIR 1328, type of *Aegilops triuncialis* ssp. *caput-medusae*); Cijteler, Aralik, *Zohary 3299* (ANK).

TURKMENISTAN: Badghis, Dash-Kuyu reg., *Acherova s.n.* (ASH); Kishi, near Ashkhabad, *Alexandrov s.n.* (ASH); Krasnovodsk, *Androssov 6* (ASH, TASH); W Kirki-Chi, *Ataeva s.n.* (ASH); Badghis, Tegelek-Kera valley, *Basilevskaya 206* (ASH); Karabil, Tek-Tek, *Beljalov & Seifulin s.n.* (ASH); Kugitangh Mt., NW Karlyuk, *Berdyev s.n.* (ASH); Karabil, SE Tarakchek, *Berdyev s.n.* (ASH); Kopet Dag, Sumbar, before Deine to Kaine-Karissa, *Bogdanovitch 112* (TASH); Jori, *Capus 1412* (P); Tachta-Bazar, 30 km E Kushka, Kara-Chop, *Chepanov & Ataeva s.n.* (ASH); Kopet Dag, near Ashkhabad, Firjuza, *Czernjakovskaja 5334b* (A, BM, C, E, ERE, G, K, MO, NY, SOM, US); Karakum desert, S border, Jura-Karakil, *Dubjansky & Basilevskaya s.n.* (ASH); Gasodarevo, near Tash-Kepri, *Klingen 1191* (ASH); Zakaspi reg., Serachsa, *Korovin 713* (TASH); Bacharden, W Saiwan-Chechsme, *Kurbandurdeev s.n.* (ASH); Badghis, plain Chor-Sefit, Kushki, Margunov, *Linczevski 535* (TASH); Badghis, Er-Oilan-Duz, near Tchai-Nuri, *Linczevski 1097* (TASH); near Ashkhabad, *Lipsky 649* (FI, US); near Ashkhabad, *Litwinov 216* (A, E, JE, P), *216a* (LY, P), *2295* (K, US); Ashkhabad reg., Keshi, *Michelson s.n.* (ASH); prov. Krasnovodsk, *Michelson 3753* (A, NY); E Kushka, *Michelson 563* (ASH); Sugeta Mt. in Kopet Dag Mts., *Micherjakov s.n.* (ASH); Chalayuk, Gazan-Kuli, *Nardina s.n.* (ASH); Ashkhabad reg., E Komarovskogo, *Nikitin & Zhilenko s.n.* (GAT, LD, MO, WIR); Serach reg., Gjaz-Gjadigi Mt., E Rachnatur, *Orazmuchommedov & Timochenko s.n.* (ASH); Tachta-Bazar reg., near Yachbil, *Petrov 149* (ASH); river Murgab, opp. Tachta-Bazar, *Petrov 137* (ASH); Kopet Dag, near Firyuza, *Popov 683* (TASH); Badghis, pass of Rach-Natur, *Seifulin & al. s.n.* (ASH); Kopet Dag, Al Checkli, *Sernukhova s.n.* (WIR, US); Kizyl Arvat, Kara-Kala, Sundosagh Mt., *Sintenis 1870* (JE, LD); Kisil Arvat, *Sintenis 1640* (LD); Ashkhabad, Mekrowa, *Sintenis 2234* (LD, Z); Chodjent reg., *Sovietkina 246* (TASH); Zakaspi reg., lake Oilan, *Travena s.n.* (TASH); NE Kara-Kala to Shevlan-Baba, *van Slageren & al. MSPGZK-91082H* (ICARDA); S Kara-Kala to Yarti-Kala, *van Slageren & al. MSPGZK-91092H, 91098H* (ICARDA); Kara-Kala reg., near Seiwan, *van Slageren & al. MSPGZK-91130H* (ICARDA); Kjuren Dag reg., *Vatoskina s.n.* (ASH); Kara-Kala, Iol-Dere canyon, *Uljanova s.n.* (TASH, WIR).

UZBEKISTAN: Keles river, near Kaplanbek, *Abolin 7609* (TASH); Fergana, S Tashkumer, *Arifkhanova & Gringov 798* (TASH); Tchatkalsk Mts., E Mirzaka, *Arifkhanova 344* (TASH); Gani to Sudjurif, *Babajeva 209* (TASH); Rosh Kurand, *Babajeva 208* (TASH); Rash-Kurgan, *Babajeva 207* (TASH); Chadzhent reg., Galodna steppe, Sparski, *Bodugoski 334* (LE); Syr-Darya, Balsik-Sai, *Borodin & Kallistow 4* (LE); Angren river, Turk, *Borodin & Kallistow s.n.* (LE); Baysun to Dennau, Chodja-Ipak, *Botschantzev & Vvedensky 131, 142, 216* (TASH); Dzhizak, *Capus 1413* (P); Jang, Kourgane (= Yangikurgan), *Capus 1414* (P); Nuratin Mts., near Chasma Mt., *Chaidarov 1710* (TASH); Samarkand, Galodna steppe, Sretienski vill., *Dimo & al. 581* (LE, TASH); Zeravchan, near Ak-Kutan, *Drobow 391* (LE); Syr-Darya, river Chirchika, near Kuplik, *Drobow s.n.* (TASH); between Zamin and Zanzur rivers, Turkmen-Sai, *Emme 54* (LE); Zeravchan valley, Oalik, *Fedtschenko s.n.* (LE); Angren river, Oktoberskaja, Urazajavka to Chanabad, *Gomolitski 144* (LE, TASH), *158* (LE); Angren river, Kurama Mt., before Kulata, *Grannitov 198* (TASH); river Wachsh, before Kugan-Tjube, *Grannitov 84* (TASH); Nuratin, spring Uzun-Kuduk, *Hajdarav 1434* (TASH); Kazanshik reg., Iskander, *Ishenko & Kosova s.n.* (ASH); Mailisashk reg., Baim Nitchko, *Joffe 485* (TASH); E Kugitangh Mt., Sherabad, SE Lailak, *Kajumov & Vvedensky s.n.* (TASH); Katakurgan reg., near Zeravchan river, *Kalshnikova 81* (LE); Chadzhen reg., Airi, *Knorring 128* (LE); Dzhizak reg., Koi-Tash, near Bag-Dan, *Knorring s.n.* (LE); Andizhan, Charzid-Ajub spring, *Knorring & Minkwitz 83* (LE); Fergana Mts., Gawa vill., *Krilsova 270* (TASH); Chobdun-Tau to Karacha-Tau, sta. Kropotkina, *Kudrjachev s.n.* (TASH); Bukhara, Kungur-Tau, *Kultiasow s.n.* (TASH); Kuduna Kursin, near Tashkent, *Kultiasow 475* (TASH); Bukhara, near Bishkent, *Kultiasow s.n.* (TASH); Sherabad, Darya plain, *Lepeshkin s.n.* (TASH); Dalversin steppe, *Lepeshkin s.n.* (TASH); Baysun reg., Kish, Chudaydad, *Lepeshkin s.n.* (TASH); NE Bek-Budi, Kungurtak Mt., near Samarkand, *Linczevski 126* (TASH); Tashkent reg., Agdhar to Charab-Chana, *Lipsky 461* (LE); Bukhara, Shachrecheps, Yangi-Keshlak, *lipsky 2789* (LE); Andizhan reg., Chervak, *Litvinov s.n.* (LE); near Tashkent at Syr-Darya, *Michelson 38* (A, LE); N side Zeravchan Mts., Urgut, *Michelson 2011* (LE); Bukhara reg., Dennau, Gissar Mts., Sangardak canyon, *Michelson 1756, 2787* (LE); Kokand, Yulkul in canyon Katran, *Minkwitz 638* (LE); near Tashkent, Dzhilga to Akdzhar, on Chimkent road, *Minkwitz 419* (ERE, LE); near Chumsan, Ugam river, *Nakanitchni 4* (TASH); Fjetalik vill., *Narzikulov s.n.* (TASH); Bukhara, Karski distr., Kashka-Darya, guzar, *Nechaeva s.n.* (LE); prov. Fergana, Gultsha, *Paulsen 377* (C); Tchiligaz vill., to Uda-Cherbak, *Pjataeva 324* (TASH); near Tchiligaz, river Kata-Uru, *Pjataeva 479* (TASH); Bukhara, Guzar to Gombolak, Kosh-Losh, *Popov 457* (LE); Samarkand, Mogol-Tau, before Ak Tash-Bulak, *Popov 811a* (TASH); W Tian Shan, Boz-Su canal near Tashkent, *Popov & Vvedensky 543* (BC, BR, C, E, K, LE, MO, NY, P, TASH, W); Kattakurgan, *Popov 357* (TASH); Mogul-Tau, near Mamoran-Sai, *Popov 736* (LE); Bel-Tau Mts., near Ak-Kuduka, *Popova 250* (TASH); Tashkent reg., Bostanlik, river Ugat, *Pratov 798* (LE); W Alai, Kashka-Darya, Samarkand, near Chechme, *Priachin s.n.* (LE); Kaplanbek, near Tashkent, *Radkewicz s.n.* (PR); Bukhara, Tiroka, *Roshevitz 697* (LD); W Namangan, Kok-Kulat, *Roshevitz 334* (TASH); Nuratau, Gatcha-Sai, *Saprochetova & Nikerov 120* (LE); Samarkand, Goloduja, *Spiridenov 81* (GAT, LE); Kyzilkum desert, Dzhizak reg., Baybak-Koktash to Pesok, *Spiridonov s.n.* (LE); Tashkent, Ulitsa Abdulla Tukayeva, *Townsend 69/220* (K, US); N Pungan on S side of Kuraminsky Mts., *van Slageren & al. MSPGAP-91203H* (ICARDA); Tian Shan, Chatkalski Mts., E Gazalkent, *Vašák s.n.* (BR, G); Angren, Kaykan-Ata, Ummati, *Virnik & al. 71* (LE); Dzhizak to Yang-Kurgan, *von Regel s.n.* (LE); Chul-Baier Mts., before Sina, *Vvedensky 78* (TASH); Angren, Kuraminski Mts., near Kulaida, *Yapronov 198* (LE); Fergana plain, near Naiman, *Zapruzinsky 503* (TASH).

EUROPE: ALBANIA: near Ersekë, *Alston & Sandwith 1984* (BM, K); Borsh, at Lumi Borskit, *Meyer 3057* (JE); Dajti Mt., near Tirana, *Hruby & al. s.n.* (PRC).

ARMENIA: Goris, Taski pass, *Arefshatian & al. s.n.* (ERE); Goris to Zangezur, *Arutyunyan s.n.* (ERE); Ararat reg., Urtzazor, *Arutyunyan s.n.* (ERE, YAI); Vaik reg., after Dzjermuk, *Arutyunyan s.n.* (ERE); Vaik to Sisian, *Arutyunyan s.n.* (ERE); Erevan, Isitsemakabert, *Arutyunyan s.n.* (YAI); Megri reg., Vakravar to Godemnis, *Aslanian s.n.* (ERE); Vokhtchabert to Chorbulak, *Avakjan 236* (LE); Yekhegnadzor reg., Shatin to Getap, *Avetissjan s.n.* (ERE); Artachats reg., Garni to Zowachen, *Avetissjan & Manakian s.n.* (ERE); Erevan, near Avdalar, *Fedorov s.n.* (ERE); Kaphan reg., Shikagog, *Gabrieljan s.n.* (ERE); Abovyan reg., Vokhchabert and Shorpulagh, *Gabrieljan & Avetissjan s.n.* (ERE); canyon Rasdan river, *Gabrieljan s.n.* (ERE); Ashtarak reg., Udzhan, near Aragats Mt., *Gabrieljan s.n.* (ERE); Vedi reg., Armash, *Gabrieljan s.n.* (ERE); Erevan, Nork, Gedar river valley, *Gabrieljan & Avetissjan s.n.* (ERE); Noyemberanski reg., Kochb, *Gandilyan s.n.* (ERE); Sisian reg., Charab, *Gandilyan & Arutyunyan s.n.* (ERE); Chanachlar, Airum reg., *Kolenati 1450* (LE); Vedi reg., Korovan, *Manakian s.n.* (ERE); Erevan to Dzyrbys, *Schmiedeknecht s.n.* (GAT); Sarai-Bulag, *Shelkownikow 11943* (ERE, LE); Tovuz, *Takhtajan s.n.* (ERE); Erevan, Djzabadlu, *Tamamschjan & Araratian s.n.* (ERE). NAGORNO-KARABACH: Aydzhabedi to Martuni, *Beideman s.n.* (LE); Shusha region, Dig to Zabu, *Flaksberger s.n.* (WIR 1375, 1376); Akera river valley, *Lavelus s.n.* (LE); Stepanakert to Shusha, *Lovelius s.n.* (LE); Gadrut, Domme, *Smoljaninova s.n.* (LE); Aladzhimski sta., *Vvedensky 16* (LE).

AZERBAIJAN: Kuba, Diviczi, *Alexeenko 1007* (LE); river Pirsagat, near Chaii, *Alexeenko s.n.* (LE); Shemakha, Sharodilskaja, *Alexeenko s.n.* (LE); Marazin reg., Gengizhevar, *Aliev s.n.* (LE); Geokczai, Arab, *Barkovskaya 12* (LE); Baku, *Becker 358* (LE); Adzhikent to Achsu, *Beideman s.n.* (LE); Zuvant distr., near Kosmaljan, Sigarafa Mt., *Grossheim s.n.* (MO); Gei-Tchai, *Grossheim s.n.* (ERE); Kjurdamir, Karagayli to Padar, *Grossheim s.n.* (E); Kuba, *Firsov 79* (WIR 1452); Talysh, Lerik, *Fedorov s.n.* (ERE); Gibreel reg., Chodoferinsk, *Grossheim & al. s.n.* (LE); Lenkoran, *Hohenacker 137* (LE); Baku, Sikh, *Holmberg 462* (LD), *463* (K, LD, W); Baku, Sangatchal, *Holmberg 539* (LD); Shirvan steppe, Kara-Tchala, *Jaroschenko s.n.* (LE); Mugan steppe, *Levandovski s.n.* (LE); Lenkoran, near Orand, *Mateeva 480* (ERE, LE); Geokczai reg., Karamarjan, *Menitzky s.n.* (LE); Lerik, Wolchi-Worota, *Menitzky & Popova s.n.* (LE); Shemakha, Tchai Dag and Zagyr Dag, *Sachokia s.n.* (LE); Gorodis and Koriagino, *Safonov s.n.* (LE); Aresh, *Shelkownikow s.n.* (ERE); Sari island in Caspian sea, *von Radde 493* (LE); Elisabethpolis (= Kirovabad), reg. Karjagin, Chajtmas and Kigris, *Vvedensky 13* (LE); Naftalan, *Zacharieva s.n.* (IIPGR). NAKHICHEVAN: Ordubad reg., Kjotam, *Arutyunyan s.n.* (ERE); city

Nakhichevan, *Gabrieljan & Avetissjan s.n.* (ERE); Ara to Dosti, *Grossheim s.n.* (ERE); distr. Norachen, Jaidshi, *Grossheim & al. 3653* (A, BM, C, E, ERE, L, LE, MO, NY, SOM, US); Aznaburt, *Jakubziner s.n.* (WIR 28266); Sari-Agl, *Jakubziner s.n.* (WIR 30233-30234); Dagri vill., *Takhtajan s.n.* (ERE); Norachen reg., Mt. Daralagjaz, Karabaglar, *Tzvelev & Chepanov 191* (LE); Ordubad and Agulis, *Woronow 14282* (LE); Djulfa reg., *Yegorova & al. 690* (LE).

BOSNIA and HERCEGOVINA: valley of Narenta, near Buna, *Fischer s.n.* (L); Žitomišlić, *Murbeck s.n.* (LD); Mostar, bank of Narenta, *Raap 164* (C, JE, K, LD, LE, P, PRC, US, Z); Zitomislic, valley of Narenta, near Buna, *Sagorski s.n.* (JE, LY-Gandoger); Trebinjcice to Pridvorci, *Vandas s.n.* (PR). BOSNIA and HERCEGOVINA (- MONTENEGRO): Suttorina, *Adamović 250* (W).

BULGARIA: distr. Kjustendil, *Achtarov 408* (SOM); Stara Zagora, *Achtarov s.n.* (SOM); near Kurjali, *Cheshmedjiev s.n.* (SOA); Dupnitza, *Davidov s.n.* (SOM); Petric, *Delipavlov s.n.* (SOA); near Topolovgrad, *Delipavlov s.n.* (SOA); Ahtopol, near Veleka river, *Delipavlov s.n.* (SOA); near Sozopol, *Delipavlov s.n.* (SOA); Paril, near Bladgoevgrad, *Delipavlov & al. s.n.* (SOA); Borislavtzi, near Khaskovo, *Delipavlov s.n.* (SOA); Popolovo, *Delipavlov s.n.* (SOA); Merek, near Svilengrad, *Delipavlov s.n.* (SOA); Malka Poljana, near Ajtos, *Delipavlov s.n.* (SOA); Zurichene, near Petric, *Delipavlov s.n.* (SOA); Levka to Kustur, *Jordanov s.n.* (SO); Mandritza, near Ivajlovgrad, *Jordanov & Janev s.n.* (SO); Boz-Dagh, near Plevnja, *Kitanov s.n.* (SO); Socolane, near Momcilgrad, *Kožuharov 2134* (SOM); Struma valley, Chotovo near Melnik, *Manitz & Marstaller s.n.* (JE); Asenovgrad, Cala valley to Kuzu-dere, *Meyer 10089* (JE); Tuslata to Balcik, *Meyer 523d* (JE); Galata, S of Varna, *Meyer 448* (GAT cult, JE); Burgas, near Gramatikovo, *Penev s.n.* (SO); Plovdiv, *Sinjaev 225* (LE); Pirin Mts., Paril, *Stojanov s.n.* (SO); Sofia, between Banki and Divotinski monastery, *Stojanov & al. s.n.* (LE, SOM); near Zlatograd, *Stojanov & al. s.n.* (SOM); Turnevo to Sumen, *Stríbrný s.n.* (SOM); Nova Mahala, *Stríbrný s.n.* (SO, SOM); near Yakoruda, *van Slageren & al. MSMZNN-90249H* (ICARDA, IIPGR); Loznitza, near Goce Delcev, *Velchev & al. s.n.* (SOM); Sturkovo, near Pazardjik, *Vihodcevsky s.n.* (SO); Sofia, near Ljulin, *Vihodcevsky 780* (BM, C, L, LE); Družba, near Varna, *Wagenitz 2320* (LD, WIR); Bedenski Bali, *Zacharieva s.n.* (IIPGR); Zvezdets, *Zacharieva s.n.* (IIPGR).

CROATIA, DALMATIA: Lapad peninsula, Gravosa, *Baenitz 10051* (LD, LY-Gandoger, SO), *s.n.* (BM, LE, OXF, US, Z); St. Sergio, near Dubrovnik, *Čelakovský s.n.* (PRC); Selve island, *de Marchesetti s.n.* (FI); Zelenika, *Kjellberg s.n.* (LD); Split, near Kiste castle, *McCallum-Webster 4073* (K); near Krk, E Sibenik, *Oberwinkler 8375* (TUB); Dubrovnik (= Ragusa), *Pichler s.n.* (A, BM, BR, JE, LD, LY, K, MO, PR, PRC); Brioni island, *Ronniger s.n.* (W); Rijeka, Martinsčica, *Rossi 6046* (BC, ERE, GE, JE, L, LY-Gandoger, PRC, SO, W, type of *Aegilops croatica*; also LY, LY-Gandoger, voucher of *Aegilops ovata* Gand. non L.), *s.n.* (BM, JE, K, LY-Gandoger, P, TO, W); ibid., *von Degen 96* (A, BM, JE, K, LE, LY, US); Lapad peninsula, Gravosa, *Sagorski s.n.* (JE). ISTRIA: Zapana island, *Ascherson s.n.* (JE); Servola, *Braun s.n.* (P); Parenzo, *de Marchesetti s.n.* (PI-GUAD, PRC, TO, W); Pola, *Freyn s.n.* (JE, LD, PR); near Poreč, *Geissler s.n.* (W); Rovinj, *Höpflinger s.n.* (BM, C, F, LD); Emperor forest, near Pola, *Pichler s.n.* (B, P); Losinj island, *Richter s.n.* (PI); Rovinj to Vrsar, *Soják s.n.* (LE); Isola, near Capo d'Istria, *Veselsky s.n.* (BM, GAT, JE, LE, LY-Gandoger).

CYPRUS: Kyrenia, *Casey 1023* (K); Koutraphas to Evrykhou, *Della s.n.* (ARI 2046, K); Pano Amiandos, *Della s.n.* (ARI 2047-2048, K); Ayios Ioannis, Malounda, *Della s.n.* (ARI 2029, K); Ayios Antonios, Sotira, *Della s.n.* (ARI 2039, 3061-3062, K); Chionistra, *Della s.n.* (ARI 3061); Ayios Epiphanios to Palechori, *Della s.n.* (ARI 3097); Alapknou to Vikla, SE Ephtagonia, *Edmonson & McClintlock 2990* (E, G, K); Kryos Potanos, *Kennedy 103* (K); Limassol, *Laukkonen 377* (K); Troödos, 'Olympus Camp' Hotel, *Lindberg s.n.* (CYP, K, LD, W); Ayii Anargyri near Phini, *Meikle 2873* (C, CYP, K); Platania, *Merton 2352* (CYP, K); Paphos, Agios Georgios to Kithani, *Rechinger 62024a* (E); Pentedactylos and Prodromos, *Sintenis & Rigo 657* (FI, K, LD, LY-Gandoger, P, PR); Klepini, E of Kyrenia, *van Slageren & Guarino MSLG-89081H* (ARI, ICARDA); Timi to Panayia, near Pendalia, *van Slageren & al. MSLGAD-89113-aH* (ARI, ICARDA); Prodhromos, *Young 7369* (K); Famagusta, *Wängsjö 5073* (LD).

FRANCE, ALPES DE HAUTE PROVENCE: Sisteron, *Jousset s.n.* (LY); Chabestan, *Jousset s.n.* (LY). ALPES MARITIMES: near Nice, at Colomars, *Arbost s.n.* (BR); near Cannes, *Aunier s.n.* (C); Roquebrune, *Bicknell s.n.* (GE); Beaulieu, *Corstorphine s.n.* (BM); Juan-les-Pins, *Dinter s.n.* (GE, JE, LY). ARDÈCHE: St. Vallier, *Chabert s.n.* (FI); Col d'Escrinet, *le Tourneux de la Perraudière s.n.* (LY); Les Vaux to Gravièrese, *Soulié s.n.* (MPU-Coste). AUDE: Narbonne, *Delort s.n.* (LY-Gandoger); Narbonne, Pech de l'Aguèle, *Gautier s.n.* (LY-Gandoger); Moux, *Neyraut s.n.* (A); Narbonne, *Ruget*

504 (BM). AUVERGNE: Montmurat, *Isaäcson s.n.* (BR). AVEYRON: Tournemire, near St. Affrique, *Copineau 100* (US); Tarn valley, towards Muse, *Coste s.n.* (MPU-Coste); Camarès, *Delmas s.n.* (G, MPU); Dourbie valley, *Guillon s.n.* (F, LY); Peyrileau, *Ivolas s.n.* (LY-Gandoger); Boyne, *Vanden Berghen s.n.* (BR). BOUCHES DU RHÔNE: Pas de Lanciers, *Autheman s.n.* (LY-Gandoger); Martigues, *Autheman s.n.* (LD, LY-Gandoger); Aix, St. Castagne, *Lenormand s.n.* (MO); near Carry-le-Rouet, *Roux 4802* (BEI); Marseille, Montredon, *Souden s.n.* (Z). CANTAL: St. Saudin-de-Maurs, *Louis s.n.* (L). CHARENTE MARITIME: near Sonnac, *Giraudias s.n.* (JE, LD). DRÔME: Lavayson, *Chabert s.n.* (FI); Romans, *Hervier-Basson s.n.* (BEI, FI, K, LD, LY, LY-Gandoger, PI, PR, PRC, RAB, TO, Z); Crest, *Mouillefarine s.n.* (LD). GARD: Les Angles, *Delacour s.n.* (K); Le Vigau, *Diomède s.n.* (K); Vismer, *Jordan s.n.* (BM, C); Alais, *Jordan s.n.* (K). GERS: Belmont to St. Etienne, *Coste s.n.* (MPU-Coste). GIRONDE: Bordeaux, *Neyraut s.n.* (JE, LY). HAUTES-ALPES: Ribiers, *Reverchon s.n.* (BR, LY, K); St. Véran, *Vanden Berghen s.n.* (BR). HAUTE GARONNE: Les Causses, St. Félix, *Lebrun s.n.* (BR). HAUTE-LOIRE: Lempdes, *Arnaud s.n.* (Exsicc. Puel et Maille 31) (LY-Gandoger, LY-Jordan); Chambezon, Allagnon valley, *Billy s.n.* (Lambinon exsicc. 11909) (BC, C, RNG). HÉRAULT: Blayrasse, near Montpellier, *André s.n.* (LY); Lamalou, near Béziers, *Cosson s.n.* (LD, LE, MO); Grammont, *de Montesquiou s.n.* (LY-Gandoger); Montpellier, Font-Carade, *Dubuis 8896* (BC, BR, C, LD, MO, NY, RAB, RNG); Ribante, near Béziers, *Dupuy s.n.* (Exsicc. Soc. Dauphinoise 1444b) (BR, FI, LY-Gandoger, P, RAB, TO); Amiane, *Durbey s.n.* (RAB); La Pompiniane, near Montpellier, *Flahaut s.n.* (C, LY-Gandoger); Montpellier, *Godron s.n.* (FI, P); Males de Rigaud, near Agde, *Lardière s.n.* (L); Béziers to St. Geniès, *Litzler s.n.* (BR); Le Caylar, *Loret & Barrandon s.n.* (MPU); Castelnau-le-Lez, near Montpellier, *Mandon s.n.* (LY, P); Port Juvénale, *Touchy s.n.* (LE); pas de l'Escalette, *Weiller 119.39* (MPU). INDRE: Varennes, *Aristobile s.n.* (Exsicc. Soc. Cénomane 1094) (BR, LY, GAT). LOT: Cahors, *Chaubart s.n.* (LY-Gandoger). LOT-ET-GARONNE: Beauville, *Arnaud s.n.* (Exsicc. Soc. Dauphinoise 1444) (F, FI, LD, LE, LY, LY-Gandoger, P, Z); Agen, *Fourcade s.n.* (K); Fumel, *Garroute s.n.* (LY-Gandoger, MO). LOZÈRE: Mende, *Gaillardot s.n.* (JE); Gorges du Tarn, Les Vignes to La Maleire, *Soulié s.n.* (MPU-Coste); Le Rozier, *Vanden Berghen s.n.* (BR). PUY-DE-DÔME: Lempdes to Clermont, near Puy-de-Dôme, *Arnaud 31* (A, C, FI, K, L, LE, P, PR); plain of Moriat, *Brunel s.n.* (BR); near Clermont-Ferrand, *Héribaud s.n.* (BM); near Issoire, plateau de Pardines, *Loiseau s.n.* (LD). PYRÉNÉES ORIENTALES: Banyuls, Sorède, *Conill s.n.* (CAI, GAT, JE, LY, SOM, Z); St. Paul de Fenouillet, *Copineau s.n.* (C); Callieaurs, *Ruget s.n.* (BM); Perpignan to St. Estève, *Warion s.n* (LY-Gandoger). RHÔNE: Vienne to Lyon, *Mall s.n.* (A). TARN-ET-GARONNE: Montaigu, near Moissac, *Lagrèze-Fossat s.n.* (Exsicc. Billot 965) (F, JE, K, L, LE, LY-Gandoger, P, PI, TUB). VAR: Valesure, *Bicknell s.n.* (L, LD, PR, SOM, W); near Toulon, *Bourgeau 432* (BM, LY-Jordan); Hyères, *Fischer-Coster s.n.* (Z); Fréjus, *Garnier s.n.* (BR); Luc, *Hanry 198* (BM, C, JE, L, LD, LE, OXF, P, US), *s.n.* (Exsicc. Billot 1788) (BM, BR, F, FI, JE, LE, LY, LY-Gandoger, MO, MPU, OXF, P, PI, WAG); near Montrieux, *Huet du Pavillon s.n.* (P); Les Mauves, *Lebrun 2794* (BR); Pesquiers, *Pellat s.n.* (FI). VAUCLUSE: Sablet, near Orange, *Auzende s.n.* (P); Orange, *Godet s.n.* (LY); Carpentras, *Mill s.n.* (PH); Avignon, *Requien s.n.* (BOLO, K, MPU). VIENNE: St. Genert, *Lloyd s.n.* (JE). ISLANDS: CORSICA: Solenzara, *Aellen 4883* (F, LD, LE, MO, US); St. Florent, *Lousley s.n.* (RNG).

GEORGIA: Tbilisi, Dallahane gorge, *Davis 33893* (E, LE); Tblisi, Zedazeni, *Grossheim s.n.* (ERE); Zangezur reg., Gerjusy, *Grossheim & Jaroschenko s.n.* (ERE); Tblisi, Wera river, *Schischkin s.n.* (ERE); Batumi, Artvin, river Godrawi, *Woronow 191, 192* (LE); near Tbilisi, *Woronow 5334a* (A, BM, C, E, ERE, G, K, LE, MO, NY, SOM, US); W Tblisi, valley of Kura, *Zündorf & Schnittler 54* (JE).

GREECE, ATTICA: Kiphissia, *Guiol 558* (BM); Phaleron, *Haussknecht s.n.* (BR, JE, LE, PRC); Pentelikon monastery, *Haussknecht s.n.* (BEI, BM, BR, JE, LE); Athens, *Lacaita 5783* (BM); near Athens, Amarousi and Kiphissia, *Leutwein de Fellenberg s.n.* (Z); N Yerania Oros, Agios Ioannis Prodromos, near Corinthe, *Runemark & Svensson 48933* (LD). LÁRISA: Tyrnova (Tírnovos), Angathotton, *Alston & Sandwith 828* (BM, K). MACEDONIA: E Thessaloniki to Kavalla, *Barclay 1393* (K); Langadhas, Lahanas to Evangelista, *Greuter 11089* (G); Kaputsides, near Thessaloniki, *Rechinger 8972* (BM), *8988* (BM, JE, K, LD, W); Serrai (Seres), *Rechinger 9194* (K, LD); Drama, *Stainton 7630* (K, US); Turica to Kopriva, *Turrill 260* (K). PELEPONNESUS: Achaia, Kalavryta, *Bornmüller 1707* (BC, BM, JE, K, LD, PR, W); Corinthe reg., S Soulinarion, *Runemark & Svensson 48869* (LD); Argolis penins., N Palea Epidhavros, *Runemark & Svensson 48633* (LD); Lakonia penins., Mani, W Nomia, *Runemark & Svensson 48161* (LD); Nauplion, *von Spruner s.n.* (C, TUB). STEREÁ: Delphi, around Marmaria, *Phillips 34* (K); Voiotia ('Boeotia'), *Schousbou s.n.* (LD-Retzius). THESSALIA: Epirus, Métsovon, *Balls & Gourlay B3775* (K); Aïvali, *Haussknecht s.n.* (BM, JE, LE); Agrapha, Koróna monastery, Pindus Mts., *Haussknecht s.n.* (JE); Kalambaka, Metochi, *Sintenis 233* (FI, P, PR); Larissa, *Vavilov s.n.* (WIR 1271-1272). THRACE: Nom. Xanthis, W Lykodromion, Oros Achlat, *Burri & Krendl s.n.* (W); prov. Evros, Esimi, Pilea, N Loutros, *Greuter 10952* (BR, LD). ISLANDS: ANDROS: NE Batsi, *Snogerup 9232* (LD); NE Akra Thiakion, *Snogerup & von Bothmer 32814* (LD); SSE Mt. Agios, Saranda, *Snogerup & von Bothmer 32524* (LD); SW Gavrion, *Snogerup & von Bothmer 34672* (LD); NW Apoikia, *Snogerup & von Bothmer 31634* (LD). CHIOS: NNW Langada, *Snogerup 7368* (LD); near Marmara, *Snogerup 7484* (LD); Agios Markelos, *Snogerup 8422* (LD). CORFU: Kastellani, *Baenitz s.n.* (L); Akhilleion, *Sprengel s.n.* (FI). DILOS: Fourni, *Runemark & Engstrand 36303* (LD). EUBOEA: Achmet Aga, Prokopion, *Rechinger 17176* (K, MO, US); near Papades, *Rechinger 19259b* (G, US); N Akra Mantili, *Runemark & Snogerup 11643* (LD). KARPATOS: N Lom, *Burton R107* (RNG). KITHNOS: N Chora, *Runemark & Engstrand 38235* (LD). LESVOS: S Kalloni, near Kerami, *Edmondson & McClintlock 2622* (E); Mytilini, Lepetymnos Mts., Celia to Ypsilometopon, *Rechinger 5776a* (BM, K, LD); Mt. Ordymnos, Antissa, *Rechinger 5869b* (BM, K, LD, US). MIKONOS: NNE Ormos Limani, *Runemark & Nordenstam 16140* (LD); mountain N Ano Mera, *Runemark & Engstrand 35258* (LD). MILOS: NNE Profites Elias, *Runemark & Bentzer 29869* (LD). NAXOS: SSE Axapsis, *Runemark & al. 3876* (LD); Moni to Sifones, *Runemark & Engstrand 35019* (LD); Koronos, *Runemark & Snogerup 10021* (LD); Stavros Keramotis, *Runemark & Snogerup 9734* (LD). NISYROS: Ramos, *Papatsou 442* (E). PATMOS: N Skala, *Runemark & von Bothmer 46726* (LD). RHODES: Simi Pedi, *Carlström 8298* (LD); Mt. Profitas, *Synnott s.n.* (K). SAMOS: S Vurliotes, N Agios Ilias, *Runemark & al. 19838* (LD). SAMOTRAKE: Kamariotissa to Chorio, *Rechinger 9690a* (BM). SERIFOS: Volo, *Runemark & Engstrand 38103* (LD); Pirgos, *Runemark & Engstrand 38142* (LD). SKÓPELOS: Nom. Magnisias, Kira Panagia, E Agios Petros, *Snogerup 5311* (LD). THASOS: Kinira bay, *Price 1203* (K); Limenas, *Sintenis & Bornmüller 470* (BM, LD, P, PH, PR). TINOS: N Isternia, *Runemark & Engstrand 37160* (LD); above Kardiani, *Runemark & Engstrand 37377* (LD).

ITALY, CALABRIA: Aspromonte, Bova Marina to Bova, *Davis & Sutton 64760* (BM); Paola, *Fiori s.n.* (FI); Levanto to Punta del Semaforo, *Mattirolo & Ferrari s.n.* (TO); Catanzaro, near Mosofolo, *Micheletti s.n.* (TO); Mallonidi, near Reggio, *Pasquale s.n.* (P); Valle Grandi, Longobucco, *Sarfatti & Corradi s.n.* (FI); W Saracena, SW Castrovillari, *Snogerup 2129* (LD). FRIULI VENEZIA GIULIA: Trieste, *Baumbach s.n.* (JE, LD); Zaule, near Trieste, *Kammerer s.n.* (TO). LIGURIA: Montaldo, *Abbà s.n.* (TO); Levanto, *Aellen s.n.* (US); Genoa, Mt. Bartolomeo, *de Notaris s.n.* (P); Corniglia, Spezia, Lavanis, *Fontana s.n.* (TO). PIEMONTE: Acqui, *Bicknell s.n.* (GE); Susa, near La Brunetta, *Ferrari & Barrino s.n.* (B, LY, TO); Nizza Monferrato, *Montaliou s.n.* (JE); valley of the Bormida, *Vallino s.n.* (TO); Piana Crixia, Garrino, *Vignolo-Lutati 179* (TO). TOSCANA: Pari, near Siena, *Botteri s.n.* (P); Busceto, near Livorno, *Caruel s.n.* (BR, MO, PI-CAR, TO); Mt. Ferrato, near Prato, *Costa-Reghini s.n.* (PI); Cortona, Gremiasco and Fabbrica, *Ferrari s.n.* (LY); Florence, Majano, near Fiesola, *Fiori 220* (A, BM, GE, K, LE, LY, OXF, PI, PI-GUAD, PI-PASS, TO, Z); Impruneta, near Florence, *Levier s.n.* (BEI, PI-PASS); Radda in Chianti, *Savi s.n.* (PI); near Florence, Scopeti to Vecchia, *Sommier s.n.* (L, LY, PI, PI-GUAD). OTHER ITALY: Rocchetta Ligure, *Abbà s.n.* (TO); Chianti, *Beccari s.n.* (P); Maggio Giungno, *Conume s.n.* (JE); Cilento, 100 km to Battapaglia, *Davis & Sutton 62737* (BM); Castellegio, valley Gorgente, *Ferrara s.n.* (LE); Bologna, *Gabelli s.n.* (LY-Gandoger); Gallipoli, *Groves s.n.* (BM, GE, LE, LY-Gandoger, OXF, type of *Aegilops triuncialis* var. *breviaristata*); Naples reg., Bagnuoli, *Guadagno s.n.* (LY-Gandoger); Apulia, Taranto, *Lacaita 219b* (A, PI-PASS); S Tirol, Valsugano, near San Christoforo, *Murr s.n.* (GE, JE, LD, LE, LY); Mombaldone, road to Vengore, *Vignolo-Lutati & Fontana s.n.* (GAT). ISLANDS: ELBA: San Ilario, campo nell'Elba, *Kramer & Westra 3417* (CAI, U). SARDINIA: Capo Spartivento, *Micheletti s.n.* (PI-GUAD); Sassari, *Nicotra s.n.* (B). SICILY: Catania, *Chiovenda s.n.* (BOLO); Termini, *Gandoger 1004* (LY-Gandoger); Aguano, Salito river, *Guadagno s.n.* (PI-GUAD); Boccadifalco, *Lojacono s.n.* (LE); Messina, *Presl s.n.* (PRC, type of *Aegilops echinata*); Naso, *Todaro 1407* (BR, FI, JE, PH-PENN, TO); Caltavuturo, *Todaro 1202* (L).

MACEDONIA: Skopje (Üsküb), near Vodna, *Bornmüller 2274* (JE); lake Doiran, *Bornmüller 5286* (JE, NY); Resen to Bitola, near Makazi, *Mennega & Driehuis 115* (BM, MO, U, Z); Prilip to Bitola, *van Oostroom & Hennipman 23806, 23820* (L); Valandovo to Strumica, *van Oostroom & Hennipman 23684* (BM, L).

PORTUGAL: Beira Baixa, Ribeira, *Benta Rainha 1559* (US); near Lisbon, Odivellas, *Coutinho 983* (COI); Serra de Monsanto, *Coutinho 9839* (BR, COI); Marais, *d'Alhandra s.n.* (LY-Gandoger); near

Corte-Figueira, *Daveau 350* (BM); Lisbon, *Daveau s.n.* (LY-Gandoger); Corte-Figueira to Mû, *Daveau s.n.* (P); Alhandra, *Daveau 562* (P); Odivellas, Arredores de Lissabon, *d'Oliveira David 983* (BM); Degolados to Campo Maios at Monte dos Regados, *Fernandes & al. 8639* (COI, LD, RAB); Vila Viçosa, Herdade de Vigaria, *Fernandes & al. 1941* (COI); Abrantes to Sardoal, *Fernandes & al. 5840* (COI); near Ferreia de Alentejo, *Fernandes & al. 7560* (COI, SOM); Bragança, *Ferreira 646* (C); Castello de Vide, *Ferreira s.n.* (COI); Pinhao, *Ferreira s.n.* (COI); Extremadura, Cruz Quebrada, *Fontes & Silva 126* (US); Trás-os-Montes, Serra de Vila Flôr, *Gandoger s.n.* (LY-Gandoger, MO); Portimao, Alves Praia, *Kaue s.n.* (C); Alto Alentejo, Elvas, Horta do Salgadinho, *Malato-Beliz 16300* (BR, C, ERE, LD, RNG); Relves Veades, E Simes, *Matos & Cabaaf 14057* (COI); Coimbra, *Mathez 647* (BR); Caldas de Moledo, *Murray s.n.* (BM); prov. Extremadura, *Welwitsch 345* (BM, LE).

RUSSIA, 'CAUCASUS': s.loc., *Hohenacker s.n.* (A, BR, C, E, US). DAGHESTAN: Derbent, *Alexeenko 1240* (LE); Chura reg., near Bujnaksh, *Alexeenko s.n.* (LE); Kaitag-Tabassaran, near Juczche, *Alexeenko 1250* (LE); Petrovsk, *Lipsky s.n.* (LE); Makhachkala, Tarki-Tau Mts., Tarki, *Prokhanov 498* (LE); Karski reg., Kagizman, Ak-Chai river, Novo-Nikolajevka, *Woronow 12574* (LE).

SLOVENIA: Triester Karst, Borst, *s.coll., s.n.* (B).

SPAIN, ALBACETE: Hellin, *Bourgeau s.n.* (P); La Molata, near Alcaraz, *Cuatrecasas s.n.* (BC); SSE Alcaraz to Riopar, *Goyder & Jury 332* (BM, RNG). ALICANTE: Sierra Mariola, *Gandoger s.n.* (LY-Gandoger). ALMERIA: Sierra Nevada, Fiñana, *Gandoger s.n.* (LY-Gandoger); Velaz – Rubio, *Reverchon 1104* (BC, GE, JE, LE, LY, LY-Gandoger, P, PR). AVILA: Avila city, *Gandoger s.n.* (LY-Gandoger). BADAJOZ: Fregenal de la Sierra to Zafra, *Hammer 2627, 2628* (GAT). BARCELONA: Montserrat, below Monistrol, *Leresche 2* (C); Anoia, el Bruc de Dalt, Nuet Badia, *Panneda s.n.* (BC); S. Eugal, *Sennen s.n.* (BM, LD). BURGOS: Aranda, *Gandoger s.n.* (LY-Gandoger). CACERES: near Plasencia, *Bourgeau s.n.* (BM, C, LD, P); Logrosan to Monasterio, *Hammer 2643* (GAT). CÁDIZ: Lapieda, near Puerta Sta. Maria, *Bourgeau 572* (LY-Gandoger, P); Los Barrios – Almoraima, *Brinton-Lee 1290* (BM); near Castella de la Frontera, N Algeciras, *Ellmann & Hubbard 722* (K, RNG); Alcula de Guadaira, *Font Quer s.n.* (BC); Gibraltar, *Munro s.n.* (A, K, NY). (CASTILLA LA NUEVA): Verte de Baños, *Weiller 19.23* (MPU). CATALUÑA: S. Florent, *Bubani s.n.* (LY-Gandoger). CIUDAD REAL: Sierra Moren, Despeñaperros, *Gandoger s.n.* (LY-Gandoger). CORDOBA: Belmez, *Gandoger s.n.* (LY-Gandoger). CUENCA: Huete, *Weiller 109.25* (MPU). GERONA: Mutanyes de Prades, Vall de Castelfullit, *Masclans & Batalla i Xatruch s.n.* (BC). GRANADA: SE Granada, *Ellmann & Hubbard 760* (K); Lanteira, *Font Quer s.n.* (BC); Alhambra, Mt. Tejeda, Granada, *Huter & al. 430* (LE); Puebla de Don Fadrique, *Reverchon s.n.* (Kneucker exsicc. 177) (A, BM, BR, C, GAT, GE, K, L, LD, LE, MO, NY, RNG, PR, SO, SOM, Z); Jerez del Marquesado, La Delesa, *Valdés & al. 262* (RNG); Alhambra, *Willkomm 952* (K, P). HUELVA: Aracena, *Hammer 2639* (GAT). HUESCA: La Peña, *Gandoger s.n.* (LY-Gandoger); near Gesera, *Soulié s.n.* (MPU-Coste). JAÉN: Sierra Magina, La Moraleda, *Gandoger s.n.* (LY-Gandoger); Sierra de Cazorla, above Los Leganillos, *Heywood 1144* (BM); Sierra de Segura, Los Acebeas, *Heywood 3091* (BM, RNG); Jabaliuz, *Winkler s.n.* (K). LEÓN: Puerto de Castro, *Gandoger s.n.* (LY-Gandoger). LÉRIDA: Segrià, towards Granja de Escarpe, *Masclans s.n.* (BC). MADRID: Campos de la Moncioa, *Borja Carbonell s.n.* (C, K); Cerro Negro, *Bourgeau 2177* (BM, K, L, LD, LE, LY, LY-Gandoger, LY-Jordan, P, PRC, US); Aranjuez, *Gandoger s.n.* (LY-Gandoger); Siñedes, *Jerónimo 127* (BM); Fuente Castellana, *Lange s.n.* (C, FI); near Madrid, *Vavilov 58592* (WIR 1283, voucher of *Aegilops triuncialis* ssp. *typica*); Sierra de Guadarrama, *Vavilov 58597* (WIR 1288). MÁLAGA: Serrania de Ronda, *Ball s.n.* (NY, PH); Cerro San Anton, *Ball s.n.* (A); Sierra de Agua, *Gandoger s.n.* (LY-Gandoger); Vélez to Canillas de Aceituna, *Gros 49* (BC); Marbella, Puerto Caborino, *Michel 7345* (BR); Antequera, *Valdés & al. 113* (RNG). MELILLA (in Morocco): hippodrome, *Sennen & Mauricio 9623* (BC, BM, MPU, RAB, RNG). MURCIA: Calasparra, *Gandoger s.n.* (LY-Gandoger); Cartagena, *Jiménez s.n.* (LY-Gandoger); Caraneca, Sierra de Mojantes, *Ortiz 295* (NY); Puerta de la Cadeña in Sierra de la Fuensanta, *Porta & Rigo 489* (BM, BR, K, P, PR). SALAMANCA: Ciudad Rodrigo, *Gandoger s.n.* (LE, LY-Gandoger, MO). SEVILLA: near Sevilla, *Ball s.n.* (K); Puerto Serrano, near Sevilla, *Ball s.n.* (US); Esteba, *Domingo s.n.* (BC); S. Nicolas del Puerto, *Silvestre Domingo 2236/68* (RNG, SEV). SORIA: La Rioja, Soria, *Dahl s.n.* (C); city of Soria, *Gandoger s.n.* (LY-Gandoger). TARRAGONA: Mora de Ebro, *Gandoger s.n.* (LY-Gandoger). TOLEDO: Toledo, *Brissgono 146, 147* (BM); Castella Nova, La Calderim, *Font Quer s.n.* (BC); Polan, *Gandoger s.n.* (LY-Gandoger); Sierra Calderina, *Gandoger s.n.* (LY-Gandoger). VALENCIA: s.loc., *Pau s.n.* (LY-Gandoger). VALLADOLID: St. Valladolid, *Delvosalle s.n.* (BR); Mt. Torozo, near Valladolid, *Lange s.n.*

('99') (C). ZAMORA: Toro, *Gandoger s.n.* (LY-Gandoger); Alto de las Burras, *Sierra s.n.* (BC). ZARAGOZA: Ateca, *Font Quer s.n.* (BC); Calatayud, *Vicioso s.n.* (L, LD, LY-Gandoger). OTHER SPAIN: s.loc., *Vavilov s.n.* (WIR 1372, type of *Aegilops triuncialis* ssp. *fascicularis*).

UKRAINE, CRIMEA: Lozowoja, *Alexandrova & al. s.n.* (LE); Kazantip, *Belanina s.n.* (LE); Simferopol to Katcha, *Borodina s.n.* (LE); Tabodrak and Mungush, *Busch s.n.* (LE); S Simferopol, *Davis 33529* (K, W); Yarilgatch and Ak-Mechech, *Dzevandowsky s.n.* (LE); Novopaulovka, 22 km from Simferopol, *Elias & al. 5754* (NY); Tiberti, *Fedtschenko s.n.* (LE); Toile to Katchikalen, *Fedtschenko s.n.* (LE); Livadia, *Golde s.n.* (SOM); Jalta, *Golde 898* (C, K, LE, LY, PRC, WIR 1269-1270); Simferopol, *Jakushkin 12* (WIR 1354); valley of the Peturuay, *Munro s.n.* (K); Matachon, near Sebastopol, *Rehmann s.n.* (P); Feodosia, *Sarandinski s.n.* (LE); Bakhchisarai region, Tankovoye, *Stankevich & Dorofeev s.n.* (WIR 2783); Alushta region, Kastel Mt., *Stankevich & Dorofeev s.n.* (WIR 2644); Martian penins., *Stulova s.n.* (LE); Koktebil, *Tranzschel s.n.* (LE); Simferopol, *Tzvelev & al. 839* (LE).

YUGOSLAVIA, MONTENEGRO: Antivari, *Horasky s.n.* (PRC). SERBIA: Pljactravica, *Adamovič s.n.* (K); near Vranja, Sobina, *Adamovič s.n.* (R, L); Nič, *Bierbach s.n.* (LE); Lescovac, *Ilič 351a* (JE); near Vranja, Sobina, *Ilič s.n.* (Kneucker exsicc. 410a) (A, B, BM, C, GAT, GE, JE, K, MO, NY, SOM, Z); Pirot, *Ničič s.n.* (LY-Gandoger); Aleksinač, *Pančić s.n.* (LY-Gandoger).

ADVENTIVE: AMERICA: U.S.A., CALIFORNIA: Butte Co., E Honcut, *Ahart 2227* (NY); Butte Co., SE Chico, *Bridwell 110* (MO); Solano Co., NE Vacaville, *Crampton 1440* (AHUC); El Dorado Co., Camino, *Crampton 2023* (AHUC); Yolo Co., W Winters, *Crampton 5255, 5859* (AHUC); Solano Co., S Winters, *Crampton 5160* (AHUC); El Dorado Co., W Clarksville, *Crampton 5229* (AHUC); Amador Co., S Latrobe, *Crampton 5214* (AHUC); El Dorado Co., Frenchtown, S Shingle Springs, *Crampton 5246* (AHUC); Sacramento Co., Grant Line, *Crampton 5210* (AHUC); Calaveras Co., SE San Andreas to Calaveritas, *Crampton 5292* (AHUC); Yuba Co., SE Loma Rica, *Crampton 7366* (AHUC); Nevada Co., Sierra Nevada Memorial Hospital, *Crampton 9402* (AHUC); Sonoma Co., NE Santa Rosa, *Fuller 4484* (DAV); Stanislaus Co., NE Eugene, *Haig s.n.* (DAV); Sacramento Co., S Folsom, *Hoover 5298* (K); Marin Co., East Peak, Tamalpais Mt., *Howell 29107* (DAV); Sutter Co., Juba, *Kennedy 582* (DAV); Butte Co., SE Chico, *Mallory 269* (DAV); Calaveras Co., E Bellota, *Malmsten s.n.* (DAV); Solano Co., Vacaville to Winters, *McCaskill & Onega 620* (DAV, UCR); Calaveras Co., W Copperopolis, *McNeal 949* (NY); Grass Valley, French Ravine, *Rose 71040* (BR, BM, LD, WIR); Butte Co., Honcut, *Taylor 2740* (DAV); Solano Co., Vacaville to Winters, *Tucker 3333* (BEI, DAV); Solano Co., NE Vacaville, *Williams s.n.* (DAV). NEW YORK: Yonkers, Yonkers wool mill, *Bicknell s.n.* (NY). EUROPE: BELGIUM: Aalst (Alost), *Crépin s.n.* (BR); Pepinster, *Pelgrims s.n.* (RNG); Antwerp, *van Rompaey s.n.* (BR). FRANCE, PARIS: near La Bièvre, *de Jussieu s.n.* (P). SEINE-ET-MARNE: Fontainebleau, *Mèrat de Vaumartoise s.n.* (P). GERMANY: Schleichtental, *Berolini s.n.* (JE); Leipzig, *Duty s.n.* (LD); Würzburg, *Lattermann s.n.* (MO). SWITZERLAND: Zürich, *Beyer s.n.* (Z); Zürich, Giesshübel, *Thellung s.n.* (Z). U.K., ENGLAND: Avonmouth docks, *Bannister s.n.* (K); Blackmoor, *Ryves s.n.* (K); Bristol, Ashton Gate, *Sandwith s.n.* (K). SCOTLAND: Leith, *Fraser s.n.* (RNG).

S.LOC.: 'in Oriente'?, *s.coll., s.n.* (LINN 1218.9, type of *Aegilops squarrosa*).

Germplasm collections examined:

AFRICA: ALGERIA: Tiaret, Wadi Alil, *Holly & al. DZA-102* (ICARDA, ITGC, NARC-J); W Tlemcen, *Humeid & al. 90-DZA-48* (ICARDA, ITGC).

MOROCCO: Chefchaouen, E Bab Taza, *van Slageren & Istar MSAI-90135* (ICARDA, INRA-M); Ksar El-Kbir, Ouzzane to Fez, at Moulay Bouchta, *van Slageren & Istar MSAI-90147* (ICARDA, INRA-M); Ksar El-Kbir to Souk Larba, near Arbaoua, *van Slageren & Istar MSAI-90142* (ICARDA, INRA-M); Khemisset, El Harcha, *van Slageren & Istar MSAI-90102* (ICARDA, INRA-M); Khemisset, near Otmane on Oulmes – Khenifra road, *van Slageren & Istar MSAI-90108* (ICARDA, INRA-M); Taza to Abjelil at Oued Amlil, *van Slageren & Istar MSAI-90123* (ICARDA, INRA-M).

ASIA: JORDAN: Ifjetj, near Shoubak, *Humeid J-6-5* (ICARDA).

PAKISTAN: Baluchistan, Jehngir Abad, near Qila Saifulla, *Humeid & al. PAK-1259* (ICARDA, PARC); Baluchistan, Khaili Azad, 29 km E Muslim, *Humeid & al. PAK-1258-2* (ICARDA, PARC); Baluchistan, Kala Chena, 42 km W Ziarat, *Humeid & al. PAK-1253-1* (ICARDA, PARC); Baluchistan, Toot Daman, W Khanozai, *Humeid & al. PAK-1237-1* (ICARDA, PARC); Baluchistan, Loar Mawali, 25 km NE Pishin, *Humeid & al. PAK-1233-3* (ICARDA, PARC); Baluchistan, Kali Taj Mohammed, E

Quetta, *Humeid & al. PAK-1215-1* (ICARDA, PARC); Baluchistan, Attok Zai, NE Quetta, *Humeid & al. PAK-1216-1* (ICARDA, PARC); Baluchistan, Sher Jan Agha, 28 km S Noshki, *Humeid & al. PAK-1247-1* (ICARDA, PARC); Baluchistan, Urak, 24 km NE Quetta, *Humeid & al. PAK-1217-3* (ICARDA, PARC).

SYRIA: Idlib, Kafr Kharim to Harem, *Bourgois SY-20178* (IPGRI, ICARDA); near Hassaheh on road to Aleppo, *Damania & al. DFKO-9* (ICARDA, SARD); 83 km W Hassakeh on road to Aleppo, *Damania & al. DFKO-20* (ICARDA, SARD); Idlib, W Urmi Juz, *Elings & al. ID-355* (ICARDA, SARD); 23 km E Tartous to Safita, *Humeid & al. BMW-32-1* (ICARDA, SARD); Lattakia, Ayen Al-Wadyi, N Slonfeh to Sehna, *van Slageren & al. MSWRKA-88237-a* (ICARDA, SARD).

TURKEY: Ankara, 22 km N Celebi, *Güzel & al. SMN-040889-0602* (ICARDA, PGRRI); Kayseri, 25 km SE Himmetdede, *Güzel & al. SMN-070889-0401* (ICARDA, PGRRI); Konya, NE Kulu, *Güzel & al. SMN-040889-0901* (ICARDA, PGRRI); Kayseri, S Pinarbaşi to Sariz, *Güzel & al. SMN-080889-0501* (ICARDA, PGRRI); 24 km W Sivas, *Güzel & al. SMN-090889-0501* (ICARDA, PGRRI); Konya, W Eregli to Karaman, *Güzel & al. SMN-050889-0203* (ICARDA, PGRRI); Konya, SW Cumra, *Güzel & al. SMN-050889-0402* (ICARDA, PGRRI); Sivas, SE Yildizeli, *Güzel & al. SMN-090889-0401* (ICARDA, PGRRI); Sivas, 21 km SW şarkişla to Gemerek, *Güzel & al. SMN-090889-0201* (ICARDA, PGRRI); Konya, 32 km E Yunak, *Güzel & al. SMN-060889-0402* (ICARDA, PGRRI); Sivas, NW Sincan, *Güzel & al. SMN-030889-0104* (ICARDA, PGRRI); 49 km To Aksaray from Konya, *Güzel & al. SMN-070889-0101* (ICARDA, PGRRI); Hazar lake, 35 km SE Elâziğ, *Metzger & Jana 79TK018-077* (USDA); Malatya, 32 km SE Darende, *Metzger & Jana 79TK013-061* (USDA); 20 km NE Kayseri, *Metzger & Jana 79TK007-042* (USDA); Nevşehir, SE Ürgüp, *Metzger & Jana 79TK005-031A* (USDA); 43 km NE Van, *Metzger & Jana 79TK074-394* (USDA); Van, NE Gevas, *Metzger & Jana 79TK046-280* (USDA); Hakkari, SW Semdinli, *Metzger & Jana 79TK057-329* (USDA); Kirşehir, SE Múcur, *Metzger & Jana 84TK412-003-01* (USDA); SW Kagizman – Igdir – Erzurum junction, *Metzger & Jana 79TK092-464A* (USDA); Manisa, 23 km N Buldan – Sarigol juncion, *Metzger & Jana 84TK161-053* (USDA); Bursa, N Gemlik, *Metzger & Jana 84TK237-008* (USDA); Konya, 36 km N Beyşehir and 19 km SW şarkîkaraaşaç, *Metzger & Jana 84TK353-002* (USDA); Çanakkale, 24 km E Ayvacik, *Tüten & al. CNM-190689-0301* (ICARDA, PGRRI); N Çanakkale to Lapseki, *Tüten & al. CNM-200689-0702* (ICARDA, PGRRI); W Çay to Afyon, *Tüten & al. CNM-140689-0201* (ICARDA, PGRRI); Istanbul, NW Silivri – Çerkezköy junction, *Tüten & al. CNM-270689-0202* (ICARDA, PGRRI).

EUROPE: ARMENIA: Shamshadin reg., Naur to Berd, *Gandilyan s.n.* (AAI).

AZERBAIJAN, NAKHICHEVAN: Shakhbuz reg., Selesuz, *Dorofeev s.n.* (VIR).

BULGARIA: Burgas, near Grudovo to Boljarovo, *van Slageren & al. MSRIMZ-89187* (ICARDA, IHAR, IIPGR); Plovdiv, E Pestera, *van Slageren & al. MSRIMZ-89161* (ICARDA, IHAR, IIPGR); Burgas, S Jambol to Kalcevo, *van Slageren & al. MSRIMZ-89183* (ICARDA, IHAR, IIPGR); Burgas, N Ajtos, *van Slageren & al. MSRIMZ-89215* (ICARDA, IHAR, IIPGR); Sofia reg., N Kjustendil to Dragovistica, *van Slageren & al. MSMZNN-90288* (ICARDA, IIPGR, VIR).

PORTUGAL: Faro, Santa Iria, *Mota & al. 92-A* (INIA); Loule, Faro, Salir, *Mota & al. 50-A* (INIA); Santiago do Cacem, Beja, Sines, *Mota & al. 10-A* (INIA); Santiago do Cacem, Beja, Melides, *Mota & al. 8-A* (INIA); Beja, Cuba, *Mota & al. 121-A* (INIA); Viana do Alentejo, Evora, *Mota & al. 130-A* (INIA); Arraiolos, Evora, *Mota & al. 140-A* (INIA); Evora, Estremoz, *Mota & al. 149-A* (INIA); Albufeira, Faro, Alcaria, *Mota & al. 50-B* (INIA).

RUSSIA: Daghestan, upper Dzhalgan village, *van Slageren & Boguslavski MSRB-90191* (ICARDA, VIR); Daghestan, NE Izberbash, *van Slageren & Boguslavski MSRB-90180* (ICARDA, VIR).

Notes: 1. Through what I think is an unintended omission, Quézel & Santa (1962: 158) confuse *Aegilops triuncialis* and *Ae. geniculata*. *Aegilops triuncialis* keys out and is correctly described, but in the line under the ssp. *eu-triuncialis* Eig they in fact describe *Ae. geniculata* ('Epi ± ovoïde, de 1-3 cm long, à 3-5 épillets généralement ventrus et rapprochés'), but this species name is missing. Thus the taxa that are further keyed out there, viz. ssp. *triaristata* (Willd.) Rouy, ssp. *atlantica* Eig, and ssp. *eu-ovata* Eig, do *not* refer to *Ae. triuncialis* but to *Ae. geniculata* instead. The author names of these subspecies indicate their status under *Ae. ovata* and are listed by me as such (see at 10.8 and 10.12).

2. Arutyunyan & Gandilyan (1990: 746-748) present an elaborate and highly artificial system of intraspecific classification of *Aegilops triuncialis*. They characterize ecotypes with a combination of three characters, each presented in abbreviation (l.c., 747), as follows: (1) awns *muticus* (mu), *aristatus* (ar), and *subaristatus* (sar); (2) surface of the glumes *nudus* (nu), *setosus* (se), *tuberculatus* (tu), and *pubescens* (pu), and (3) spike colour as *albus* (al), *luteus* (lu), *cinereus* (ci), *fumigatus* (fu), *hepaticus* (he), *niger* (ni), *violaceus* (vi), *lividus* (li), and *rubescens* (ru).

Thirty five taxa are then described using combinations of the abbreviated descriptors cited above. I assume these taxa to be varieties as they are grouped together under two 'convarieties' (not a category listed by the ICBN in Art. 4.1, but it may be added because of Art. 4.2). They are presented in two categories. Firstly the ones that 'describe' already existing varieties, for example '*arnual*' (Arut. & Gandilyan?) = var. *triuncialis* = var. *muricata* Zhuk. = var. *albescens* Pop. (l.c., 748). There is no indication as to whether the name *arnual* has to be seen as a new (and then superfluous) name for the (in this case typical) variety, but I have assumed so. The name *arnual* is the combination of *ar* (aristatus – awn form), *nu* (nudus – surface of glume), and *al* (albus – spike colour). This group refers to 10 epithets proposed, nine of which are connected with a variety, one with a forma ('f.' *flavescens* Hammer). Although none of the new epithets nor the corresponding varietal and forma names is indicated as a *syn. nov.* we can at best say that Arutyunian & Gandilyan's names are superfluous (because of Art. 63.1) renamings after the earlier established ones. They are treated under the nomenclature of the respective *Ae. triuncialis* taxa.

A second group of 25 names is indicated only with an 'm.' (= 'mihi', a word usually abbreviated as such (Stearn, 1978: 464) and indicating a new taxon), and are not connected to any existing variety. These names are invalidly published because they have no rank indicated (Art. 24.1), lack a Latin description or diagnosis (Art. 36.1), and have no type specimen indicated (Art. 37), and are therefore excluded (see Chapter 12, Nomina nuda).

Thus, Arutyunyan & Gandilyan published 25 *nomina nuda* and 10 superfluous renamings at the variety level, grouped within two convarieties, of which one name (convar. '*triaristatum* m.') is invalid because of Art. 36.1 (only a Russian description), and, in addition a superfluous renaming of the typical convariety, and the other name (convar. '*biaristatum* m.') an invalid *nomen nudum* (see above at the nomenclature of *Ae. triuncialis*). In addition, Arutyunyan & Gandilyan follow Hammer's (1980b: 238) distinction between the var. *flavescens* Popova (linked with the var. *hirta* Zhuk. by Hammer) and the forma *flavescens* (Pop.) Hammer (seen by Hammer as the typical form of the variety *flavescens*). However, the var. *flavescens* is described as '*arpual*', but the forma *flavescens* as '*luarpual*'.

The naming of these small intraspecific taxa is similar to *Aegilops mutica* where eight such names were proposed by Gandilyan (1975: 246) following a similar system of notation (see Chapter 11). In that case, however, there is a short, Latin diagnosis provided and designation of a type collection, and the names are therefore not invalid, superfluous, or *nomina nuda*.

Besides the fact that these varieties are incorrectly published, my main reason for rejecting them is the concept that *Aegilops triuncialis* is a species of which intraspecific variation is best expressed with a much broader definition, summarized in the key to the varieties on p. 350. Minor differences resulting from an unspecified environment or genetic makeup do not warrant variety status.

3. Bowden (1959: 668) rejected LINN 1218.9, which is labelled 'squarrosa 3' in Linnaeus' handwriting, as the type specimen of *Aegilops squarrosa* since he had identified it as *Ae. triuncialis*. Later, he referred nevertheless to this specimen as 'the lectotype specimen' (l.c., 1966: 133), indicating that he did see it as the type of *Ae. squarrosa* as intended by Linnaeus (1753). This lectotypification effectively reduced the name *squarrosa* to the status of heterotypic synonym under *triuncialis*, and has been cited by Bor (1960: 654) to reject *squarrosa* as the correct name of the taxon now referrable to with its next available name, *tauschii* Cosson. The erroneous lectotypification of the taxon '*Ae. squarrosa* L.' has to be corrected as it is against traditional usage. The choice of the Buxbaum (1728, Tab. 50, fig. 1) illustration to lectotypify *Ae. tauschii* will maintain traditional usage of this taxon under its next available name (see at 10.17, note 1). Various authors who cite '*Ae. squarrosa* L.' in their (mainly floristic) publications do so in the sense of 'non Linnaeus (1753)' and are listed under this heading at *Ae. tauschii* (see at 10.17).

10.18b **Aegilops triuncialis** L. var. **persica** (Boiss.) Eig **Figs. 76(3), 83-84**

Aegilops triuncialis L. var. *persica* (Boiss.) Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 323 (1928a), Feddes Repert., Beih. 55: 134 (1929a); Hammer, Feddes Repert. 91: 238 (1980b); Arutyunyan & Gandilyan, Biol. J. Armenia 43(9): 748 (1990).

Basionym: *Ae. persica* Boiss., Diagn. pl. orient. Sér. 1(7): 129 (1846), Fl. orient. 5(2): 676 (1884); Parsa, Fl. Iran 5: 824 (1952).

Type: (Iran) ad radices montis Sabst-Bushom prope urbis Schiras, *Kotschy 365* (holo: G-BOIS; iso: BM, C, E, FI, G, JE, K, LE, LY-Gandoger, MO, MPU, OXF, P, PI, PRC, TUB). – Note: excluded isotype: a collection in W, carrying the same, printed label *Kotschy 365 = Aegilops kotschyi* Boiss. Fig. 84 presents the holotype from G-BOIS.

Homotypic synonyms:

Triticum persicum (Boiss.) Aitch. & Hemsl. in Aitchison, Trans. Linn. Soc., Ser. 2(3): 127 (1888); Bowden, Can. J. Gen. Cyt. 8: 135 (1966).

Ae. triuncialis L. ssp. *persica* (Boiss.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 500 (1928); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 37 (1973); Tzvelev in Fedorov (ed.) Zlaki SSSR: 159 (1976, Russian) / 227 (1984, English).

Ae. triuncialis L. ssp. *orientalis* Eig, Feddes Repert., Beih. 55: 134 (1929a); Mouterde, Nouv. Fl. Liban, Syrie 1: 148 (1966), *nom. illeg.* (Art. 63.1).

Aegilopodes triuncialis (L.) Á.Löve ssp. *persica* (Boiss.) Á.Löve, Feddes Repert. 95: 501 (1984), *comb. incorr.* (Art. 68.1: illegitimate generic name; see Chapter 7).

Triticum triunciale (L.) Rasp. ssp. *persicum* (Boiss.) Kimber & Feldman, Wild Wheat 60 (1987), *comb. inval.* (Art. 33.2).

Heterotypic synonyms:

Ae. triuncialis L. [var. *persica* (Boiss.) Eig] subvar. *glauca* Miczynski, Bull. Soc. bot. France 76: 716 (1929), **syn. nov.** – Type: not indicated. Only 'Transcaspia' is cited in connection with material, cultivated by Miczynsky that was sent to him from Leningrad by Dr Karpechenko (l.c., 1929: 715-716).

Ae. triuncialis L. [var. *persica* (Boiss.) Eig] subvar. *hispida* Miczynski, Bull. Soc. bot. France 76: 716

(1929), **syn. nov.** – Type: not indicated. Only 'Afghanistan' is cited in connection with material, cultivated by Miczynsky that was sent to him from Leningrad by Dr Karpechenko (l.c., 1929: 715-716).

Description (Fig. 76-3): *glume* apex of lateral spikelets with a short adaxial awn, up to 1 cm, longer towards the apex of the spike, and a broadly adaxial tooth of 2-4 mm, occasionally a small tooth in between; apex of apical glumes with 3 awns, the central one well developed, 2.5-5.5 cm long, erecto-patent in position, the lateral ones much reduced, 0.6-2.5 cm, sometimes only developed as 1-2 mm long teeth. *Lemma* apex of fertile florets with 2-3 short teeth only, of the fertile florets of the apical spikelets with 3 teeth, the central one developing into a short awn of up to 2 cm.

Otherwise as var. *triuncialis*.

Distribution (Fig. 83): a Western Asiatic element, rarely found in the eastern part of the distribution area of *Ae. triuncialis*: northern Iraq, Iran, Afghanistan (Aitchison, 1888: 127, who mentions, rather exaggerating, a common occurrence), as well as from the Caucasus and various parts of central Asia: Turkmenistan, Uzbekistan (Zhukovsky, 1928; Tzvelev, 1976/1984). Recently also found in Cyprus (e.g., collection *van Slageren & al. MSLGAD-89107H*).

Ecology, flowering and fruiting time: as var. *triuncialis*.

Altitude: from 130 m (Cyprus) probably up to 2000 m. Altitudinal data are, however, scarce and 2000 m is an estimate, derived from the locations of various specimens.

Genome: CU (female parent 'C' x male parent 'U') with 2x = 4n = 28 (Chennaveeraiah, 1960: 91, sub *A. persica*; Waines & Barnhart, 1992: Table 2; sub *Ae. triuncialis* ssp. *persica*). See 10.18a at 'Genome'.

Etymology: the final epithet refers to Persia, or Iran, from where it was first described as a species by Boissier.

Herbarium specimens examined:

ASIA: AFGHANISTAN: Herat, *Furse 5410* (K, LE, US); Mazar-i-Sharif, near Aq Kupruk, *Hedge & Wendelbo W3915* (E); Mazar-i-Sharif, *Hewer 1122* (K, LE); Farnam prov., SW Darzob, *Kozhevnikov s.n.* (WIR); W Obeh, *s.coll., s.n.* (probably Reading Univ. Bot. Exp.) (US).

IRAN: near Kazerun, *Gentry 14681* (UCR); 38 km S Ilam to Golon, *Harlan 9* (US cult.); mountain Sabst-Bushom, near Shiraz, *Kotschy 365* (BM, C, E, FI, G, G-BOIS, JE, K, LE, LY-Gandoger, MO, MPU, OXF, P, PI, PRC, TUB, type of *Aegilops triuncialis* var. *persica*), *366* (L, P, W); Kuh-Barfi, near Shiraz, *Kotschy s.n.* (FI); lake Chakhudar, W of Sarakhs, *Merton 3900* (K); Khorasan, 20 km S Sarakhs to Mashad, *Runemark & Sardabi 23395* (E); Tehran, *von Bunge s.n.* (P); Khorassan, Shahrud to Nishapur (Neshabur), *von Bunge s.n.* (G-BOIS); E Khorramabad, *s.coll., s.n.* (GAT cult.).

IRAQ: Assyria, at Kirkuk, *Bornmüller 1899b* (G); WNW Shaqlawa to Arbil, *Bot. Exp. Univ. Kyoto BMUK 6-13-1-T* (US); Hajki, *Helbaek 1873, 1877, 1881, 1884, 1886, 1931, 1932, 1934, 1939* (C); Jarmo, dry stations around camp, *Helbaek 1120A* (C); Sulaymaniyah to Dokan, *Rechinger 10077* (G); Salahuddin resort area, *Springfield 68* (UCR); Rawandiz, *Thorpe s.n.* (UCR); Mosul reg., S slope Jebl Sinjar, *van Slageren & al. MSSKKB-93008H* (ICARDA); Kirkuk, Jarmo, *Wheeler Haines s.n.* (E); Darbendikhan, *Wheeler Haines W1640* (E).

TURKEY: Anitab (Gaziantep), *Post 333* (US).

TURKMENISTAN: Karabil, canyon Kara-Baba, *Berdyev s.n.* (ASH); W Karabil, frontier Derwaza-Kele, Kura-Chor, *Berdyev s.n.* (ASH); Karabil, well of Bedem, *Berdyev s.n.* (ASH); Karabil, Poskriob-Ka, *Berdyev s.n.* (ASH); Karabil, Chadzja-Gurdek, *Berdyev s.n.* (ASH); Karabil, frontier Tarachzi, *Berdyev s.n.* (ASH); Gishta-Bazar reg., near Kushka, *Chepanov s.n.* (ASH); NW Tachta-Bazar, Murgab river, *Chepanov s.n.* (ASH); Karabil, Doul-Bay, *Chepanov s.n.* (ASH); Tachta-Bazar, Karabad-Kachan,

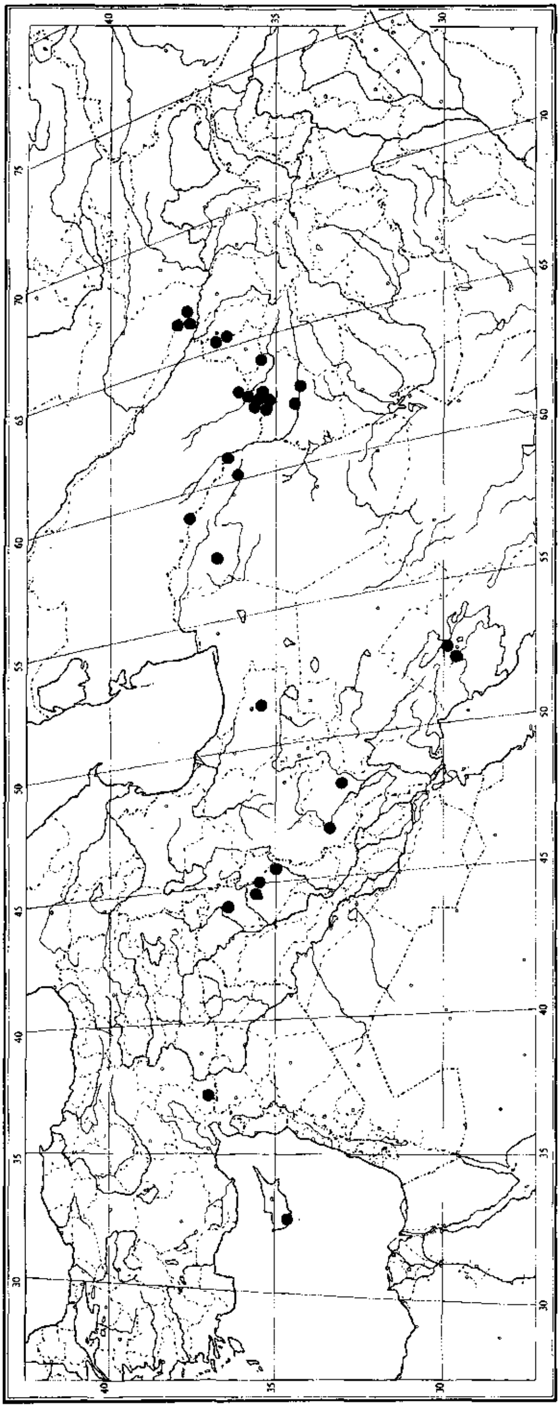

Fig. 83. Distribution of *Aegilops triuncialis* var. *persica* in west and central Asia.

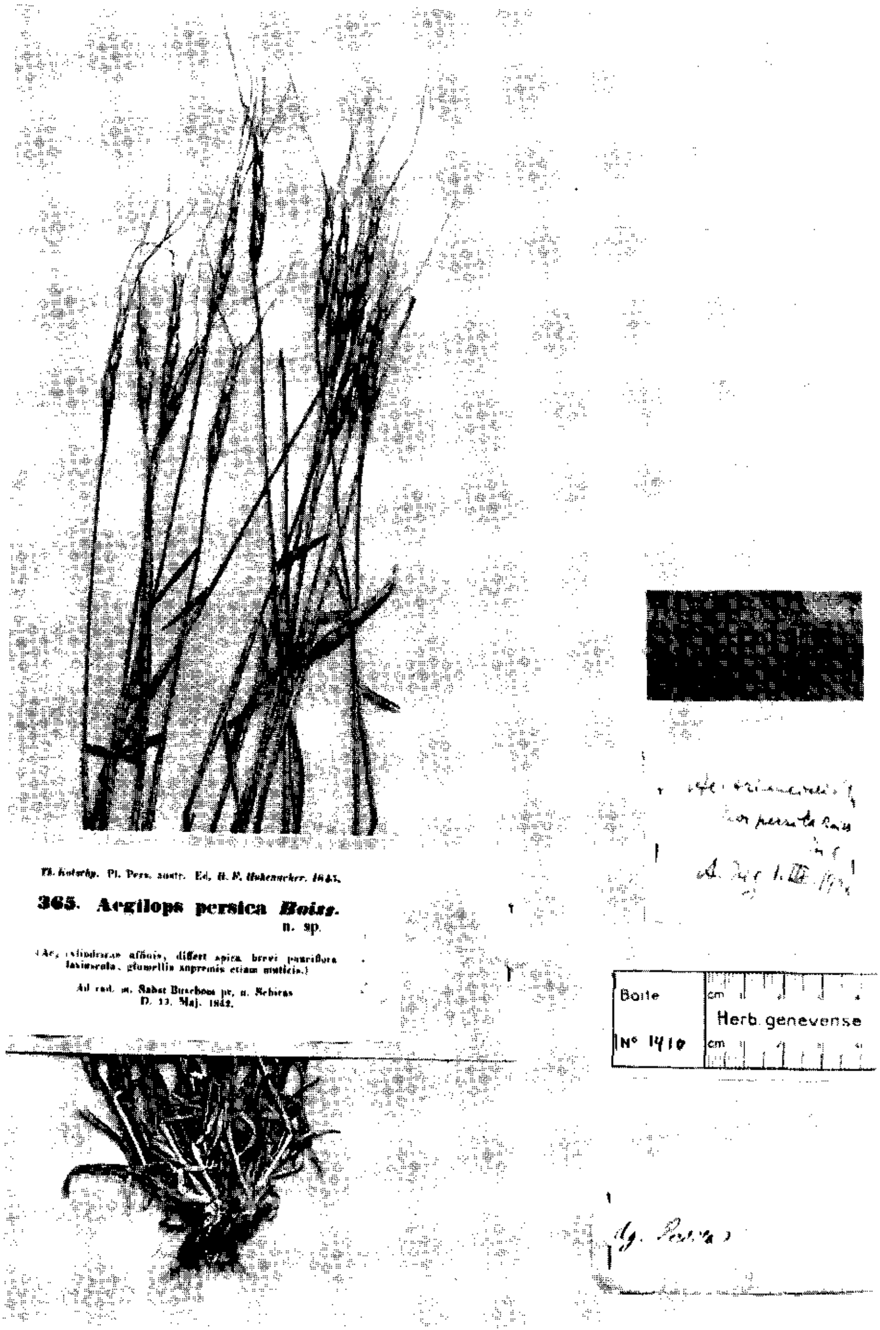

Fig. 84. Holotype in G-BOIS of *Aegilops persica* (= Aegilops *triuncialis* var. *persica*) (coll. *Kotschy 365* from near Shiraz). Note Eig's handwritten annotation from 1928 at centre-right.

Gutkova s.n. (ASH); Kugitangh Mts., near Bazar-Tepe, *Gutkova & Ataeva s.n.* (ASH); Kopet Dag, Kurt-Su, *Michelson s.n.* (ASH); Kugitangh Mts., near Markushi, *Nevski 176* (ASH); Kushka, *Seifulin & Pernijazov s.n.* (ASH).

UZBEKISTAN: Kugitangh Mt., Bazar-Tjube, *Bogdanovitch & Riabov s.n.* (TASH).

EUROPE: CYPRUS: Tsadha to Stroumbi, *van Slageren & al. MSLGAD-89107H* (ARI, ICARDA); near Pendalia towards Panayia, *van Slageren & al. MSLGAD-89113-bH* (ARI, ICARDA).

Germplasm collection examined:

EUROPE: CYPRUS: Paphos, 8 km from Timi to Panaya, *van Slageren & al. MSLGAD-89111* (ARI, ICARDA).

Note: the variety *persica* is not reported in the floras of Iraq (Bor, 1968) and Iran (Bor, 1970) although its presence in these areas is confirmed by herbarium specimens.

10.19 **Aegilops umbellulata** Zhuk. **Figs. 85-86**

Aegilops umbellulata Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 447, 483 (1928); Eig, Feddes Repert., Beih. 55: 215 (1929a, with var. *typica*); Post, Fl. Syria (ed. 2) 2: 784 (1933); Grossheim, Fl. Kavkaza (ed. 2) 1: 357 (1939); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 767 (1943, with var. *typica*); Grossheim, Opredelitel rastenich Kavkaza [Key to Caucasus plants] 719 (1949); Karjagin, Fl. Azerbaijana 1: 339 (1950); Thiébaut, Fl. Lib.-Syr. 3: 317 (1953); Chennaveeraiah, Acta Horti Gotoburg. 23: 164 (1960); Mouterde, Nouv. Fl. Liban, Syrie 1: 146 (1966); Sachokia, Opredelitel rastenich Gruzii [Key to Georgian plants] 2: 482 (1969); Bor, Fl. Iraq 9: 192 (1968), Fl. Iranica 70/30: 202 (1970); Tzvelev in Vassilczenko, Nov. Syst. Pl. Vasc. 10: 38 (1973), in Fedorov, Zlaki SSSR 160 (1976, Russian) / 229 (1984, English); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980); Hammer, Feddes Repert. 91: 236 (1980b, with ssp. *umbellulata* var. *umbellulata*); Davis, Fl. Turkey 9: 240 (1985, with ssp. *umbellulata*); Gandilyan & Arutyunyan, Biol. J. Armenia 40(6): 477 (1987, with ssp. *umbellulata* var. *umbellulata*).

Lectotype: (Turkey) Asia Minor, Galatia, Dizgurt-Dagh Mt., at the height of 1000 m, in abundance, X.1925, *Zhukovsky s.n.* (holo: WIR 1439). Designated by Zhukovsky in WIR; see note 1.

Homotypic synonyms:

Triticum umbellulatum (Zhuk.) Bowden, Can. J. Bot. 37: 666 (1959), Can. J. Gen. Cyt. 8: 133 (1966); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 48 (1987).

Kiharapyrum umbellulatum (Zhuk.) Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 495 (1984, with ssp. *umbellulatum*).

Heterotypic synonyms:

Ae. nigricans Jord. & Fourr., Brev. pl. nov. 2: 128 (1868), **syn. nov.** – Neotype: (Turkey) Lycia ('In incultis Lyciæ, ex clar. E. Bourgeau'), cultivé à Lyon, fl. 30 mai 1865, *Jordan s.n.* (holo: LY-Jordan). See note 3 at 10.8, *Aegilops geniculata*. Material supplied by Bourgeau, cultivated by Jordan. – Homotypic synonym: *Ae. ovata* L. forma *nigricans* (Jord. & Fourr.) Maire & Weiller, Fl. Afrique nord 3: 368 (1955).

Ae. ovata L. var. *quinquearistata* Post, Fl. Syria (ed. 1) 899 (1896), (ed. 2) 2: 784 (1933); Bornmüller, Beitr. Kenntnis Fl. Syrien, Palästina, Verh. k.k. zool.-bot. Ges. Wien 68: 651 (1898), **syn. nov.** – Syntypes: (Turkey) Akherdagh, 13.IX.1884, *Post s.n.* (BEI); (Turkey) Aintab (= Gaziantep),

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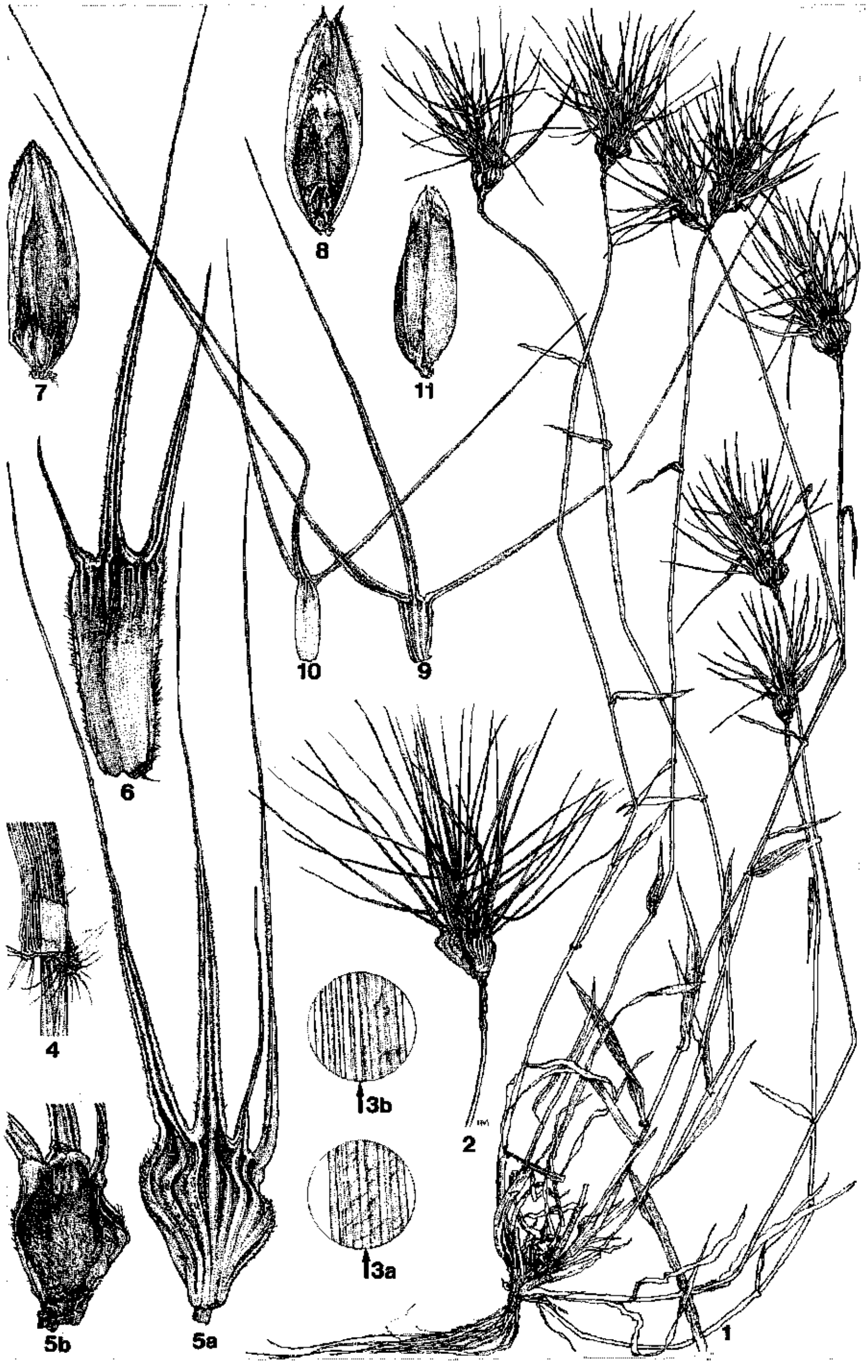
Fig. 85. *Aegilops umbellulata*. 1, habitus (x 1/2); 2, spike (x 1); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 3a (x 5); 4 stem, leaf sheath, ears and leaf blade (x 2); 5-8, lower floret of lowest spikelet in a spike: 5a, glume, 5b, glume inner view, showing hairy surface, 6, lemma, 7, palea with lodicule on left side, 8, palea with dorsal surface of mature seed (5-8 all x 4); 9-10, uppermost, sterile spikelet: 9, glume, 10, lemma (both x 4); 11, ventral surface of mature seed (x 4). (1-3, 5-11. *Tüten & al. CNM-210689-0903*; 4. *Tüten & al. CNM-190689-0402*; both cultivated at ICARDA from germplasm accessions.)


8
7
11
10
9
6
4
3b
3a
2
5b
5a
1

V.1887, *Post s.n.* (BEI); (Turkey) Marash, V.1886, *Post s.n.* (BEI).

Ae. ovata L. var. *anatolica* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 328 (1928a), Feddes Repert., Beih. 55: 215 (1929a); Hammer, Feddes Repert. 91: 236 (1980b, considers it a synonym of *umbellulata*). – Syntypes (three collections cited by Eig, 1928a; inspected ones listed): (Turkey) Amasia, *Bornmüller 468* (B, JE, K (*pro parte*), LD, LE, OXF, PH, SO); (Syria) Aleppo, Haussknecht s.n. (B, BM, K, P). – Note: the other part of *Bornmüller 468* in K is *Ae. biuncialis* (see at 10.2).

Ae. umbellulata Zhuk. var. *pilosa* Eig, Feddes Repert., Beih. 55: 216, Fig. 15-i (1929a); Hammer, Feddes Repert. 91: 236 (1980b); Gandilyan & Arutyunyan, Biol. J. Armenia 40(6): 477 (1987), **syn. nov.** – Type: (Turkey) Lycia, Elmalu, VI.1860, *Boissier s.n.* (holo: G-BOIS, not found).

Ae. umbellulata Zhuk. ssp. *transcaucasica* Dorof. & Migush., Bull. WIR 19: 5 (1971); Hammer, Feddes Repert. 91: 236 (1980b), **syn. nov.** – Type: (Azerbaijan) Origo-Transcaucasus, Azerbajdzhan, regio Axu (= Achsu), 21.VII.1963, *Dorofeev s.n.* (holo: WIR, not found). – Paratype: (Azerbaijan) Origo-Transcaucasus, Azerbajdzhan, regio Axu (= Achsu), 1970, *Migushova s.n.* (holo: WIR, not found). – Homotypic synonyms: *Ae. umbellulata* Zhuk. forma *girmanica* Must. & Aminov, Abstracts of papers of the second Congres VOGiC of N.I. Vavilov ('Tez. Rab. vtorogo S-ezda VOGiS'), Vol. 1: 2 (1972, '*girmanicum*'); Gandilyan & Arutyunyan, Biol. J. Armenia 40(6): 477 (1987, in syn.), *nom. illeg.* (Art. 63.1). *Kiharapyrum umbellulatum* (Zhuk.) Á.Löve ssp. *transcaucasicum* (Dorof. & Migush.) Á.Löve, Feddes Repert. 95: 495 (1984). *Ae. umbellulata* Zhuk. var. *transcaucasica* (Dorof. & Migush.) Gandilyan & Arut., Biol. J. Armenia 40(6): 477 (1987).

Ae. umbellulata Zhuk. [ssp. *transcaucasica* Dorof. & Migush.] var. *tuluni* Gandilyan & Arut., Biol. J. Armenia 40(6): 477 (1987), **syn. nov.** – Type: (Azerbaijan) Nakhichevan, reg. Ordubad, pag. Bilav, 1000-1350 m, VI.1986, *Gandilyan & Arutyunyan s.n.* (holo: YAI; iso: ERE).

Diagnostic characters: tufted, many-tillered annuals, 15-35 cm tall excluding spikes; spikes 1.5-4 cm tall excluding awns, with (3-)5-6 spikelets, the upper 1-2 of which are sterile, and (2-)3 rudimentary spikelets; glumes obovate, widest above the middle, then abruptly constricted, with 3-4(-5) awns; 2 lemma awns as long as the glume awns, 1 reduced; caryopsis free.

Description (Fig. 85): tufted *annuals* (*Fig. 85-1*), usually with many tillers. *Culms* geniculate and prostrate at base, then ascending, 15-35 cm tall excluding spikes; foliage ± evenly distributed, dense at base of culms, more sparse above. *Leaf* blades linear-acuminate, 2-10 cm long, 0.2-0.3 cm wide; sheath margins hyaline, ciliate or not (*Fig. 85-4*). *Inflorescence* (*Fig. 85-2*) a narrowly ovoid spike, consisting of an ellipsoid basal part, rather abruptly changing to a narrowly cylindrical upper part, 1.5-4 cm long excluding awns, ± 0.6 cm wide in lower part, but only ± 0.2 cm in upper part; disarticulating as one unit at maturity with the rudimentary spikelets remaining attached to the culm; with (3-)5-6 spikelets of which the upper 1-2 sterile, and (2-)3 rudimentary spikelets. *Spikelets* sessile, the lower 2-4 obovoid-ellipsoid, ventricose, around 10 mm long excluding awns and ± 5 mm wide, the reduced, upper ones subcylindrical, only 3-4 mm long, ± 1 mm wide; from ± 3 times as long as the supporting rachis internode in the base of the spike changing gradually to only 0.3 times in the apical part; with 3-5 florets, the upper 2 sterile, the 1-2 upper spikelets with 1 reduced, sterile floret. *Glumes* (*Fig. 85-5*) 2, coriaceous (but the lateral margins broadly hyaline), obovate, subventricose, widest above the middle and then abruptly constricted, 5-8 mm long, those of the apical spikelet(s) (*Fig. 85-9*) obtrapezoid, much reduced and only 2 mm long, the surface glabrous or scabrous, rarely adpressed-velutinous, green to purplish-green; veins unequal in width, flattened, sunk into the surface, unequally spaced, usually more yellowish and lighter in colour than the glume surface, scabrid to setulose, veins of apical glumes ± parallel; the truncate apex extending into 3-4(-5) setulose awns, 2-4 cm long, sometimes purplish to blackish in colour, erecto-patent to deflexed in position, inner surface at the base velutinous (*Fig. 85-5b*). *Lemmas* (*Fig. 85-6, 10*) of fertile florets exserting the glumes for up to 1/4 of their length, 6-8 mm long, narrowly ovate-elliptical, boat-shaped, the apex with 2-3 setulose awns, 2-3.5 cm long and 1 weakly developed, ± 0.5 cm long, awn, awn position similar to the glume awns; inner surface of apical region velutinous. *Paleas* (*Fig. 85-7, 8*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 85-11*) 5-7 mm long, free from lemma and palea.

Distribution (Fig. 86): a Mediterranean / Western Asiatic element, predominantly occurring in Turkey, but also present along most of the Fertile Crescent arc (but less common on the western arc in Lebanon and northwestern Syria), in Transcaucasia and Iran. Not recorded from Cyprus. Occurs also on the eastern Aegean islands, and thus an illustration that these islands, covered by Davis' *Flora of Turkey and the East Aegean Islands*, are floristically closer to Anatolia than to Greece (Davis, 1965: 1). Uncommon throughout its range.

Ecology: a species of fallow, grasslands (often with other *Aegilops* species), roadsides, margins of cultivation such as vineyards and (bread) wheat fields, and of edges and within forests and plantations of, e.g., *Quercus*, *Pinus*, *Cedrus*, and *Juglans*. In Greece found at the seaside on sandy dunes. This species often grows on shallow, rocky soils with a bedrock consisting predominantly of limestone or basalt,

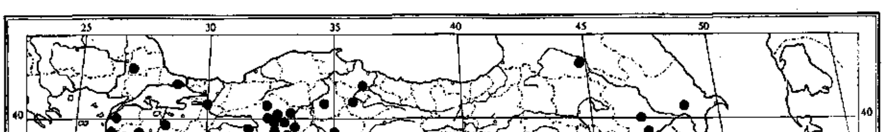


Fig. 86. Distribution of *Aegilops umbellulata* in western Asia. Adventive location in U.K. not shown.

less frequently shale or sandstone; soil textures recorded are clay- and sandy loams, with more pure clay and loam, Mediterranean terra rosa, alluvium, gravel, and gypsum to a lesser extent. *Aegilops umbellulata* prefers more humid conditions than many other species of the genus: collated annual rainfall data vary between 350 and 700 mm, but locations that receive up to 1100 mm have also been recorded.

Altitude: from sea level up to 1800 m.

Flowering and fruiting time: April – June (- July in mountainous regions).

Genome: U with 2x = 2n = 14 (Chennaveeraiah, 1960: 89; Waines & Barnhart, 1992: Table 1).

Vernacular names:

Azeri: Chetirvari bugdayiot (Karjagin, 1950: 339).

Kurdish: Kar kukhînk (from a collection at K from Dahuk, Iraq: *Makki 3278*); Carchanchina (unconfirmed name from a collection at K from Khormal, Iraq: *Al-Rawi 8845*). Both names, quoted by Bor (1968: 194), are similar to Kharken keina (at *Ae. crassa*) and Karkhankina (at *Ae. cylindrica*), meaning 'donkey choke' (S. Al-Kaisi, pers. comm.).

Uses: locally a fodder plant in Iraq (Bor, 1968: 194).

Etymology: the final epithet is derived from the Latin 'umbellulatus' [= furnished with partial umbels, cf., Stearn, 1978: 536], and refers to the spike outline.

A geographical selection of ca 340 herbarium specimens examined:

ASIA: IRAN: Qasvin, *Bornmüller 8457* (B); Tehran, near Emirabad, *Bruhns 940* (B); Qazvin, Hamadan, *Cherbjanovsky s.n.* (LE); Badgka, NE Shiraz, *Gentry 14944* (K, UCR, US); 12 mi. E Kazerun to Shiraz, *Gentry 14679* (MO, UCR); N Dezful to Khorramabad, *Gentry 14635* (K, UCR); Tabriz prov., Sofian, *Grossheim s.n.* (LE); Shaban, Bakhtiari, *Koelz 14996* (US); 50 km from Khorramabad, *Köie s.n.* (C); 60 km NE Dezful, *Köie 299* (C, LE); near village Dalechi, Abushir (Bushire) to Shiraz, *Kotschy 366b* (BM, G-BOIS, P); 24 km Borujerd to Khorramabad, *Kuckuck 457d* (B); Azerbaijan, E Mahabad, *Kuckuck 249k* (B); 176 km Tabriz to Mianeh, *Kuckuck 262b* (B); Bidestan, Ghazvini, *Sabeti & al. 10245E* (K); prov. Fars, E Dasht-e Arzhan, *Soják 5631* (PR); Fars, near Mián Jangal, *Soják 5317* (PR); Tang-i-Dchis, near Konar Tachte (Takhteh), *Stapf s.n.* (K); Kuh Ayub, *Wendelbo 826* (K); W Shiraz to Kazerun steppe, *Wendelbo 841* (E, K); NE Haft Kel, *Wright & Bent 503-505* (K); NE Shiraz, *Zohary s.n.* (UCR).

IRAQ: Sersang to Suara Tuka, *Abdel-Karim & al. 41070* (A, BAG); NW Mandali, *Al-Kaisi & al. 51475* (BAG, K), *50796* (BAG); NE Sersang to Amadiyah, *Al-Kaisi & al. 51080* (BAG); Tawela to Halabja, *Al-Rawi 22135* (K); Plingan, NW Ranya, *Al-Rawi & al. 28642* (K); Kirkuk to Koi Sanjaq, *Al-Rawi 28004* (K); Sharanish, *Al-Sharif & Al-Hamad 50228* (BAG); Qal'a Shirwana, *Boore 507* (K); Arbil, Shaqlawa, Kuh-Sefin, *Bornmüller 1895* (B); valley W Pirmum Dagh, Arbil reg., *Gillett 8171* (K); Qaradagh, *Gillett 7839* (K); E Qaranjir, *Gillett & Al-Rawi 7560* (K); Gweija Dag, *Gillett & Al-Rawi 11691* (BAG); Jarmo, *Helbaek 705* (C, K), *1043* (K); N Bawian, *Leatherdale 42* (BM); Kirkuk, *Makki 3728* (K); Jasina, near Sulaymaniyah, *Omar 42724* (BAG, K); Sulaymaniyah, Avroman Mt., near Tawela, *Rechinger 10209* (K); Sulaymaniyah to Dokan, *Rechinger 10075* (G); Amadiyah to Sersang, *Salah & Hamad 52644* (BAG); W Salahuddin, *Springfield 66, 67* (K); Khanaqin, *Wheeler Haines W1960* (LE); N Khoraqim, *Wheeler Haines W1894* (K).

LEBANON: Hazmiye, *Mouterde 2145* (G).

SYRIA: Aleppo, Muslemiye, *Goerbing s.n.* (B); Aleppo, Jebl Nahar, *Haussknecht s.n.* (JE); Aleppo, *Haussknecht s.n.* (B, BM, K, P, type of *Aegilops ovata* var. *anatolica*); near Aleppo, *Kotschy s.n.* (Pl. Alepp. Kurd. Moss. 174) (G, LE, P, TUB, US); Qaratchok Dag, *Pabot s.n.* (G).

TURKEY: Cilicia, Anamur, *Albaille 6458* (MPU); Izmir, Kemalpaşa, *Alava & Bocquet 4974* (E, G); Izmir, *Balansa s.n.* (L, LE); Maraş city, *Balls B1121* (BM); Thrace, Bahceköy, Edirne reg., *Bauer & Spitzenberger 916* (W); Samsun, Ladik, Sultan Daglari, *Birand & Zohary 2190* (ANK); Manavgat, *Birand 23* (ANK); Ankara ('Galatia, ancyra'), in valley Kawakli-Dere, *Bornmüller 14740* (A, B, BM, C,

E, G, JE, K, LD, LE, P, PR, US, W, Z); Birecik, valley of Kara-Su, *Bornmüller 14741* (B, Z); Bithynia, Vesin-Han, *Bornmüller 14742* (A, B, BM, LD, W); Amasia, *Bornmüller 465* (B), *468* (B, JE, K (*pro parte*), LD, LE, OXF, PH, SO, type of *Aegilops ovata* var. *anatolica*); Lycia, Elmalu, *Bourgeau s.n.* (G-BOIS, LE, MPU, P); Bozburun, Yarimadasi Bayir, *Carlström 10248* (LD); Muğla, Bayirköy, *Carlström 11469* (LD); Datça, Knidas, *Carlström 9793* (LD); Datça, Tuludag to Karadag, *Carlström 9785, 12333* (LD); N Marmaris, *Carlström 12319* (LD); Ankara, Çankiri, *Coode & Jones 2134B* (E); Adana to Ceyhan, *Coode & Jones 366* (E); Adana, Karataş, *Coode & Jones 275* (E); Ankara, Mihaliççik to Sariyarbaraji, *Davis & Coode 37220* (BM, E, K); Diyarbakir, N Ergani, *Davis & Hedge 29016* (ANK, BM, C, E, K); Urfa – Hilvan, 32 km from Urfa, *Davis & Hedge 28252* (ANK, BM, E, K); Baykan to Bitlis, *Davis 43150* (E, ERE, K, SOM); Maraş, Pazarcik, Narli to Karabiyikli, *Davis & Hedge 27845* (ANK, BM, E); Niğde, Hasan Dag above Taspinar, *Davis & al. 19023* (BM, E, K); Mardin to Nusaybin, *Davis & Hedge 28460* (ANK, BM, E, K); Ankara, Kepekli bogazi, *Düzenli 112* (ANK); Afyon, Dunilupinar, Berbercam Tepe, *Ekim & al. 5500* (ANK); Eskişehir, Türkmen Dagi, *Ekim 2220* (ANK); Ankara, Beytepe, *Erik 1550b* (HUB); Lycia, *Forbes 650* (K); Bitlis valley, S Bitlis, *Frodin 38* (BM, W); Adana, Pozanti, *Gleisberg 276* (ANK); Siirt, Baykan, Malabado, *Harlan 7929* (K); Birecik, *Haussknecht s.n.* (JE); Antalya, Kiremithaneler, NE Kara-Dagh, *Hennipman & al. 156* (L); Antalya, Selimiye, S Manavgat, *Hennipman 876* (B, K); Kemalpaşa – Qumudlu, *Huber-Morath 5702* (B, JE); Yozgat, Cekerek, *Ilarshan 1227* (ANK); Bucak to Pomucak, *Jackson 5099* (E); E Çardak, *Johnson & Hall s.n.* (UCR); N Urfa, *Johnson & Hall s.n.* (UCR); E Silvan, *Johnson & Hall s.n.* (UCR); Ankara, Kecioren, Hacikadun valley, *Karamanoglu s.n.* (ANK); Ankara, Baraj Yolu, *Kasapligil s.n.* (MO); Ankara, Kalecik, *Kilinç 123* (ANK); Cilicia, Taurus Mts., *Kotschy s.n.* (G-BOIS); Ankara, Çuluk, *Kotte s.n.* (ANK, K); Ankara, Kecioren, Hacikadun valley, *Krause 4998, 5463* (ANK); Gölhisar to Dirmil, *Nydegger 16249* (B, BC, C, G, RNG); Konya, Seydicetur, *Ocakverdi 1490* (ANK); Ankara, Etymeşut, *Pilát 3754* (PRC); Muğla, S Fethiye, *Polunin 13963* (E); Akherdagh, *Post s.n.* (BEI, type of *Aegilops ovata* var. *quinquearistata*); Aintab (= Gaziantep), *Post s.n.* (BEI, type of *Aegilops ovata* var. *quinquearistata*); Maraş, *Post s.n.* (BEI, type of *Aegilops ovata* var. *quinquearistata*); Konya, Thyanitis, *Siehe 123* (E, K, LE, Z); Çanakkale, near ancient Troy, *Sintenis 187* (B, BM, JE, K, LD, LE, P, W); Birecik, *Sintenis 582* (K, LD); Kharput, Shushnas, *Sintenis 2039* (LD); Konya, Ermenek, Kazanci Kasabasi, *Sümbül 1993A* (HUB); Üzünküyü, *Tengwall 7* (K); Aspendos, E Antalya, *Townsend 63/92* (K); Efes to Meryemana, *von Regel s.n.* (G); Konya, Ermenek, *Vural 708* (ANK); Aydin, Ephesus ruins, *Wallace s.n.* (RNG); Muğla, Marmaris, *Wallace s.n.* (RNG); Çubuk Baradji, near Ankara, *Walter 741* (B); Gazi Çiftlik, near Ankara, *Walter 796* (B); Amasia, *Wiedemann 35* (JE); Erzincan, Kemaliye, *Yildirimli 2878* (ANK, G, HUB); Maraş, Göksun, *Yildiz 2622* (ANK); Maraş, Süleymanli, *Yildiz 1838* (ANK); Angora, *Zhukovsky 142* (WIR 1446), *368* (WIR 1443); Dizgurt-Dagh, *Zhukovsky s.n.* (WIR 1437-1438; WIR 1439, type of *Aegilops umbellulata*); Dizgurt-Dagh, near Angora, *Zhukovsky s.n.* (WIR 1436); Gaziantep to Maraş, *Zohary s.n.* (UCR).

EUROPE: ARMENIA, NAGORNO-KARABACH: Gadrut reg., Domme, *Smoljaninova s.n.* (LE).

AZERBAIJAN: Kjurdamir distr., near Kalagajly, towards Gerdymanhai river, *Grossheim s.n.* (GAT, L, LE). NAKHICHEVAN: Ordubad reg., Bilav, *Gandilyan & Arutyunyan s.n.* (ERE, YAI, type of *Aegilops umbellulata* var. *tuluni*).

GREECE, ISLANDS: CHIOS: near Mezaria, *Orphanides 3430* (G-BOIS); Nea Moni, *Snogerup 6766* (LD). CRETE: Merabello, near Agios Nikolaos, *Bowen 2048* (RNG); Sitia, Koprokefala, *Runemark & al. 18219* (LD). KOS: Angora ruins, *Brenan 11064* (K). LESVOS: E Keramia, Bourounia Mt., *Edmondson & McClintlock 2553* (E). LIPSÓI: SE Lipsói town, *Runemark & von Bothmer 46579* (LD). RHODES: E Salakos, *Carlström 4951* (LD); ENE Agios Theodoros, *Carlström 5308, 5355* (LD); Filerimos, *Kaae s.n.* (C). SAMOS: Agios Kiriaki, *Runemark & al. 19775* (LD); W Maratokampos, *Runemark & al. 19044* (LD); S cliff Mt. Kerki, *Runemark & al. 19212* (LD).

ADVENTIVE: EUROPE: U.K., SCOTLAND: Leith, *Fraser 509* (B, E, RNG).

CULT.: ASIA: TURKEY: Lycia, cult. at Lyon, *Jordan s.n.* (LY-Jordan, type of *Aegilops nigricans*).

Germplasm collections examined:

ASIA: LEBANON: Beka'a valley, Sanin, *Rubeiz B-14* (ICARDA).

SYRIA: Qamishly, Ain Diwar on Turkish border, *Damania & al. DFKO-37* (ICARDA, SARD); Lattakia, Kabier, *Elings & al. ID-394* (ICARDA, SARD); Lattakia, Kabr El Abid, *Elings & al. ID-367-a* (ICARDA, SARD).

TURKEY: Kayseri, E Develi, *Güzel & al. SNM-080889-0102* (ICARDA, PGRRI); Ankara, N Celebi, *Güzel & al. SMN-040889-0702* (ICARDA, PGRRI); Konya, E Kadinhani, *Güzel & al. SMN-060889-0203* (ICARDA, PGRRI); 35 km SW Elâziğ, *Metzger & Jana 79TK015-067* (USDA); Malatya, S Darende, *Metzger & Jana 79TK012-057* (USDA); at Corum, *Metzger & Jana 84TK681-002* (USDA); Manisa, S Sarigol, *Metzger & Jana 84TK162-058* (USDA); Denizli, N Buldan junction, *Metzger & Jana 84TK160-050* (USDA); near Denizli – Asagisamli junction, *Metzger & Jana 84TK157-012* (USDA); Hakkari, SW Semdinli, *Metzger & Jana 84TK563-002* (USDA); Balikesir, S Balya, *Tüten & al. CNM-210689-0903*; Çanakkale, NE Ezine to Çanakkale, *Tüten & al. CNM-190689-0402.*

Notes: 1. Zhukovsky (1928: 485) enumerates seven collections from Turkey in connection with his newly described *Aegilops umbellulata*. Four of them are present as the 'type' in WIR: nos. WIR 1436-1439. Inspection showed that Zhukovsky indicated 'lectotypus' only with the collection WIR 1439. This designation is followed.

2. This species may be confused with the partially sympatric *Aegilops geniculata*, which has roughly the same spike outline and a similar number of awns on the glumes of the fertile spikelets: (3-)4(-5). Differences are keyed out as follows:

Spikes with 5-6 spikelets of which the lower 2-3 are fertile; rudimentary spikelets (2-)3; lower, fertile spikelets obovoid-ellipsoid, widest above the middle, then abruptly constricted .... **umbellulata**

Spikes with (2-)3-4 spikelets of which the lower (1-)2-3 are fertile; rudimentary spikelets 1(-2); lower, fertile spikelets ovoid, widest at or below the middle .... **geniculata**

10.20 **Aegilops uniaristata** Vis. **Figs. 87-88**

Aegilops uniaristata Vis., Fl. dalmat. 3: 345 (1852); Schlosser von Klekovski & Vukotinovič, Fl. croat. 1294 (1869); Groves, Nuov. Gior. Bot. Ital. 19: 213 (1887); Nyman, Consp. fl. eur. 4: 839 (1882), Suppl. 2: 342 (1890); Fiori & Paoletti, Fl. Italia 1: 109 (1896); Koch, Syn. deut. schweiz. Fl. (ed. 3) 3: 2799 (1907); Fiori, Nuov. Fl. Italia 1: 160 (1923); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 453, 519 (1928); Eig, Feddes Repert., Beih. 55: 114 (1929); Chennaveeraiah, Acta Horti Gotoburg. 23: 165 (1960); Domac, Eksk. fl. Hrvatske [Croatia] 516 (1967); Zangheri, Fl. ital. 1: 980 (1976); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980); Hammer, Feddes Repert. 91: 236 (1980b); Demiri, Fl. ekskur. shqip. (Albania) 80 (1981); Pignatti, Fl. italia 3: 542 (1982); Davis, Fl. Turkey 9: 239 (1985); Bianco et al., Webbia 43: 19-24 (1989).

Type: (Croatia, Dalmatia) in herbidis circa Zara (= Zadar), unde communicavit Prof. Alschinger, *de Visiani s.n.* (holo: PAD; iso: W).

Homotypic synonyms:

Triticum uniaristatum (Vis.) K.Richt., Pl. eur. 1: 128 (1890); Ascherson & Graebner, Syn. mitteleur. Fl.

Fig. 87. *Aegilops uniaristata*. 1, habitus (x 1/2); 2, spike (x 1); 3a, abaxial surface of leaf, midway (x 5); 3b, adaxial surface of 3a (x 5); 4, stem, leaf sheath, ears and leaf blade (x 2); 5-7, lowest floret of lowest fertile spikelet in a spike: 5, glume (x 3), 6, lemma (x 3), 7, palea and immature seed (x 5); 8-10, glumes: 8, glume of second spikelet (x 3), 9, glume of third spikelet (x 3), 10, glume of apical spikelet (x 3); 11, lemma of apical spikelet (x 3); 12a, part of palea encapsuling mature seed (x 5); 12b, ventral surface of mature seed (x 5). (1-12. *s.coll., s.n.*, cultivated at ICARDA from germplasm accession (USDA-PI 276995), received from PGRRI; material originally from Croatia or Greece.)


5
6
2
8
9
7
10
11
12a
12b
3b
3a
4
1

2(1): 708 (1902); von Hayek, Prod. fl. pen. Balcan. 3: 226 (1932); Diapulis, Syn. fl. graec. 167 (1939); Bowden, Can. J. Bot. 37: 666 (1959); Webb, Fl. Eur. Turkey, Proc. Roy. Irish Acad., Sect. B. 65: 79 (1966); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 40 (1987).

Chennapyrum uniaristatum (Vis.) Á.Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 495 (1984).

Sub nom. *Ae. ovata* auct. non Linnaeus (1753): Alschinger, Fl. jadr. 23 (1832).

Heterotypic synonyms:

Ae. uniaristata Steud., Syn. pl. glumac. 1: 354 (1854), *nom. illeg.* (Art. 64.1), non de Visiani, Fl. dalmat. 3: 345 (1852). – Type: Greece, *Lenormand s.n.* (ex hb. von Steudel) (holo: P).

Ae. notarisii Clem., Sert. Orient. 99, Tab. 5, fig. 1 (1855) / Mém. Acad. Sci. Torin., Ser. 2, Vol. 16: 335 (1857); Tchichatscheff, Asie min., Bot. 2: 583 (1860). – Type: (Turkey) crescit rara in sylvulis collinis circa Ciamlicia culta Scutarium asiatium, 25.VI.1850, *Clementi s.n.* (holo: PI, left-hand specimen only; iso: G-BOIS). – Note: the right-hand specimen of the holotype sheet in PI is *Aegilops speltoides* var. *ligustica* (coll. *Blanche 2026* from Saïda, Lebanon). Scutarium refers to Üsküdar, a district on the Asiatic side of Istanbul, Turkey, where the material may have been cultivated. Ciamlicia is probably a misspelling of Cilicia in southern Turkey where the material may have originated.

Diagnostic characters: tufted, many tillered annuals, 15-35 cm tall excluding spikes; spikes moniliform, tapering towards the apex, 1.5-4 cm long excluding awns, with 3-5 fertile and (2-)3 rudimentary spikelets; glumes with 1 awn, 0.7-4 cm, increasing in length towards the apex, and 1 triangular tooth, apical glume with a 3-5 cm long, flat awn; lemma apex with 1 aristulate and 1 sharply triangular tooth, of fertile apical spikelet floret with an awn, up to 2 cm long with lateral teeth at the base; caryopsis free.

Description (Fig. 87): tufted *annuals* (*Fig. 87-1*), usually with many tillers. *Culms* semi-erect, geniculate at base, then ascending, 15-35 cm tall excluding spikes; foliage ± evenly distributed, more dense at base of culms. *Leaf* blades linear-acuminate, 2-8 cm long, 0.2-0.3 cm wide; sheath margins hyaline, ciliate in most parts (*Fig. 87-4*). *Inflorescence* (*Fig. 87-2*) a moniliform spike, tapering towards the apex, 1.5-4 cm long excluding awns, 0.2-0.4 cm wide; disarticulating as one unit at maturity with the rudimentary spikelets remaining attached to the culm; with 3-5 fertile and (2-)3 rudimentary spikelets. *Spikelets* sessile, urceolate, the apical one ± obconical, 0.7-0.9 cm long, excluding awns, 0.3-0.4 cm wide, the apical spikelet reduced, 0.6 cm long, 0.2 cm wide; spikelet length ± equal to the length of the supporting rachis internode; with 3-5 florets, the upper 2 sterile. *Glumes* (*Fig. 87-5, 8-9*) 2, coriaceous, the lateral ones ovate-elliptical, 5-7 mm long, the apex with a broadly triangular, abaxial tooth, 2-3 mm wide at the base, and an adaxial, setulose awn, increasing in length from ± 7 mm in the basal spikelet up to 4 cm subapically, at the base triangular in cross section; apical glume (*Fig. 87-10*) ± 5 mm long, elliptical, the apex extending into a 3-5 cm long awn, flat in cross section at the base; glume surface smooth; veins scabrous to setulose, unequally wide, sunk into the surface, unequally spaced, usually more yellowish and lighter in colour than the rest of the glume surface. *Lemmas* (*Fig. 87-6*) of fertile florets slightly exserting the glumes, ovate-urceolate, boat-shaped, 7-9 mm long, the apical region folded to conduplicate, apex with 1 sharp, aristulate tooth and a sharply triangular one, up to 3-4 mm long; apex of fertile floret lemma in the apical spikelet (*Fig. 87-11*) extending into an awn of up to 2 cm long with 2 lateral teeth at the base; inner surface of apical region velutinous. *Paleas* (*Fig. 87-7*) narrowly ovate-elliptical, with 2 sharp, setose keels ending in an acute apex. *Caryopsis* (*Fig. 87-12*) 5-7 mm long, free from lemma and palea.

Distribution (Fig. 88): a Mediterranean element occurring in coastal Croatia, Greece (including islands), Albania, and, rarely, in southeastern Italy. Uncommon to rare throughout its range. Locations from northwestern Turkey are probably historic. Webb (1966: 79) cites three locations from (European) Turkey, of which Kağathane (also spelled as Klathane or Kiathané) is just outside Istanbul; the other two could not be traced. No recent sites are reported, and I consider the species extinct or extremely rare in Turkey nowadays. *Aegilops uniaristata* has been rediscovered in the Tarento region in southeastern Italy by Bianco et al. (1989) from where it was also reported during the 19th century.

Ecology: in dry grasslands and bushy slopes, mainly on rocky, calcareous soils, more rarely on sandstone. Recent Italian locations (Bianco et al., 1989: 20) were on rocky, calcareous and terra rosa soils in (sometimes degraded) vegetation of, among others, *Quercus* and *Pistacia*, with additional presence of wild oats and *Ae. geniculata* and *neglecta*, as well as in the margins of olive groves.

Altitude: from sea level up to about 750 m. In Italy between 100 and 460 m.

Flowering and fruiting time: May – June (in Dalmatia, cf., Fiori & Paoletti, 1896: 109).

Genome: N with 2x = 2n = 14 (Chennaveeraiah, 1960: 89; Waines & Barnhart, 1992: Table 1).

Vernacular names:

Albanian: Halmuca njëhalëste [një = (number) one; halë = (amongst others) awn] (Demiri, 1981: 80).

German: Eingranniger Walch [= one-awned Walch] (Koch, 1907: 2799).

Serbo-croatian: Oštrica [a name referring to strong awns; pers. comm. M. Penčić] (Šulek, 1879: 492).

Etymology: the final epithet refers to the Latin 'uni' [= one] and 'arista' [= awn], and refers to the glume outline.

Most of the ca 170 herbarium specimens examined:

ASIA: TURKEY: Istanbul, Chichii – Klathane (Kagathane), *Aznavour s.n.* (BM, G, LY-Gandoger); Istanbul, Zékériékeny, *Aznavour s.n.* (B, BEI, BM, FI, G, L, LY, MPU, PR, W, Z); Yekanelidja, *Aznavour s.n.* (G); Alem Dagh, *Aznavour s.n.* (G); Masslah, *Aznavour s.n.* (G); Kourdkeny, *Aznavour s.n.* (G); Dodurlu-Kisikli, *Aznavour s.n.* (G); Ciamlicia (Cilicia?), *Clementi s.n.* (G-BOIS, PI, type of *Aegilops notarisii*); Maltepe, *Eig s.n.* (UCR); Beredchik (Biredjik), *Mannissadjian s.n.* (LY); Cilicia, Anamur, *Péronin 105* (K, W).

EUROPE: ALBANIA: Gjinokastër, *Alston & Sandwith 1442* (BM, K).

CROATIA, DALMATIA: island Biela in Medolino golf, *de Marchesetti s.n.* (FI); island S. Maria, near Medolino and Pola, *de Marchesetti s.n.* (FI); Capouto, *de Marchesetti s.n.* (FI); Fenera (= Fenestra?) island, near Promotore, *de Marchesetti 351a* (JE), *s.n.* (FI, LD, PI-GUAD, PR, TO, TUB, W); Sta. Maria island, near Medolino, *de Marchesetti 741* (A, BM, FI, GE, K, LE, LY, OXF, PI-GUAD, TO, Z); near Parenzo ('Parentium'), *de Marchesetti 1485* (A, B, BC, BM, C, FI, G, K, L, LD, LY, MO, OXF, P, PR, PRC, SO, US, W, Z), *s.n.* (Exsicc. Schultz 2096) (A, B, BM, BR, FI, G, K, LE, LY, MPU, OXF, P, PR, W); ibid., *de Tommasini s.n.* (FI, PI, PR, W); near Zara (Zadar), *de Visiani s.n.* (PAD, W, type of *Aegilops uniaristata*); Losinj, island Bigale, *Haračić s.n.* (JE, LD, LY, MO, MPU); Losinj, Blatina, *Haračić s.n.* (W). ISTRIA: S Istria, island Teneca(?), Marina, *de Tommasini s.n.* (FI); near Medolino, *de Tommasini s.n.* (FI); Pola, Rovigno, *de Tommasini s.n.* (W); Pola, *Freyn s.n.* (Exsicc. Baenitz 3157)

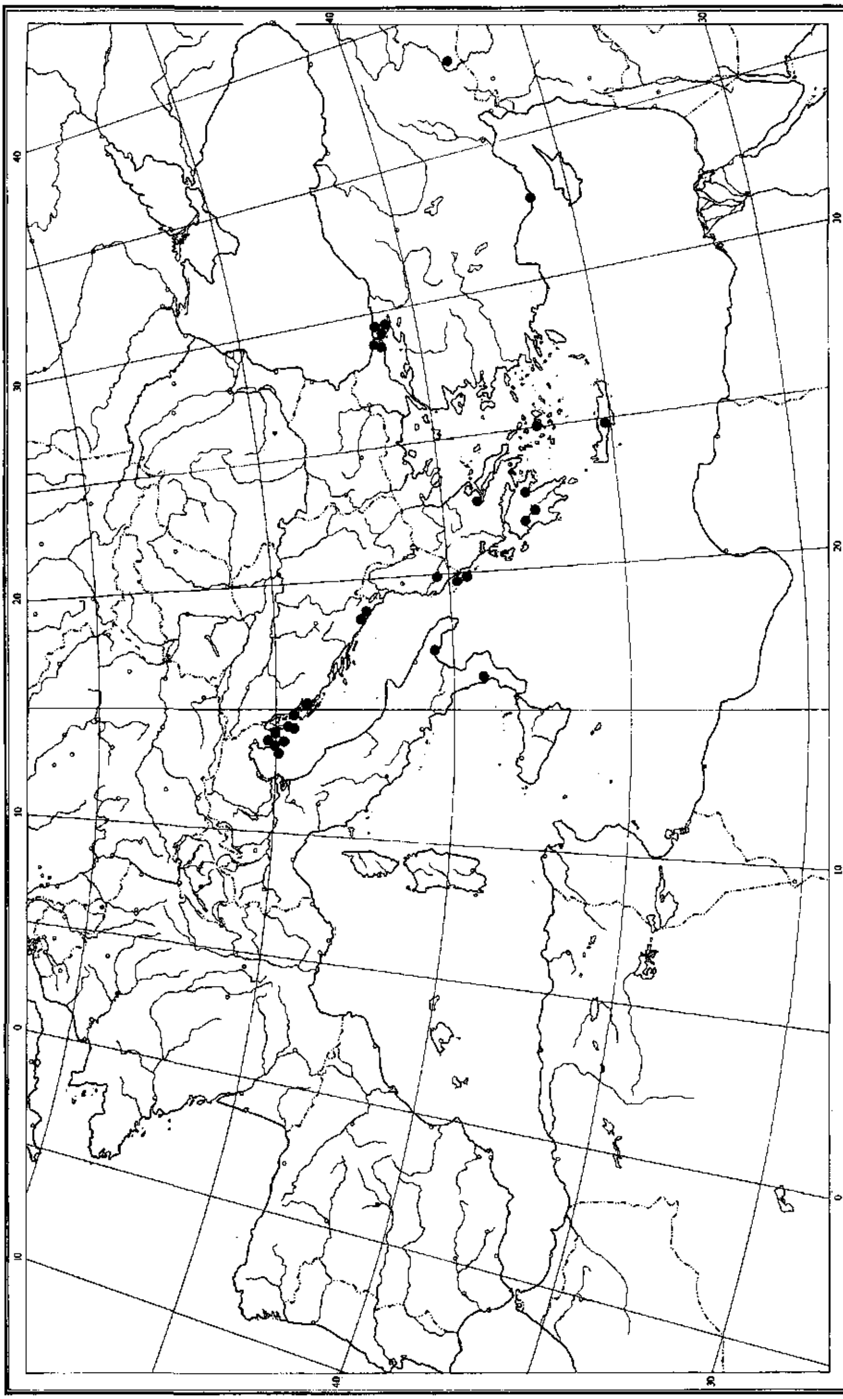


Fig. 88. Distribution of *Aegilops uniaristata* in the eastern Mediteranean.

(A, B, F, FI, JE, K, LD, LE, LY, LY-Gandoger, TO, Z); Medolino, *Gaillardot s.n.* (JE); Val Bandon, near Pola, *Hackel s.n.* (W); near Conte Grande, Pola reg., *Korb s.n.* (W); Brioni island, *Korb s.n.* (W); Pola, *Pichler s.n.* (P); S Istria, near Pola, *Rechinger s.n.* (LD); near Veruda, *Untchj s.n.* (B, G, JE, L, LY, MPU, PRC, US); Pola, Prato Vincurian, *Untchj s.n.* (FI, JE, PR); Pola, Mt. Toibon, *Untchj s.n.* (FI, GE, JE, L, LD, P, W, Z); S Istria, near Pola, *Untchj s.n.* (B, L); Franz-Jozef spring, *Untchj s.n.* (JE, L, MPU, US); S Istria, Prato Grande, near Pola, *Witting s.n.* (B, PR, W).

GREECE, PELEPONNESUS: near Nauplion, *Berger s.n.* (L); Olympia ruins, Droura hill, *Bot. Exp. Univ. Kyoto BMUK 5819, 5820* (UCR); 'Moreé', Napolide Roumanie, *Despreaux s.n.* (G). STEREA: 39 km N Lamia, *Zohary s.n.* (UCR). ISLANDS: CORFU: Papanti, near Kastellani, *Baenitz s.n.* (L, LE, P); at Potamo river, *Bicknell s.n.* (GE); W Kanoni strait, *Snogerup 23526* (LD). CRETE, Ioannina, *Damanakis 4210* (K). PAROS: s.loc., *Despreaux s.n.* (JE). GREECE: s.loc., *Lenormand s.n.* (ex hb. von Steudel) (P, type of *Aegilops uniaristata* auct. non Vis.).

ITALY: Leucaspide, near Tarento, *Hackel s.n.* (W).

YUGOSLAVIA, MONTENEGRO: Podgorica (= Titograd), *Rohlena 7* (BM), *s.n.* (LD, PRC); Parmaki, *Rohlena s.n.* (PR).

10.21 **Aegilops vavilovii** (Zhuk.) Chennav. **Figs. 89-91**

Aegilops vavilovii (Zhuk.) Chennav., Acta Horti Gotoburg. 23: 167 (1960, '*Vavilovii*'); Migushova & Chakimova, Bull. WIR 119: 76 (1982); Chaudary, Grasses Saudi Arabia 179 (1989, as *Ae.* 'aff. *crassa*'; see at Distribution).

Basionym: *Ae. crassa* Boiss. ssp. *vavilovii* Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 554 (1928, '*Vavilovi*'); Hammer, Feddes Repert. 91: 234 (1980b); Feinbrun-Dothan, Fl. Pal. 4: 173 (1986).

Lectotype (*nov.*): Syria, Salamie ('Salamich'), near the road, 30.IX.1926, *Vavilov 29028* (WIR 747). See note 1.

Homotypic synonyms:

Triticum syriacum Bowden, Can. J. Gen. Cyt. 8: 135 (1966); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 76 (1987). See note 2.

Gastropyrum vavilovii (Zhuk.) Á.Löve, Feddes Repert. 95: 502 (1984).

Heterotypic synonym:

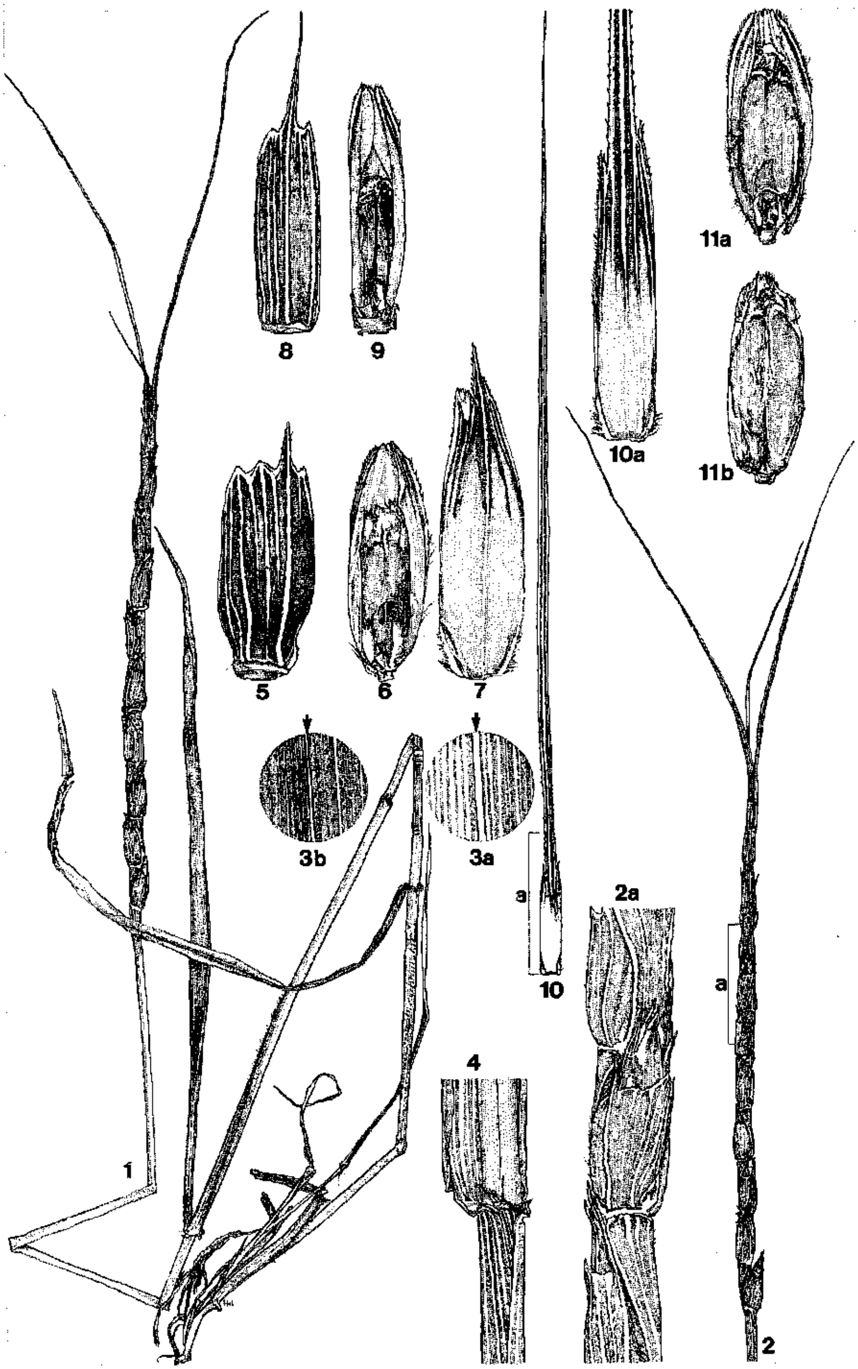
Ae. crassa Boiss. var. *palaestina* Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 326, 327 (illustr.) (1928a), Feddes Repert., Beih. 55: 92 (1929a); Post, Fl. Syria (ed. 2) 2: 787 (1933); Täckholm et al., Fl. Egypt 1: 268 (1941); Mouterde, Fl. Djebel Druze 65 (1953); Melderis in Rechinger, Ark. Bot. 5: 71 (1960); Mouterde, Nouv. Fl. Liban, Syrie 1: 151 (1966); Täckholm, Students' Fl. Egypt (ed. 2) 702 (1974). – Type: (Palestine) Jerusalem, V.1924, *Zohary s.n.* (holo: HUJ, not seen).

Diagnostic characters: robust, loosely tufted annuals, 20-60(-75) cm tall excluding spikes; spikes narrowly cylindrical, tapering in upper half, (7.5-)10-15 cm long excluding awns, with (5-)7-10 spikelets, rudimentary spikelets absent, rarely 1-2; glumes adpressed-velutinous, the apex with 2-3 teeth, the adaxial one extending into a short, up to 1 cm long, awn, apical glume with short, central awn and 2 lateral teeth; lateral lemma apex with sharp tooth at the keel, of apical lemma the flat apex extending in a 5-8(-10) cm long, diverging, setulose awn, with or without teeth at the base; caryopsis adherent.

Description (Fig. 89): robust, loosely tufted *annuals* (*Fig. 89-1*) with few to many tillers. *Culms* erect, slightly geniculate at base, 20-60(-75) cm tall excluding spikes; foliage evenly distributed, somewhat more dense at base of culm. *Leaf* blades linear-acuminate, 8-20 cm long, 0.3-0.5 cm wide; margins of sheaths hyaline, ciliate (*Fig. 89-4*). *Inflorescence* (*Fig. 89-2*) a narrowly cylindrical spike, gradually tapering in the upper half, in immature plans sometimes zig-zag shaped, (7.5-)10-15 cm long excluding awns, 0.4-0.6 cm wide, the apical spikelet only 0.2 cm wide; disarticulating barrel-type at maturity into individual spikelets with the rudimentary spikelets remaining attached to the culm (or the lowest fertile spikelet in case no rudimentary spikelets are developed); with (5-)7-10 fertile spikelets, rudimentary spikelets usually absent, but rarely 1-2 developed. *Spikelets* (*Fig. 89-2a*) sessile, narrowly ovoid, 8-15 mm long excluding awns, 4-5 mm wide; the apical spikelet obconical and more slender, around 2-3 mm wide; spikelet length ± equally the length of the supporting rachis internode; with 4-5 florets, the upper 2 sterile, sometimes the basal spikelet more reduced and with 1 fertile and 2 sterile florets only. *Glumes* (*Fig. 89-5*) 2, coriaceous (but the lateral margins hyaline), of the lateral spikelets ovate-truncate, 7-10 mm long, the surface closely adpressed-velutinous; veins unequally wide, sunk into the surface, more or less parallel, usually yellowish and ligher in colour than the glume surface, adpressed-velutinous; apex of lateral glumes truncate, with 2-3 teeth, the adaxial one acute and the strongest developed, extending up to a short, setulose awn of up to 1 cm, the other teeth broadly triangular, sometimes indistinct, depressions between teeth hyaline; the apical glume (*Fig. 89-8*) ovate-rectangular, 7-9 mm long, the apex truncate with a central awn, up to 2.5 cm long, flanked by 2 triangular, lateral teeth, sometimes indistinct. *Lemmas* (*Fig. 89-7*) of fertile florets exserting the glumes, 8-11 mm long, narrowly ovate, boat-shaped, coriaceous in the apical and lateral parts, hyaline only in central and basal parts, inner and outer surface of apical region velutinous, the apical region in the lateral spikelets folded up to conduplicate, keeled; apex of lateral lemmas with a sharp, setulose tooth at the keel, up to 5 mm long subapically, and 2-3 sometimes indistinct lateral teeth; apical region of lemmas of the apical spikelet (*Fig. 89-10*) flat, extending into a long, flat awn, 5-8(-10) cm long, diverging and curving outward, with (*Fig. 89-10a*) or without 2 sharp lateral teeth at the base (typically – but not always – one awn with, one awn without lateral teeth, but both with and both without is also observed), setulose on outer surface of central vein and margins, inner, flat surface scabrous; apex of third, sterile, apical floret occasionally with an awn of up to 1.5 cm long (*Fig. 89-2*). *Paleas* (*Fig. 89-6, 11a*) narrowly elliptical, with 2 sharp, setose keels, each ending in a sharply acute apex. *Caryopsis* (*Fig. 89-11b*) 6-8 mm long, adherent to lemma and palea.

Distribution (Fig. 90): a Western Asiatic element, predominantly occurring in the western arc of the Fertile Crescent: Jordan, Palestine, Syria (southwestern, central and northeastern parts), and Lebanon. Distinctly *not* found on the Mediterranean coast and only to the east of the adjacent mountain ranges in Palestine, Lebanon and Syria. Also found in southern Turkey, close to the Syrian border, and

Fig. 89. *Aegilops vavilovii*. 1, habitus (x 1/2); 2, spike (x 1/2); 2a, enlarged part of spike, showing spikelets in situ (x 2); 3a, abaxial leaf surface, midway (x 5); 3b, adaxial surface of 3a (x 5); 4, stem, leaf sheath, ears and leaf blade (x 2); 5-7, lowest floret of spikelet in centre of spike: 5, glume, 6, lemma, 7, palea with immature seed (5-7 all x 3); 8-10, lowest floret of apical spikelet: 8, glume (x 3), 9, palea with immature seed (x 3), 10, lemma (x 1); 10a, enlargement of basal part of 10 (x 3); 11a, palea and mature seed (x 3); 11b, dorsal surface of mature seed (x 3). (1-11. *van Slageren & Jaradat MSAJ-88001H*.)



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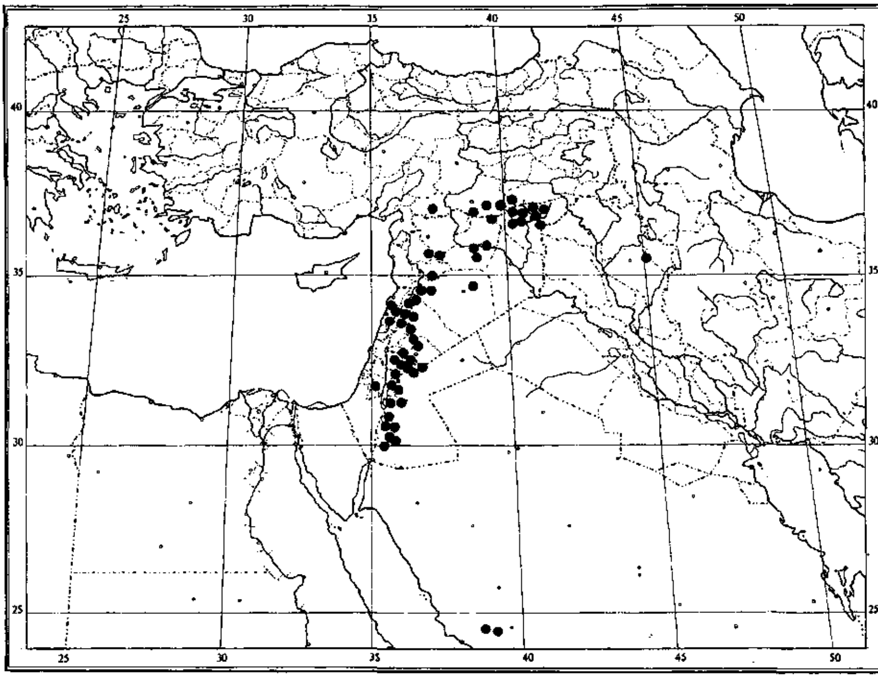


Fig. 90. Distribution of *Aegilops vavilovii* in western Asia. Adventive location in the U.K. not shown.

in Iraq, thus in the more central part of the Crescent. Uncommon throughout its range and rare in Turkey and Iraq.

A few, isolated sites are now known from Saudi Arabia, probably resulting from introduction. Chaudari (1989: 179-180 and Fig. 56) was unsure of the identification of material found near Medinah that had been collected by Collenette. Her specimens at E and K, as well as Chaudari's drawing now confirm the occurrence in Saudi Arabia of *Ae. vavilovii*. See also note 3. Found adventive in Scotland.

Ecology (Fig. 91): a species of roadsides, fallow, grasslands, and edges of and within cultivated areas, such as orchards, olive groves, vineyards, and barley and *durum* wheat fields (where it can grow up to 75 cm tall). Populations of *Ae. vavilovii* may vary from small and scattered to large and dense stands, sometimes intermingled with other *Aegilops* species (Fig. 91). *Aegilops vavilovii* can predominantly be found on a bedrock of limestone, more occasionally also on basalt (e.g., in the Sweida region in southern Syria), flint or sandstone. Observed soil texture is predominantly clay- and sandy loam, with more pure clay, loam or sands to a lesser extent. Growth on very poor, stony soils, as well as on silty loams in water catchments is recorded. The majority of rainfall data indicate good drought tolerance, in range from 100-275 mm, but up to 550 mm is recorded in some higher locations.

Altitude: 275-1550 m.

Flowering and fruiting time: April – July.

Genome: DMS (female parent 'DM' x male parent 'S') with 2x = 6n = 42 (Chennaveeraiah, 1960: 92, sub *A. crassa* ssp. *vavilovii*; Waines & Barnhart, 1992: Table 2; sub *Ae. vavilovii*). Similarly to *Ae. juvenalis* (see at 10.9), this designation is in contrast with the one of Kimber & Tsunewaki (1988: as 'DMS', sub *T. syriacum*) who consider all constituting genomes as modified from the original, diploid ones.

Etymology: the final epithet refers to N.I. Vavilov (1887-1943), Russian botanist, agronomist, geneticist and phytogeographer; in charge of the All Union Institute of Applied Botany (later N.I. Vavilov Institute) in 1924; travelled widely during 1929-1940, in the Mediterranean region among others, collecting economic plants.

Most of the 52 herbarium specimens examined:

ASIA: IRAQ: E Qaranjir, road Kirkuk – Sulaymaniyah, *Al-Rawi 21621* (K).

JORDAN: near El Sahab, *Samuelsson 896* (BM, LD); Mafraq, W El Buweida, *van Slageren & Jaradat MSAJ-88001H* (ICARDA); Mafraq, SE El Buweida, *van Slageren & Jaradat MSAJ-88004H* (ICARDA); W Mafraq, *van Slageren & Jaradat MSAJ-88007H* (ICARDA); Mafraq, Hamama, W Rihab, *van Slageren & Jaradat MSAJ-88010H* (ICARDA); El Madwar, E Jarash, *van Slageren & Jaradat MSAJ-88022H* (ICARDA); Irbid – Mafraq road at split to Hausha, *van Slageren & Jaradat MSAJ-88025H* (ICARDA); Mafraq, Suweilima, off road Mafraq – Dara'a, *van Slageren & Jaradat MSAJ-88039H* (ICARDA); Madaba, El Rawdha, SW Naur, *van Slageren & Jaradat MSAJ-88065H* (ICARDA); Madaba, Dab'a, on Desert Highway, *van Slageren & Jaradat MSAJ-88072H* (ICARDA); Tafila, E Rashadiya, *van Slageren & Jaradat MSAJ-88076H* (ICARDA); Ma'an, Humaima, Ras en Naqb to Quweira, *van Slageren & al. MSBHAJ-88175H* (ICARDA).

PALESTINE: s.loc., *s.coll.*, *s.n.* (K, US cult.).

SAUDI ARABIA: Umm Figra, 50 km W Medinah near At Tawr, *Collenette 7087* (E, K, RIY 13186); Umm Figra, 70 km W Medinah, *Collenette 7210* (E).

SYRIA: Antilebanon, near Damascus, *Blanche s.n.* (BEI, G); Damascus, *de Labillardière s.n.* (G); Jebl Qara, *Dinsmore 20320* (K); Jebl Druze, Shahba, *Mouterde 7261* (G); S in Hauran reg., near Tissia, *Pabot s.n.* (G); Jebl Abd-el-Aziz, *Pabot s.n.* (G); Antilebanon, Qadi el Jbarior, *Peyron 1803* (G); Boueidar, next to ICARDA exp. fields, *van Slageren & Sweid MSFS-91007H* (ICARDA); Breda, at ICARDA exp. fields, *van Slageren & Sweid MSFS-91003H, 91005H*; Breda, at ICARDA exp. fields, *van Slageren & al. MSFSHA-91008H* (ICARDA, WAG); Hassake, E Qantari, Al Misherfe to Tall Tamr, *van Slageren & Sweid MSFS-91025H* (ICARDA); Hassake, just S of Tall Tamr, *van Slageren & Sweid MSFS-91026H* (ICARDA); Hassake, N Jebl Abd-el-Aziz, coming from Tall Tamr, *van Slageren & Sweid MSFS-91030H* (ICARDA); E Hassake, 30 km W Al Khatouniye, *van Slageren & Sweid MSFS-91034H* (ICARDA); 10 km N Hassake to Qamishly, *van Slageren & Sweid MSFS-91036H* (ICARDA); W Derbasiye, *van Slageren & Sweid MSFS-91055H, 91056H* (ICARDA); 20 km W Ras-el-Ain to Tall Abiad, *van Slageren & Sweid MSFS-91064H* (ICARDA); Salamie, *Vavilov 29026* (WIR 754), *29028* (WIR 2719; WIR 747, type of *Aegilops vavilovii*).

TURKEY: 22 km Urfa to Viranşehir, *Davis 42283* (E, K); Urfa – Akçakale, *Davis & Hedge 28155* (E, K); Mardin, *Post 39* (G); Anitab (= Gaziantep), *Post s.n.* (BEI).

ADVENTIVE: EUROPE: U.K., SCOTLAND: Leith, *Fraser 509* (RNG, W); Slateford, *Fraser s.n.* (RNG).

Germplasm collections examined:

ASIA: JORDAN: Karak, 130 km S Amman on Desert road towards Aqaba, *Bourgois SY-20253* (IPGRI, ICARDA); Karak, N Qasr on King's Highway, *van Slageren & al. MSBHAJ-88155* (ICARDA, JUST); Ma'an, El-Hai, Shaubak – Petra road, *van Slageren & al. MSBHAJ-88166* (ICARDA, JUST); Iftjetj, near Shaubak, *van Slageren & Jaradat MSAJ-88080* (ICARDA, JUST); Ma'an, NW Basta, on road Petra – Ma'an, *van Slageren & al. MSBHAJ-88168* (ICARDA); Ma'an, S Rajif, road Wadi Musa – Ras en Naqb, *van Slageren & al. MSBHAJ-88170* (ICARDA, JUST); Ma'an, Abu El-Lasan, road Ma'an – Ras en Naqb, *van Slageren & al. MSBHAJ-88171* (ICARDA, JUST); Ma'an, El Beida, road Shaubak – Petra, *van Slageren & al. MSBHAJ-88163* (ICARDA, JUST); Karak, Qatrana, on Desert Highway, *van Slageren & Jaradat MSAJ-88074* (ICARDA, JUST); Tafila, Rashadiya, near cement factory of Shaubak, *van Slageren & al. MSBHAJ-88179* (ICARDA, JUST); Um El-Jaml, 10 km E Mafraq, *van Slageren & Jaradat MSAJ-88008* (ICARDA, JUST).

LEBANON: Beka'a valley, Irsal region, *Rubeiz C-1, 2, 9, 12, 17, 20, 40* (ICARDA).

PALESTINE: Mishor Chava, Nachal ABDE(?), *Johnson s.n.* (UCR).

SYRIA: 50 km N Damascus to Homs, *Bourgois SY-20205* (IPGRI, ICARDA); W Hassake towards Aleppo, *Damania & al. DFKO-10* (ICARDA, SARD, VIR); Homs, Sadat, *Elings & al. ID-349* (ICARDA, SARD); Homs, 21 km W Sajaneh, *Elings & al. ID-323* (ICARDA, SARD); Raqqa, Zink, S Kum, *Elings & al. ID-312* (ICARDA, SARD); Raqqa, 12 km S Rasafa, *Elings & al. ID-309-a* (ICARDA, SARD); Al Garbocia, 20 km E Homs to Tadmor, *Humeid & al. BMW-14-3* (ICARDA, SARD); 27 km NE Tadmor (Palmyra), Arak, road to Deir-ez-Zor, *Humeid & Hamran BM-6-b* (ICARDA); before Tukkaya on road Zabadani – Damascus, *van Slageren & al. MSGMKO-88123* (ICARDA, SARD); Damascus, NE Zabadani to Surghaya, *van Slageren & al. MSGMKO-88118* (ICARDA, SARD); Damascus, before Maddaya to Zabadani, *van Slageren & al. MSGMKO-88114* (ICARDA, SARD); El Hasim, on Damascus – Sweida road, *van Slageren & Mir-Ali MSGM-88087* (ICARDA, SARD); Hassake, W Derbasiye, 20 km E Ras el Ain, *van Slageren & Sweid MSFS-91061* (ICARDA).

Notes: 1. Four sheets in WIR relate to the type collection mentioned by Zhukovsky ('Syria, Salamich, leg. Vavilov!', cf., 1928: 554), with one of them without location data. Of the three other, perfectly comparable sheets the choice of the lectotype was indicated by the best documented and by Vavilov himself having annotated the material.

2. Bowden (1966: 135) proposed a *nom. nov.*, *syriacum*, when he recombined *Ae. vavilovii* to *Triticum* as it resulting combination would be superfluous after *T. vavilovii* (Tumanian) Jakubz. (see Chapter 5 at 5.4.3 for notes on the latter name).

3. Although already described in 1928 by Eig and Zhukovsky as a variety of *Ae. crassa*, the number of herbarium specimens so far has been very limited. As a result the distribution area was clearly insufficiently known. Although uncommon it is a very distinctive, sizeable grass, which can easily be recognized. The number of specimens (52, including many newly reported here) is far less than of comparably uncommon to rare species such as *Ae. comosa* (140 and 185 for the two varieties, respectively) and for *Ae. uniaristata* (170). Their distribution in Europe as compared to the West Asian occurrence of *Ae. vavilovii* may explain the greater numbers. Next to a significant increase in herbarium specimens there is now a comparable number of germplasm accessions available and reported here, again mainly representing new site data.

4. *Aegilops vavilovii* can be confused with the sympatric and equally robust and drought-tolerant *Ae. crassa*. Differences are keyed out as follows:

Spikes narrowly cylindrical, tapering in the upper half; apex of lateral spikelet lemmas with a sharp tooth at the keel, up to 5 mm long; apex of apical spikelet lemmas extending in a long, flat awn, 5-8(-10) cm long, diverging, curving outward, with or without teeth at the base .... **vavilovii**

Spikes moniliform; apex of lateral and apical spikelet lemmas with 1 sharp tooth, towards the spike apex developing into a flat, up to 8.5 cm long, awn (a single, well-developed spikelet in the apical part may thus have up to 5 large lemma awns, dominating the aspect of the spike) .... **crassa**

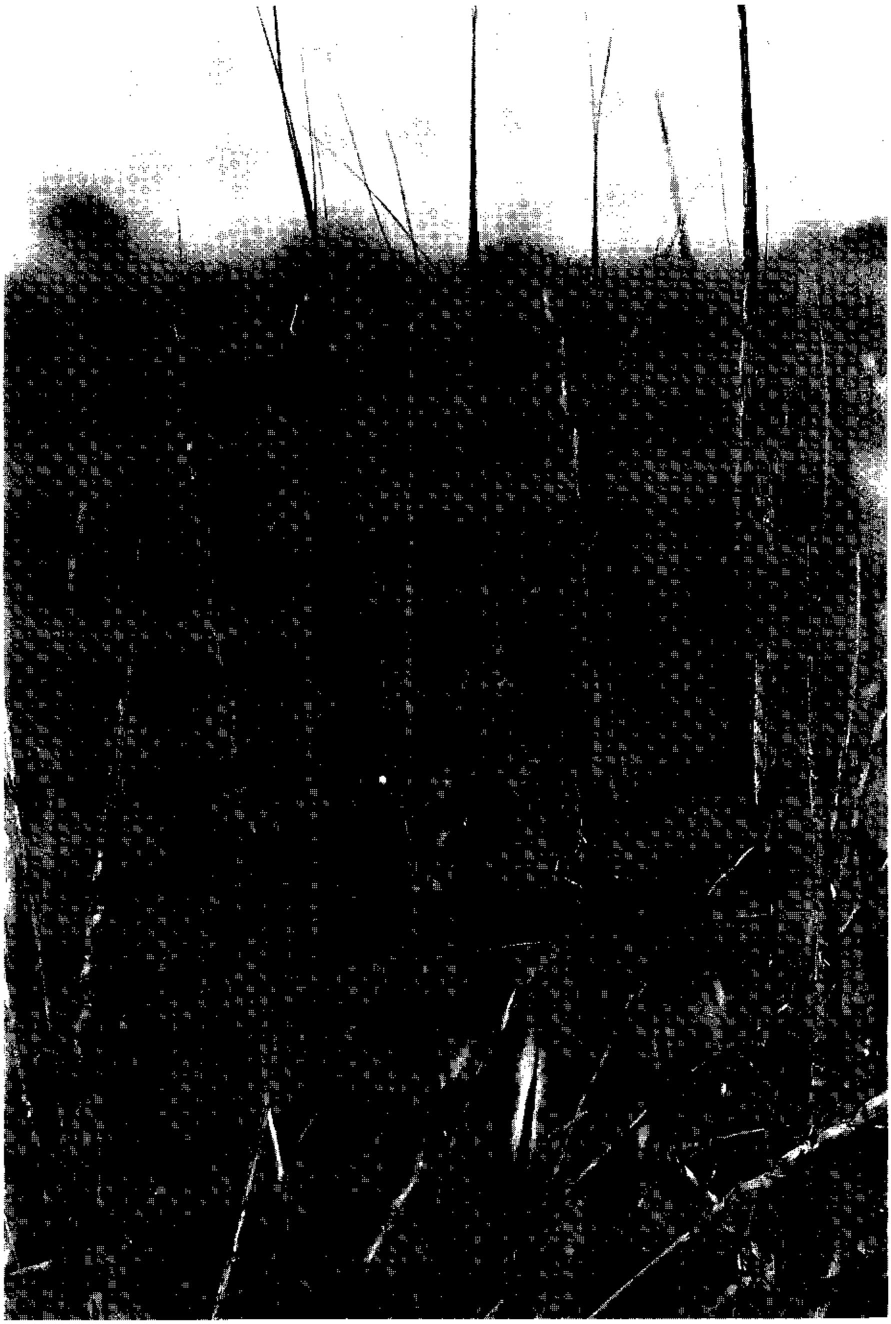


Fig. 91. The cylindrical spikes of *Aegilops vavilovii* (*van Slageren & Sweid MSFS-91003H*, ICARDA) intermingled with the moniliform spikes of *Ae. crassa* (*van Slageren & Sweid MSFS-91002H*, ICARDA) in a ditch on the ICARDA experimental fields at Breda, 40 km SE Aleppo, NE Syria.

10.22 **Aegilops ventricosa** Tausch **Figs. 38, 92-95**

Aegilops ventricosa Tausch, Flora 39: 108 (1837); Boissier, Voy. bot. Espagne 2: 682 (1844a); Heynhold, Alph. Aufz. Gew. / Nom. bot. hort. 2: 10 (1846); Parlatore, Fl. ital. 1: 514 (1850); Jaubert & Spach, Ill. pl. orient. 4: 17 (1851a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 356 (1851b); Walpers, Ann. bot. syst. 3: 790 (1852); Godron, Fl. juvenalis (ed. 1, Latin) 47 (1853), (ed. 2, French) Mém. Acad. Stan. (Nancy) 434 (1853, separately published 1854); von Steudel, Syn. pl. glumac. 1: 355 (1854); Cosson & Durieu de Maisonneuve, Expl. sci. Algérie 2: 209 (1855); Grenier, Fl. massil. adv., Mém. Soc. Emul. Doubs 3(2): 434 (1858); Willkomm & Lange, Prod. fl. hispan. 1: 108 (1861); del Amo y Mora, Fl. fan. Penins. Iberica 1: 256 (1871); Nyman, Consp. fl. eur. 4: 839 (1882); Battandier & Trabut, Fl. Alger 108 (1884), Fl. Algérie 1(2): 241 (1895), Fl. Algérie Tunisie 393 (1905); Gandoger, Fl. Eur. 25: 8 (1892); Fiori & Paoletti, Fl. Italia 1: 109 (1896, with α *typica*); Coste, Fl. descr. France 3: 658 (1906); Lázaro é Ibiza, Comp. fl. Españ. (ed. 2) 1: 657 (1906), (ed. 3) 2: 72 (1920); Hegi, Ill. Fl. Mitt.-Eur. (ed. 1) 1: 390 (1908), (ed. 2) 1: 500 (1936); Durand & Barratte, Fl. libyc. prodr. 276 (1910); Fiori, Nuov. Fl. Italia 1: 160 (1923, with α *typica*); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 453, 521 (1928); Eig, Feddes Repert., Beih. 55: 95 (1929a, with var. *vulgaris*); Feinbrun, Feddes Repert. 28: 65-66 (1930); Pampanini, Prodr. fl. ciren. 137 (1930, with var. *vulgaris*); Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931, with var. *vulgaris*); Jansen & Wachter, Nederl. Kruidk. Arch. 128 (1931); Lindberg, Itin. medit. 9 (1932); Douin in Bonnier, Fl. ill. France 12: 64 (1934); Fournier, Quatre fl. France 88 (1935); Jansen, Fl. neerl. 1(2): 122 (1951); Cuénod et al., Fl. Tunisie 156 (1954); Maire & Weiller, Fl. Afrique nord 3: 353 (1955, with var. *vulgaris*); Chennaveeraiah, Acta Horti Gotoburg. 23: 166 (1960); Quézel & Santa, Nouv. fl. Algérie rég. dés. mérid. 1: 157 (1962); Keith, Checklist Libyan Fl. 199 (1965, with var. *vulgaris*); Mouterde, Nouv. Fl. Liban, Syrie 1: 151 (1966); Hess et al., Fl. Schweiz 1: 383 (1967); Täckholm, Students' Fl. Egypt (ed. 2) 700 (1974); Scholz, Liste Gräs. Libyens, Willdenowia 7: 436 (1974); Guinea Lopez & Ceballos Jiménez, Elenco Fl. Vasc. Españ. 3578 (1974); Zangheri, Fl. Ital. 1: 980 (1976, with ssp. *ventricosa*); Bonafè, Fl. Mallorca 1: 216 (1977); Guinochet & Vilmorin, Fl. France 3: 967 (1978); Tutin & Humphries in Tutin et al., Fl. Eur. 5: 201 (1980); Hammer, Feddes Repert. 91: 234 (1980b, with var. *ventricosa*); Pignatti, Fl. italia 3: 542 (1982); Thiébaud & Deschatres in Jeanmonod et al., Not. Contr. Fl. Corse, Candollea 41: 59 (1986); Talavela in Valdés et al., Fl. Vasc. Andal. Occ. 3: 377 (1987); Sagredo, Fl. Almeria 48 (1987); Sherif & Siddiqi in El-Gadi, Fl. Libya 145: 109 (1988); Larghetti et al., FAO/IBPGR Pl. Gen. Res. Newsl. 88/89: 74-75 (1992); Zamanis et al., Wheat Info. Service 75: 57 (1992).

Neotype: (Spain, Granada) Sierra Nevada, *Boissier s.n.* (G; isoneotypes: A, BR, C, E, F, G, JE, K, LE, MPU, NY, P, PI, TUB, W). Here designated. See note 1.

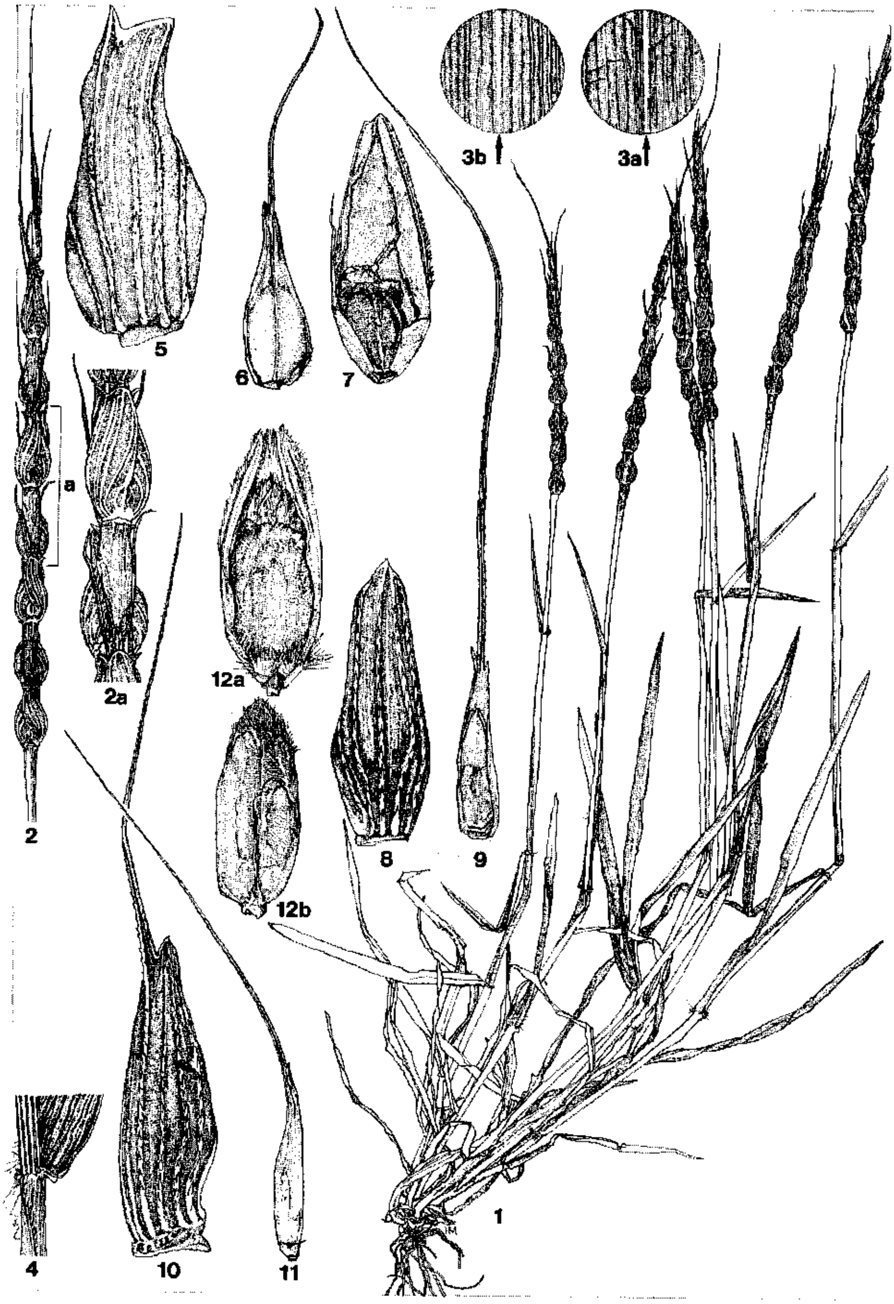
Homotypic synonyms:

Triticum ventricosum (Tausch) Ces., Pass. & Gibelli, Comp. fl. ital. 1(4): 86 (1869); Richter, Pl. eur. 1: 128 (1890); Durand & Schinz, Consp. fl. afric. 5: 940 (1894); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 711 (1902); Zimmermann, Adv. Ruderalfl. Mannheim 72 (1907); Thellung, Fl. adv. Montpellier 148 (1912); Knoche, Fl. baléar. 1: 335 (1921); Bowden, Can. J. Bot. 37: 676 (1959); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 70 (1987).

Gastropyrum ventricosum (Tausch) Á.Löve, Biol. Zentralbl. 101: 208 (1982), Feddes Repert. 95: 501 (1984).

Sub nom. *Ae. squarrosa* auct. non Linnaeus (1753): Linnaeus, Sp. pl. (ed. 1) 2: 1051 (1753), (ed. 2) 2: 1489 (1763) *pro parte*; Cavanilles, Icon. 1: 62, Tab. 90, fig. 2 (1791); Desfontaines, Fl. atlant. 2: 384

Fig. 92. *Aegilops ventricosa*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlarged part of spike, showing spikelets in situ (x 2); 3a, abaxial surface of leaf, midway (x 6); 3b, adaxial surface of 3a (x 6); 4, stem, leaf sheath, ears and leaf blade (x 2); 5-7, lower floret in spikelet in centre of spike: 5, glume (x 5), 6, lemma (x 21/2), 7, palea and immature seed (x 5); 8-9, lower floret of apical spikelet: 8, glume (x 5), 9, lemma and palea, adaxial view (x 21/2); 10-11, upper floret of apical spikelet: 10, glume (x 5), 11, lemma (x 21/2); 12a, palea and mature seed, dorsal surface (x 5); 12b, mature seed, ventral surface (x 5). (1-3, 12. *van Slageren & al. MSBHSS-89040H*; 4-11. *Holly & al. DZA-69*, cultivated at ICARDA from germplasm accession.)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(1799; excl. all synonyms, but description and location refer to *ventricosa*); Persoon, Syn. pl. 1: 107 (1805; *pro parte* and excl. refs. to von Schreber and Buxbaum; locations refer to both '*squarrosa*' and *ventricosa* but descr. to *ventricosa* only); von Willdenow, Sp. pl. (ed. 4) 4(2): 944 (1806; excl. ref. to von Schreber); de Lamarck & de Candolle, Fl. Franç. (ed. 3) 3: 721 (1805, reissue 1815; excl. ref. to von Schreber, but descr. and ref. to Balbis' *Ae. caudata* auct. non L. (see below) refer to *ventricosa*); Duby, Bot. gall. (ed. 2) 1: 528 (1828; excl. ref. to von Schreber, but descr. and location are *ventricosa*); Kunth, Enum. pl., Suppl. tomi primi 371 (1835, see note 2); Mutel, Fl. franç. 4: 154 (1837; excl. refs. to von Schreber, Buxbaum and Palisot de Beauvois' *T. aegilops* but descr. and clear illustr. of Fig. 648 are *ventricosa*), Atlas, Tab. 92, Fig. 648 (1837); Tenore, Fl. napol. 5: 289 (1835; excl. refs. to von Schreber and to Palisot de Beauvois' *T. aegilops*); Cosson, Notes pl. crit. 1(2b): 68 (1850; remarks correctly that von Schreber should be excluded); Gillet & Magne, Nouv. fl. franç. (ed. 2) 505 (1868). See note 2.

Sub nom. *Ae. caudata* auct. non Linnaeus (1753): Balbis, Elenco, Addit. fl. Pedem. 98 (1801), Misc. bot. 45-46 / Mem. Acad. Torino 7: 361 (1804; excl. ref. to von Schreber).

Heterotypic synonyms:

Ae. fragilis Parl., Fl. ital. 1: 515 (1850); Nyman, Consp. fl. eur. 4: 839 (1882); Pignatti, Fl. italia 3: 542 (1982; see note 3); Hammer, Kulturpflanze 33: 129 (1985); Pignone et al., Hereditas 116: 137-140 (1992, see note 3), **syn. nov.** – Syntypes: (Italy, Puglia) in pascuis apuliae, VI.1848, *Gasparrini s.n.* (FI, PAV (not seen)); (Italy, Sardinia) in pascuis aridis, *Moris s.n.* (FI, TO (not found)). – Homotypic synonyms: *Triticum fragile* (Parl.) Ces., Pass. & Gibelli, Comp. fl. ital. 1(4): 87 (1869); Richter, Pl. eur. 1: 128 (1890), *comb. inval.* (Art. 64.1), non *T. fragile* Roth, Catal. bot. 2: 7 (1800), q.e. *Agropyron junceum* (L.) P.Beauv., nec *T. fragile* Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950), *nom. inval.* (Art. 64.1), q.e. *T. dicoccum* x *T. durum*. *Ae. ventricosa* Tausch var. ('β') *fragilis* (Parl.) Fiori & Paol., Fl. Italia 1: 109 (1896); Fiori, Nuov. Fl. Italia 1: 160 (1923). *Ae. ventricosa* Tausch ssp. *fragilis* (Parl.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 523 (1928); Zangheri, Fl. Ital. 1: 980 (1976).

Ae. squarrosa L. var. β *comosa* Coss., Notes pl. crit. 1(2b): 68 (1850), **syn. nov.** – Type: (Algeria) in pascuis Algeriae prope Oran, *Durieu de Maisonneuve s.n.* (holo: P, not seen). – Homotypic synonyms: *Ae. ventricosa* Tausch subvar. ('S.-v.') *comosa* (Coss.) Coss. & Durieu, Expl. sci. Algérie 2: 210 (1855); Battandier & Trabut, Fl. Alger 108 (1884). *Triticum ventricosum* (Tausch) Ces., Pass. & Gibelli subvar. *comosum* (Coss.) Th.Durand & Schinz, Consp. fl. afric. 5: 940 (1894). *Ae. ventricosa* Tausch forma *comosa* (Coss.) Battand. & Trab., Fl. Algérie 1(2): 242 (1895), Fl. Algérie Tunisie 393 (1905, as 'β *comosa*'). *Ae. ventricosa* Tausch ssp. *comosa* (Coss.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 522 (1928). *Ae. ventricosa* Tausch var. *comosa* (Coss.) Eig, Feddes Repert., Beih. 55: 97 (1929a); Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931); Maire & Weiller, Fl. Afrique nord 3: 355 (1955); Keith, Checklist Libyan Fl. 199 (1965); Hammer, Feddes Repert. 91: 235 (1980b).

Ae. squarrosa L. var. γ *truncata* Coss., Notes pl. crit. 1(2b): 68 (1850), **syn. nov.** – Syntypes: (Algeria) in pascuis Algeriae prope Oran, *Durieu de Maisonneuve s.n.* (P, not seen); (Algeria) prope Ghelma, *Kremer s.n.* (P (in hb. Durieu, cf., Cosson, 1850), not seen). – Homotypic synonyms: *Ae. ventricosa* Tausch subvar. ('S.-v.') *truncata* (Coss.) Coss. & Durieu, Expl. sci. Algérie 2: 210 (1855); Battandier & Trabut, Fl. Alger 108 (1884). *Triticum ventricosum* (Tausch) Ces., Pass. & Gibelli subvar. *truncatum* (Coss.) Th.Durand & Schinz, Consp. fl. afric. 5: 940 (1894). *Ae. ventricosa* Tausch forma *truncata* (Coss.) Battand. & Trab., Fl. Algérie 1(2): 242 (1895), Fl. Algérie Tunisie 393 (1905, as 'γ *truncata*'). *Ae. ventricosa* Tausch ssp. *truncata* (Coss.) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 523 (1928). *Ae. ventricosa* Tausch var. *truncata* (Coss.) Eig, Feddes Repert., Beih. 55: 97 (1929a); Jahandiez & Maire, Cat. pl. Maroc 1: 90 (1931); Maire & Weiller, Fl. Afrique nord 3: 355 (1955); Hammer, Feddes Repert. 91: 235 (1980b).

Ae. subulata Pomel, Nouv. Mat. Fl. Atlantique 388 (1874); Battandier & Trabut, Fl. Alger 208 (1884), Fl. Algérie 1(2): 242 (1895; sub nom. '*Ae. cylindrica* Host', see note 4), **syn. nov.** – Type: (Algeria) lieux herbeux des montagnes Aflou, 6.VI.1860, *Pomel 171* (holo: AL, not seen; iso: MPU, W). – Homotypic synonyms: *Triticum subulatum* (Pomel) Th.Durand & Schinz, Consp. fl. afric. 5: 939 (1894). *Ae. cylindrica* Battand. & Trab., Fl. Algérie 1(2): 242 (1895), Fl. Algérie Tunisie 393 (1905); Ducellier, Bull. Soc. Hist. Nat. Afr. Nord 26b: 157, 159-160 (1935); Quézel & Santa, Nouv. fl. Algérie rég. dés. merid. 1: 157 (1962), *nom. illeg.* (Art. 64.1), non Host, Descr. icon. gram. austriac. 2: 6 (1802). See note 4. *Ae. ventricosa* Tausch var. *subulata* (Pomel) Maire & Weiller, Fl. Afrique nord 3: 355 (1955).

Ae. ventricosa Tausch var. *prostrata* Sennen & Mauricio in Sennen, Plantes d'Espagne no. 9622 (1926; preprint of Bull. Soc. ibér. Cienc. nat.); Emberger & Maire, Cat. pl. Maroc 4: 947 (1941). – Type: (Morocco) Beni-Said, au Pont du Kert, *Sennen & Mauricio 9622* (holo: BC; iso: BM, G, MPU, RAB, RNG, W).

Ae. ventricosa Tausch var. *obscura* Miczynski, Bull. Soc. bot. France 76: 715 (1929); Ducellier, Bull. Soc. His. Nat. Afr. Nord 26(b): 156 (1935), **syn. nov.** – Type: (Algeria) Constantine, Berteaux, *Ducellier s.n.* (holo: AL, not seen).

Diagnostic characters: slender to robust annuals with few to many tillers, 20-40(-65) cm tall excluding spikes; spikes distinctly moniliform, (3.5-)5-12 cm long excluding awns, with (3-)6-8(-11) spikelets, rudimentary spikelets absent, rarely 1-2; glume apex with a sharp, outwardly curving, tooth and a broad triangular tooth, one apical spikelet glume with apex acute or with short awn but without lateral teeth, the second glume apex with lateral teeth; lemma apex with a short or longer tooth, which may increase to an awn of up to 3 cm, apex in apical spikelets extending into awn of up to 4 cm; caryopsis adherent.

Description (Fig. 92, 95): slender to robust *annuals* (*Fig. 92-1; Fig. 95*) with few to many tillers. *Culms* erect, slightly geniculate at base, 20-40(-65) cm tall excluding spikes; foliage evenly distributed, somewhat more dense at base of culm. *Leaf* blades linear-acuminate, 7-15 cm long, 0.3-0.6 cm wide; margins of sheaths hyaline, ciliate (*Fig. 92-4*). *Inflorescence* (*Fig. 92-2*) distinctly moniliform, (3.5-)5-12 cm long excluding awns, 0.3-0.6 cm wide; disarticulating barrel-type at maturity into individual spikelets with the rudimentary spikelet(s) remaining attached to the culm (or the lowest spikelet in case no rudimentary spikelet is developed); with (3-)6-8(-11) fertile spikelets, rudimentary spikelets 1-2 but mainly absent. *Spikelets* (*Fig. 92-2a*) sessile, urceolate (the apical spikelet only slightly so) 7-11 mm long excluding awns, 0.2-0.5 cm wide; spikelet length from slightly longer than the supporting rachis internode at the base of the spike to 0.7 times that length at the apex of the spike; with 2-5 florets, the upper 1-2 sterile. *Glumes* (*Fig. 92-5*) 2, coriaceous, of lateral spikelets ovate-truncate, 7-8 mm long, the surface glabrous; veins setulose, unequally wide, sunk into the surface, unequally spaced, usually yellowish and lighter in colour than the glume surface; apex of lateral glumes truncate with a short, sharply acute, adaxial tooth, up to 3 mm long and curving outward, and a broad, sometimes indistinct, triangular abaxial tooth; apical glumes (*Fig. 92-8, 10*) narrowly ovate-oblong, 6-8 mm long, veins ± parallel, the apex of one glume (*Fig. 92-8*) acute with a central short tooth, sometimes extending into a setulose, short awn of up to 9 mm long, the apex of the second glume (*Fig. 92-10*) with a well-developed setulose awn of up to 20 mm long, flanked by 2 short teeth. *Lemmas* (*Fig. 92-6*) of fertile florets slightly exserting the glumes, 8-10 mm long, boat-shaped, the apical part folded, its inner surface velutinous; the apex extending into a setulose awn, the length of which varies widely: from a few mm only, even at the apex of the spike, to well developed and around 7 mm long in the basal spikelet, increasing to 3 cm subapically; apical region of apical spikelet lemmas (*Fig. 92-9, 11*) flat, apex extending in a well-developed awn of up to 4 cm long, with or without sharp lateral teeth at the base. *Paleas* (*Fig. 92-7, 12a*) narrowly elliptical, with 2 sharp, setose keels, each ending in a sharply acute apex. *Caryopsis*

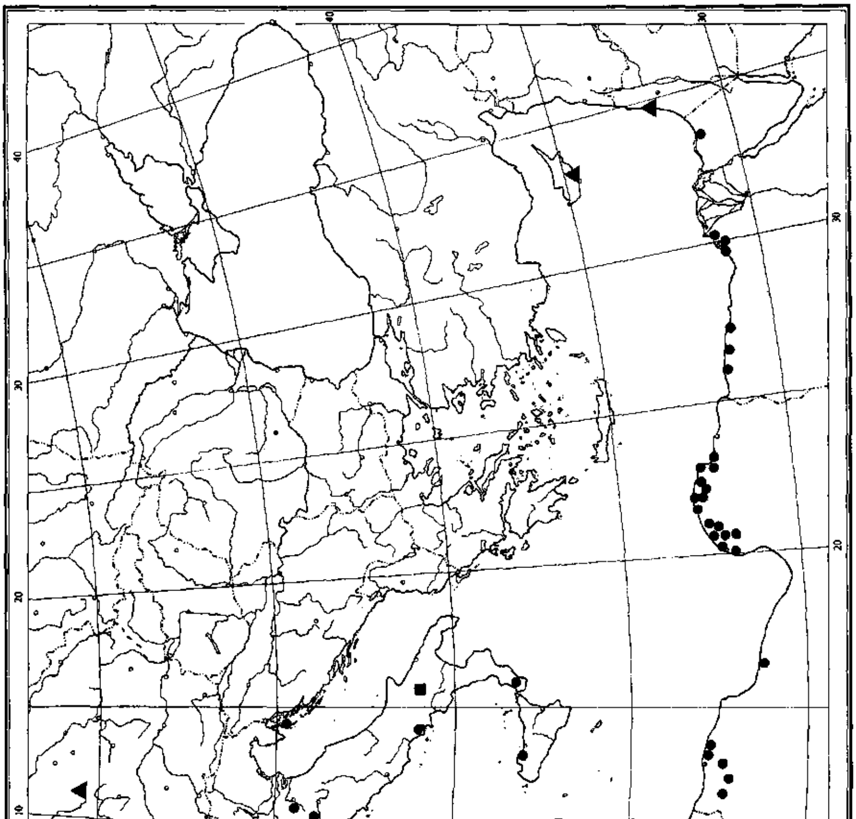


Fig. 93. Distribution of *Aegilops ventricosa* in the western Mediterranean and northern Africa. ● = locations; ▲ = adventive locations (not shown for Argentina, the Caucasus and part of the U.K.). For adventive distribution in the U.S.A., see Fig. 38.

(*Fig. 92-12b*) 5-7 mm, adherent to lemma and palea.

Variation (Fig. 95): in length of spike: 3.5-12 cm; in number of spikelets: 4-11, and in the lateral lemma awns: a few mm only in base of spike and remaining short (former variety *truncata*), or around 7 mm at the base and increasing up to 3 cm subapically (former variety *comosa*).

Distribution (Figs. 38, 93-94): a Mediterranean / Circumboreal element occurring north and northwest of the Sahara, on the Iberian peninsula, and in southern France, Corsica and Sardinia. Rarely also in Italy, with specimens examined from the northern and central parts as well as from Sardinia and Sicily. Recently reported from the Potenza prov. in southern Italy by Larghetti et al. (1992). *Aegilops ventricosa* is the only species of the genus with a predominant occurrence in the western Mediterranean. Uncommon throughout its range.

Present as an adventive in the U.S.A. (Delaware, see Fig. 38), and in various countries in northwestern (e.g., Belgium and the Netherlands (Jansen, 1951: 122)) and central Europe (Zimmermann, 1907: 72; Hegi, 1908: 390; Hess et al., 1967: 383), as well as in the eastern Mediterranean (Cyprus, Palestine) and the Transcaucasus (Azerbaijan). Recently for the first time reported from northern Greece (Zamanis et al., 1992), a location which I also consider adventive. The adventive localities are partly shown in Figs. 93-94.

Ecology: a species of grasslands, fallow, roadsides, sandy wadis, and edges of and within cultivation of, e.g., olives, figs, and almonds, and of various cereals, such as rye, barley, maize, and bread and *durum* wheat (with which it occasionally hybridizes, see Chapter 4.2 at 4.2.2.4). Also found in scrubs of *Pistacia* and *Juniperus*, oak forests, and in *Poterium*-dominated vegetation. Often found together with other *Aegilops* species (*geniculata*, *triuncialis*). This species can predominantly be found on soils with a limestone bedrock, far less on basalt or sandstone. Recorded soil textures include clay- and sandy loams, less often more pure clay or loam. Growth on very poor, stony soils, as well as on saline locations, and even marshy riversides reported. Rainfall data vary widely: from less than 100 mm up to 600 mm, but most are from the range 200-350 mm.

Altitude: from sea level up to 1850 m.

Flowering and fruiting time: over a long period: February – August, but varying within the range of the species: February – May in Libya (Durand & Barratte, 1910); May – August in Spain (May on the Canary Islands, (Bonafé, 1977); June – July (del Amo y Mora, 1871); June – August (Sagredo, 1987)).

Genome: DN (female parent 'D' x male parent 'N') with 2x = 4n = 28 (Chennaveeraiah, 1960: 92; Waines & Barnhart, 1992: Table 2).

Vernacular names:

Arabic: Oum el guemah [= mother of (durum) wheat]; Guemah el hadjela [= wheat of partridge]; Habbet el hadjela [= seed of partridge]; Hachechet el hadjela [= grass of partridge]; Bou stout [= father of 'stout']; Sboulet el far [= spike of the mouse] (all from Trabut, 1935: 16). Trabut's enumeration refers both to *Ae. ventricosa* and *Ae. geniculata* and is therefore also listed under the latter species (see 10.8).

Catalonian: Blat de perdiu [= wheat from the partridge], Blat bord, Blat del dia-

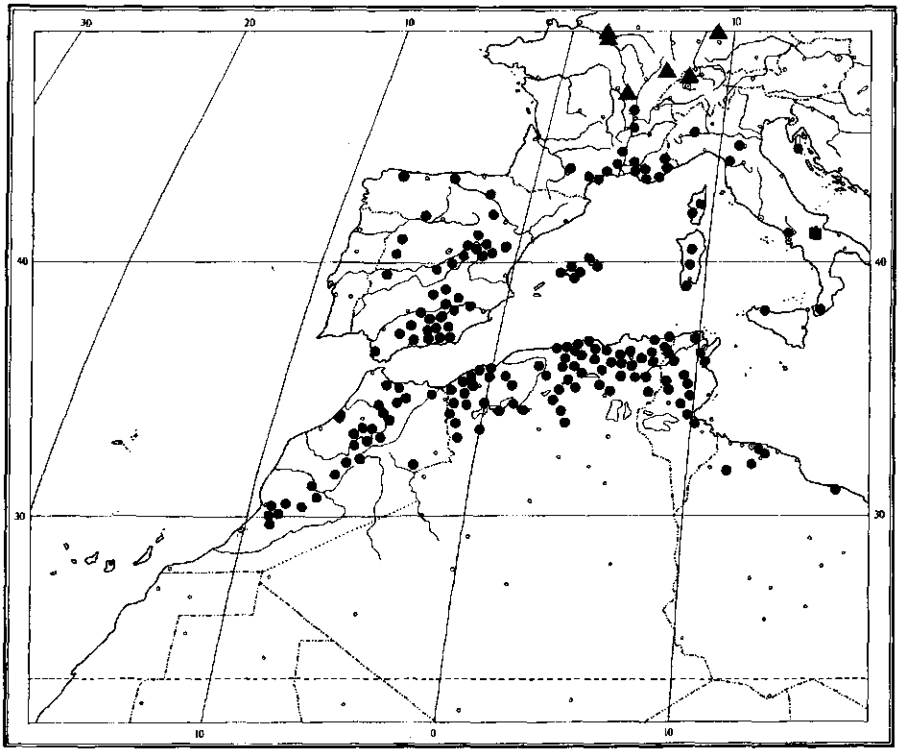


Fig. 94. Distribution of *Aegilops ventricosa* in the western Mediterranean, showing complete area of distribution in Morocco. ● = locations; ▲ = adventive locations in Europe (partially shown).

ble [= wheat from the devil], Blat de canya vermella, Blat d'en Mannà (all from Bonafé, 1977: 216). The first name from Mallorca, the last two from Menorca. All these names are also used for *Ae. geniculata* (see at 10.8).

French: Égilope roide [= stiff *Aegilops*; 'roide' is an old form of 'raide', meaning stiff or unbendable] (de Lamarck & de Candolle, 1805 (reissue 1815): 721; Tenore, 1835: 289; both sub *Ae. squarrosa*); Égilope cylindrique [= cylindrical *Aegilops*] (Mutel, 1837: 154, sub *Ae. squarrosa*); Egilope rude [see above at roide] (Gillet & Magne, 1868: 505, sub *Ae. squarrosa*); *Aegilops* en chapelet [= string (of beads) *Aegilops*] (Cuénod et al., 1954: 156); Blé de la perdrix [= wheat of the partridge] (on herbarium specimen from an unknown collector from Oran, Algeria, at MPU); Égilope ventru [= swollen, inflated *Aegilops*] (Douin in Bonnier, 1934: 63).

German: Bauchiges Hartgras [= roundish, belly-shaped hard grass] (Heynhold, 1846: 10). Bauchicher Walch [= roundish, belly-shaped Walch] (Hess et al., 1967: 383).

Italian: Egilope rigonfia [= swollen *Aegilops*] (Tenore, 1835: 289, sub *Aegilops squarrosa*); Cerere panciuta [panca = belly, or round (in shape), thus panciuta = belly-shaped] (Pignatti, 1982: 542); Cerere fragile (Pignatti, 1982: 542, sub. *Ae. fragilis*).

Uses: 'Good pasture for all animals' (on herbarium specimen from an unknown collector from Oran, Algeria, present at MPU).

Etymology: the final epithet is derived from the Latin 'ventricosus' [= swollen, especially on one side, cf., Stearn, 1978: 543], and refers to the spikelet outline.

A geographical selection of ca 830 herbarium specimens examined:

AFRICA: ALGERIA: Oran, plain of Miserghin, *Balansa 695* (C, E, FI, G, K, LY-Gandoger, LY-Jordan, MPU); Oran, *Balansa 696* (C, E, FI, G, LY, LY-Gandoger, LY-Jordan, MPU); ibid., *Bourgeau 19* (BR, C, E, FI, G, K, LE, LY-Jordan, MPU, P, W), *255* (A, F, G, JE, K, LE, LY, LY-Gandoger, MPU, P, PI, US, W), *s.n.* (BEI, K, LY-Jordan, MO, MPU, US, W); Bou Medfa, *Battandier s.n.* (MPU); Chellala, Chabonnia, *Botschantzev s.n.* (LE); Oran, *Boissier & Reuter s.n.* (C, K, LE, MPU, P, W); Algiers, fort de l'eau, *Boreau s.n.* (BM); Mt. Charrouban, *Bourgeau s.n.* (P); Oran, Tiaret, *Bousquet s.n.* (LY); Cheliff, *Brondel s.n.* (LE); near Aumalo (Sour el Ghozlane), *Charoy 323* (P); S Medeah, *Chaben s.n.* (FI); Laghouat, *Chevalier 144a* (MPU, P, PRC, Z); near Constantine, slopes of Djebel-el-Anach, *Choulette 299* (BM, G, K, LD, LY, LY-Gandoger, MPU, P, PI, W); Le Boulaf to La Redoute, *Clary 265* (P); Aïn Mansour, *Clary 465b* (MPU); Kef Selsef, near Constantine, *Cosson s.n.* (P); prov. Constantine, Jebl Babor, *Cosson s.n.* (P); Limgad, near Batna, *Cosson s.n.* (P); Oran, El Oudja, *Cosson s.n.* (P); near Oran, Falaise de la Batterie espagnole, *Cosson s.n.* (A, JE, MPU); Oran, Terny, *d'Alleizette s.n.* (L, LY-Gandoger, PRC); near Algiers, Birtouta, *d'Alleizette s.n.* (LD); Djebel Amour, NE Aflou, *Davis 58640* (BM, E); Guelma to Constantine, *Davis 52304* (BM, E); Medea to Berrouaghia, *Davis 53213* (BM, E, RNG); Algiers, Reghaïa, *Debray s.n.* (MPU); Bedeau, plain of Chegga, *Doumergue s.n.* (LY); S El Aricha, *Doumergue s.n.* (LY); Djelfa, Hassi-Essed, *Dubuis s.n.* (MPU); Batna, *du Colombier 10* (JE); Oran prov., Sig, *Durando s.n.* (G, L, LY, MPU, PI, W); Algiers, Kouba, *Durando s.n.* (BR); Mila, *Durieu de Maisonneuve s.n.* (P); plain of Boñe, *Durieu de Maisonneuve s.n.* (P); slopes at Koubas, *Duval-Jouve s.n.* (MPU); Oran, at Santa Cruz, *Faure s.n.* (BM, CAI, E, FI, G, JE, LD, LY-Gandoger, MPU, PRC, W, Z); Tlemcen to Bou Medina, *Faure s.n.* (G); Oran, hippodrome, *Faure 821* (LD, LY-Gandoger); Tiaret, Aïn Kermès, *Faurel 5993* (BR, L, MPU); Algiers, near Trolard-Taza, *Faurel s.n.* (MPU); Chott Bitteri, *Gandoger s.n.* (MO); Muley Abd-el-Kadr, *Havard s.n.* (G); Bogari, near Algiers, *Joly s.n.* (MPU); Oran, La Senia, *Le Cesve s.n.* (Exsicc. Soc. Franç, ed. Duffour 7361) (BC, BM, FI, G, MPU, PR, Z); Blida, *Lefebvre 168* (BM, K, P, W); plain of Boñe, *Letourneux s.n.* (P, W); near Lambasin, *Letourneux s.n.* (C, P); plateau of Almeida, Jebl Mourdjado, *Maire s.n.* (MPU); Djelfa, Aïn Taouzara, *Maire s.n.* (MPU); Mansoura, *Meyer 609* (FI); Medeah, *Monard s.n.* (P); Bou Taleb and Madids, *Olivier & Reboud 609* (FI); Ghar Rouban, *Pomel s.n.* (MPU); Aflou, *Pomel 171* (MPU, W, type of *Aegilops subulata*); Oran, Jebl Mekaat-el-Bey, *Pommergue s.n.* (MPU); Ain Beida, *Reboud s.n.* (P); Constantine, Oued el Arab, *Reboud s.n.* (LY-Gandoger); Djelfa, *Reboud 448* (G); Kabylie, Kerrata, *Reverchon 245* (B, BM, E, F, FI, G, JE, LD, LY, LY-Gandoger, MO, NY, OXF, P, PI-GUAD, SO, W), *s.n.* (Exsicc. Baenitz 10493) (B, E, LD, LE, US); Algiers, Fort de l'eau, *Revelière 449* (LY); Alger, plateau Nahr, near Bonaiche, *Rodin & Kalinov 2352* (LE); Oran, Jebl Amour, Aïn Aflou, *Roux s.n.* (MPU); lac Titterie, *Salle 95* (BR, C, JE, LY-Gandoger, P); Souk Ahras to Hammam Zaid, Medjerda Mts., *Scholz & Baillargeon 88a* (B); Algiers, fort de l'eau, *Théveneau s.n.* (US); Mascara, *Toussaint s.n.* (MPU); Berrouaghia, *Trabut s.n.* (MPU); Brazza, Radjradj, *Trabut s.n.* (MPU); Teniet el Had, *Trabut s.n.* (MPU); Djurdjura, Tizi-Djaboub, *Trabut 165* (MPU); Algiers, Benoushir, *Vavilov s.n.* (WIR 1567); Oran, *Vavilov 2864* (WIR 1588); Sidi bel Abbes, *Warion s.n.* (E, FI); Lalla – Maghura, *Warion s.n.* (W); Algiers, *Weiller 252.07* (MPU).

EGYPT: Mersa Matrouh to Sidi Barrani, *Botschantzev s.n.* (LE); Sinai, Wadi Isleh, *Muschler s.n.* (G); Amria, Mariut, *Täckholm s.n.* (BR, CAI); King Mariut, 20 km W Alexandria, *van Slageren & al. MSBHSS-89H001* (ICARDA); Psamalah, E Mersa Matrouh, *van Slageren & al. MSBHSS-89040H* (ICARDA, WAG).

LIBYA: Labraq, 15 km from Lamluda, *Ali 743* (ULT); Cyrenaica, Tamimi – Umm Tayum, *Boulos & al. 4265* (CAI); Tejoura, E Tripoli to Khoms, *Boulos 1566* (ULT); Cyrenaica, around Al-Abiyar, Jebl Akhdar, *Davis 49908* (E, RNG, ULT); E Labraq to Derna, *El-Gadi & al. 1472-G* (ULT); Benina to El-Rajma, near Benghasi, *Faruqi 1358, 1360a* (ULT); Tokra to El Bayda, *Faruqi 1630* (ULT); 135 km E Benghasi to El Bayda, *Faruqi 1804* (ULT); Tripolitania, Aras Philaenorum, *Maire & Weiller 1644* (MPU); Shahhat (Cyrene), *Pampanini 222* (G); Sirte, *Ramadan & al. 309/Z* (ULT); El Bayda to Shahhat, *Siddiqi & Ramadan 2428-7* (ULT); Benghazi, Gotto of Lethe, *Simpson 39178* (BM); Benghasi, *Sin-*

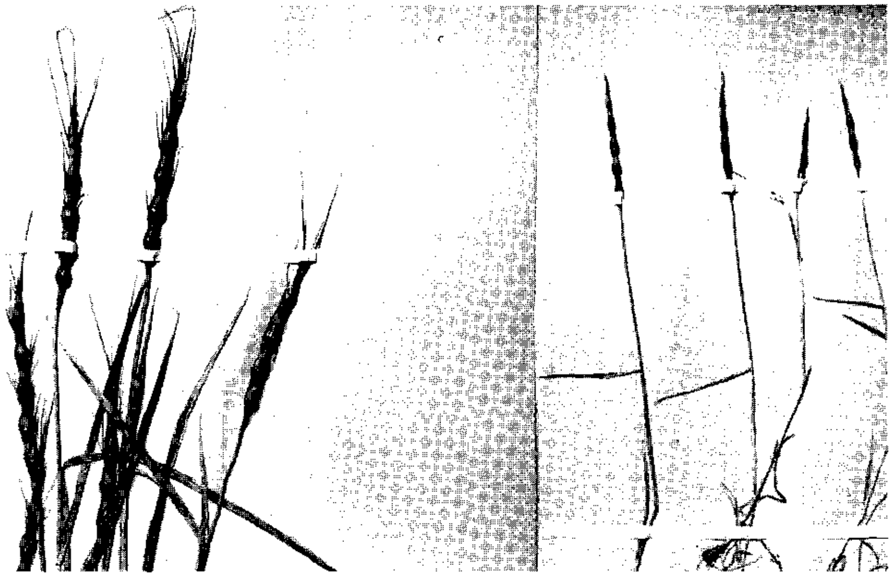


Fig 95. Spike variation in *Aegilops ventricosa*. Left: former subvar. *comosa*; right: former subvar. *truncata*. Both *Doumerque s.n.* from near Oran, Ageria, in LY.

tenis 400 (LD); Derna, *Taubert 563* (JE, P); Jebl Jefren, near Gualide, *Trotter 24* (W).

MOROCCO: Agadir, near Tiguermine, *Blanché i Vergés & al. 9402* (C, E, ERE, G, RNG); Beni-Mellal, Tizi n'Isly to Imichil, *Charpin & al. MAR 656* (G, RAB); Tafraoute to Irherm, *Davis & King 68049* (E); Ait Abdallah to Azoura (Tafraoute – Irherm), *Davis 48837* (BM, E, NY, ULT); Moyen Atlas, NW Ifrane, forest of Jaba, *de Wilde & Dorgelo 2748* (L); Oulmès, valley of Oued Tenaous, *Durbey s.n.* (RAB); Bou Denib, *Durbey s.n.* (RAB); Beni Snassèn, Martimprey-du-Kiss, Le Guerbouz, *Faure s.n.* (MPU); Azrou to Aïn Leuh, *Fernández Casas & al. FC-7158* (B, G); Cudea Arneb, Beni-Bu-Jahi, *Font Quer 51* (BC, BM, G, MPU, RAB, Z); Oued Queret, *Gandoger s.n.* (G, L, LE); Anti-Atlas, Tafraoute, *Gatefossé 3999* (MPU); Reraia, Grand Atlas, *Hooker s.n.* (G); Moyen Atlas, Bekrit, *Jahandiez 595* (BC, BM, E, G, LD, MPU, Z); Moyen Atlas, Beknit Souk, *Lewalle 8536* (BR); Grand Atlas, Reraïa river, near Asni, *Lindberg 3274* (LD); Azrou, ravine of Tiocemliline, *Maire s.n.* (RAB); mts. near Kert river, *Maire & Wilczek s.n.* (MPU); Moyen Atlas, NW Ifrane, forest of Jaba, *Mathez 978* (MPU, RAB); Irherm to Taliouine, *Reading Univ./BM Exp. 538* (BM, E, MO, RNG); El Tleta d'Ichemzarn, *Sauvage 9463* (RAB); Beni-Said, at Pont du Kert, *Sennen & Mauricio 9622* (BC, BM, G, MPU, RAB, RNG, W, type of *Aegilops ventricosa* var. *prostrata*); Beni-Bu-Yahi, Aguada de Afso, *Sennen & Mauricio 8981* (BM, G, MPU, RAB, W); S Ifrane, coming from Aflou, *van Slageren & Istar MSAI-90114H* (ICARDA); Rabat Station, *Vavilov 40883, 40884, 44887* (WIR 777, 778, 1573, 1576); Ifrane, *Wängsjö 4926* (LD).

TUNISIA: Eribu Das Ouled, NE El-Djem, *Cosson & al. s.n.* (P); Bizerte, *Cuénod s.n.* (G); Kasserine to Sbeitla, *Davis & Lamond 57229* (BM, E, RNG); Jebl Mezemzem, Henchir Temeur, *Letourneux s.n.* (P); Bizerte, *Long s.n.* (MPU); near Bargou, *Murbeck s.n.* (LD); Gabès, Kebira, *Pitard 2306, 2648* (G); Aïn Kerma, near Aïn Razouan, N Ghardimaou, *Roux s.n.* (P); Maktar, *Vavilov 28059* (WIR 1578, 1584).

EUROPE: CROATIA, DALMATIA: Losinj grande, *Le Sourd s.n.* (MPU).

FRANCE, ALPES MARITIMES: near Nice, *Coquerel 97* (BC); Col de Braus, *Dittrich s.n.* (LE). BOUCHES DU RHÔNE: Marseille, Lavoirs à Laine, *Blaisse & Roux s.n.* (G, LY, MPU, P); Marseille, *Grenier s.n.* (MO, MPU, PR); near Marseille and at Décombres à Martegaux, *Roux s.n.* (Exsicc. Billot 2984) (BR, F, G, JE, K, LD, LE, LY, LY-Gandoger, MPU, NY, OXF, P, PI, PRC, Z); Roquevaire, Rouveyrolle, *Samat s.n.* (Exsicc. Duffour 6022) (BC, MPU); Aix to Tholonet, *Terré 3300* (RAB). GARD: Nîmes to Sauve, at Castanet, *Cabanès s.n.* (MPU); Nîmes to Aigues Mortes, bank of the Rhône, Codognan vill., *Labruns s.n.* (MPU). HAUTE GARONNE: Union village, Chateau de la Pitohounelle, *Leredde s.n.* (Exsicc. de Retz 352) (G, RAB). HÉRAULT: Montpellier, Port Juvénale, *Cosson s.n.* (BM, BR, JE, P); ibid., *Requien s.n.* (G, K, LE, MPU, P, TO), *Touchy 287* (B, G, LE, LY, LY-Gandoger, MPU, PRC); Béziers, *d'Alleizette s.n.* (PR); Montpellier, *Gaillardot s.n.* (JE); near Béziers, Gargailhau, *Renaud s.n.* (FI, MPU); Agde, *Théveneau s.n.* (LE). RHÔNE: Lyon, Digne du Grand-Loup, *Perret s.n.* (Exsicc. Soc. Cenomane 200) (LY, MPU, MPU-Coste). VAR: Hyères, *Albert s.n.* (LY); Toulon, *Huet du Pavillon s.n.* (LY, MPU). VAUCLUSE: Orange, Haut Abrian, *Girerd s.n.* (Exsicc. Lambinon 12773) (B, BC, C, G, RNG). ISLANDS: CORSICA: Ajaccio, *Pelgrims s.n.* (BR); Ajaccio to La Parata, *Simon 71-296* (LD).

ITALY: Bologna, *Gabelli s.n.* (LY-Gandoger); Calabria, *Gasparrini s.n.* (MPU); Puglia, *Gasparrini s.n.* (FI, type of *Aegilops fragilis*); near Naples, *Moricand s.n.* (G); Toscana, Pistoia, *Moris s.n.* (FI); Piemonte, Casale Monferrato, *Negri s.n.* (Exsicc. Soc. Dauphinoise 2303) (F, FI, G, K, LY, LY-Gandoger, MPU, P, PI, TO, Z). ISLANDS: SARDINIA: Laconi, *Masala s.n.* (FI); s.loc., *Moris s.n.* (FI, type of *Aegilops fragilis*); Pula, *Schleicher s.n.* (G, TUB). SICILY: Palermo, *s.coll., s.n.* (LE).

SPAIN, ALBACETE: S. Juan de Alcaras, *Bourgeau 926* (G, K, LD, LE, LY-Gandoger, OXF, P); Nerpio, near Cortijo de la Hoja del Espino de Arriba, *Charpin & Fernández Casas s.n.* (G); Sierra de Aléara, *Porta & Rigo 490* (P, PR). ALAVA: La Puebla, *Elias s.n.* (Sennen Pl. d'Espagne 4147) (BC, BR, CAI, G, LD, MPU, W). ALMERÍA: Becare to La Venta de Geira, *Gros s.n.* (BC); Sierra de Cabrera del Cuarto, *Reverchon s.n.* (Kneucker exsicc. 411) (A, B, C, G, GAT, GE, JE, K, L, LD, LE, MO, NY, PR, SO, W, Z). 'ANDALUCIA': Sierra de la Nieva, *Reverchon 374* (G, GE, JE, K, LD, LY, LY-Gandoger, NY, P, PR, PRC, TO, W). CANTABRIA: near Potes, *Soulié s.n.* (MPU). CÁCERES: Minas de Aldeamoret, *Ladero & Santos s.n.* (RNG). CÁDIZ: Cádiz city, *Gandoger s.n.* (PRC). CIUDAD REAL: Alcázar, *Porta & Rigo 740* (G, JE, LY-Jordan, NY, P, W). GRANADA: Huéscar, Sierra de Guillimona, near La Haya del Espino, *Arístegui & Leal 436* (NY); Sierra Nevada, *Boissier s.n.* (A, BR, C, E, F, G, JE, K, LE, MPU, NY, P, PI, TUB, W, type of *Aegilops ventricosa*); Sierra Nevada, *Bolle s.n.* (NY); S. Geronimo, Siera Nevada, *Bourgeau 1503* (F, FI, G, K, L, LD, LE, LY, LY-Gandoger, LY-Jordan, MPU, NY, P); Sierra de Loja, *Del Campo s.n.* (G); Sierra de Alcazar, Solana de la Cueva, *Huter & al. 12* (BR, G, K, LD, LE, LY-Gandoger, MPU, P, PR, PRC, TO, W, Z); El Ruche, *Nilsson 1662* (LD); Puebla de Don Fadrique, *Saint Lager s.n.* (A, G, NY, PR, W); La Losa, *Valdés & al. 2064* (RNG). GUADALAJARA: Sierra de Mágina, Ciennense, Cortigo de los Prados, *Cuatrecasas s.n.* (BC); Loranca, *Gil s.n.* (LY-Gandoger). JAÉN: Puerto de Despeñaperros, *Hackel s.n.* (C); Sierra la Cazorla, *Reverchon 374* (B, F, G, GAT, JE, LY, PR, SO); Poyotello, Sierra de Segura, Segura river, *Valdés & al. 2346* (RNG). LOGROÑO: Rioja, *Zubia s.n.* (LY-Gandoger). MÁLAGA: Bobadilla, *de Coincy s.n.* (P); Ronda y Sierra to Las Nieves, *Talavera & Valdés 2886/74* (RNG, SEV). MURCIA: s.loc., *Willkomm s.n.* (MPU). SALAMANCA: Salamanca, *de Coincy s.n.* (P); Muñoz, *Rico s.n.* (BC). TERUEL: S Aragón, Cella, *Font Quer s.n.* (BC); Sierra de Javalambre, Collado de El Gavilan, *Reading Univ. Bot. Exp. 1147* (RNG); Leopardo, *Zapater s.n.* (LY-Gandoger). TOLEDO: Sierra Calderina, *Gandoger s.n.* (LY-Gandoger). VALLADOLID: Castromonte a la Sta. Espina, *Sennen s.n.* (Pl. d'Espagne 155) (B, BC, JE, L, LY, MPU, W). BALEARIC ISLANDS: MALLORCA: Aibusera, *Beckett 1234* (RNG); near Lloseta, *Bicknell s.n.* (GE, TO); Eremita de Betlem, Artà, *Dahlgren & al. 1034* (LD); Sta. Pousa, N Palma-Paguera road, *Duvigneaud & Lambinon 74E658* (LD, RAB); Calvia, *Gandoger s.n.* (LY-Gandoger, W); Bellver, *Palau s.n.* (BC, G); NNE valley of Coscona, *Reijnders 2566* (L); San Pedro, Bahia d'Alcudia, *van Balgooy 1225* (L). MENORCA: Cabo Dartuch, *Dahlgren & al. 878* (LD); Alayor, *Rodríguez 896* (Z), *s.n.* (LY-Gandoger, Z); Alcayor, Sta. Pousa, *Rodríguez s.n.* (C, FI, LY-Gandoger, MPU, P); Binisarmeña, *Rodríguez s.n.* (LY-Gandoger, MPU).

ADVENTIVE: AMERICA: ARGENTINA: Cantero, prov. of Buenos Aires, *Burcco 21933* (G). U.S.A., DELAWARE: Pe Harto(?), centreville, *Commons s.n.* (PH). ASIA: PALESTINE: near Jaffa, *Mouterde FR-16* (G). EUROPE: AZERBAIJAN: Elisabethpol (= Kirovabad), *Hohenacker s.n.* (B, FI, LY-Gandoger, PR, W, Z). BELGIUM: Goé, Vesdre, *Pelgrims s.n.* (RNG). CYPRUS: Amathus, *Holub s.n.* (K). FRANCE, DOUBS: Gare de Besançon, *Paillot s.n.* (P). HAUTES DE SEINE: Bruyères de Sèvres, *de Bullemont s.n.* (BR). NIÈVRE: Bona, *von Lorent s.n.* (TUB). VAL d'OISE: Argenteuil ('introduit'), *Bécourt s.n.* (B, G, GE, LY, MPU, Z). GERMANY: Erfurt, *Brumml 463* (B); Mannheim, Ludwigshafen, *Zimmermann s.n.* (L). SWITZERLAND: Bâli (Basel?), *Busschodts s.n.* (BR). U.K., ENG-

LAND: Colchester, Hythe Quay, near maltings, *Brown 2350* (K, RNG); Staffordshire, Burton-on-Trent, *Druce 832/8* (RNG), *R482* (K); Bath, near Tiverton, *Dunn s.n.* (K); Slateford, *Fraser 509* (E, RNG, W); Berwickshire, Chirnside, *McClintlock s.n.* (RNG); Midlands, Slateford, *Potts s.n.* (K). WALES: Cardiff, Splott, *Melville s.n.* (K); Cardiff, *Smith s.n.* ('introduced with grain refuse') (RNG).

Germplasm collections examined:

AFRICA: ALGERIA: 77 km SW Tebessa, *Holly & al. DZA-73* (ICARDA, ITGC, NARC-J); Bou Saada, Touem, *Holly & al. DZA-66* (ICARDA, ITGC, NARC-J); Bou Saada, Ras El Kas'a on road to Djelfa, *Holly & al. DZA-69* (ICARDA, ITGC, NARC-J); Constantine, *Holly & al. DZA-256* (ICARDA, ITGC, NARC-J); Djelfa, 15 km after Aflou to Tiaret, *Holly & al. DZA-88* (ICARDA, ITGC, NARC-J); Tiaret, Abd El Kadr, *Holly & al. DZA-94* (ICARDA, ITGC, NARC-J); Djelfa, 40 km S Bou Saada, *Holly & al. DZA-357* (ICARDA, ITGC, NARC-J); Tlemcen, El Aouiedg, 28 km N El Aricha, *Humeid & al. 90-DZA-34* (ICARDA, ITGC); El Aricha, *Humeid & al. 90-DZA-33* (ICARDA, ITGC).

MOROCCO: Tetuan, Dar Chaoui, 23 km Torle to Rabat, *Damania & al. MKL-228* (ICARDA, INRA-M, NARC-J).

Notes: 1. When Tausch (1837: 108-109) redescribed Linnaeus' *Ae. 'squarrosa'* he repeated the latter's indication 'Habitat in Oriente' under *Ae. ventricosa*, but added 'colitur frequenter in hortis'. A similar phrase is connected with his new *Ae. speltoides*, which follows *ventricosa* (l.c., 109: 'Colitur in hortis cum antecedente.'). At the redescribed *squarrosa* he referred to Buxbaum and his own collections from 'Tauria' (see note 1 at *Ae. tauschii*, 10.17). The connection with de Tournefort, present in the three examined editions of the *Species plantarum* (Linnaeus, 1753, 1763; von Willdenow, 1806) is, however, omitted. As *Ae. ventricosa* is distinctly *not* an Oriental species it is likely that Tausch related his description to specimens cultivated in the botanical garden of Prague (the Hortus Canalius, cf., Stafleu & Cowan, 1986: 183), where he taught courses in botany during 1815-1826, being a professor at the University of Prague.

I was informed that any material from Tausch that may be designated type status and that may be present in both PR and PRC is not available in any of these herbaria (V. Rejzlová from PRC through V. Holubec, pers. comm.). The suggestion was raised that the specimens may be lost or that they never existed, and that Tausch used living specimens only for his description. This problem now exists for both *Ae. ventricosa* and *Ae. speltoides* (var. *speltoides*; see at 10.16) and consequently I have designated neotypes for both species in view of Arts. 7.9 and 7.10 of the *Code*. For *Ae. ventricosa* this is a collection from Spain: Granada, Sierra Nevada, *Boissier s.n.*, of which good material is present in many herbaria (though not in G-BOIS, as this separate herbarium relates only to Boissier's *Flora orientalis* (see *Index Herbariorum*)). This location is mentioned in Boissier's *Voyage* (1884b: 683). For *Ae. speltoides* this is *Bornmüller 1735* from Turkey (see at 10.16). Both are well documented and distributed collections, now serving as the '...nomenclatural type as long as all of the material on which the name of the taxon was based is missing...' (Art. 7.9).

2. As is shown by the notations in the list of references under '*Ae. squarrosa* auct. non L.' there has been considerable confusion in the interpretation of the species '*squarrosa*' and *ventricosa*. This goes back to the illustrations of J.Ch. Buxbaum in his *Centuria* (1728, Tab. 50, fig. 1), and, referring to him, of von Schreber in his *Beschreibung der Gräser*, Vol. 2 (1772: Tab. 27, fig. 2). Especially von Schreber is often referred to by later authors. Linnaeus' (1753: 1051) one-line description of *Ae. squarrosa* added to the confusion. [Another one was the occurrence 'in Iberia' of both, clearly allopatric, species: this is taken to mean Spain and Portugal for *ventricosa*, but an old name for Georgia in the Caucasus for *squarrosa*.]

Buxbaum (1728) presents a phrase-description and illustration of *Ae. squarrosa* auct. non L. and noted 'In montibus apricis Iberiæ Iulio' [in sunny places in the mountains (of) Iberia (and flowering in) July]. He meant, however, the Caucasian, and *not* the Spanish-Portugese location! [The *Centuria* deals with plants found 'circa Byzantium & in Oriente observatas' and was published in St Petersburg.] Von Schreber (1772) cites Buxbaum's phrase name, as well as the description form Linnaeus' *Species plantarum* (from the second edition, which is identical here to the first ed.) under the header of '*Aegilops sqvarrosa*', and notes that the 'home country of this grass is the Asiatic Province Georgia' (l.c., 45; transl.). He thought the illustration of Buxbaum to be imprecise and gave a new one (equally unclear, however). This illustration is referred to by all authors listed under the item 'sub nom. *Ae. squarrosa* auct.'. Even Cavanilles (1791), dealing with Spanish plants, refers to Schreber's plate while presenting a clear illustration of *Ae. ventricosa* under the header of *Ae. squarrosa*!

According to Boissier (1844a: 683), Linnaeus' (1753: 1051; 1763: 1489) one-line description of *Ae. squarrosa* indicated nothing typical for that species. He remarked on the other hand that the Buxbaum and Schreber illustrations and their indication of the country of distribution clearly refer to *squarrosa* and not to *ventricosa*. In the fourth edition of the *Species plantarum* von Willdenow (1806: 944) redescribed the *squarrosa* from the first two editions in a way that has since been interpreted in the sense of *ventricosa*, e.g., by Tausch (1837) and Cosson (1850: 68, as 'Willd. sp. IV. 944 excl. syn.', which he cited under the header '*Ægilops squarrosa* L., sp. II. 1489 *ex parte*' – my italics). Earlier, Tausch (1837: 108) concluded the same when redescribing Linnaeus' *Ae. squarrosa*. He splitted *Ae. ventricosa* and *speltoides* off, and located von Willdenow's *squarrosa* under his new *Ae. ventricosa* (but under exclusion of its synonyms: the *squarrosa* of the second edition of the *Species plantarum* and the Schreber plate).

The *Ae. squarrosa* in Kunth's *Enumeratio plantarum* (1833: 458) is difficult to interpret. He refers to the second edition of the *Species plantarum* through its page number '1489', the Schreber plate, the *T. aegilops* from Palisot de Beauvois (see Chapter 12, Nomina nuda), and to 'Oriens' as the locality of the species. All point at *squarrosa* auct., thus *tauschii*. But he also refers to von Willdenow's description in the fourth edition of the *Species plantarum*. This last reference may be the reason that Tausch (1837) and Cosson (1850) nevertheless have put Kunth under their *Ae.* '*ventricosa*'. In his *Supplementum tomi primi*, however, Kunth (1835: 371) redescribed '*squarrosa*' in detail but this time unambiguously in the sense of *ventricosa* (l.c., 'Glumæ...ovatæ, convexæ, apice bilobæ...'; compare my Fig. 92-5). It is remarkable that Eig cited only Kunth's *Supplementum* and not his *Enumeratio* at *Ae. ventricosa* in his monograph (Eig, 1929a: 95, sub. 'Syn. *Ae. squarrosa*'). As a result I have located Kunth's *Enumeratio* under *Ae. squarrosa* auct. at *Ae. tauschii* (see at 10.17) and his *Supplementum* under the same header at *ventricosa* (see above at the nomenclature).

Finally, Cosson (1850: 68-69) manages to clearly separate the two taxa. For what is now *Ae. ventricosa* he maintained the epithet *squarrosa* from Linnaeus (but *pro parte*) because most of the contemporary botanists were doing so despite Tausch's redescription. He therefore did not accept Tausch's new name. Von Willdenow (excl. synonym), Cavanilles, Desfontaines, Kunth (excl. ref. to von Schreber), Duby, and Mutel's *Ae. squarrosa* are all cited as references, as is Tausch's and Boissier's use of the name *ventricosa* (l.c., 68, transl.). The real '*squarrosa*' of Buxbaum and von Schreber, as well as this name *sensu* Tausch and the remark from Boissier's *Voyage* (see above) are listed under his renaming, *tauschii*. This renaming became necessary due to his maintainance of *squarrosa* auct. and gave Cosson the opportunity to honour Tausch's correct analysis of the confusion (l.c., 68, transl.)

The type specimen of *Ae. ventricosa* must be seen in view of Tausch's interpretation of this taxon (see note 1). The type of *Ae. tauschii* involves Linnaeus' (1753, 1763), Tausch's (1837) and Cosson's (1850) interpretations of *Ae. squarrosa* auct. and is dealt with at note 1 of *Ae. tauschii*, 10.17.

3. In recent literature only Pignatti (1982: 542) keeps *Ae. fragilis* as a separate species from *ventricosa*, based on: (1) a spike of 3-4 spikelets (vs 3-4(-10) spikelets) that are 'less inflated', (2) a glume awn of the lateral spikelets of only a few millimetres, and (3) an awn of the terminal spikelet of more than 2 cm (vs 10-15 mm). This variation is completely covered by *Ae. ventricosa* as it is here understood.

A recent study of a rather limited number of accessions (four from *Aegilops ventricosa*, one of *Ae. fragilis*) by Pignone et al. (1992) showed some cytological differences between the two groups, but, due to cultivation of seeds under similar environmental conditions, a reduction in morphological differences at the same time. Morphological differences as suggested by Fiori (1923: 160) and Pignatti (1982: 542) were also reduced through cultivation. They concluded that their karyological data did not warrant separate specific status of *Ae. fragilis*, but that geographical isolation may be the cause of the apparent chromosomal differences.

4. The name '*Aegilops cylindrica* Host' has been erroneously coined by Battandier & Trabut (1895: 242) for ostensibly depauperate and not very inflated specimens of *Ae. ventricosa* from mountainous and steppe regions in Algeria. *Aegilops. subulata* Pomel was added by them as a synonym. However, isotype specimens of *Ae. subulata* in MPU (carrying '*Ae. cylindrica* Host' in Battandier's or Trabut's handwriting) consist of very young specimens, and were collected before any seed development. Ducellier (1935) notes that the specimens described as *Ae. cylindrica* represent the variety *truncata* of *Ae. ventricosa* (l.c., 157, 159-160).

11 Description of the genus *Amblyopyrum*

[For the history of the genus, see Chapter 3.3; considerations on phylogeny, especially in relation to *Aegilops* are in 4.3; notes on taxa delimitation in 5.1, on the generic status in 5.3; further notes on ecology and distribution are in 6.2.]

Amblyopyrum (Jaub. & Spach) Eig

Amblyopyrum (Jaub. & Spach) Eig, P.Z.E. Inst. Agric. Nat. Hist., Agric. Rec. 2: 199 (1929b); Roshevitz, Zlaki. Vvedenie v izuchenie kormovykh i khlebnykh zlakov [Grasses. Introd. fodder, cereal grasses] 344 (1937, Russian) / 340 (1980, English); Pilger, Das System der Gramineae, Bot. Jahrb. 76: 314 (1954); Chennaveeraiah, Acta Hort. Gotoburg. 23: 162 (1960); Bor, Fl. Iraq 9: 224 (1968), Fl. Iranica 70/30: 203 (1970); Tzvelev in Fedorov, Zlaki SSSR 154 (1976, Russian) / 219 (1984, English), The System of Grasses (Poaceae) and Their Evolution, Bot. Rev. 55: 161 (1989); Baum, Can. J. Bot. 56: 378 (1978b, '*Amblyopyron*'); Farr et al., Index Nominum Genericorum (Plantarum) 1: 64 (1979); Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 494 (1984); Davis, Fl. Turkey 9: 232 (1985); Watson & Dallwitz, The grass genera of the world 85 (1992); Frederiksen, Nordic J. Bot. 13(5): 490 (1993).

Basionym: *Aegilops* L. subg. *Amblyopyrum* Jaub. & Spach, Ill. pl. orient. 4: 23 (1851a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 358 (1851b); Walpers, Ann. bot. syst. 3: 791 (1852); Eig, Feddes Repert., Beih. 55: 57 (1929a); Hammer, Feddes Repert. 91: 229 (1980b).

Type (and only) species: *Amblyopyrum muticum* (Boiss.) Eig.

Homotypic synonyms:

Aegilops L. sect. *Amblyopyrum* (Jaub. & Spach) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 455 (1928); Senjaninova-Korczagina, Proc. USSR Congr. Gen., Pl.-Anim. Breeding, vol. 2: 456 (1930), Bull. Appl. Bot., Gen. & Pl. Breeding, Ser. 2(1): Tab. 15 (1932); Kihara, Züchter 12: 61, Tab. 12 (1940), Cytologia 19: 342, Tab. 3 (1954); MacKey, Relationships in the Triticinae, Proc. Third Int. Wheat Gen. Symp. 45 (1968, author as '(Zhuk.) Kihara'); Kihara & Tanaka, Wheat Info. Serv. 30: 2 (1970); Gendels, Bot. Zhurn. 65(6): 864 (1980); Witcombe, Guide species *Aegilops* 2, 11 (1983); Clayton & Renvoize, Genera Graminum, Kew Bull. Add. Ser. 13: 158 (1986).

Aegilops L. sect. *Anathera* Eig, Feddes Repert., Beih. 55: 67 (1929a), *nom. illeg.* (Art. 63.1).

Etymology: the generic name is derived from the Greek 'amblyos' [= blunt] and 'pyros' [= wheat].

11.1 **Amblyopyrum muticum** (Boiss.) Eig — **Figs. 96-102**

Amblyopyrum muticum (Boiss.) Eig, P.Z.E. Inst. Agric. Nat. Hist., Agric. Rec. 2: 200, 204 (1929b, with var. *typicum*); Chennaveeraiah, Acta Horti Gotoburg. 23: 163 (1960, with ssp. *muticum*); Bor, Fl. Iraq 9: 224 (1968), Fl. Iranica 70/30: 203 (1970); Takhtajan & Fedorov, Fl. erevana (ed. 2) 366 (1972); Löve, Biol. Zentralbl. 101: 207 (1982), Feddes Repert. 95: 494 (1984, with ssp. *muticum*); Tzvelev in Fedorov (ed.) Zlaki SSSR 154 (1976, Russian) / 220 (1984, English); Davis, Fl. Turkey 9: 232 (1985, with var. *muticum*); Gandilyan in Kazarjan, Red data book Armenian SSR 193, 249 (1990); Frederiksen, Nordic J. Bot. 13(5): 490 (1993).

Basionym: *Aegilops mutica* Boiss., Diagn. pl. orient., Sér. 1(5): 73 (1844b), Fl. orient. 5(2): 678 (1884); von Steudel, Syn. pl. glumac. 1: 355 (1854); Tchichatscheff, Asie min., Bot. 2: 583 (1860, includes both varieties as *Ae. 'liliacea'* and *Ae. tripsacoides*); Cosson, App. fl. juv. alt., Bull. Soc. Bot. France 11: 163 (1864); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 456, 544 (1928); Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 329 (1928a, with var. *typica*), Feddes Repert., Beih. 55: 67 (1929a); Hegi, Ill. Fl. Mitt.-Eur. (ed. 2) 1: 500 (1936); Gandilyan, Bull. Appl. Bot., Gen. & Pl. Breeding 54: 245 (1975); Hammer, Feddes Repert. 91: 229 (1980b, with var. *mutica* forma *mutica*).

Type: (Turkey) Cappadocia, ad Euphratem, *Aucher-Éloy 2977* (holo: G (not seen); iso: [the hispid specimens of:] BM, FI, G-BOIS, K, MPU, OXF, P). – Note: a mixed gathering of the same collection serves as the type for the var. *loliaceum* (Davis, 1985: 233). The photograph in DAO, used by Bowden (1959: 667) cannot be considered an isotype (ICBN, Art. 7.6). See note 1.

Homotypic synonym:

Triticum muticum (Boiss.) Hack. in Fraser, Ann. Scot. Nat. Hist., Quart. Mag. 103 (1907); Thellung in Zimmermann, Adv. Ruderalfl. Mannheim 72 (1907; as a *comb. nov.*, thus an isonym), Fl. adv. Montpellier 154 (1912), *comb. illeg.* (Art. 64.1), non Schübler, Diss. char. descr. cereal. 10-11 (1818). See note 2.

Heterotypic synonyms:

Aegilops tripsacoides Jaub. & Spach, Ill. pl. orient. 2: 121, Tab. 200 (1847, including '-β: Spiculis glabris'; see note 3), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 358 (1851b); Walpers, Ann. bot. syst. 3: 791 (1852); von Steudel, Syn. pl. glumac. 1: 356 (1854). – Type: (Turkey) Phrygia, prope Thermes Hieropolitanas (hodie Pambouk Calessi), *1839, Jaubert s.n.* (holo: P, not seen). – Note: the type location is described by Jaubert & Spach (1851b: 358) as 'Caria legit *Jaubert*'. Caria is a region in SW Turkey (cf. Stearn, 1978: 218). – Homotypic synonyms: *Triticum muticum* (Boiss.) Hack. var. *tripsacoides* (Jaub. & Spach) Thell. in Zimmermann, Adv. Ruderalfl. Mannheim 72 (1907), Fl. adv. Montpellier 154 (1912); Hegi, Ill. Fl. Mitt.-Eur. (ed. 2) 1: 500 (1936, see note 4). *Ae. mutica* Boiss. ssp. *tripsacoides* (Jaub. & Spach) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 546 (1928). *Triticum tripsacoides* (Jaub. & Spach) Bowden, Can. J. Bot. 27: 666 (1959), Can. J. Gen. Cyt. 8: 133 (1966; both here and in 1959 as forma *tripsacoides*); Feldman & Sears, Sci. Am. 244: 102 (1981); Kimber & Feldman, Wild Wheat 22 (1987).

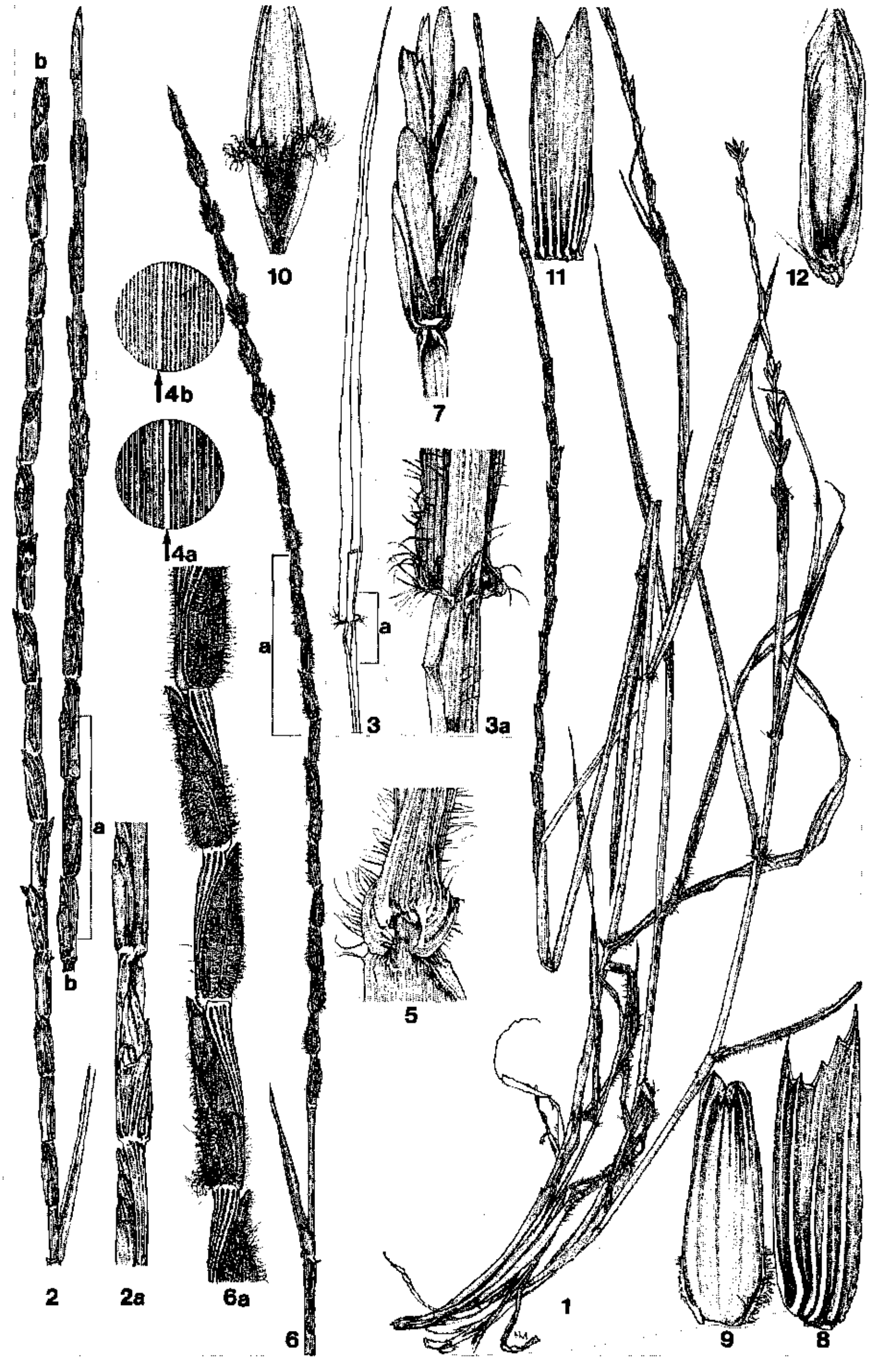
Aegilops mutica Boiss. forma *gandiljanii* Hammer, Feddes Repert. 91: 229 (1980b); Frederiksen, Nordic J. Bot. 13(5): 490 (1993, for all Gandilyan's (1975) varieties). – Type: (Armenia) RSSA Armeniae, prope pagis Dschervesch, Vochtschabert et Gegadir (distr. Abovjan), 1.VIII.1972, *Gandilyan s.n.* (holo: YAI; iso: WIR). – Note: according to Gandilyan (1975: 246) WIR is the holotype, but YAI is now considered the holotype (see notes 5 and 6). – Homotypic synonym: *Aegilops mutica* Boiss. var. *nurub* Gandilyan, Bull. Appl. Bot., Gen. & Pl. Breeding 54: 246 (1975), *nom. illeg.* (Art. 64.4). See note 6.

Aegilops mutica Boiss. var. *pual* Gandilyan, Bull. Appl. Bot., Gen. & Pl. Breeding 54: 246 (1975); Hammer, Feddes Repert. 91: 229 (1980b; in synonymy of the typical form of the species; see note 5). – Type: see forma *gandiljanii*.

Aegilops mutica Boiss. var. *puluci* Gandilyan, Bull. Appl. Bot., Gen. & Pl. Breeding 54: 246 (1975). – Type: see forma *gandiljanii*. – Homotypic synonym: *Ae. mutica* Boiss. forma *puluci* (Gandilyan) Hammer, Feddes Repert. 91: 229 (1980b).

Aegilops mutica Boiss. var. *puruni* Gandilyan, Bull. Appl. Bot., Gen. & Pl. Breeding 54: 246 (1975). – Type: see forma *gandiljanii*. – Homotypic synonym: *Ae. mutica* Boiss. forma *puruni* (Gandilyan) Hammer, Feddes Repert. 91: 229 (1980b).

Fig. 96. *Amblyopyrum muticum* var. *loliaceum*. 1, habitus (x 1/2); 2, spike (x 1); 2a, enlarged part of spike, showing spikelets in situ (x 2); 3, outline of leaf blade and ears (x 1/2); 3a, enlarged part of 3, showing stem, leaf sheath, ears and leaf blade (x 2); 4a, abaxial surface of leaf, midway (x 5); 4b, adaxial surface of 4a (x 5); 5, leaf sheath, ears and leaf blade of leaf at base of culm, showing well-developed hairyness (x 2); 7, rachilla and spikelet in adaxial view, showing various florets (x 3); 8-10, lower floret of spikelet in centre of spike: 8, glume, 9, lemma, 10, palea with young seed, showing feathery pistils (8-10 all x 5); 11-12, apical spikelet: 11, glume, 12, ventral view of lemma and palea, encapsuling seed (both x 5). *Amblyopyrum muticum* var. *muticum*. 6, spike (x 1/2); 6a, enlarged part of spike, showing spikelets in situ (x 2). (1-5, 7-12. *Güzel & al. SNM-060889-0303*; 6. *Güzel & al. SNM-060889-0502*; both cultivated at ICARDA from germplasm accessions.)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For literature, typification and synonyms referring specifically to the varieties, see under there.

Key to the varieties:
Glumes and of apical parts of the lemmas hispid, i.e. covered with short, whitish, stiff hairs .... var. **muticum**
Glume and lemmas glabrous .... var. **loliaceum**

11.1a **Amblyopyrum muticum** (Boiss.) Eig var. **muticum**
Figs. 96(6), 97-98, 100-102

Diagnostic characters: annuals, culms 40-90 cm tall; spikes awnless, (15-)20-35(-45) cm long, only 3-4 mm wide, with (9-)12-20(-24) spikelets, disarticulating wedge-type; spikelets with 5-9 florets, the lowest 2-3 fertile; glumes with diverging nerves and widest at the truncate, erose apex; surface of glumes and upper parts of lemmas hispid; apex of lower paleas rounded to emarginate.

Descriptio generico-specifica (Figs. 96-6 (but see note below), 97, 100): loosely tufted *annuals* with usually a few, rarely up to 30, tillers. *Culms* unbranched, slender, erect, 40-70(-90) cm tall excluding spikes, with 3-5 nodes; foliage sparse, more dense at base of culm. *Roots* fibrose, 5-15 cm long, unbranched and with thin, short, lateral rootlets only, whitish. *Leaves* (*Fig. 96-3, 4-5*) glaucous-green, 8-25 cm long, 0.6-1.1 cm wide, gradually reduced to the 2-10 cm length and 0.2-0.7 cm width of the flag leaf, with ciliate venation and margins at the base of the culm, which gradually becomes reduced to totally absent in the upper parts; ligule short, membraneous, transversally linear, up to 1 mm long, apical margin eroded; auricles at base of leaf blade, falcate, often yellowish, margins ciliate; leaf blade narrowly linear-acuminate, surface scabrid, especially adaxial, to glabrous, margins setulose, ciliate in lower parts of culm, ciliae more reduced to absent in upper parts, with 5-7 main nerves. *Inflorescence* (*Fig. 96-6; Fig. 100*) a narrowly cylindrical spike, (15-)20-35(-45) cm long, 3-4 mm wide, with (9-)12-20(-24) awnless, fertile spikelets; rudimentary spikelets at base of spike absent; spike at maturity disarticulatng wedge-type into groups of spikelets, eventually into individual spikelets. *Rachis segments* (*Fig. 96-6a*) noded; internodes coriaceous, narrowly cuneate-rectangular, flat at the base, gradually becoming concave and thickened above, (9-)12-22 mm long; nodes broadly reniform, supporting a single, sessile spikelet and the base of the next higher internode; inner and outer surface scabrid, the upper part of the outer surface also setulose; internode margins setose; venation on outer surface diverging towards the truncate apex. *Spikelets* (*Fig. 96-6a; Fig. 100*) all alike, oblong-cylindrical, sessile, alternate, laterally compressed, closely appressed to the concave rachis internode, 8-15 mm long, 0.3-1.2 times the length of the corresponding rachis internode, the apical spikelet usually at a 90^0 angle to the lateral ones; with 5-9 florets, the lowest 2-3 fertile. *Glumes* (*Fig. 97-13a, d*) 2, truncate-cuneate, widest at the apex, concave, coriaceous but with hyaline margins, rounded at the back, 4-9 mm long, venation conspicuous with nerves diverging towards the apex; outer surface hispid with long, stiff, whitish, pointed hairs; the

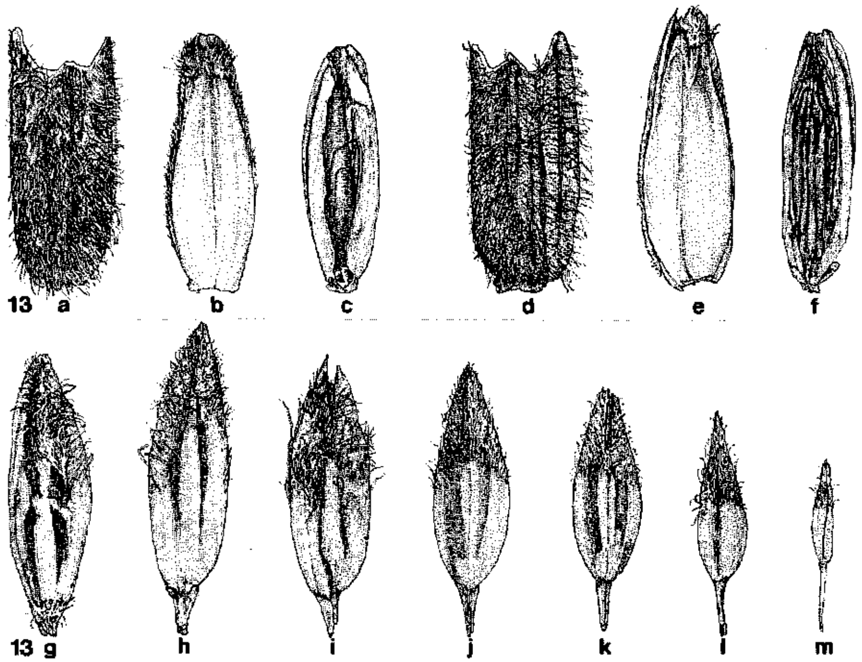

Fig. 97. *Amblyopyrum muticum* var. *muticum*. 13, analysis of a single spikelet in centre of the spike. 13a-c, lowest floret: glume (a), lemma (b), palea (c); 13d-f, second lowest floret: glume (d), lemma (e), palea and anthers (unclear) (f); 13g-l, entire third to eighth floret, showing increased reduction; 13m, ninth, sterile and much reduced uppermost floret (13a-m all x 5). (13. *Güzel & al. SNM-060889-0502*; cultivated at ICARDA from germplasm accession.)

apex erose with two blunt to acute, lateral teeth and an irregularly toothed, hyaline central part. *Lemmas* (*Fig. 97-13b, e, g-m*) elliptic-obtuse to -emarginate, hyaline, but somewhat coriaceous in the apical part where five nerves are developed, the lower ones 7-10 mm long, concave but the apical part sometimes conduplicate, glabrous but with the upper parts hispid, especially when protruding from the glumes or more basal lemmas; apex rounded. *Paleas* (*Fig. 97-13c, f*) narrowly elliptic, hyaline, the lower ones ± 7 mm long, with two smooth keels, their apices being a part of the rounded to emarginate palea apex. *Lodicules* 2 per fertile floret, hyaline, trullate to angular-ovate; margins irregular ciliate. *Stamens* 3 per fertile floret, anther loculaments 4 mm long. *Pistil* about 3 mm long; ovary hyaline before fertilization, broadly obovate-triangular, surface covered with short, hyaline hairs; styles 2, very short; stigmas (*Fig. 96-10*) 2, plumose, free from each other, diverging at anthesis. *Fruit* (*Fig. 96-12*) a caryopsis, obovate-oblong, ± 4 mm long, compressed, adaxially grooved over the entire length, adherent to lemma and palea; hilum linear, almost as long as the grain; embryo 1/4-1/3 the length of the grain.

Note: although the drawing of Fig. 96 depicts the var. *loliaceum* the typical variety is identical with the exception of the hispid glumes and lemmas (shown in Fig. 96-6 and 97). Hence the above description refers to several items of this Figure.

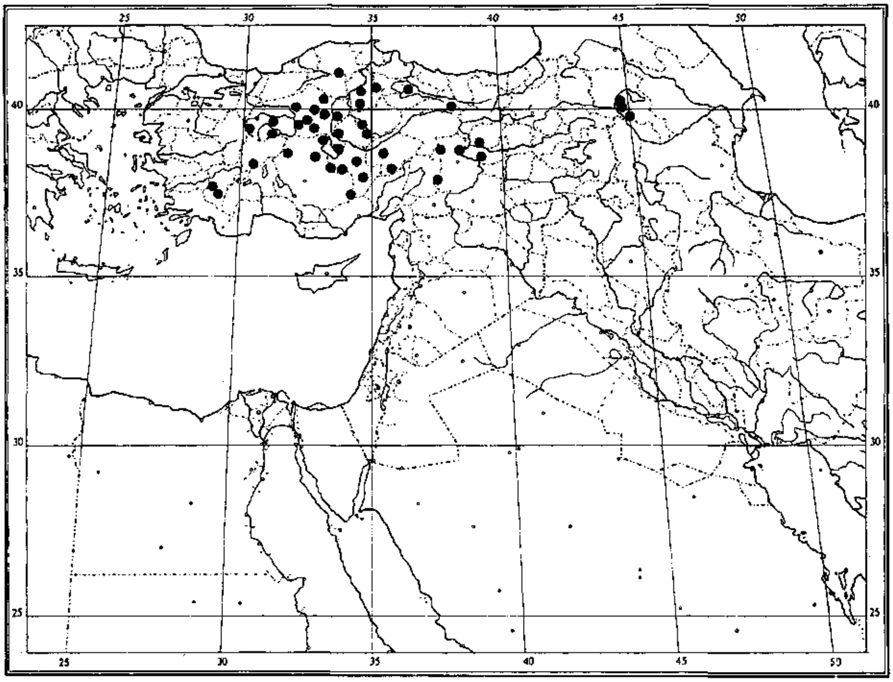

Fig. 98. Distribution of *Amblyopyrum muticum* var. *muticum* in western Asia. Adventive locations in Europe not shown.

Variation (Fig. 102): both varieties show conspicuous variation in the length of the spike: 15-45 cm, and, concurrently, the number of spikelets: 9-24. Variation in colour and, to some extent, hairiness of the glumes is also found.

Distribution (Figs. 98, 101): a Western Asiatic element, occurring only on the central Anatolian plateau in Turkey, and in Armenia. A disjunct distribution, and there are no records (yet) from regions in eastern Turkey with a comparable continental climate. Tanaka (1983: 1018-1019) reports the species from Qamishly in northeastern Syria, and from near Khvoy in northwestern Iran, but these sites are not confirmed. See also Chapter 6.2. Found as an adventive in 1906 in the harbour of Mannheim, Germany (Zimmermann, 1907: 72; Hegi, 1936: 500). Uncommon throughout its range.

Ecology (Fig. 101): open places near roadsides, dry igneous hill slopes (Fig. 101), and mountain slopes (cf., Roshevitz, 1937: 344), edges of cultivation, and grassy steppes with, e.g., *Aegilops*, *Artemisia*, *Thymus* and *Astragalus*. On loamy and calcareous soils. Rainfall amplitude is 300-450 mm annually. Usually in rather loose stands and with both varieties growing intermingled.

Altitude: 600-1250 m, rarely up to 1480 m, and possibly as low as 450 m (see also Chapter 6.2).

Flowering and fruiting time: June – August.

Genome: T with 2x = 2n = 14 (Chennaveeraiah, 1960: 89; Waines & Barnhart, 1992: Table 1).

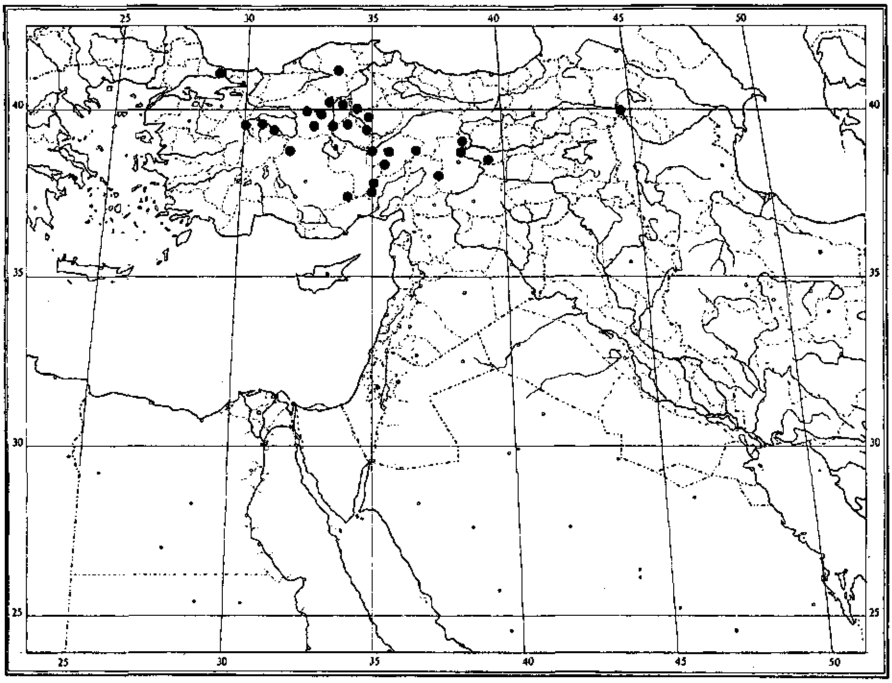

Fig. 99. Distribution of *Amblyopyrum muticum* var. *loliaceum* in western Asia. Adventive locations in Europe not shown.

Vernacular names:

Armenian: Ptatepug ankist [ptatepug is a combination of put = useless, and tep = chaff, first becoming p(u)tatep(-ug as a conjugation added), then ptatepug; an = not; kist = awn. Thus: useless like chaff and with no awns (R. Nalbandian, pers. comm.).] (Gandilyan in Kazarjan, 1990: 249).

Turkish: Narin boğday otu [narin = slender, slim; boğday = wheat; otu = grass]; Kil otu [kil = hair; otu = grass]; Tüysüz buğday otu [tüysüz = unfeathered; buğday otu = wheat grass; this vernacular is referred to *Am. muticum* var. *typicum* Eig] (both Sabanci, 1984: 1).

Etymology: the species epithet is derived from the Latin 'muticus' [= without a point, awnless, blunt; cf. Stearn, 1978: 466], and refers to the glume and spike outline, which are awnless.

Herbarium specimens examined:

ASIA: TURKEY: Ankara, Beypazari, Zegve, *Akman 1020* (ANK); Ankara – Polatli, Aakiz, Karu bükü, *Akman & al. 13114* (ANK); Cappadocia, on the Euphrates, *Aucher-Éloy 2977* (BM, FI, G-BOIS, K, MPU, OXF, P, type of *Amblyopyrum muticum* var. *muticum*); Cappadocia W of Caesarea, *Balansa 838* (E, LY-Gandoger, LY-Jordan, MPU, W); Kayseri, Kayseri, *Balls & Gourlay B1381 p.p.* (BM, FI, K); Ankara, Cubukvadisi, Stebi Mt., *Baki 400* (K); Cihanbeyli, Yavsan Tuzlasi, *Birand s.n.* (ANK); Koçazin, *Birand & Zohary 3169* (ANK); 35 km S Ankara, Koçhisar yolu, *Birand & Zohary 3006* (ANK, HUJ); Tuz Gölü, Kochisaridan, Koçasia, *Birand & Zohary 3535* (ANK, BR, HUJ); Aksarayin, 20 km Güneyinde, *Birand & Zohary 2790* (ANK); Corum, Koças, 25 km from Güneybatisi, *Birand &*

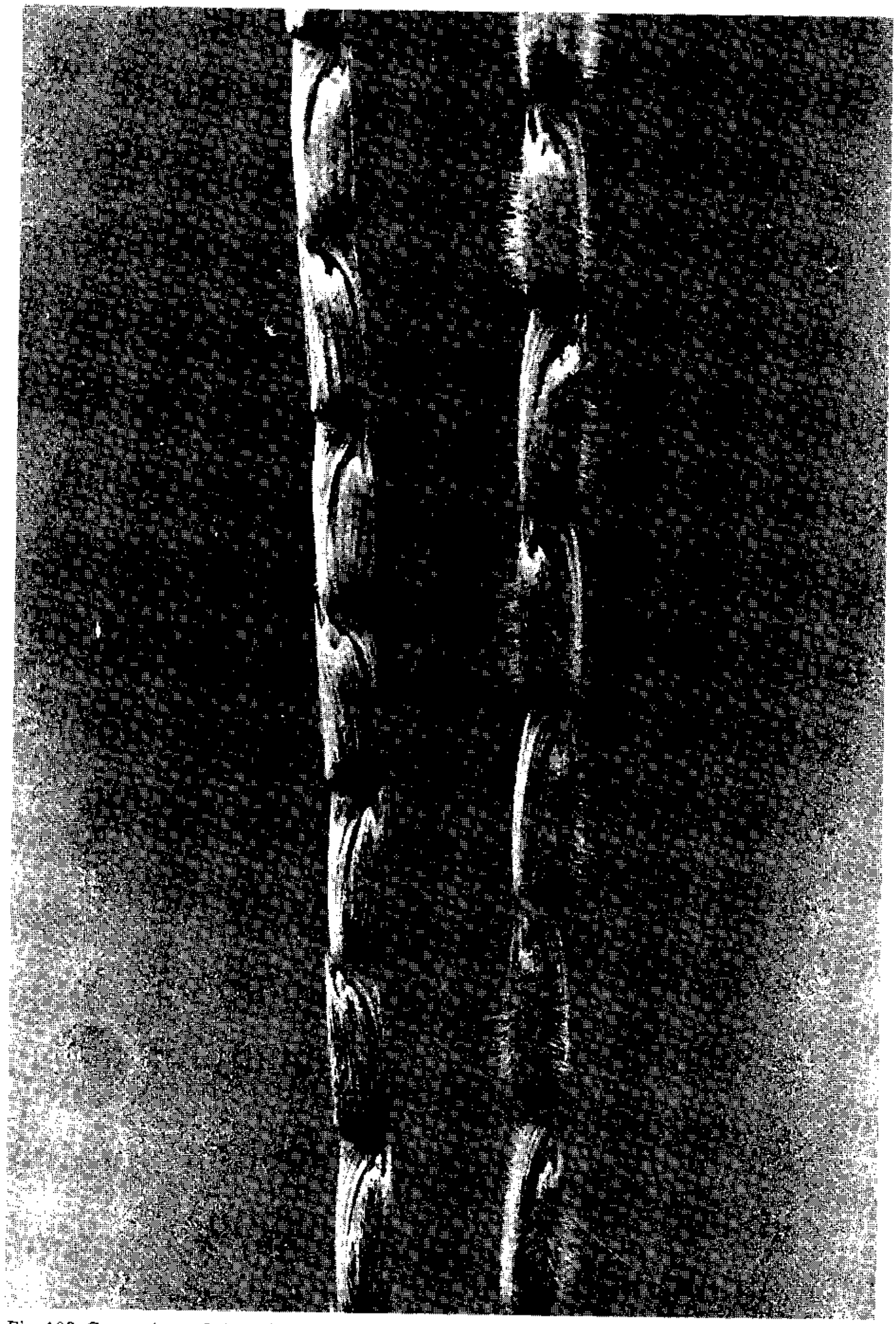

Fig. 100. Comparison of glume hairiness between var. *muticum* (right) and var. *loliaceum* (left) of *Amblyopyrum muticum*. Both spikes from a mixed germplasm collection (*Metzger & Jana 84TK157-024-02*, ICARDA, USDA), found between Asagisamli and Denizli, Turkey.

Zohary 3171, 3177 (ANK); Aksaray, 40 km from Kuzeyi, *Birand & Zohary 2682, 2669* (ANK); S Ankara, near Tuz Gölü, *Birand & Kasapligil 675* (ANK); Cappadocia, near Yozgat, *Bornmüller 1932* (BM); Cappadocia, Caesarea to Yozgat, *Bornmüller 1733* (B, PH, US); Malatya to Maraş, *Bot. Exp. Univ. Kyoto BMUK 7-1-4-A, 7-1-4-B* (K), *7-1-4-D* (US); Denizli, *Bot. Exp. Univ. Kyoto BMUK 5521, 5522* (UCR); Tokat – Resadiye batisi, *Cetik 47* (ANK); Niğde, Nevşehir, *Davis & al. 19088* (BM, K); Tunceli, Pertek – Hozat, *Davis & Hedge 31016* (ANK, BM, K); Ankara, SW Ankara, *de Koster & al. 474* (U); Anatolia, *Tchichatscheff s.n.* (reliq. Fischer 278) (LE); Ankara, Beytepe, *Erik 1333* (HUB); Ankara, Dikmen, *Gassner 408, 409* (ANK); Ankara, Kale, *Gassner 629* (ANK); Corum, SW Sungurlu towards Ankara, *Hennipman & al. 1973* (B, K, L, WAG); Niğde, NW Ulukişla, *Holtz & al. 00616* (B, E); 66 km E Eregli, *Johnson & Hall s.n.* (UCR); Ankara, Qubukvadisi Dag, *Kasapligil s.n.* (ANK); Ankara to Cubukvadisi, Stebi Mt., *Kasapligil 399* (ANK); Eskişehir, near Kaymaz, *Scheibe 1071* (B); Eskişehir, Serifiye to Hamadiye, *Scheibe 1236* (B); Elâzığ, Keban-Maden, *Sintenis 823* (B, K, LE, P, PR, W); Paphlagonia, Kastamonu, Wilajet Kastambuli, Tonia, Sabadja, *Sintenis 4352 p.p.* (B, BEI, BM, FI, K, LE, MPU, PR, PRC, W, Z); Marmure, 40 km E Eskişehir, *Stutz 341* (NY, W), *342 p.p.* (W); Cappadocia, near Caesarea, Erciyas Dag, *Zhukovsky s.n.* (WIR); near Susehri, *Zohary 67929* (HUJ); near Keçi Ören, *Zohary s.n.* (HUJ); 'Asia minor', *Chadzji-Zadèe s.n.* (WIR).

EUROPE: ARMENIA: Abovyan reg., Dzhervesh to Shorpulagh, *Gabrieljan s.n.* (ERE); ibid., Dzhervesh to Vokhtchabert, *Gabrieljan s.n.* (ERE); near Dzhervesh, Vokhtchabert and Gegadir, distr. Abovjan, *Gandilyan s.n.* (WIR, YAI, type of *Aegilops mutica* forma *gandiljanii* and vars. *pual, puluci, puruni*).

ADVENTIVE: EUROPE: FRANCE, HÉRAULT: Port Juvénale, *Godron 46* (K). GERMANY: Mannheim, *Zimmermann s.n.* (L).

Germplasm collections examined:

ASIA: TURKEY: W Kirikkale, *Güzel & al. SMN-040889-0301* (ICARDA, PGRRI); Konya, 39 km E Yunak, *Güzel & al. SMN-060889-0502* (ICARDA, PGRRI); Ankara, 22 km N Celebi, *Güzel & al. SMN-040889-0604* (ICARDA, PGRRI); Ankara, NW Sincan, *Güzel & al. SMN-030889-0103* (ICARDA, PGRRI); Malatya, 42 km W Keban, *Güzel & al. SMN-110889-0203* (ICARDA, PGRRI); Konya, 25 km S Yunak, *Güzel & al. SMN-060889-0303* (ICARDA, PGRRI); Denizli to Asagisamli, *Metzger & Jana 84TK157-024-02* (ICARDA, USDA).

EUROPE: ARMENIA: Abovyan reg., Dzhervesh to Gegadir and Muchavan, *van Slageren & al. MSPGNG-92047 p.p.* (ICARDA).

Notes: 1. During my visit to G and G-BOIS in June 1992, material of *Amblyopyrum muticum* in G was on loan. Frederiksen (1993: 491) commented on the holotype specimens 'at G' as: (a) presenting only the hispid forms, (b) annotated by Boissier, and (c) in accordance with the protologue (in Boissier's *Diagnoses* from 1844). [However, she designates G-BOIS as the holotype; l.c., 490.] G-BOIS is the separate herbarium in G relating only to Boissier's *Flora orientalis*, which features *Ae. mutica* in the fifth volume (Boissier, 1884: 678). The material in G-BOIS, as well as Boissier's description in the *Flora* ('...spiculis glabris vel velutinis...'; l.c., 678), refers to both forms of *mutica*. It thus appears that material in G closely connects with the protologue in the *Diagnoses*, that in G-BOIS with the protologue in the *Flora orientalis*. As the species was published in the *Diagnoses* the specimens in G, and *not* those in G-BOIS, have to be considered the holotype of the typical variety of *Amblyopyrum muticum*. For the isotypes only the hispid specimens on the sheets are considered. Except FI and K all isotype sheets present mixtures of both varieties.

2. The *Dissertatio inauguralis botanica sistens characteristicen et descriptiones cerealium* (in horto academico tubingensi...) from 1818 is usually attributed to Gustav Schübler. In this book emmer wheat (*Triticum turgidum* ssp. *dicoccon*) is

Fig. 101. *Amblyopyrum muticum* (germplasm collection *van Slageren & al. MSPGNG-92047,* ICARDA) on a hillside between Gegadir, Dzhervesh and Muchavan, Abovyan district, NE Erevan, Armenia.

mentioned for the first time at species level on p. 29 (see at 5.4.3, Table 9). The title page, however, indicates that the book is the doctorate thesis of Johannes Ludovicus Rode, and that it was presented for public defense to a committee under the chairmanship of Schübler in 1818 (Stafleu & Cowan, 1985: 357-358). It was customary in those days that the established scientist wrote the thesis himself (Linnaeus and C.P. Thunberg are well known other cases), and that against payment others could earn their degree with it. Rode was never heard of since, and both emmer wheat and *T. muticum* have to be ascribed to Schübler instead (F.A. Stafleu, pers. comm.).

3. When Jaubert & Spach (1847: 121 and Tab. 200) first described *Amblyopyrum muticum* (as *Aegilops tripsacoides* Jaub. & Spach) they had material of both the hispid and glabrous forms (see their habit drawing of Tab. 200). In the second volume of their *Illustrationes* the glabrous form was noted separately as: '-β: Spiculis glabris', while the typical, hispid form was described in detail, including: '...Glumæ 2, ...dense hispidulæ...' (l.c., 1847: 121). The glabrous forms were later described in detail in the fourth volume (l.c., 1851a: 23 and Tab. 317) as *Aegilops loliacea* Jaub. & Spach. Unfortunately the type connected with the latter species name, *Aucher-Éloy 2977*, is the same as of the earlier *Ae. mutica* from Boissier. The specimens at P rather than at G or G-BOIS are the holotype of *Ae. loliacea*, but, as this is a mixed gathering of the two forms, only the glabrous specimens should now be connected with that species name. The mixture of forms is shown by Jaubert & Spach's Table 317, figs. 3 (hispid glume) and 4 (glabrous glume), although the habit drawing of this Table shows only the glabrous form.

As *Amblyopyrum muticum* is mainly outcrossing (see Chapter 4.3) the mix of hispid and glabrous forms within a single population is a well-known feature that I encountered with various herbarium specimens (e.g., *Balls B1381* (BM) and *Holtz & al. 00616 (muticum) / 00617 (loliaceum)* (B, E), which are therefore listed at both varieties), as well as in the field in Turkey and Armenia (e.g., germplasm collection *van Slageren & al. MSPGNG-92047* (ICARDA)).

Frederiksen (1993) concluded on the bases of cultivation of accessions that the genetic basis for the hispid pubescence is '...most probably controlled by a single or very few closely linked genes...' (l.c., 491). If so, then this is, in a way, a similar case to cultivated barley, *Hordeum vulgare* L. ssp. *vulgare* and its wild progenitor, ssp. *spontaneum* (K.Koch) Thell., as it is generally agreed that the genetic basis of the differences in the barleys consist of one pair of independent genes only (S. Ceccarelli, pers. comm.). Yet the separate taxonomic status for wild barley within the species *H. vulgare* is hardly disputed, although, admittedly, there is an element of convenience in this separation. Similar to the case of barley, the *visible* difference between the forms of *Amblyopyrum muticum* is striking. As partly hispid individual plants are very rarely found in nature, the taxonomic recognition of two entities is maintained. As to the rank, that of forma may be appropriate, but for consistency with similar cases in *Aegilops* (e.g., *Ae. bicornis* and *Ae. speltoides*) varietal rank is also assigned here.

4. Hegi (1936: 500) mentions an adventive location in Mannheim of *Ae. mutica* '*var.*' *tripsacoides* Jaub. & Spach. This combination formally did not exist in

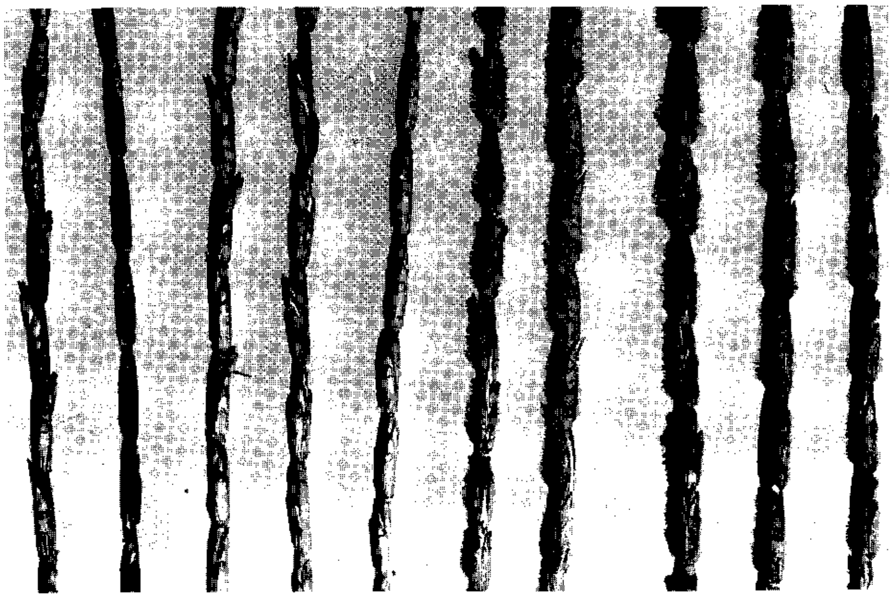

Fig. 102. Variation in spike colour and hairiness of a single population of *Amblyopyrum muticum*, found on a hillside between Gegadir, Dzhervesh and Muchavan, Abovyan district, NE Erevan, Armenia (germplasm collection *van Slageren & al. MSPGNG-92047*, ICARDA).

Aegilops mutica at that time, but it did in *Triticum muticum* (made by Thellung in Zimmermann, 1907: 72). However, contrary to his earlier (Hegi, 1908: 390) listing of *Aegilops caudata* ssp. *cylindrica* with author '(Host)' and (new) var. *hirsuta* with the citation '(Binz)' (see at *Ae. cylindrica*, 10.7), indicating, in fact, '(Host) Hegi' and '(Binz) Hegi', he does not, in my view, intend to propose a new combination here, but rather to cite Thellung's combination.

5. Dr P.A. Gandilyan informed me that the type material of his varieties was sent to WIR in 1972, but that his accompanying manuscript was not published before 1975. In the meantime the material was neglected. During my visit to WIR in June 1991, the staff were unable to show these types. Gandilyan (1975: 246) considered the set at WIR as holotypes and at YAI as isotypes. I now consider the set at YAI as the holotypes, as the material at WIR is most likely – I am not sure – not extant anymore.

It must be noted that Gandilyan (1975: 246) indicated only one type (specimen) for his eight varieties in *Ae. mutica* (four with 'glumis glabris' and thus under *Amblyopyrum muticum* var. *loliaceum*, and four with 'glumis pubescentis' thus under var. *muticum*). I have to assume that for each of his varieties the 'type specimen' refers to different specimens within this collection, as they cannot be maintained as separate taxa otherwise. [I hope the material at YAI is still there as I have been unable to see it.]

Hammer (1980b: 229) considered the description of Gandilyan's var. *pual* to apply to the typical forms of var. *mutica*, and made *pual* a synonym under the typical forma of var. *mutica* while maintaining Gandilyan's other varieties as different formae.

6. The variety *nurub* appeared twice by Gandilyan (1975: 246), probably resulting from a typing error. The variety with hairy (hispid) glumes should most likely have been called *purub* if one examines Gandilyan's list of varietal names. I agree with Hammer (1980b: 229) that this second *nurub* is illegitimate in view of Art. 64.4 since it is a homonym. Hammer renamed it with a new diagnosis as forma *gandiljanii*. For an outline of the system of variety-naming by Gandilyan and his collaborators, see note 2 at 10.18a, *Aegilops triuncialis*.

11.1b **Amblyopyrum muticum** (Boiss.) Eig var. **loliaceum** (Jaub. & Spach) Eig **Figs. 96(1-5, 7-12), 99-102**

Amblyopyrum muticum (Boiss.) Eig var. *loliaceum* (Jaub. & Spach) Eig, P.Z.C. Inst. Agric. Nat. Hist., Agric. Rec. 2: 204 (1929b); Davis, Fl. Turkey 9: 233 (1985).

Basionym: *Aegilops loliacea* Jaub. & Spach, Ill. pl. orient. 4: 23, Tab. 317 (1851a), Gram. orient., Ann. Sci. Nat., Sér. 3, Bot. 13-14: 358 (1851b); Walpers, Ann. bot. syst. 3: 791 (1852); von Steudel, Syn. pl. glumac. 1: 356 (1854).

Type: [the glabrous specimens of:] (Turkey) Cappadocia, ad Euphratem, *Aucher-Éloy 2977* (holo: P; iso: BM, G (not seen), G-BOIS, MPU, OXF). – Note: a photograph, which is not an isotype, is in DAO (see at 11.1a: the comment on the type and note 3).

Homotypic synonyms:

Aegilops mutica Boiss. var. *loliacea* (Jaub. & Spach) Eig, Bull. Soc. Bot. Genève, Sér. 2(19): 329 (1928a), Feddes Repert., Beih. 55: 68 (1929a).

Aegilops mutica Boiss. ssp. *loliacea* (Jaub. & Spach) Zhuk., Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 546 (1928); Jansen & Wachter, Nederl. Kruidk. Arch. 148 (1931); Jansen, Fl. neerl. 1(2): 121 (1951).

Triticum tripsacoides (Jaub. & Spach) Bowden forma *loliaceum* (Jaub. & Spach) Bowden, Can. J. Bot. 37: 666 (1959).

Amblyopyrum muticum (Boiss.) Eig ssp. *loliaceum* (Jaub. & Spach) Chennav., Acta Horti Gotoburg. 23: 163 (1960, author as '(Jaubert & Spach) Zhuk.'); Löve, Feddes Repert. 95: 494 (1984; as a *comb. nov.*, thus an isonym); Frederiksen, Nordic. J. Bot. 13(5): 490 (1993; starting with this one all other homotypic and heterotypic combinations of the var. *loliaceum* cited by Frederiksen in synonymy of the species name. See note 3 at 11.1a.).

Aegilops mutica Boiss. forma *loliacea* (Jaub. & Spach) Hammer, Feddes Repert. 91: 229 (1980b).

Heterotypic synonyms:

Triticum emarginatum Godr., Fl. juvenalis (ed. 1, Latin) 46 (1853) / Mém. Acad. Montp., sect. Méd. 1: 454 (1853), (ed. 2, French) 113 (1854) / Mém. Acad. Stan. (Nancy) 432 (1853); von Steudel, Syn. pl. glumac. 1: 345 (1854); Cosson, Bull. Soc. Bot. France 11: 163 (1864); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 456, 544 (1928); Chennaveeraiah, Acta Horti Gotoburg. 23: 163 (1960); Hammer, Feddes Repert. 91: 229 (1980b, sub *Aegilops mutica*). – Type: (France, Hérault) Port Juvénale, 12.VII.1837, *Touchy 293* (holo: NCY, not seen; iso: MPU). – Note: 'Patria ignota' is written by Godron (1853: 46) in connection with this species, which originates from Turkey. Found on the Port Juvénale near Montpellier, France, as an adventive. Isotype material in MPU showed only the *loliaceum* variety of *Amblyopyrum muticum*. Unfortunately the holotype in NCY has not been seen.

Aegilops mutica Boiss. var. *nual* Gandilyan, Bull. Appl. Bot., Gen. & Pl. Breeding 54: 246 (1975); Hammer, Feddes Repert. 91: 229 (1980b, considers this the typical form of the variety *loliacea* of *Aegilops mutica*). – Type: (Armenia) RSSA Armeniae, prope pagis Dschervesch, Vochtschabert et Gegadir (distr. Abovjan), 1.VIII.1971, *Gandilyan s.n.* (holo: YAI; iso: WIR; see note 5 at 11.1a).

Aegilops mutica Boiss. var. *nuluci* Gandilyan, Bull. Appl. Bot., Gen. & Pl. Breeding 54: 246 (1975), **syn. nov.** – Type: see var. *nual*. – Homotypic synonym: *Ae. mutica* Boiss. [var. *loliacea* (Jaub. & Spach) Eig] forma *nuluci* (Gandilyan) Hammer, Feddes Repert. 91: 229 (1980b).

Aegilops mutica Boiss. var. *nurub* Gandilyan, Bull. Appl. Bot., Gen. & Pl. Breeding 54: 246 (1975), **syn. nov.** – Type: see var. *nual*. – Homotypic synonym: *Ae. mutica* Boiss. [var. *loliacea* (Jaub. & Spach) Eig] forma *nurub* (Gandilyan) Hammer, Feddes Repert. 91: 230 (1980b).

Aegilops mutica Boiss. var. *nuruni* Gandilyan, Bull. Appl. Bot., Gen. & Pl. Breeding 54: 246 (1975), **syn. nov.** – Type: see var. *nual*. – Homotypic synonym: *Ae. mutica* Boiss. [var. *loliacea* (Jaub. & Spach) Eig] forma *nuruni* (Gandilyan) Hammer, Feddes Repert. 91: 230 (1980b).

Description (Figs. 96: 1-5, 7-12; 100, 102): similar to var. *mutica*, but differing in the glabrous glumes and upper lemma parts.

Variation (Fig. 102), distribution (Fig. 99), ecology (Fig. 101), altitude, flowering and fruiting time, genome type: similar to var. *mutica*. The glabrous forms have been found as an adventive in the Netherlands (Jansen, 1951: 121), and on the Port Juvénale in the Hérault in southern France (Godron, 1853: 46).

Herbarium specimens examined:

ASIA: TURKEY: Ankara, Beypazari, Zegve, *Akman 5026* (ANK); Cappadocia, on the Euphrates, *Aucher-Éloy 2977* (BM, G-BOIS, MPU, OXF, P, type of *Amblyopyrum muticum* var. *loliaceum*); Cappadocia, W Caesarea, *Balansa 838* (K, L, MPU, P), *s.n.* (L, LE); S Caesarea, *Balansa s.n.* (L); Kayseri town, *Balls & Gourlay B1381 p.p.* (BM, FI, K); Ankara, Cubukvadisi Dag, Steli Mt., *Baki 399* (K); Koças, 20 km from Güneybatisi, *Birand & Zohary 3227* (ANK, HUJ); Anatolia, Cappadocia, Caesarea to Yozgat, *Bornmüller 1732* (B, BM, FI, LY, OXF, P, PH, PR, PRC, SO, US, W, Z, material of *Amblyopyrum muticum* forma *glabra*), *2561* (B); 40 km SW Malatya to Maraş, *Bot. Exp. Univ. Kyoto BMUK 7-1-4-C* (US); NW Yerköy, Yozgat to Cerikli, *Bot. Exp. Univ. Kyoto BMUK 5501* (UCR); Halcali station, near Istanbul, *Chadzji-Zadée s.n.* (WIR); N Ankara to Çankiri, *Coode & Jones 2129A* (A, E); Niğde, Taspinar to foot of Hazan Dag, *Davis & al. 18881* (ANK, BM, K, W); Anatolia, *Tchichatscheff s.n.* (reliq. Fischer 741) (LE); 40 km S Ankara, near Ahiboz, *Godfrey & Taysi SH-5* (US); Corum, SW Sungurlu to Ankara, *Hennipman & al. 1969* (B, K, L, U, WAG); Niğde, NW Ulukişla, *Holtz & al. 00617* (B, E); Yesilova to Kemaliye, *Huber-Morath 5545* (MPU, W); 66 km E Eregli, *Johnson & Hall s.n.* (UCR); 120 km NW Kirşehir, *Johnson & Hall s.n.* (UCR); Corum, Sungurlinum to Güneybatisi, *Nijhoff & al. 1969* (ANK); Ankara, Etymešut, *Pilát 2616* (PRC); Eskişehir, Serifiye, *Scheibe 1321* (B, BM); Eskişehir, Kaymaz to Yavernisau, *Scheibe 1070* (B); Paphlagonia, Kastamonu, Wilayet Kastambuli, Tonia, Sabadja, *Sintenis 4352 p.p.* (B, BM, K, Z); Elâziğ, Keban-Maden, *Sintenis 823* (B, K, P); Marmure cementery, 40 km E Eskişehir, *Stutz 342 p.p.* (NY); Alkali flat, Baymakci, *Stutz 438* (NY); Ankara, Dikmen, *Walter 1220* (B); Cappadocia, near Bohaslajan, *Zhukovsky s.n.* (WIR); Anatolia, Cappadocia, Caesarea to Yozgat, *Zhukovsky s.n.* (WIR); 20 km W Ankara, *Zohary s.n.* (HUJ); Ankara prov., 86 km W Sungurlu, *Zohary & al. 117742* (HUJ); near Keçi Ören, *Zohary s.n.* (HUJ); 'Asia Minor', *Tchichatscheff 725* (P), *Chadzji-Zadée s.n.* (WIR).

EUROPE: ARMENIA: Abovyan reg., Dzhervesh to Shorpulagh, *Gabrieljan s.n.* (ERE); ibid., Dzhervesh to Vokhtchabert, *Gabrieljan s.n.* (ERE); near Dzhervesh, Vokhtchabert and Gegadir, distr. Abovjan, *Gandilyan s.n.* (WIR, YAI, type of *Aegilops mutica* vars. *nual*, *nuluci*, *nurub*, *nuruni*).

ADVENTIVE: EUROPE: FRANCE, HÉRAULT: Port Juvénale, *Touchy 293* (MPU, type of *Triticum emarginatum*).

Germplasm collections examined:

ASIA: TURKEY: Konya prov., 25 km S Yunak, *Güzel & al. SNM-060889-0303* (ICARDA, PGRRI).

EUROPE: ARMENIA: Abovyan reg., Dzhervesh to Gegadir and Muchavan, *van Slageren & al. MSPGNG-92047 p.p.* (ICARDA).

12 Nomina nuda

When voucher specimens indicated that taxa other than those accepted for *Aegilops*, *Amblyopyrum* or x *Aegilotriticum* are involved, the *nomina nuda* are listed in Chapter 13, Excluded taxa.

Aegilops biuncialis Vis. var. **biaristata** Hack. in Groves, Nuov. Gior. Bot. Ital. 19: 212 (1887), **syn. nov.** – Voucher: (Italy) Taranto, Leucaspide, *Groves s.n.* (G). = *Aegilops biuncialis* Vis. – Note: the main collection of Henri Groves ('of Florence', 'Enrico', cf., Lanjouw & Stafleu (1957: 242)) is in FI, but I have been unable to locate this voucher there.

Aegilops caudata C.A.Mey., Verz. Pfl. Casp. Meer. 26 (1831); Grisebach in von Ledebour, Fl. ross. 4: 326 (1852, sub. var. β *meyeri* Griseb. ex Ledeb. of *Ae. squarrosa*), non Linnaeus (1753). – Voucher: (Azerbaijan) in campis aridis subsalsis prope Sallian, *C.A. von Meyer s.n.* (LE, not seen). = *Aegilops tauschii* Coss. – Note: von Meyer collected in the Caucasus during 1829-30 (Stafleu & Cowan, 1981: 441), possibly together with Hohenacker. The specimen and its location, mentioned by C.A. von Meyer in connection with *Ae. caudata* auct., was later used by Grisebach for his var. β *meyeri* Griseb. ex Ledeb. of *Ae. squarrosa* (with collector *von Meyer*). It is also similar to the type specimen of *Ae. squarrosa* L. var. *salinum* Zhuk., but Zhukovsky cites Hohenacker as collector and a specimen, relating to *salinum* is present in WIR (Zhukovsky, 1928: 549). See also the nomenclature at 10.17, *Ae. tauschii.*

Aegilops caudata L. var. **aristata** Tchich., Asie min., Bot. 2: 582 (1860), **syn. nov.** – Voucher: (Turkey) Phrygia, ad pagum Bulgas-Kevi, haud procul ab urbe Uchak. *Bal. (= B. Balansa) s.n.* (G-BOIS, L). = *Aegilops caudata* L. – Note: this voucher later became one of the syntypes of the var. β *polyathera* Boiss. of *Ae. caudata* L.

Aegilops cylindrica Hohen. (ex Griseb.) in Ledeb., Fl. ross. 4: 326 (1852), *nom. inval.* (Art. 34.1*(c)*), non Host, Icon. descr. gram. austriac. 2: 6 (1802). = (probably) *Aegilops tauschii* Coss. – Note: published name from Hohenacker's herbarium, and cited only in synonymy of *Ae. squarrosa* by Grisebach in his treatment of the grasses for the *Flora rossica* of von Ledebour. Although various Hohenacker collections from the region of this flora have been seen, none has shown a connection with this name.

Aegilops cylindrica Schur, Enum. pl. Transsylv. 813 (1866); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 469 (1928), non Host, Icon. descr. gram. austriac. 2: 6 (1802). = *Aegilops geniculata* Roth.

Aegilops cylindrica Moris ex Nyman, Consp. fl. eur. 4: 839 (1882); Barbey, Fl. Sard. comp. 73 (1885), *nom. inval.* (Art. 34.1*(c)*), non Host, Icon. descr. gram. austriac. 2: 6 (1802). = (probably) *Aegilops ventricosa* Tausch. – Note: Nyman

(1882: 839) published '*Aegilops cylindrica* Mor. exs.', a name on an exsiccatum from Moris' herbarium, as a synonym under *Ae. fragilis* Parl. The latter species is a synonym of *Ae. ventricosa* Tausch (see at 10.22).

Aegilops cylindrica Host var. **taurica** Roem & Schult., Syst. veg. 2: 771 (1817, '...varietas *taurica* ad Rottboellas referenda videtur P. de Beauv....'); Tausch, Flora 20: 108 (1837; in syn. of *Ae. squarrosa* (auct. non L.) and ignoring the reference to *Rottboellia* of Roemer & Schultes); Cosson, Notes pl. crit. 1(2b): 69 (1850; only in syn. of *Ae. tauschii*, also ignoring Roemer & Schultes), *nom. inval.* (because of Art. 34.1*(a)* at Roemer & Schultes, because of Art. 34.1*(c)* at Tausch and Cosson). = ? – Note: Roemer & Schultes refer this variety to *Rottboellia* as presented by Palisot de Beauvois (probably in his *Agrostographie* from 1812). Although Palisot de Beauvois enumerates a number of species in that genus, Roemer & Schultes do not indicate to which one this may apply. The reference to Palisot is ignored by Cosson and Tausch.

Aegilops laticuspis Boiss. ex Eig, Feddes Repert., Beih. 55: 94 (1929a), *nom. inval.* (Art. 34.1*(a)*). = (most likely) *Aegilops juvenalis* (Thell.) Eig. – Note: Eig mentioned this herbarium name from Boissier in his comments under *Ae. juvenalis* but, according to him, neither material nor notes relating to this name were found in Boissier's herbarium.

(x) Aegilops leveillei Sennen (& Pau?) in Sennen, Bol. Soc. Aragon 15: 231 (1916, 'x *Ae. leveillei* Sen. = *Ae. triaristata* x *triuncialis* ej.'), Fl. Catal. 198 (1917, 'x *Æ. Seveillei* Sennen'), Butl. Inst. Catal. Hist. Nat. 6: 122 (1920, '= *AEgilops triaristata* x *triuncialis* ej.'); Maire, Contr. étude fl. Afrique Nord 17, Bull. Soc. Hist. nat. Afrique Nord 22: 71 (1931a, 'x *Aegilops leveillei* Sennen – *Aegilops ovata* L. x *triuncialis* L.'), Contr. étude fl. Afrique Nord 18, Bull. Soc. Hist. nat. Afrique Nord 22: 325 (1931b, in syn. of *Ae. triaristata*); de Bolòs y Vaireda, Veg. Comar. Barcelon. 231 (1950, '*Leveillei*'); Maire & Weiller, Fl. Afrique nord 3: 367 (1955, 'x *A. Leveillei*'); Hammer, Feddes Repert. 91: 247 (1980b, author as 'Sennen et Pau'). – Voucher: (Spain) Barcelona towards Valdoncellas, sables granitiques, inter parentes, 17.V.1919, *Sennen s.n.* (BC, BM, LY). = *Aegilops neglecta* Req. ex Bertol. – Note: the author is cited by Hammer (1980b: 247) as 'Sennen et Pau', while all previous references only cite 'Sennen'. In spite of repeated suggestions of a hybrid nature all inspected material is *Aegilops neglecta* as here understood.

Aegilops mixta Sennen, Butl. Inst. Catal. Hist. Nat. 6: 122 (1920, '= *AE. ovata triaristata* ej.'), Plantes d'Espagne no. 3234 (1926, 'x *Aegilops mixta*'; preprint of Bull. Soc. ibér. Cienc. nat.); Eig, Feddes Repert., Beih. 55: 138 (1929a). – Voucher: (Spain) Catalogne, Barcelone, sables granitiques du Tibidabo, V et VI.1917, *Sennen (Plantes d'Espagne) 3234* (BC, BM, LY, MPU-Coste, W). = *Aegilops neglecta* Req. ex Bertol. – Note: I have been unable to find a description in Sennen's *Plantes d'Espagne*, relating to no. 3234, and hence consider this species a *nomen nudum*. In spite of repeated suggestions of a hybrid nature all inspected material is *Aegilops neglecta* as here understood. The name is absent at Zhukovsky (1928), and was not validated by Eig (1929a: 138), who cites '*Ae. mixta* Sennen in schedae, Pl. d'Espagne, (1917), No. 3234' as a synonym under *Ae. triaristata* Willd.

Aegilops mutica Boiss. forma **glabra** Hausskn. ex P.H.Davis, Fl. Turkey 9: 233 (1985), *nom. inval.* (Art. 34.1*(c)*). – Voucher: (Turkey) Cappadocia, inter Caesareum et Yozgat, 22.VI.1890, *Bornmüller 1732* (B, BM, FI, LY, OXF, P, PH, PR, PRC, SO, US, W, Z). = *Amblyopyrum muticum* (Boiss.) Eig var. *loliaceum* (Jaub. & Spach) Eig. – Note: I have been unable to find any description by Haussknecht or anyone else until Davis published this apparent herbarium name in synonymy of *Amblyopyrum muticum* var. *loliaceum* in his *Flora of Turkey*.

Aegilops nova Winterl, Index hort. bot. Univ. Hung. 2 (1788); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 710 (1902, in syn. of '*T. caudatum* B. *T. cylindricum*' and with note 'hardly to be seen as a valid name'); von Degen, Mat. Termés-Zettud. Ertes. 35: 475 (1917); Chase & Niles, Index Grass Species 1: 9 (1962), *nom. inval.* (Art. 20.4*(a)*). = *Aegilops cylindrica* Host. – Note: according to Chase & Niles (1962: 9), and as well as because of Art. 23.6*(a)*, the name *nova* should not be seen as a species name. Hence the (later) name *cylindrica* has been adopted. The name *Ae. nova* is considered by them as the basis for the hybrid *Aegilops sancti-andreae* Degen (von Degen, 1917), but I fail to see why. Winterl (1788: 2) mentions in his description: '...spicam per articulos *fragilem...*' [my italics], a typical *cylindrica* character compared with the non-fragile spikes of hybrids (see Chapter 4.2.1). Moreover, he does not mention the apparent sterility, which is also characteristic of the hybrid species. Thus, I consider *Ae. nova* a different taxon from *Ae. sancti-andreae*, and the material in the Hortus of Pest University most likely represented then undescribed *Ae. cylindrica*. Von Degen (1917: 475) did not validate *Ae. nova* in view of Art. 34.1*(a)* but only mentioned it: '[*cylindrica* Host]' is added in the formula accompanying his new hybrid species (see at 4.2.2.5).

Aegilops ovata Gand., Bull. Soc. Bot. France 67: 283 (1920); Rechinger, Fl. Aegaea, Akad. Wiss. Math.-Naturw. Kl., Denkschr. 105: 767 (1943, in syn. of *Aegilops biuncialis* var. *archipelagica* – sic!), **syn. nov.**, non Linnaeus (1753). – Voucher: (Croatia) in cultis ad Martinsčica in litt. Croat., 23.V.1889, *Rossi 6046* (LY, LY-Gandoger). = *Aegilops triuncialis* L.

Aegilops ovata γ **ambigua** Vayr. ex A.Bolòs, Cavanillesia 4: 62 (1931). = (probably) *Aegilops geniculata* Roth. – Note: posthumously published name from E. Vayreda y Vila in a list of new combinations and (apparently) *nomina nuda* for the flora of Catalunya, edited by A. de Bolòs y Vaireda. The name is followed by '*Ae. ambigua...*', which may be a very indirect reference (Art. 32.3) to *Ae. ambigua* Hausskn., a heterotypic synonym of *Ae. comosa* (see at 10.5). Being recorded from S. Cristòfol de Montserrat, it is extremely unlikely that the predominantly Greek *comosa* is involved. The '...' after *ambigua* may therefore refer to 'auct. non' in order to distinguish it from its namesake. Unclear, and if 'auct. non' then a *nomen nudum*.

Aegilops ovata L. var. **hirsuta** Tchich., Asie min., Bot. 2: 582 (1860), **syn. nov.** – Voucher: (Turkey) 'Ponto', inter pagum Feringe et urbem Niksar, reg. silvat., mont., alt. c. 600 m, 1858, *Tchichatscheff Pl. As. Min. exsicc. 670* (P, not seen). = (probably) *Aegilops geniculata* Roth.

Aegilops palaestina Peyron ex Feldman & Kislev, Isr. J. Bot. 26: 196 (1977), *nom.*

inval. (Art. 34.1*(a)*). – Voucher: (Palestine) Acre, 29.V.1882, *E. Peyron s.n.* (G). = *Aegilops longissima* Schweinf. & Muschl. – Note: published but not accepted herbarium name. Peyron gave the name and provided a handwritten description to a sample of *Ae. longissima* but never published it.

Aegilops squarrosa Pall. ex M.Bieb., Fl. taur.-caucas. 1: 434 (1808, in syn. of *Ae. cylindrica*); Grisebach in von Ledebour, Fl. ross. 4: 326 (1852, in syn. of misapplied *Ae. caudata*), *nom. inval.* (Art. 34.1*(c)*), non Linnaeus (1753). = (probably) *Aegilops cylindrica* Host. – Note: this name is cited in synonymy only by Marschall von Bieberstein and by Grisebach. In both cases with 'ind. Taur.' added. Refers probably to a misapplied name from P.S. von Pallas (1741-1811), German botanist and explorer of Russia, Siberia and the Crimea (= 'Tauria', to which the note at the name may refer). I have not been able to check in which of Pallas' various publications this name is found (in case it is not a herbarium name published by Marschall von Bieberstein).

Aegilops triticoides Link ex Asch., Magyar Bot. Lapok 1(6): 12 (1902, as '*Aegilops* [nec *Crithodium*] *triticoides* Link herb!'); Ascherson & Graebner, Syn. mitteleur. Fl. 2(1): 712 (1902); Fiori, Fl. Italia 4: 33 (1907); Zhukovsky, Bull. Appl. Bot., Gen. & Pl. Breeding 18(1): 524 (1928), *nom. inval.* (Art. 34.1*(c)*), non Req. ex Bertol., Fl. ital. 1: 788 (1834). = *Aegilops speltoides* Tausch var. *ligustica* (Savign.) Fiori. – Note: Boissier (1884: 678) published the herbarium name *Crithodium triticoides* in synonymy of *Ae. bicornis*, of which the description partly refers to *bicornis*, partly also to *Ae. speltoides* var. *ligustica*. Ascherson (1902: 12) cited Link's name later in synonymy of *Triticum speltoides* ssp. ('B. II') *ligusticum*, but indicated that the herbarium material belonged to *Aegilops*.

Aegilops triuncialis Hochst. ex Steud., Syn. pl. glumac. 1: 354 (1854), *nom. inval.* (Art. 34.1*(c)*), non Linnaeus (1753). = (probably) *Aegilops biuncialis* Vis. – Note: published name from Hochstetter's herbarium, and cited only in synonymy of *Aegilops intermedia* Steud. by von Steudel, now a heterotypic synonym of *Ae. biuncialis* (see at 10.2).

Aegilops triuncialis L. var. ('β') **glabriuscula** Fisch. & C.A.Mey. ex Heynh., Alph. Aufz. Gew. / Nom. bot. hort. 2: 10 (1846). = (probably) *Aegilops triuncialis* L. – Note: name without description, cited as a 'β' under *Ae. triuncialis* in the second part of Heynhold's *Nomenclator*. I have been unable to find any publication by (F.E.L. von) Fischer and (C.A. von) Meyer, who jointly authored several papers (cf., Stafleu & Cowan, 1976: 836-837), relating to this name. The rank is a variety following Art. 35.3 of the *Code*.

Aegilops triuncialis L. ssp. **triuncialis** convar. **triuncialis** (vars.?) **arnuci** (first time), **arnuli, arnulu, arnulucim, arnulunim, arpuci, arpulu, arpuluoim, arpuni, arseal** (first time), **arseci, artual** (first time), **artuci, artuli, ciarnulu, ciarpulu** (first time), **narnulu**, and **ruarnulu** Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990). **Aegilops triuncialis** L. ssp. **triuncialis** convar. **biaristatum** Arut. & Gandilyan (vars.?) **arnual, arnuci** (second time), **arpual, arseal** (second time), **artual** (second time), **ciarpulu** (second time), and **narpulu** Arut. & Gandilyan, Biol. J. Armenia 43(9): 748 (1990), all *nom. inval.* and **syn. nov.** =

Aegilops triuncialis L. – Note: all names are new synonyms here, but also invalidly published as (1) they lack a Latin description, even though the epithets are abbreviated Latin descriptions themselves (which is allowed, but which cannot also serve as a description); (2) no type specimen is indicated, and (3) no clear indication of rank is given. Their rank is not necessarily that of a variety as one of the superfluous renamings of an existing taxon (*luarpual* for forma *flavescens* (Pop.) Hammer) refers to a forma instead. The author names are also omitted and only presented as 'm.' (= mihi). This does not invalidate a name but should be avoided following Rec. 46D of the *Code*. See also note 2 at 10.18a, *Ae. triuncialis*.

Aegilops truncata Ledeb. ex Bek., Ocherk Tifliskoi Flori [Characters of the Flora of Tblisi] 18 (1853); Trautvetter, Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 9: 312 (1884). = ? – Note: cited by both Beketow and Trautvetter with the author von Ledebour but in both cases only as a name.

Agropyrum acutum Pour(r). ex Knoche, Fl. baléar. 1: 335 (1921), *nom. inval.* (Art. 34.1*(c)*). = *Aegilops ventricosa* Tausch. – Note: Knoche (1921: 335) published a herbarium name, '*Agropyrum acutum* Herb. Pour.?' (who may be P.A. Pourret (1754-1818)), in synonymy of *Triticum ventricosum*, but without any further indication.

Crithodium aegyptiacum Trin. ex Steud., Nomencl. bot. (ed. 2) 1: 440 (1840, with '*Triticum bicorne*' added), (ed. 2) 2: 715 (1841, in synonym of *T. bicorne*), Syn. pl. glumac. 1: 355 (1854, in synonym of *Ae. bicornis*), *nom. inval.* (Art. 34.1*(a)* and *(c)*). = *Aegilops bicornis* (Forssk.) Jaub. & Spach. var. *bicornis*.

Crithodium triticoides Link ex Boiss., Fl. orient. 5(2): 678 (1884, with 'Link herb!'), *nom. inval.* (Art. 34.1*(c)*). See at *Aegilops triticoides* Link ex Asch.

Triticum aegilops P.Beauv., Ess. Agrostogr. 180 (1812. '*Ægylops*'). = *Aegilops tauschii* Coss. – Note: material which may relate to this name is probably in G or P-JU, the two most important depositions of Beauvois' specimens (cf., Stafleu & Cowan, 1983: 15), but, unfortunately, has not been seen. This *nomen nudum* became validated by Roemer & Schultes (1817: 769) who connected it with the *Ae. squarrosa* of the fourth edition of the *Species plantarum* by von Willdenow (1806: 944), with the descriptions and illustrations of von Schreber (1772) and Buxbaum (1728), and with the geographic origin, mentioned by the latter two authors (l.c., 1817: 770, as 'In *Oriente*, in *Georgia*'). It is known, however, that Roemer and Schultes did not see any of Palisot's materials, and their link with '*squarrosa*' appears to be a guess; it would be interesting to see if it is a correct one, and I have, in fact, assumed so. See also the nomenclature at *Ae. tauschii* (10.17). *Triticum aegilops* P.Beauv. is also mentioned as a synonym of *Ae. squarrosa* in Kunth's (1833) *Enumeratio plantarum*. His '*squarrosa*' is interpreted by me as 'auct. non L.', thus *tauschii*. Kunth may have seen a Beauvois specimen, which thus may be good *tauschii*, while working in Paris. See also note 1 at 10.17, *Ae. tauschii*, and note 2 at 10.22, *Ae. ventricosa*. [With notes provided by Dr J.F. Veldkamp (L).]

Triticum bicorne Forssk. var. **nana** Druce, Rep. British Exchange Club 9(3): 471 (1930); Meikle, Fl. Cyprus 2: 1823 (1985, err. with p. 417 for the Druce reference). – Voucher: (Cyprus) Salamis, IV.1928/IV.1930, *G.C. Druce 38* (OXF). = *Aegilops bicornis* (Forssk.) Jaub. & Spach var. *bicornis*. – Note: two sheets in OXF, both collected by George Claridge Druce on Cyprus, refer to his collection no. 38. They are both from Salamis, just north of Famagusta. The indication *nana* is not found on any sheet, and the name is published without description. The specimens are, however, well developed, and I consider Meikle's (1985: 1823) remark that this variety relates to a dwarfed or starved condition of the typical plant as erroneous. [Druce reference kindly provided by S. Marner (OXF).]

Triticum ovatum auct. non Rasp. var. **intermedium** F.Herm. ex Knoche, Fl. baléar. 1: 334 (1921, author as 'Hermann'), **syn. nov.** = *Aegilops geniculata* Roth. – Note: this variety was published by Knoche under *T. ovatum*, but not in synonymy. The description ('...une forme à palaea à 3-4 arètes...') probably refers to the glumes, in which case it is not even an atypical form of *Ae. geniculata* that would justify separate varietal status. The reference to Hermann is unclear, but among several people with this name listed by Brummitt & Powell (1992), Friedrich Hermann (1873-1967), contemporary and of similar German descent as Herman Knoche (1870-1945), may be the most likely one to be cited in the first volume of the *Flora baléarica*, which was published in 1921.

Triticum turcomanicum Roshev., Consp. Gram. Turkest. Ross., Not. Syst. Herb. Hort. Petrop. 38: 91 (1923, separate (pre-)print of Acta Horti petro. 38 of 1924), in Fedtschenko & Fedtschenko, Consp. Flor. Turkest. Kirgh. 1, Trudy Imp. St-Petersburgsk. Bot. Sada [= Acta Horti petro.] 38(1): 149 (1924). = *Aegilops juvenalis* (Thell.) Eig. – Note: later validly published as *Aegilops turcomanica* (Roshev.) Roshev. by Roshevitz (1928: 413) before taken up again under *Triticum* by Bowden (1959: 676) as *T. turcomanicum* (Roshev.) Bowden. See the nomenclature at *Ae. juvenalis* (10.9).

13 Excluded taxa

When possible the taxa listed here were studied from type material. Names that are originally published in *Aegilops* for hybrids between *Aegilops* and *Triticum* are, of course, excluded but treated in detail in Chapter 4.2.

Aegilops aromatica Walter, Fl. carol. 249 (1788, '*aromaticum*'); Hitchcock, Ann. Rep. Miss. Bot. Garden 16: 55 (1905, '*aromaticum*'); Eig, Feddes Repert., Beih. 55: 226 (1929a, considers it *Ctenium americanum* 'Spreuz.' – must be Spreng.); Hammer, Feddes Repert. 91: 243 (1980b, cites Eig, including the erroneous author name). – Type: '*Aegilops* 387' (holo: BM-Walter). = *Ctenium aromaticum* (Walter) A.Wood, Class-book bot. (ed. s.n.) 806 (1861); Hitchcock, Man. Grasses U.S., USDA Misc. Publ. 200: 829 (1935), (ed. 2, rev. Chase) 848 (1951). [= *Ctenium aromaticum* (Walter) Hitchc., Rhodora 8: 210 (1906, 'pro comb. nov.', thus an isonym.]

Aegilops aspris J. Bauhin ex Peterm., Cod. linn. index 4 (1840), *nom. inval.* (Art. 34.1*(a)* and *(c)*). – Based on: *Cerri glans, Aegilops aspris* J.Bauhin, Hist. pl. 1: 77 (1650; page err.). = *Quercus aegilops* L. – Note: cited as a binomial by Petermann, but not accepted by him as a separate species as the Bauhin phrase-name is only cited in synonymy of *Q. aegilops* in Richter's *Codex* (1835-39: 943). The p. 77 from Bauhin is erroneous as *Quercus* is not treated there (presumably on another page in this book).

Aegilops bromoïdes Tabern. ex P.Beauv., Ess. Agrostogr. 146 (1812, as '*Aegylops Bromoïdes* Scheuchzer Vid. *Apluda gryllus*'); Juel, Burser hort. sicc. 15 (1936, as '*Aegylops bromoides* Tab.' at no. I.127(bis) sub *Stipa capillata* L.); Savage, Linn. det. hort. sicc. Burs. 10 (1937; sub *Stipa juncea* L.), *nom. inval.* (Art. 34.1*(c)*: only cited in synonymy by Palisot de Beauvois, Juel and Savage). – Based on: *Aegilops* IV *bromoïdes* I Tabern., Neuw Kreuterb. 1: 670 (1588, '*Ægylops* IIII *Bromoïdes* I'). = *Stipa capillata* L. – Note: see Chapter 3.1, pre-Linnaean history, for more data on this species.

Aegilops bushirica Roshev. in Köie, Beitrag Fl. Südwest-Irans 1 (Dan. Sci. Invest. Iran, Part 4): 54 (1945); Parsa, Fl. Iran 5: 820 (1952); Bor, Fl. Iraq 9: 190 (1968), Fl. Iranica 70/30: 198 (1970); Löve, Feddes Repert. 95: 501 (1984); Hammer, Kulturpflanze 33: 128 (1985); Al-Rawi, Fl. Kuwait 2: 324 (1987, in syn. of *Ae. triuncialis*). – Type: (Iran) Bushire, 3.III.1937, *Köie 1042* (holo: C; iso: LE). The photograph in K is not an isotype (Art. 7.6). = *Aegilops cylindrica* Host x *Triticum* L. sp. (4n). – Note: *Ae. bushirica* has tentatively been considered to be a heterotypic synonym of *Ae. triuncialis* by Bor (1968: 190; 1970: 198), following his estimation that it could be a hybrid between *Ae. triuncialis* and *Ae. cylindrica*. Löve (1984: 501) considered it identical with the subspecies *persica* of *Ae. triuncialis*, a species which he had earlier transferred to a separate genus, *Aegilopodes* Á.Löve. Upon examination I agree with Hammer (1985: 128), who considered this species a hybrid of *Ae. cylindrica* x *Triticum* (4n). The outline of the spikelets is, however, rather similar to specimens of the hybrid with hexaploid wheat (see Chapter 4.2). In addition the size of the awns of the glumes of the terminal spikelet of the type collection at C does not suggest *Ae. triuncialis* in the parentage.

Aegilops caudaristata Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950), *nom. inval.* (Arts. H.10.1, 36.1 and 40.1). = *Aegilops caudata* L. x *Aegilops uniaristata* Vis. – Note: an artificial hybrid of two *Aegilops* species, but invalidly published as there is no Latin diagnosis or reference, which, after 1 January 1935, is also required for hybrids among species or lower ranks. Even when validly described this taxon should be excluded as it is not a botanical species.

Aegilops caudata L. var. **α langeana** Amo, Fl. fan. Penins. Iberica 1: 256 (1871). = x *Aegilotriticum langeanum* (Amo) van Slageren. See Chapter 4.2.2 at 4.2.2.3.

Aegilops caudatoides Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950), *nom. inval.* = *Aegilops caudata* L. x *Aegilops speltoides* Tausch. – Note: see at *Ae. caudaristata*.

Aegilops ciliaris J.König (ex Rottler) ex Roem. & Schult., Syst. veg. 2: 772 (1817); von Steudel, Nomencl. bot. (ed. 2) 1: 29 (1840); Eig, Feddes Repert., Beih. 55: 226 (1929a); Hammer, Feddes Repert. 91: 244 (1980b). – Based on: *Aegilops ciliaris* J.König ex Rottler, Neue Schr. Ges. Naturf. Freunden, Berlin 4: 210 (1803); Matthew, Bot. J. Linn. Soc. 113: 366 (1993), *nom. inval.* (Art. 34.1*(a)*: the name from König is not accepted by Rottler). – Type: (India, probably Tamil Nadu) in India orientalis, Muritsur, 30.Nbr.1799, *Klein s.n. (792?)* (holo: B-W 2282). = *Eremochloa muricata* (Retz.) Hack. – Note: Rottler described this species, referring to (Johann Gerhard) König for the name, under an unnamed new genus which he thought was close to *Manisuris* L. His paper from 1803 described a trip from Tranquebar to Madras in India. The plants were found in Muritsur, but the month in the date on the label must have been December instead of November ('Nbr.') as follows from his journal. The plants were given by Rottler in 1803 to Klein, a colleague missionary, as was annotated by von Willdenow on the sheet. The label furthermore mentions *792*, probably either Klein's or Rottler's collection number, and the note 'an *Ischaemum*?', which refers to *Ischaemum pectinatum* Trin., a synonym of *Eremochloa muricata*. The description of the species was later almost literally cited by Roemer & Schultes (sub.: '*A. ciliaris* Koenig', l.c., 772). Eig (1929a: 226) and Hammer (1980b: 244) refer to *Ae. ciliaris* as '*Rottboellia ciliaris* Willd.' (in fact Willd. ex Steud.), probably in view of von Steudel's remark in his *Nomenclator botanicus* (ed. 2) 1: 29 (1840). Here *Rottboellia ciliaris* is cited under *Ae. ciliaris*, but only in synonymy and thus invalid in terms of the correct name for the *Aegilops* species. Also the number 2282 of the von Willdenow herbarium is cited on page 29. [The correct identification was made by Prof. H. Scholz (B), while notes on *Ae. ciliaris* were kindly provided by Dr J.F. Veldkamp (L).]

Aegilops compressa L.f. ex Savage, Cat. Linn. herb. 182 (1945). – Voucher: s.loc., *s.coll., s.n.* (LINN 1218.14). = *Hemarthria* R.Br. species (fide Dr J.F.

Veldkamp (L) upon joint inspection). – Note: this name is not published other than in Savage's (1945) catalogue of the Linnaean herbarium. It has been impossible to identify the species involved as the structure of the spikelet could not be examined. The type species of *Hemarthria*, *H. compressa* (L.f.) R.Br. is based on *Rottboellia compressa* L.f. and thus on another collection.

Aegilops cordata Aitch. ex Hook.f., Fl. Brit. India 7: 367 (1896, as '*Æg. cordata*, Linn.'). = ? – Note: listed under 'DOUBTFUL SPECIES' in J.D. Hooker's *Flora of British India*. He refers to Aitchison's 'Cat. Panjab. Pl. 560'. This is apparently not his *A catalogue of plants of the Punjab and Sindh* of 1869 as it is not mentioned there. A misspelling of *Ae. caudata* L.?

Aegilops crithodium Steud., Syn. pl. glumac. 1: 355 (1854); Eig, Feddes Repert., Beih. 55: 226 (1929a, considers it '*Triticum monococcum* L.' without distinction in either the cultivated or the wild subspecies / variety), *nom. illeg.* (Art. 63.1). [= *Crithodium aegilopoides* Link, Linnaea 9: 132 (1834). Von Steudel (1854) cites Link's name as a synonym.] = *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell.

Aegilops cuneata Roxb. ex Hook.f., Fl. Brit. India 7: 158 (1896), *nom. inval.* [= *Rottboellia perforata* Roxb.] = *Mnesithea laevis* (Retz.) Kunth. – Note: a herbarium name of Roxburgh published by J.D. Hooker under *Rottboellia perforata* (and only known in synonymy) in his *Flora of British India*. If it is the *Rottboellia* species, it will now be referrable to *Mnesithea* Kunth.

Aegilops exaltata L., Mant. pl. 2 [altera]: 575 (1771); Eig, Feddes Repert., Beih. 55: 226 (1929a); Hammer, Feddes Repert. 91: 246 (1980b). – Type: India, *Koenig 10* (holo: LINN 1218.15). [= *Rottboellia exaltata* (L.) L.f., Nov. gram. gen. 23, 37 (1779). = *Rottboellia corymbosa* L.f., Suppl. pl. 114 (1782) = *Ophiuros corymbosus* (L.f.) C.F.Gaertn., Suppl. carp. 1(1): 4, Tab. 181, fig. 3a (1805), *nom. illeg.*] = *Ophiuros exaltatus* (L.) Kuntze, Rev. Gen. Pl. 2: 780 (1891). – Note: following the proposal of Clayton (1980: 691) the genus *Rottboellia* L.f., Suppl. pl. 114 (1782) has been conserved over *Rottboellia* L.f., Nov. Gram. Gen. (1779) as is reported by Brummitt in Taxon (1983: 624). *Ae. exaltata* L. was renamed as *Rottboellia corymbosa* by Linnaeus fil. in 1782 to distinguish it from his new *R. exaltata*, which, however, is a later homonym of *R. exaltata* (L.) L.f. (1779). It was proposed that the name *R. exaltata* L.f. should be conserved over its available correct name, *R. cochinchinensis* (Lour.) Clayton, on the grounds of the familiarity and economic importance of the species (Simon, 1982: 564). This proposal was, however, rejected (Brummitt, 1985: 659), and *R. cochinchinensis* has to be adopted (see also under *Ae. fluviatilis*). *Ae. exaltata* L. is the basionym of *Ophiuros exaltatus* (L.) Kuntze with *Koenig 10* (LINN 1218.15) as the type specimen. The *Koenig* is Johann Gerhard *König* (1728-1785), correspondent with, among others, Linnaeus fil. and Retzius, and a missionary and plant collector in India, Thailand, the Malaysian Peninsula, and Sri Lanka (cf., Stafleu & Cowan, 1979: 600; see also at *Aegilops ciliaris*). Eig (1929a: 226) and Hammer (1980b: 246) suggest that *Ophiuros corymbosus* (L.f.) C.F.Gaertn. is now the correct name. That name is, however, superfluous as it is also based on *Ae. exaltata*. The later combination by Kuntze (1891) thus has preference.

Aegilops fluviatilis Blanco, Fl. Filip. (ed. 1) 47 (1837), (ed. 2) 32 (1845), (ed. 3) 1: 59 (1877); von Steudel, Syn. pl. glumac. 1: 356 (1854); Merrill, Rev. Blancos Fl. Filip., Govt. Lab. Publ. (Philip.) 27: 91 (1905), Sp. blancoan. 64 (1918); Eig, Feddes Repert., Beih. 55: 226 (1929a); Hammer, Feddes Repert. 91: 246 (1980b). [= *Panicum stagninum* Retz. (according to Merrill, 1918: 64).] = *Echinochloa stagnina* (Retz.) P.Beauv. – Note: Merrill (1905) at first thought the species involved was *Rottboellia exaltata* L.f. (now referable as *Rottboellia cochinchinensis* (Lour.) Clayton; see at *Aegilops exaltata*), but referred Blanco's description in 1918 to the *Panicum* species, now under *Echinochloa*. The cited specimen ('*Merrill, Species Blancoanae No. 353*', l.c., 1918: 65) cannot be regarded as the holotype of *Ae. fluviatilis* as Blanco's herbarium is no longer extant. A revisor of *Echinochloa* may, in due course, designate it neotype status. Eig (and later, Hammer) refers to *Ae. fluviatilis* as *Rottboellia exaltata* L.f. (in fact '(L.) L.f.'; see above) and may have based himself on Merrill's (1905) publication, rather than on the *Index Kewensis* as he suggests for (most of) his excluded species. (The *Index* does not suggest any other species for *Ae. fluviatilis*.)

Aegilops grenieri (K.Richt.) Husn., Graminées 4: 79 (1899). – Basionym: x *Triticum grenieri* K.Richt., Pl. eur. 1: 129 (1890, '*Grenieri*'). = x *Aegilotriticum grenieri* (K.Richt.) P.Fourn. See Chapter 4.2 at 4.2.2.2.

Aegilops hordeiformis Steud., Syn. pl. glumac. 1: 354 (1854); Eig, Feddes Repert., Beih. 55: 226 (1929a, considers it '= (?) *Trit. monococcum* L.'); Hammer, Feddes Repert. 91: 247 (1980b, cites Eig's remark), **syn. nov.** – Type: (Iraq?) 'Mesopotamia', ex hb. *Lenorman 10* (holo: P). = *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell. – Note: as Eig (1929a: 226) was unsure, and as the species name may have referred to both the cultivated and wild subspecies, I consider its identification as the wild ssp. *aegilopoides* as a new synonym.

Aegilops hystrix Nutt., Gen. N. Amer. pl. 1: 86 (1818); Kunth, Enum. pl. 1: 458 (1833, under 'Species dubiae'); Eig, Feddes Repert., Beih. 55: 226 (1929a, considers it '*Sitanion Hystrix* Smith'); Hammer, Feddes Repert. 91: 247 (1980b, cites Eig). – Type: (U.S.A.) 'on the arid plains of the Missouri', *Nuttall s.n.(?)* (holo: PH, not found). = *Sitanion hystrix* (Nutt.) J.G.Smith, Bull. U.S. Div. Agrost. 18: 15 (1899).

Aegilops incurva L., Sp. pl (ed. 1) 2: 1051 (1753), (ed. 2) 2: 1490 (1763, '*incurvata*'), Mant. pl. 2 [altera]: 501 (1771, '*incurvata*'); Eig, Feddes Repert., Beih. 55: 226 (1929a, considers it *Lepturus incurvatus* (L.) Trin.); Hammer, Feddes Repert. 91: 247 (1980b, cites Eig). [= *Lepturus incurvatus* (L.) Trin., Fund. Agrost. 123 (1820)] = *Parapholis incurva* (L.) C.E.Hubb., Blumea, Suppl. 3: 14 (1946). – Note: in LINN four collections are present of *Parapholis incurva* (see Table 6), two of them carrying the name *incurva* (LINN 1218.10 and 1218.13) and two with *incurvata* (LINN 1218.11 and 1218.12), an orthographic variant. Hubbard does not indicate which of the four sheets he considers as the holotype.

Aegilops longearistata Steud., Syn. pl. glumac. 1: 356 (1854). = ? – Note: Von Steudel (l.c. 356) mentions after his description '*A. triticoides* Hrbr. Mus. Lugd. Bat. Surinam'. This refers to a Surinam plant, present in the Rijksherbarium at Leiden (L). It is, however, unlikely that the hybrid of *Triticum* and *Aegilops* is involved, as von Steudel's note indicates, and as also Hammer (1980b: 247) supposes. Dr J.F. Veldkamp (L) informed me that von Steudel visited Leiden and that the type of this species must be among the (sizeable) collection of Surinam grasses at Leiden. Strangely enough there is no reference to *Ae. longearistata* in the *Flora of Surinam*, which was partly written by Henrard at Leiden, nor in Judziewicz's (1990) recent volume of the *Flora of the Guianas*.

Aegilops microstachys Jord. & Fourr., Brev. pl. nov. 2: 131 (1868); Richter, Pl. eur. 1: 127 (1890); Greuter & Rechinger, Chloris Kythereia, Boissiera 13: 170 (1967). – Homotypic synonym: *Aegilops ovata* L. var. η *microstachys* (Jord. & Fourr.) Rouy, Fl. France 14: 332 (1913). = ? – Note: described from France ('In incultis Galliæ australis: Montjoyer (Drôme)', l.c., 132). No material was found in LY-Jordan, LY-Gandoger, or MPU-Coste, the most likely herbaria where specimens of the Jordan & Fourreau microspecies may be found. In view of their history most probably *Ae. geniculata* or *Ae. neglecta* was involved. Although the number of glume awns is described by Jordan & Fourreau as 'four', which is not found in *Ae. neglecta*, it is also 'four' in *Ae. virescens*, a microspecies which is clearly *Ae. neglecta* (see at 10.12). Excluded because of absence of material. Greuter & Rechinger (1967: 170) cite *Ae. microstachys* in synonymy of (*Ae. geniculata* and) *T. vagans*, but this cannot have been based on inspection of a type specimen. [The same holds for *Ae. vagans*.] See also note 2 at *Ae. geniculata* (10.8).

Aegilops muricata Retz., Observ. bot. 2: 27 (1781); Palisot de Beauvois, Ess. Agrostogr. 146 (1812); Eig, Feddes Repert., Beih. 55: 226 (1929a, considers it *Eremochloa muricata* 'Hack.'); Hammer, Feddes Repert. 91: 248 (1980b, cites Eig). – Type: [s.loc.] *König(?) s.n.* (holo: LD (but see below), sub '[127] *Rottboellia muricata* Nob.'). = *Eremochloa muricata* (Retz.) Hack. – Note: Retzius annotated the type collection with a reference to *Rottboellia*, as was later done with *Aegilops muricata* by Palisot de Beauvois. Dr S. Snogerup (LD) informed me that the LD sheet may be one of several (others may be, e.g., in C). As I have been unable to check this, Stafleu & Cowan (1983: 735) are followed in designating the LD specimen as the (holo)type. Although there is no location mentioned on the type specimen, Retzius mentions after the description: 'Ex India Orientali diu habui...' (l.c., 28), which may have been the type locality. That would make it likely that J.G. König, who was involved in several parts of Retzius' *Observationes*, was the collector of the type specimen, and if so, then the holotype must be located in C rather than LD (Stafleu & Cowan, 1983: 736). [For König see also at *Ae. ciliaris* and *exaltata*.]

Aegilops ovata L. forma **hirtiglumis** (Nábělek) Parsa, Fl. Iran 5: 819 (1952), **syn. nov.** – Basionym: *Triticum thaoudar* Reut. (in Bourg.) ex Hausskn. forma *hirtiglumis* Nábělek, Iter turc.-pers. 5, Publ. Fac. Sci. Univ. Masaryk 111: 29 (1929). = *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell. – Note: Parsa refers to Nábělek's (1929) fifth volume of his *Iter turcico-persicum*. Nábělek's book has a complicated typography, which is aggravated by what I think is a printing error on p. 29. Here the forma *nudiglumis* Nábělek belongs to *Ae. ovata* auct. as is shown by its type specimen (*Nábělek 3166*; see the nomenclature at *Ae. genicu-*

lata, 10.8), but the forma *hirtiglumis* Náběĺek, referred to by Parsa, belongs to subdivisions in *Triticum thaoudar*. This is because its description must be seen as a continuation of the last paragraph of p. 28 of Nábelek's *Iter turcico-persicum*. My inspection of the collections, referred to the forma *hirtiglumis* (*Náběĺek 3314, 3315a, 3368a*), showed that they all belong to *T. monococcum* L. ssp. *aegilopoides* (Link) Thell. under which I recon *T. thaoudar*. [Wild *Triticum* taxa will be revised separately from this publication.]

Aegilops saccharina Walter, Fl. carol. 249 (1788, '*saccharinum*'); Hitchcock, Ann. Rep. Miss. Bot. Garden 16: 56 (1905, '*saccharinum*'); Eig, Feddes Repert., Beih. 55: 226 (1929a, considers it *Dactyloctenium* '*aegyptiacum* Willd.'); Hammer, Feddes Repert. 91: 250 (1980b, cites Eig). – Type: '*Aegilops*' (holo: BM-Walter). = *Dactyloctenium aegyptium* (L.) P.Beauv.

Aegilops sancti-andreae Degen, Mat. Termés-Zettud. Ertes. 35: 475 and Tab. 5 (1917). = x *Aegilotriticum sancti-andreae* (Degen) Soó. See Chapter 4.2 at 4.2.2.5.

Aegilops speltaeformis Jord., Ann. Sci. Nat., Sér. 4., Bot., T. 3: 313 (1855). = x *Aegilotriticum speltaeforme* (Jord.) van Slageren. See Chapter 4.2 at 4.2.2.6.

Aegilops speltaristata Cif. & Giacom., Nomencl. fl. ital. 1: 179 (1950), *nom. inval.* = *Aegilops speltoides* Tausch x *Aegilops uniaristata* Vis. – Note: see at *Aegilops caudaristata*.

Aegilops strausii Hausskn., Mitt. Thür. Bot. Ver., Neue Folge 15: 6 (1900); Eig, Feddes Repert., Beih. 55: 226 (1929a), *nom. nud.* – Voucher: (Iran) Persia occidentalis, in dit. urbe Sultanabad: in monte Raswend, *Strauss s.n.* (B, JE, W). = *Triticum aestivum* L. ssp. *aestivum*. – Note: I agree with Bornmüller's annotation of the voucher: 'Doch wohl *Tr. vulgare* verwildert' [surely *Tr. vulgare* naturalized]. Although described from Iran it is not mentioned in Bor's treatment of the grasses in *Flora Iranica* 70/30 (1970).

Aegilops tetratauschii Gandilyan et al. in Gandilyan, Shakarian & Petrosian, Biol. J. Armenia 39(1): 10 (1986; author as 'm.'), *nom. inval.* (Arts. 36.1 and 37) – Type: not indicated. = *Ae. tauschii* Coss. x *Ae. tauschii* Coss. – Note: autotetraploid form of *Ae. tauschii* that was artificially created through chromosome doubling, thus with 2n = 28. This otherwise not described 'species' is invalidly published because of Arts. 36.1 (no Latin diagnosis) and 37 (no type indicated). Not a botanical species and excluded from the genus.

Aegilops triticoides Req. ex Bertol., Fl. ital. 1: 788 (1834). = x *Aegilotriticum triticoides* (Req. ex Bertol.) van Slageren. See Chapter 4.2 at 4.2.2.7.

Aegilops triuncialis forma **phoenichaeta** Sennen & Mauricio, Cat. fl. Rif. orient. 135 (1933, 'o hibrida'), *nom. nud.* = ? – Note: material from Targuist, Morocco, relating to this forma was not described by Sennen & Mauricio, but only interpreted by them as a hybrid. No indication of the parental species was provided either. As no material has been available, this taxon is therefore excluded from *Aegilops*.

Aegilops vagans Jord. & Fourr., Brev. pl. nov. 2: 130 (1868). – Homotypic synonyms: *Ae. ovata* L. var. γ *vagans* (Jord. & Fourr.) Rouy, Fl. France 14: 332 (1913). *Triticum vagans* (Jord. & Fourr.) Greuter in Greuter & Rechinger, Chloris Kythereia, Boissiera 13: 170 (1967). = ? – Note: Described from France ('In incultis Galliæ australis: circa Monspelium etc.', l.c., 130), but no material was present in LY-Jordan, LY-Gandoger or MPU-Coste, the most likely herbaria where specimens of the Jordan & Fourreau microspecies may be found. In view of the history of these microspecies most likely *Ae. geniculata* or *Ae. neglecta* was involved. Excluded because of lack of material. See also at *Ae. microstachys* in this Chapter, and note 2 at *Ae. geniculata* (10.8).

Aegilops vulgari-ovata (Godr. & Gren.) H.Loret & Barrandon, Fl. Montpellier (ed. 1) 2: 770 (1876), (ed. 2) 577 (1886). – Basionym: *Triticum vulgari-ovatum* Godr. & Gren. in Grenier & Godron, Fl. France 3(2): 600 (1856). = x *Aegilotriticum triticoides* (Req. ex Bertol.) van Slageren. See Chapter 4.2.2. at 4.2.2.7.

Aegilops vulgari-triaristata (Godr. & Gren.) H.Loret & Barrandon, Fl. Montpellier (ed. 1) 2: 771 (1876), (ed. 2) 578 (1886), *nom. inval.* (Arts. 23.6*(d)* and H.10.3, and thus also because of Art. 32.1*(b)*). – Basionym: *Triticum vulgari-triaristatum* Godr. & Gren. in Grenier & Godron, Fl. France 3(2): 601 (1856), *nom. inval.* (Arts. 23.6*(d)*, 32.1*(b)* and H.10.3). = x *Aegilotriticum grenieri* (K.Richt.) P.Fourn. See Chapter 4.2 at 4.2.2.2.

Aegilops vulgari-triuncialis Lange, Pug. pl. hispan. 1: 56 (1860), *nom. inval.* (Arts. 23.6*(d)* and H.10.3, and thus also because of Art. 32.1*(b)*). = x *Aegilotriticum langeanum* (Amo) van Slageren. See Chapter 4.2 at 4.2.2.3.

The following taxa are also to be excluded from *Aegilops*:
Numerous (148) microspecies are listed under several taxa of *Aegilops* by Gandoger in his *Flora Europae*, vol. 25: 1-10 (1892), as follows (number of microspecies between brackets): *Ae. ovata* (in the sense of *Ae. geniculata*) (57), *Ae. triaristata* (= *Ae. neglecta*) (32), *Ae. triuncialis* (25), *Ae. caudata* (4), *Ae. cylindrica* (8), *Ae. squarrosa* (= *Ae. tauschii*) (2), *Ae. ventricosa* (13), *Ae. aucheri* (= *Ae. speltoides* var. *speltoides*) (7). They are invalidly published in view of Art. 33.4 (Ex. 12) of the ICBN because of misapplication of the term 'species'. For most of these microspecies, material was traced in Gandoger's herbarium, and this invariably belonged to *Aegilops*. However, I adhere to Stafleu & Cowan's (1976: 911) remarks in *Taxonomic Literature II* that these microspecies have consistently been ignored and that the binomials of the *Flora Europae* '...are now placed outside the domain of botanical nomenclature...'. This also applies to the nine microspecies of the hybrid species *Aegilops triticoides* (see Chapter 4.2).

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Index to exsiccatae

The three-letter abbreviations (four-letters with the hybrid genus in order to avoid confusion) in parentheses correspond with the first three letters of the species and variety epithets of the revision. *Aegilops*, *Amblyopyrum* and x *Aegilotriticum* are treated separately; germplasm collections are not indexed as they are available through various germplasm catalogues.

With two collectors both names are cited; with more than two the first name is followed by '& al.'. Compound names such as 'von Heldreich' are cited under the main part of the name, thus as 'Heldreich, Th.H.H. von', unless a compound name is indicated as such by Brummitt & Powell (1992) or by the *Index Herbariorum, Part II, Collectors* (e.g., 'Van Heurck, H.F.').

This index includes all herbarium specimens examined for this study. A selection of these data is presented throughout Chapters 10 and 11, while from Chapter 4.2 only specimens from the seven accepted species are included. Material relating to the various other natural hybrids is listed only in Chapter 4.2 and not further indexed.

Aegilops

Aaronsohn, A., 669 (kot), s.n. (per-bra, tri-tri)
Abbà, s.n. (gen, tri-tri).
Abbas, S.Q. & Al-Shaer, s.n. (kot).
Abdel-Karim, G.A. & Al-Qaran, 2333 (kot).
Abdel-Karim, G.A. & al., 41070, 40565 (umb).
Abdul-Majeed, M. & Shalty, 171 (kot).
Abedin, S., 2919 (tau).
Abolin, R.I., 56, 906 (tau), 1485, 1635, 1944, 7073 (tau), 7607 (cra), 7608 (tau), 7609 (tri-tri).
Abraham, s.n. (gen, kot, lon, per-per, sha).
Acherov, s.n. (cra).
Acherova, s.n. (tri-tri).
Acherova & al., s.n. (tri-tri).
Achrapjelski, s.n. (tau).
Achtarov, B.T., 408 (tri-tri), s.n. (biu, cyl, gen, tri-tri).
Adamovič, L., 250 (tri-tri), 266 (neg), s.n. (biu, gen, neg, tri-tri).
Adams, 30 (cyl).
Aellen, P., 1863 (biu), 1865, 1871, 1872, 1875, 1876-1878 (tri-tri), 1883 (tau), 1889, 1911, 1913, 1992-1996, 2019-2021, 2023, 2028, 4883 (tri-tri), 4923, 4928 (gen), s.n. (cyl, tri-tri).
Aellen, P. & Esfandiari, E., 5278 (tri-tri).
Agardh, s.n. (gen).
Agnew & Wheeler Haines, R., W1955, W1956 (spe-lig), W1957, W1958, W1960 (spe-spe).
Agnew & al., W1955, W1956 (spe-lig), W2001, W2002 (cyl), 2006 (tri-tri), s.n. (tri-tri)
Ahart, 2227 (tri-tri).
Ahles, H., 7378 (cyl).
Ahles, H. & al., 6260 (cyl).
Ahmad, 1321 (gen).
Ahmad Chaikh, 35 (cra).
Aitchison, J.E.T., 461 (cra, tau), 495 (tri-tri), 560, 1146 (tau).
Akeroyd, J.R., 475 (cau).
Akinfiev, I.J., s.n. (cyl).
Akkerman, s.n. (cyl).
Akman, 4521, 9253 (neg), 13018 (tri-tri), 13869 (cau), 13870 (tri-tri), 14273 (neg)
Akman & Ekim, T., s.n. (tri-tri).
Al-Abbasi, s.n. (vav).
Al-Ani & Hadi, 9805 (cra).
Al-Dabbagh & al., 45992 (neg).
Al-Effendi, 3858 (juv), 3858A (col).
Al-Eisawi, D.M., 1056 (gen), 1151 (per-per), 1439 (kot).
Al-Eisawi, D.M. & Jarrar, 6459 (gen).
Al-Kaisi, S., 51082 (spe-spe).
Al-Kaisi, S. & Al-Khayat, A.-H.M.A., 50635 (kot), 50636 (tri-tri).

Al-Kaisi, S. & Hamad, 45059 (spe-spe).
Al-Kaisi, S. & Wedad, 51938 (cra).
Al-Kaisi, S. & al., 51003 (gen), 51080 (umb), 51475 (umb), 50796 (umb), 50945 (umb).
Al-Khayat, A.-H.M.A. & al., 51001 (tri-tri).
Al-Rathi, 5569 (tau).
Al-Rawi, A., 5762 (kot), 5783 (cra), 8461 (tri-tri), 8845 (umb), 11358 (spe-spe), 11457 (tri-tri), 11500 (umb), 11637, 11673 (kot, tri-tri), 13712, 13809 (cyl), 20903 (kot), 21210 (cra), 21246 (kot), 21501 (cra), 21596 (spe-spe), 21572 (biu), 21621 (vav), 21638, 21643 (tri-tri), 21674 (spe-lig), 21691 (tri-tri), 21722, 21722A (spe-lig), 21750 (neg), 21766A, 21854 (tri-tri), 21871 (tri-tri), 21871A (col), 21905, 22135 (umb), 22376, 22445, 22579, 22760 (tri-tri), 22957 (spe-spe), 22928 (spe-lig), 23285, 25253 (tri-tri), 28004 (neg, umb), 30838 (kot), 31170 (tau).
Al-Rawi, A. & Haddad, 25737 (kot).
Al-Rawi, A. & El-Kholy, 12297 (kot, tri-tri).
Al-Rawi, A. & al., 10559 (kot), 10667 (tri-tri), 27896 (kot), 27990 (tri-tri), 28054 (umb), 28068A, 28216, 28265, 28360, 28455 (tri-tri), 28642 (neg), 28788 (umb), 28807 (tri-tri), 28642 (neg, umb), 29103, 29160 (kot), 31788, 32097 (cra), 32862 (tau).
Al-Sharif & Al-Hamad, 50228 (umb).
Al-Shehbaz, I.A. & Al-Monawi, s.n. (cra).
Al-Shehbaz, I.A. & Al-Mousawi, s.n. (kot).
Al-Shehbaz, I.A. & al., s.n. (kot).
Alava, R.O., 6651 (col), 6983, 6984, 6987, 10418 (tri-tri), 10550 (col).
Alava, R.O. & Bocquet, G.F., 4974 (umb), 4977 (biu), 4993 (cau), 5285 (tri-tri).
Alava, R.O. & Regel, R.E., 50505 (cau).
Albaille, 6455 (spe-spe), 6458 (umb), s.n. (gen).
Albert, A., s.n. (neg, tri-tri, ven).
Alcott, s.n. (gen, per-per).
Alexander, J.C.M., s.n. (gen, tri-tri).
Alexander, J.C.M. & Kupicha, F.K., 247 (gen), 508 (tri-tri).
Alexandrov, L.P., s.n. (tri-tri).
Alexandrova, s.n. (cra, tau, tri-tri).
Alexandrova & al., s.n. (tri-tri).
Alexeenko, M.A., 46 (cyl), 268, 781 (tau), 1007, 1240 (tri-tri), 1241 (cyl), 1242 (tau), 1243 (biu), 1249, 1250 (tri-tri), 1251 (tau), 1252 (biu), 1253 (tau), 1254 (kot), 1256, 1257 (biu), 1258 (tau), 1289 (cyl) 1585 (tau), 1591 (biu), 1600 (tau), 1607, 1608 (neg), 1612 (biu), 1613, 1615 (tau), 1618 (cyl), s.n. (biu, cyl, neg, tau, tri-tri).
Alexeenko, M.A. & Woronow, G.J.N., 1579 (tau), 1589 (cyl).
Alhandra, d', s.n. (tri-tri)
Ali, 743 (ven), 1887, 2605 (gen).
Ali & Khalifa, 380 (gen).
Aliev, D.A., s.n. (tri-tri).
Alinoğlu, s.n. (spe-lig, tri-tri).
Alioth, F.S., s.n. (cyl, ven).
Alizzi, H.A., 31973, 32709, 34362 (kot), 35184 (cra).
Alizzi, H.A. & Husain, 33786 (kot), 34073 (tau).
Alizzi, H.A. & Omar, 35007 (kot).
Alleizette, A.Ch. d', s.n. (gen, ven).
Allen, s.n. (tri-tri).
Almazan, s.n. (gen, ven).
Alston, A.H.G., 10414, 10811, 10980 (gen).
Alston, A.H.G. & Simpson, N.D., 97 (biu).
Alston, A.H.G. & Sandwith, N.Y., 235, 721 (biu, neg), 828 (tri-tri), 830 (neg), 1442 (uni), 1863 (neg), 1984 (tri-tri).
Altobelli, s.n. (gen).
Amblard, s.n. (tri-tri).
Amdursky, I., 114 (gen), s.n. (per-bra, per-per).
Amin, A., s.n. (bic-bic).
Amin, A. & al., s.n. (kot).
Amin-Bazargan, 19289 (tri-tri).
Amirova, s.n. (tau).
Amman, J., s.n. (gen).
Amshoff, G.J.H., s.n. (com-com, tri-tri).
Ananeva, s.n. (cyl).
Ančev, M.E., s.n. (neg).
Anders, J., 2763 (spe-spe), 2768 (umb), 6133, 6273 (tau), 6684 (cra), 6190, 6847, 8931 (tau).
Andersen, J.C. & Petersen, 147 (tri-tri), 199 (tau).
Anderson, 781 (cyl).
André, A., s.n. (biu, tri-tri).
Andrejev, W.N., 107 (biu), s.n. (biu, cyl, gen).
Andrejeva, s.n. (biu).
Androssov, N.V., 6 (tri-tri), 4307b (tau), s.n. (cra, tau, tri-tri).
Androssova, E.Ja., 228 (tau).
Aniots, s.n. (gen).
Anisits, s.n. (tri-tri).
Annalijev, S.A., s.n. (cra).
Antipova & Tsirina, s.n. (cyl).
Antoni, 1385 (gen).
Araratian, s.n. (col, tri-tri).
Arbost, s.n. (tri-tri).
Arcangeli, G., s.n. (gen).
Archibald, 1687 (tri-tri), 2268 (tau).
Arefshatian & al., s.n. (tri-tri).
Ariello & Montacchini, s.n. (gen).
Ariemovitski, s.n. (cyl).
Arifkhanova, 128 (tau), 137, 318 (cyl), 344 (tri-tri), 508 (cyl).
Arifkhanova & Gringov, 621 (cra), 798 (tri-tri).

Aristandy & al., 47a (tri-tri).
Aristegui & Leal, 436 (ven).
Aristobile, s.n. (tri-tri).
Armitage, E., s.n. (bic-bic, kot, sha).
Arnaud, 31 (tri-tri), s.n. (gen, tri-tri).
Arnott, s.n. (ven).
Arnow, 389, 461, 2781 (cyl).
Arutyunyan, M.G., s.n. (biu, col, cra, cyl, neg, tau, tri-tri).
Arutyunyan, M.G. & Muradyan, L.G., s.n. (neg).
Arvat, A., s.n. (cyl).
Ascherson, P.F.A., 796 (bic-bic), s.n. (bic-bic, neg, tri-tri).
Asherov, 3 (tau).
Ashgirova & al., s.n. (cra).
Aslanian, s.n. (cyl, tau, tri-tri).
Assadi, M. & Mozaffarian, V., 30512 (cyl).
Assche van, s.n. (gen).
Ataeva, A.A., s.n. (tau, tri-tri).
Atchley, S.C., 293 (gen), 1082 (tri-tri), s.n. (biu).
Atwood, Ch. & Thompson, 11011 (cyl).
Aubouy, s.n. (gen, neg, tri-tri).
Aucher-Éloy, P.M.R., 2996 (bic-bic), 2913 (cra), 2964 (gen), 2967 (cyl), 2980 (spe-spe).
Augé de Lassus, s.n. (tri-tri).
Aujard-Catot & Ledoux, E.P., s.n. (gen).
Aunier, J.J.N.A., s.n. (gen, neg, tri-tri).
Auquier, P.H., 1838 (gen).
Aureude, s.n. (cyl).
Autheman, A., s.n. (biu, cyl, gen, neg, tri-tri, ven).
Auzende, s.n. (cau, cyl, tri-tri).
Avakjan, K.G., 236 (tri-tri), s.n. (tau).
Avellano & al., 1971 (gen).
Avetissjan, V.E., s.n. (tau, tri-tri).
Avetissjan, V.E. & Gabrieljan, E.Tz., s.n. (cyl).
Avetissjan, V.E. & Gandilyan, P.A., s.n. (cyl).
Avetissjan, V.E. & Manakian, s.n. (tri-tri).
Avetissjan, V.E. & al., s.n. (cyl, tau, tri-tri).
Ayasligil, Y., s.n. (cau).
Ayasse, A.E., s.n. (biu, cau, col, cyl, gen).
Aznavour, G.V., s.n. (biu, cau, col, com-sub, gen, neg, uni).

Babajeva, 207, 208, 209 (tri-tri).
Babakhanloo, 23787 (cyl).
Bacigalupi, R.C.F. & Heckard, L.R., 8550 (tri-tri).
Baenitz, K.G., 10051 (tri-tri), s.n. (biu, cyl, gen, tri-tri, uni).
Bagda, H., 33 (cyl), s.n. (spe-lig).
Bagdanovski-Geenev, s.n. (biu).
Bågenholm, s.n. (cyl).
Bagi(?), s.n. (gen).
Baguet, s.n. (gen).
Bailey, 2381, 4004 (cyl), s.n. (cyl, gen).
Baillet, C.C., s.n. (neg).
Baily, s.n. (cyl, gen).
Bairn, s.n. (tri-tri).
Bakker, s.n. (gen).
Balabajev, s.n. (tau).
Balabajeva, 213 (cra).
Balansa, B., 12 (cau), 13 (com-com), 40 (spe-lig), 42 (cyl), 695, 696 (ven), 714 (gen), 753, 754 (spe-lig, spe-spe), s.n. (biu, cau, cyl, gen, spe-lig, spe-spe, tri-tri, umb, ven).
Balarne, s.n. (gen).
Balbis, G.B., s.n. (cyl, ven).
Baldacci, A., 50 (cau), s.n. (com-sub, gen).
Baldini, R., s.n. (gen).
Balgooy, M.M.J. van, 1225 (ven).
Ball, J. 1509 (per-per), 1806 (gen), 2075 (gen), 2258 (per-per, tri-tri), s.n. (gen, tri-tri).
Ball, J. & al., 163 (gen).
Balls, E.K., B1121 (umb), 1121b (col, gen), B2340 (spe-lig), B2345 (tri-tri).
Balls, E.K. & Gourlay, H.W., B3775 (neg, tri-tri).
Balls, E.K. & Gowdar, 1121A (umb).
Balsamo, F., s.n. (gen).
Bandarenko, 54 (cyl).
Bandarenko & Majloen, 368 (cyl).
Bankfust(?), 4419 (tri-tri).
Bannister, s.n (cyl, tri-tri).
Bara, s.n. (gen).
Baramuk, s.n. (cyl).
Barau, de, s.n. (tri-tri).
Barbey, W., 939 (gen, kot, per-per), 955 (bic-ana), s.n. (cau, gen, kot).
Barbieri, P., s.n. (gen, neg).
Barclay, 1393 (tri-tri), 1814 (biu).
Barkley, E.A., 32 Ir 2284 (kot), 2053, 7980 (cra).
Barkley, E.A. & Askari, 1791 (per-per).
Barkley, E.A. & Brahim, 1284 (kot).
Barkley, E.A. & al., 1381 (kot), 1446 (tri-tri).
Barkoudah, Y.I., 246 (spe-lig), 247, 482 (gen), 517, 5/456, 5/703 (per-per).
Barkoudah, Y.I. & Sanadiki, N., s.n. (neg, per-per, tri-tri).
Barkovskaya, 12 (tri-tri).
Barrandon, A., s.n. (biu).
Barratte, J.F.G., s.n. (gen).
Barrier & Boivin, B., 418 (gen), 420 (cyl).
Barsali, E., s.n. (gen).
Bartha, Z., s.n. (cyl).
Bartley & Pontius, 823 (cyl).
Başarman, M., s.n. (gen).
Baschant, s.n. (cyl, tau).
Basilevskaya, N.A., 206 (tri-tri).
Basin Brahim-Basha, s.n. (kot).

Bastreri, V., s.n. (spe-lig, tri-tri).
Batanouny & al., s.n. (spe-lig, spe-spe).
Batchadzjanova, s.n. (tri-tri).
Batelli, s.n. (gen).
Batikah, s.n. (tri-tri).
Battandier, J.A., s.n. (gen, tri-tri, ven).
Battcha, s.n. (cra).
Bauer & Spitzenberger, 916 (umb), 974 (gen).
Baumbach, s.n. (gen, neg, tri-tri).
Bavazzano & Ricceri, s.n. (cyl).
Baya, 202 (gen).
Bayer, 1449 (tau), s.n. (cyl).
Bayer Clumper, s.n. (tri-tri).
Baylis, 98 (kot), s.n. (neg).
Baytop, A., 929 (tri-tri).
Baytop, A. & Berk, s.n. (gen, neg).
Bazzanti, s.n. (gen).
Beau, 664 (gen), 883 (gen, neg), 1284 (gen), s.n. (gen).
Beauverd, G., s.n. (biu, gen, neg).
Beccari, O., s.n. (kot, tri-tri).
Becherer, A., s.n. (cyl, gen).
Beck, 2 (gen).
Becker, A., 2 (cyl), 8 (tau), 82 (kot), 139 (cyl), 358 (tri-tri), s.n. (biu, cyl, kot, neg, per-per, tau, tri-tri).
Beckett, 1234 (ven), 1235 (gen), s.n. (ven).
Bécourt, s.n. (ven).
Beetle, A.A., 598 (gen).
Behboudi, 219, 223 (kot).
Behboudi & Aellen, P., 1969 (tau).
Behr, H.H., s.n. (biu).
Beideman, s.n. (biu, cyl, tau, tri-tri).
Bélanger, Ch.P., 272/36 (col).
Belanina, N.B., s.n. (tri-tri).
Belbalho, s.n. (gen).
Belianina, N.B. & Kisseleva, E.I., 211, s.n. (biu).
Beljalov & Seifulin, E.M., s.n. (tri-tri).
Bellringer, 24 (spe-spe).
Belolov, s.n. (kot, tau).
Belolov & Berdyev, B.B., s.n. (cyl).
Benoist, R., 335, 428 (gen), 528 (tri-tri).
Benta Rainha, 332 (neg), 1559 (tri-tri) 1561 (neg), 3625 (tri-tri).
Bentham, G., s.n. (neg, ven).
Berdyev, B.B., s.n. (cra, kot, tau, tri-per, tri-tri).
Berdyev, B.B. & Belolov, s.n. (cyl, tri-tri).
Berdyev, B.B. & Gutkova, s.n. (cra, tri-tri).
Berezovski, s.n. (cra).
Berger, F.X., 182 (com-sub), s.n. (cyl, uni).
Berjozin, s.n. (tau).
Bernarriez, s.n. (gen).
Berneau, s.n. (gen).
Berolini, s.n. (tri-tri).
Bertault, 93 (gen).
Berti, G., s.n. (gen).
Bertoloni, A., s.n. (gen, neg).
Bertoloni, G., s.n. (gen. neg).
Berton, M.C., 156 (biu).
Bervin, s.n. (cra).
Bettle, 5811 (cyl).
Beyer, R., s.n. (cyl, tri-tri).
Biasoletto, B., s.n (gen).
Bicchi, C., s.n. (gen).
Bicknell, C., s.n. (cau, cra, gen, neg, tau, tri-tri, uni, ven).
Bicknell, C. & Polini, s.n. (gen, neg).
Bidensich, s.n. (biu).
Bierbach, O., s.n. (neg, tri-tri).
Bijl, 28 (neg), 39 (gen).
Billiet, G. & Jadin, F., 750 (gen).
Billy, s.n. (tri-tri).
Biltz, s.n. (com-com).
Birand, H., 23 (umb), 37 (neg), 53 (spe-lig, tri-tri), 61 (tri-tri), 69 (cra), 86 (tri-tri, umb)
Birand, H. & Davis, P.H., 2348 (biu).
Birand, H. & Kastamanoglu, 3077 (tri-tri).
Birand, H. & Zohary, D., 2053 (tri-tri), 2055 (cyl), 2190 (umb), 2351, 2444 (tri-tri), 2445 (cau), 2605 (cyl), 3077 (cyl), 3354, 31071 (tri-tri), s.n. (tri-tri).
Birzin, s.n. (tri-tri).
Bisse, J., s.n. (cyl).
Bisse, J. and Schneider, 4, 7 (biu), 41 (cyl).
Björqvist, I. & al., 103, 604, 744 (kot).
Blackburn & Schafer, G., s.n. (gen).
Blagovestschensky, A.V., s.n. (tri-tri).
Blaisse, 24 (cra).
Blaisse & Roux, H., 66 (cra), s.n. (cyl, spe-lig, spe-spe, ven).
Blanche, E., 44 (gen), 46, 47 (spe-lig), 48 (gen), 49, 50 (per-per), 402 (kot), 604 (spe-spe), 609, (spe-lig), 776 (per-per, spe-lig), 777 (per-per), 778 (spe-lig), 801 (biu, per-per), 802-804 (per-per), 805 (per-bra), 1837 (gen, per-per), 2026 (spe-lig, spe-spe), 3470 (gen), 3939 (per-per), 3941 (tri-tri), 3942 (gen, tri-tri), s.n. (biu, cau, cyl, gen, per-bra, per-per, sea, spe-lig, spe-spe, tri-tri, vav).
Blanché i Vergés, C. & al., 9402 (ven).
Blanchet, R., 2543 (biu), s.n. (gen).
Blanco, A., 394 (gen).
Blauner, B.F., s.n. (gen).
Blinovskij, K.V., s.n. (tri-tri).
Blom, C.H., s.n. (cyl, gen).
Bobrov, 1364a (tau).
Bobrov & Jarmolenko, A.V., 22 (tau).
Bobrov & Tzvelev, N.N., 98, 498 (tau).
Bocquet, G.F., 10147 (gen).
Bocquet, G.F. & al., 10111, 10925, 11510 (gen).

Boulos, L., 229 (bic-bic), 1566 (ven), 1966 (bic-bic), 2443, 3026 (gen, kot), 4507 (gen), 15478 (kot), 15505 (bic-bic), s.n. (bic-bic, gen, neg).
Boulos, L. & Wallad, 7227a (sea), 7825 (bic-bic), 7833 (kot).
Boulos, L. & al., 1596 (kot, gen), 3917, 4265 (ven), 4299, 7109 (kot), 8300 (per-per).
Bourcart, s.n. (neg).
Bourgeau, E., 2, 19 (ven), 159 (cau, cyl), 255 (ven), 277 (cau, cyl), 278 (tri-tri), 309, 325, (gen), 432, 572 (tri-tri), 926, 1503 (ven), 2177 (tri-tri), s.n. (biu, cyl, gen, neg, tri-tri, umb, ven).
Bourjot Saint-Hilaire, s.n. (gen).
Bousillon, s.n. (gen).
Bousquet, s.n. (ven).
Bové, N., s.n. (gen, ven).
Bowden & Sims, 131, 402, 1308, 1503, 1862 (gen).
Bowen, 1381 (biu, gen), 1827 (gen), 2048 (umb), 2053, 2191 (biu), 3498 (neg), 3556 (biu), s.n. (biu, per-per).
Bowles Scho. Bot. Exp., 2447 (tri-tri), 2553 (per-per).
Braccarini, s.n. (gen).
Bracht, s.n. (biu, gen, neg).
Branco, s.n. (biu, gen).
Brandt, M., 892 (gen).
Brauch, s.n. (gen).
Braun, s.n. (gen, neg, tri-tri).
Braun-Blanquet, J., s.n. (neg, tri-tri).
Braun-Blanquet, J. & Soest, J.L. van, s.n. (gen, neg).
Braun-Chur, s.n. (gen, neg).
Braune & Kürschner, VO2593 (tau), VO2595 (tri-tri).
Brayle, s.n. (tri-tri).
Brébisson, L.A. de, s.n. (cyl).
Bredemeier, F., s.n. (cyl).
Breese, s.n. (gen).
Brenan, 11064 (umb), 13092 (gen).
Brenckle, J.F., 48277 (cyl).
Bresinsky, A., s.n. (tri-tri).
Bretzl, s.n. (gen).
Brichi Mustapha, s.n. (gen).
Bridwell, A.W., 110 (tri-tri).
Brinton Lee, 208 (gen), 1290 (tri-tri).
Briquet, J.I., 193 (gen).
Brissgono, 146, 147 (tri-tri).
Brixia, de, s.n. (gen, neg).
Brizgailova, s.n. (cyl).
Broek, ten, s.n. (gen).
Brogniart, A., s.n. (ven).
Brondel, s.n. (ven).
Brongersma, L.D., s.n. (gen).
Brooks, 9989 (cyl).
Brotherus, A.H., 918 (gen), 937 (cyl, tau), 938 (tri-tri).
Brotherus, A.H. & V.F., 55 (cyl).
Brour, s.n. (neg).
Brown (probably various), 3 (bic-bic), 237 (umb), 268, 472 (tri-tri), 2350 (ven), 2547 (neg), 2549 (tri-tri), s.n. (gen, tri-tri).
Bruhns, C., 893 (tau), 940 (umb), s.n. (col, gen, kot, per-per, tau).
Brumati, s.n. (gen).
Brummitt, R.K., 4539 (neg), 4599 (gen), 6496 (neg).
Brummitt, R.K. & al., 201 (gen).
Brumml, 463 (ven).
Brunel, s.n. (tri-tri).
Bruno, s.n. (cyl).
Bruns, 592 (tau).
Bruynseels, 902 (gen).
Bubani, P., s.n. (tri-tri).
Buddell, 175 (cyl).
Buhl, C.A., 11325 (cyl), 11326 (tau).
Buhse, F.A., s.n. (tau, tri-tri).
Bujorean, G., 518 (cyl).
Bukasov, S.M., 21 (cra), 180 (tau).
Bukeeva, s.n. (cyl, tri-tri).
Bukinich, 145, 14805, s.n. (tri-tri).
Bulavkina & al., s.n. (cyl).
Bulgarkova, L.L., s.n. (tri-tri).
Bullemont, de, s.n. (gen, ven).
Bunge, A.A. von, 2 (tri-tri), s.n. (tau, tri-per, tri-tri).
Bür, s.n. (tau).
Burbridge, F.W.T., 159 (biu).
Burcco, 21933 (ven).
Bureau, L.É., s.n. (gen).
Burnat, É. & Cavillier, F.G., s.n. (neg).
Burri, R. & Krendl, F.X., s.n. (biu, cau, gen, tri-tri).
Burton, R107 (tri-tri), R109 (cau).
Burtt-Davy, J., s.n. (spe-lig).
Busch, s.n. (biu, tri-tri).
Bush, B.F., 12133, 12133A, 12133b, 12137, 12137A, 12141, 12141A, 12141B, 12148, 12150, 12466, 12468, 12468A, 13187 (cyl).
Busschodts, s.n. (ven).
Butkov, A.Y., s.n. (cra).
Butkov, A.Y. & al., 443 (cra).
Butler, s.n. (gen).
Butter, 707 (gen).
Buwalda, P., 2383 (gen).
Buzilova & Vihodcevsky, N., s.n. (neg).

Cabanès, J.G., s.n. (ven).
Cabezudo, B. & al., 971/76, 1532/75, s.n. (gen).

Calder, J.A., 2085 (per-per).
Caldesi, L., s.n. (gen, neg, tri-tri).
Caldoni, s.n. (gen).
Calduch, M., s.n. (gen).
Callé s.n. (gen).
Callier, A.S., 107, 201a (biu), 268 (cyl), 368, s.n. (biu).
Calvert, H.H., 7 (neg), s.n. (cau, neg).
Camb. Univ. Exp., 21 (tri-tri).
Cambessèdes, J., s.n. (gen).
Campbell, s.n. (neg).
Campo, P. del, s.n. (gen, ven).
Cañada, s.n. (tri-tri).
Canby, s.n. (tri-tri).
Cannon, J.F.M., 2401, 3148, 3849, 4247, 4966 (gen).
Cannon, J.F.M. & al., 50 (gen).
Cappelletti, C. & Fontana, s.n. (gen).
Capus, G., 1412, 1413, 1414 (tri-tri), 1415 (cra).
Carestia, A., s.n. (gen).
Carlström, A.L., 69 (col), 70, 95 (cau) 104 (gen), 209 (cau), 352 (per-per), 640 (cau), 1062, 1073 (gen), 4407b (biu), 4951 (umb), 5184, 5308 (biu, umb), 5355 (umb), 5482, 5601 (biu), 5897, 5917 (gen), 6024 (cau), 6107, 6204 (biu), 6642 (cau), 6244 (gen), 6606 (cau), 6787 (per-per), 6923 (biu), 7029 (gen), 7249, 7647, 7685 (biu), 8298 (tri-tri), 8445 (biu), 9091 (gen), 9466, 9785, 9793 (umb), 10230 (tri-tri), 10248 (umb), 10301, 10374, 10411, 10684, 10918, 11270, 11357 (tri-tri), 11394, 11469, 11595 (umb), 11607 (tri-tri), 12017 (biu), 12319 (tri-tri, umb), 12333 (umb).
Carneiro, A.B., 68 (tri-tri).
Caron, s.n. (tri-tri).
Carr, 481 (tri-tri).
Carreiro, M.M., 453, s.n. (gen).
Caruel, Th., s.n. (cyl, gen, neg, tri-tri).
Cary, M., s.n. (cyl).
Casaretto, G., s.n. (gen).
Casey, 497 (gen), 1023, 1776 (tri-tri).
Castagne, J.L.M., 75 (biu), s.n. (gen).
Cauvet, D., s.n. (gen).
Cavara, F., s.n. (gen).
Cedmakova, s.n. (cyl, tri-tri).
Čelakovský, s.n. (gen, tri-tri).
Cercian, s.n. (biu).
Cernoch, 12215 (cyl), 32.752 (neg).
Cesati, V. de, 51, 183 (gen), s.n. (gen, neg).
Cetik, 23, 24, 3701 (tri-tri), 5318 (spe-lig), 20729 (umb), 20884 (tri-tri).
Chabat & Ruget, s.n. (gen).
Chaben, s.n. (ven).
Chabert, A.Ch., s.n. (gen, tri-tri).
Chaboisseau, Th., 140 (biu), 1214 (cau), s.n. (cau).
Chaffanjon, A., 597 (tau).
Chaidarov, 1710 (tri-tri), 1321 (cra).
Chakrabarty, T. & Al-Rawi, A., 30312, 30420 (kot).
Chakrabarty, T. & al., 31706 (kot), 33124 (tri-tri).
Chambarion, s.n. (neg, tri-tri).
Chaparliev, s.n. (cyl).
Chapman, E., 67, 105 (gen), 450 (per-per), 597, 616 (per-bra), 656 (gen), 26127 (biu), 26157 (spe-spe), 26111 (spe-lig, spe-spe), 26127 (biu), 26344 (cau), 26360 (tri-tri).
Chaporova & Shishlov, 342 (cra).
Charoy, A., 253, 293 (gen), 323 (ven).
Charpentier, J.G.F. de, s.n. (gen).
Charpentier, 43 (cyl), s.n. (cyl).
Charpin, A., s.n. (neg).
Charpin, A. & Fernández Casas, F.J., s.n. (ven).
Charpin, A. & Greuter, W., 8322 (cyl), 8344 (gen), 8345 (neg).
Charpin, A. & al., 87 (gen), MAR 656 (ven), 19502 (gen).
Charrel, L. (Abd-ur-Rahman-Nadji), 5-672 (spe-lig), s.n. (com-sub, cyl, spe-spe, ven).
Chasanov, 17 (cyl).
Chase, M.A., 8873, 10415, 15762 (cyl).
Chatenier, C., s.n. (neg).
Chater, A.O., 110, 221 (biu).
Chatin, G.A., s.n. (gen).
Chaubart, L.A., s.n. (biu, cau, com-sub, gen, tri-tri).
Chauvin, F.J., s.n. (ven).
Cheese, ACW1140 (tri-tri).
Chemakov, s.n. (tau).
Chepanov, s.n. (biu, cra, cyl, juv, tau, tri-per, tri-tri).
Chepanov & Ataeva, A.A., s.n. (cra, tau, tri-tri).
Chepanov & Seifulin, E.M., s.n. (tau).
Cherbjanovsky, s.n. (kot, umb).
Cheshmedjiev, I.V., s.n. (biu, neg, tri-tri).
Chevalier, F.F., 144a (ven), s.n. (gen).
Chevallier, L., s.n. (gen).
Cheverneau, s.n. (neg).
Chevrenidi, 364 (cyl).
Chiappori, A., s.n. (gen).
Chiarugi, A., s.n. (gen).
Chiovenda, E., s.n. (gen, neg, tri-tri).
Chipanova, s.n. (tri-tri).
Chonazarov, 524 (cyl).
Chopinet, R.G., s.n. (gen).
Chort & al., s.n. (tri-tri).
Choulette, J.E., 100 (gen), 299 (ven), 398 (neg), 595 (tri-tri).

(cyl), 48837 (ven), 49559 (gen), 49908, 50284 (ven), 50332 (kot), 51675, 52085 (gen), 52304 (ven), 52737 (gen), 53213 (ven), 54349 (biu, gen), 54931 (tri-tri), 55317 (gen), 55471 (tri-tri), 50474 (ven), 51675, 58535 (gen), 58640 (ven), 58901 (tri-tri), 58902, 69834 (gen).

Davis, P.H. & Bokhari, M.H., 55997, 56531 (kot).

Davis, P.H. & Cetik, 18800, 18880, 20319 (tri-tri).

Davis, P.H. & Coode, M.J.E., 36895 (tri-tri), 37220 (umb).

Davis, P.H. & Dodds, L.G., 18647 (biu), 18714 (tri-tri), 18815, 18815A (neg), 18815B (tri-tri), 18821A (tri-tri), 18827 (tri-tri, umb).

Davis, P.H. & Hedge, I.Ch., 26977 (gen), 27142, D27243 (biu), 27243 (kot, tri-tri), 27845 (umb), 27929 (biu), 27933 (gen), 27961, 28139 (tri-tri), 28142 (spe-spe), 28145 (cra), 28155 (vav), 28165 (biu), 28252 (umb), 28368 (umb), 28404 (tri-tri), 28415 (spe-lig), 28417, 28419 (spe-spe), 28460 (umb), 28481 (cau, tri-tri), 28509 (tri-tri), 28555 (tri-tri), 28671 (cau), 28752 (tri-tri), 28764 (neg), 29016 (umb), 29108 (col), 29123 (umb), 31033 (spe-lig), 31071 (col, tri-tri).

Davis, P.H. & Lamond, J.M., 56867, 56984 (gen), 57229 (ven), 57704 (gen).

Davis, P.H. & King, 68049 (ven), 68285, 68410 (gen).

Davis, P.H. & Polunin, O.V., 22042 (spe-spe), 22094 (tri-tri), 22131 (spe-spe).

Davis, P.H. & Sutton, D.A., 62704 (gen), 62737 (tri-tri), 62791 (gen), 64760 (tri-tri), 65530 (neg).

Davis, P.H. & al., 19023 (umb), 19077 (tri-tri), 19128 (umb), 19255 (tri-tri), 19256 (umb), 19425 (gen), 19426, 19578, 19596, 19634 (tri-tri), 19696 (neg), 19901 (spe-lig), 20165 (cyl).

Day 479, s.n. (tri-tri).

Deaver, T107 (biu).

Debeaux, J.A., 14, 96, s.n. (gen, neg).

Debray, F., s.n. (gen, ven).

Decaisne, J. s.n. (gen).

Deflers, M.A., 108 (bic-bic), 51, 108 (bic-ana), 221 (kot).

Degen, Á. von, 94 (gen), 95 (neg), 96 (tri-tri), s.n. (cyl, neg).

Delacour, s.n. (gen, neg, tri-tri).

Delavaux, s.n. (neg).

Delbès (Père), s.n. (spe-spe).

Delbos, s.n. (gen).

Delessert, J.P.B., s.n. (per-per, sea).

Delipavlov, D.D., s.n. (biu, cau, cyl, gen, neg, spe-lig, tri-tri).

Delipavlov, D.D. & Cheshmedjiev, I.V., s.n. (cyl, tri-tri).

Delipavlov, D.D. & Popova, G.M., s.n. (tri-tri).

Delipavlov, D.D. & al., s.n. (biu, tri-tri).

Della, A., s.n. (bic-bic, biu, gen, per-bra, per-per, tri-tri).

Dellampo, s.n. (neg).

Delmas, J.P., s.n. (tri-tri).

Delort, s.n. (gen, neg, tri-tri).

Delvaux, s.n. (neg).

Delvosalle, s.n. (gen, tri-tri).

Demaree, J.B., 12479 (cyl).

Demirörs, 62, 1455 (neg), 1459 (tri-tri).

Demorina, 49 (tri-tri), 83, 84 (tau), 102, 158 (tri-tri), s.n. (tau).

Deripova, s.n. (cyl).

Deschamps, L.A., 520 (biu).

Déséglise, P.A., 158, s.n. (cyl).

Desfontaines, R.L., s.n. (ven).

Deslib.(?), s.n. (gen).

Deslile, s.n. (ven).

Despaty, M., s.n. (gen).

Despreaux, J.M., s.n. (cau, com-sub, gen, uni).

Dessiatov, 452 (tau).

D.E.S.T.(?) 158 (umb).

Deverall & Flannigan, 0356 (neg).

Devesa, J.A. & al., 2068/81 (gen).

Deyroc, s.n.(364) (spe-lig), s.n. (spe-lig, spe-spe).

Dickson, V., 241 (kot).

Dimitrov, S.G. & Zacharieva, M., 9211-1913 (com-com).

Dimo & al., 556 (tau), 581 (tri-tri).

Dingilstatt, 128, 129 (tau).

Dingilstatt & Sovietkina, M.M., 201 (tau).

Dinsmore, J.E., B724 (gen), 724c (per-per), B 1270 (spe-spe), 1381 (sha), 1478 (per-per, spe-spe), B 3270 (spe-spe), 4107 (biu, per-per), 5253, 5637 (per-bra), 10742 (neg), 11270 (spe-spe), 12975 (tri-tri), 13719 (kot), 13556 (bic-bic), 20320 (vav), 20405 (spe-lig), s.n. (per-bra).

Dinsmore, J.E. & Meyers, F.S., 724b (per-per).

Dinter, M.K., s.n. (tri-tri).

Diomède, s.n. (gen, neg, tau, tri-tri).

Dippold, s.n. (neg).

Disprenne, s.n. (com-sub).

Dittrich, M., s.n. (ven).

Djemken, 344 (tau).

Dobignard, A., 3447 (gen), 3481 (tri-tri).

Doğan, M., 113 (col), 119, 125 (tri-tri), 203 (cau).

Doig, s.n. (cyl, tri-tri).

Dolenko, 276, 354 (tau).

Domin, K., s.n. (gen).

Domingo, D.C., s.n. (gen, tri-tri, ven).
Donat, s.n. (gen).
Dongé, s.n. (gen).
Dörfler, I., 388, 389 (biu), 739 (biu, neg).
Dorgelo & de Wilde, s.n. (neg).
Dorner, J., s.n. (cyl).
Dostál, J., 2156 (neg).
Doumergue, F., s.n. (gen, per-bra, tri-tri, ven).
Drabble, E.F., 98 (bic-bic).
Drar, M., 176 (per-bra), s.n. (bic-bic, kot).
Drar, M. & Sa'ad, F.M., s.n. (kot).
Drobow, V.P., 177 (tri-tri), 226 (tau), 391, 810, s.n. (tri-tri).
Drobow, V.P. & Gomolitski, P., 640, 834 (tau).
Druce, G.C., 38 (bic-bic), 832/8, R482 (ven), s.n. (biu, gen, per-per).
Dubiansky, V.A. & Basilevskaya, N.A., s.n. (tri-tri).
Dubuis, A., 8896 (tri-tri), s.n. (gen, neg, ven).
Duby, J.É., s.n. (gen).
Ducali, s.n. (neg).
Ducoinun, s.n. (gen).
Ducommun, J.C., s.n. (gen, neg, tri-tri).
Dudley, W.R., 34899 (biu, tri-tri).
Duffour s.n. (gen, ven).
Duhamel du Monceau, H.J., s.n. (gen).
Dulac, J., s.n. (gen).
Dunal, M.F., s.n. (neg, tri-tri).
Dunant de Salatin, Ph., s.n. (gen).
Dunn, s.n. (ven).
Dunouchaud, s.n. (gen).
Dupuy, D., s.n. (260?) (gen), s.n. (neg, tri-tri).
Durand & Centena, s.n. (gen).
Durando, G.L., s.n. (gen, ven).
Duraniet, s.n. (gen).
Durbey, s.n. (gen, tri-tri, ven).
Durham, J.W., s.n. (biu).
Durieu de Maisonneuve, M.Ch., s.n. (gen, ven).
Durville, 142, s.n. (cau).
Dustrouchau, s.n. (gen).
Duthie, J.F., 10845 (tau), s.n. (gen).
Duty, s.n. (cra, cyl, tri-tri).
Duval-Jouve, J., s.n. (biu, gen, neg, spe-lig, ven).
Duvigneaud, J., 66E13 (gen), s.n. (cyl).
Duvigneaud, J. & Lambinon, J., 74E658 (ven).
Duvigneaud, J. & al., 77E170 (ven).
Duyfjes, B.E.E. & al., 33 (neg), 624 (neg).
Düzenli, 112 (umb).
Dzevandowsky, S.A., s.n. (tri-tri).
Dzivnovgorskaja, 201 (tau).

Edelberg, L., 2108 (tri-tri).
Edgecombe, W.B., 24a (per-per), A-338 (gen), A-428 (col), A-790 (gen), A-805-1 (biu), 864 (per-per), A-822, A-865 (gen), A-882-1 (per-per), A-1467 (tri-tri), B-212 (per-per), B-586(1) (tri-tri), B-586, B-588 (per-per), B-902 (biu, col), s.n. (gen).
Edmondson, C.H., 2701 (biu).
Edmondson, C.H. & McClintlock, D.C., 2553 (umb), 2580 (biu), 2622 (tri-tri), 2938 (biu), 2990 (tri-tri).
Eggers, von, s.n. (biu).
Ehrenberg, Ch.G., s.n. (bic-bic, gen, kot, per-bra, per-per).
Eig, A., s.n. (bic-bic, kot, per-per, sha, spe-spe, uni).
Eig, A. & Zohary, M., 26, s.n. (lon).
Eig, A. & al., 24 (bic-bic), s.n. (gen, per-bra, per-per).
Eig & al. s.n. (per-per).
Ek, Ch.M., s.n. (cyl).
Ekart, T.Ph. & Irmisch, J.F.Th., s.n. (gen, neg).
Ekberg, L., W9099 (cra).
Ekim, T., 1633 (gen), 2219 (biu), 2220 (umb), 2221 (tri-tri).
Ekim, T. & Düzenli, 3754 (umb), 5471 (tri-tri).
Ekim, T. & al., 5500 (biu, umb), 5501 (biu).
El Batanouny, s.n. (cra, kot).
El-Gadi & al., 1384-G (gen), 1472-G (ven), 1829-G (gen), 1835-G (ven).
El Hadidi, M.N., s.n. (bic-bic, kot, per-bra).
El Hadidi, M.N. & al., s.n. (bic-bic).
El-Jaley, 27, 2221, s.n. (gen).
El Khanagry, 33 (bic-bic).
El Khanagry & Makhtar, 17 (bic-bic), 119 (per-bra), 203, 275 (kot), 280 (bic-bic), 327 (kot), s.n. (bic-bic).
Elias, 4671 (neg), s.n. (tri-tri, ven).
Elias & al., 5754 (tri-tri).
Ellman, E. & Sandwith, N.I., 101, 860, 1032 (gen).
Ellman, E. & Hubbard, Ch.E., 400 (gen), 471 (neg), 654, 722 (tri-tri), 760 (tri-tri), 1158 (gen).
Els, s.n. (neg).
Emme, E.K., 12 (tri-tri), 29 (tau), 54, 79 (tri-tri), 533 (cra).
Engelhardt, H., s.n. (gen).
Entz, G., s.n. (cyl).
Eren, 113 (col).
Erichsen, C.F.E., s.n. (cyl).
Erik, S., 195, 1269 (tri-tri), 1463 (cau, cyl), 1459 (tri-tri), 1550b (umb), s.n. (tri-tri).
Ertter, B.J., 4089 (cyl).
Escayrac, d', 383, 389 (gen).
Espina, R., s.n. (gen).
Evans, s.n. (spe-lig).
Evans & Guest, E.Rh., 13228 (kot).
Evers, G., 1393 (cyl), s.n. (neg, tri-tri).

(biu, cau, cyl, per-per, tri-tri, vav).
Fre. (frère) Louis, s.n. (cra, kot, spe-spe, tri-tri, umb).
Freitag, H.E., 14935 (tau).
Freyn, J.F., 875 (neg), s.n. (cyl, gen, tri-tri, uni).
Frickmann, s.n. (gen).
Friis, I., 892 (gen).
Fritsch, s.n. (tri-tri).
Fritze, R., s.n. (gen, tri-tri).
Frivaldszky von Frivald, E., s.n. (cyl, gen).
Frodin, D.G., 38 (umb).
Fuckel, K.W.G.L., s.n. (cyl).
Fuller, T.O., 1611 (cyl), 4484, 4485 (tri-tri), 4491 (gen), 8970 (cyl).
Furse, P., 2101A (tri-tri), 2101c (col), 5410 (tri-per), 5972 (tau), 6026 (tri-tri), 6057 (cra), 6426 (tri-tri), 7131 (tau), 7269 (tri-tri), 7594 (tau), 7662 (tri-tri), 7720 (cra), 8186 (tri-tri).
Furse, P. & Synge, P.M., 799/19 (cyl).
Furth, s.n. (tri-tri).

Gabelli, L., s.n. (gen, neg, tri-tri, ven).
Gabrielith, R., 77 (per-per).
Gabrieljan, E.Tz., s.n. (col, cra, cyl, tau, tri-tri).
Gabrieljan, E.Tz. & Avetissjan, V.E., s.n. (cyl, tri-tri).
Gabrieljan, E.Tz. & Yanovski, s.n. (tri-tri).
Gabrieljan, E.Tz. & al., s.n. (cyl).
Gadeceau, E.J.A., s.n. (biu, gen, tri-tri).
Gage, A.Th., s.n. (gen).
Gaillardot, Ch., 303 (bic-bic), 509, 509b (gen), 510 (tri-tri), 2359 (gen), 2793 (spe-lig), s.n. (cyl, gen, per-per, spe-lig, tri-tri, uni, ven).
Gailleraud, s.n. (gen).
Galiano, E.F. & Valdés, s.n. (gen).
Galiano, E.F. & al., 1816/69 (gen).
Galkina & Nikerov, s.n. (cra).
Gamble, J.S., 28233 s.n. (gen).
Gammie, G.A., s.n. (tau).
Ganĉev, S.P., s.n. (cyl, neg, tri-tri).
Gandhi, 268 (cyl).
Gandilyan, P.A., s.n. (cyl, tau, tri-tri).
Gandilyan, P.A. & Arutyunyan, M.G., s.n. (tri-tri, umb).
Gandoger, M., 220, 221 (gen), 297 (cau), 298, 326, 619, 1003 (gen), 1004 (gen, tri-tri), 1411 (spe-lig), 1859, 1860, 2202 (gen), 2203 (biu), 4483, 5359 (cau), 10665, 11163 (biu), 11793 (gen), 12834 (biu), 12835 (gen), s.n. (biu, cau, com-com, gen, neg, tri-tri, ven).
Ganemin, 76 (biu).
Ganeschin, S.S., s.n. (cyl).
Garantzour, s.n. (tau).
Garbunova, s.n. (tau).
Garchen, 131 (tau).
Gardner, R.O., 711, 1389, s.n. (gen).
Gardner, R.O. & Jury, S.L., 1104 (gen).
Garnier, J., s.n. (tri-tri).
Garaudy, de, s.n. (ven).
Garrigues, s.n. (gen, ven).
Garroute, s.n. (gen, neg, tri-tri).
Garzon, s.n. (cyl).
Gasparrini, G., s.n. (gen, neg, ven).
Gasque, du, 423 (bic-bic).
Gassner, J.G., 404 (cyl), 467 (tri-tri).
Gatefossé, J., 3999 (ven), s.n. (gen, ven).
Gates, F.C., 1528, 14734 (cyl).
Gates, F.C. & Barker, 14292 (cyl).
Gauba, E., G-6, 37, 38 (tau), 56 (bic-bic), 40 (cra), s.n. (kot).
Gauthier, R., s.n. (gen, tri-tri).
Gavelle, s.n. (tri-tri).
Gavioli, O., s.n. (gen).
Gay, H., s.n. (spe-lig, tri-tri).
Geerinck-Coutrez, D., 2623 (gen).
Geier, s.n. (cyl).
Geissler, P., 5570, 5571 (gen), s.n. (gen, tri-tri).
Geldikhanov, A.M., s.n. (cra).
Gemmi, s.n. (neg).
Gemurin, 135 (tri-tri).
Gennari, P., s.n. (neg).
Genneou, A., s.n. (gen).
Genner, s.n. (gen).
Gennini, s.n. (tri-tri).
Gentry, A.H., 12819 (tri-tri), 14600 (kot, per-per, tri-tri), 14604, 14605 (tri-tri), 14627, 14628 (kot), 14635 (umb), 14679 (umb), 14680 (kot), 14681 (tri-per), 14944 (umb), 14945 (tri-tri), 14948 (cra), 14953 (cra, kot), 15016 (kot), 15038 (tri-tri), 15210 (cra), 15340 (cyl).
Georgiev, S., s.n. (biu, cyl, tri-tri).
Gerbinot & al., 374 (gen).
Gerhard, W., s.n. (cyl, gen, tri-tri).
Geyer, C.A., s.n. (cyl).
Ghabbour, s.n. (bic-bic, kot).
Ghafur, A., 362 (gen).
Ghitnick, s.n. (gen).
Ghorasi-al-Hosseini, 210 (cra, tau).
Gibbs & al., 1615.69 (gen).
Gil, s.n. (gen, ven).
Gilbert, 5 (per-per), 21 (sha), 22 (per-per).
Gilecy(?), s.n. (neg).
Gillet, s.n. (neg).
Gillett, J.B., 6695, 6832 (kot), 7839 (umb), 8007 (cra), 8169 (tri-tri), 8170 (biu), 8171 (umb), 8201 (spe-spe), 8215 (tri-tri), 8216 (spe-spe), 8312 (tri-tri), 8336 (spe-spe), 8337 (spe-lig), 8338 (spe-spe), 8339 (spe-lig), 8342 (tri-tri), 10708 (kot), 10801 (spe-spe), 10866 (tau), 10895 (tri-tri), 10902 (biu), 10904 (cra),

11154 (tau), 11173 (spe-spe), 11551 (neg), 11553 (tri-tri), 11154 (tau), 11155 (spe-spe), 11627, 11174 (spe-lig), 15970 (kot).
Gillett, J.B. & Al-Rawi, A., 6988 (kot), 7131 (cra), 7131A (tau), 7209 (tri-tri), 7209A (kot), 7210 (tri-tri), 7367 (cra), 7382, 7383, 7385 (tri-tri), 7465 (cra), 7535 (umb), 7554 (tri-tri), 7560 (umb), 11602 (tri-tri), 11603 (cra, juv), 11632 (tri-tri), 11691 (umb), 11695 (tri-tri).
Gilli, A., s.n. (gen).
Gioron, s.n. (neg).
Giovanni, di, 495 (gen).
Girardet, A., s.n. (tri-tri).
Giraudias, L., s.n. (tri-tri).
Girerd, s.n. (ven).
Girod, L.A., s.n. (cyl, gen, neg, ven).
Gitelman s.n. (cyl).
Glanville, 515, 262 (gen).
Gleisberg, W., 276 (umb).
Glibin, s.n. (tri-tri).
Globenko, s.n. (biu).
Gmelin, s.n. (neg).
Gnezdillo, 25 (tau, tri-tri), 56 (tau), 68 (cra), 73 (tau), 76, 83, 90, 114 (cra).
Godefroy, F.F., s.n. (gen).
Godeh, 215 (gen).
Godet, Ch.H., s.n. (biu, gen, neg, tri-tri).
Godfrey, 516 (tri-tri).
Godfrey & Taysi, SH-16 (cau).
Godron, D.A., s.n. (cyl, neg, tri-tri, ven).
Godzhun, s.n. (cyl).
Goebel, K.I.E., s.n. (biu).
Goerbing, s.n. (umb).
Goiran, A., s.n. (gen, neg).
Gola, G., s.n. (gen, tri-tri).
Golde, D., 394 (biu), 898 (tri-tri), 5333b (cyl), s.n. (biu, cyl, gen, tri-tri).
Golopencza, 1323 (cyl).
Goloskokov, V.P., 1, 4307a (tau), s.n. (tau, tri-tri).
Gombault, R., 597 (gen), 598, 854 (biu), 855 (per-per), 987 (tri-tri), 2954 (gen), 2955 (sea), 2956 (spe-lig), 2957 (sea).
Gomolitski, P., 3 (tri-tri), 33c, 36, 143 (tau), 144, 158, 342 (tri-tri), s.n. (tau).
Gomolitski, P. & Fedorov, A.A., 44 (tau), 95, 116 (tri-tri), 195 (tau), 367 (tri-tri).
Gomolitski, P. & Dolgech, s.n. (cra).
Gomolitski, P. & al., 49 (cra).
Gontscharow, N. & al., 72 (tau), 141 (cra).
Goodman, G.J., 4180, 5276 (cyl).
Goodman, G.J. & Lawson, 8429 (cyl).
Gordjaghin, A.J., 766, 768 (cyl), 771 (tau), 773, 810 (cyl).
Gorelova, s.n. (tri-tri).
Gossavi, s.n. (gen).
Gouget, É., s.n. (gen).
Gould, F.W., 11438, 13974 (cyl).
Govits, s.n. (cyl).
Goyder, D.J. & Jury, S.L., 332 (tri-tri).
Grabmayr, A. s.n. (gen, neg).
Gradstein, S.R. & Smittenberg, 266, 312 (biu), 315 (cau).
Graells, M. de la Paz, s.n. (tri-tri).
Graham, 90, 485, 515 (kot).
Gramatikov, s.n. (gen).
Grannitov, 18, 27, 50, 84, 198 (tri-tri), 451, 617 (cra), 895 (tau).
Grannitov & Mironov, B.A., 19, 201 (tau).
Granon, s.n. (tri-tri).
Grant, 16030 (tri-tri), 17561 (cra), s.n. (gen).
Grantzow, C. & Zaballos, 144 (gen).
Grass, 138 (cyl), 441 (spe-spe), 458 (spe-spe).
Grecescu, D., s.n. (cyl).
Green & al., 11 (kot).
Gregoriev, 3 (tau).
Grenier, J.Ch.M., s.n. (com-sub, spe-lig, ven).
Greuter, W., 4504 (cau), 4579 (gen), 4580 (col), 5115 (biu), 5120 (cau), 6536 (biu, cau), 6537 (cau), 6539 (com-sub), 9072 (tri-tri), 10835 (biu), 10952, 11089 (tri-tri), 13964 (biu, neg), 24992 (com-sub), s.n. (tri-tri).
Greuter, W. & Rechinger, K.H., 44621 (biu).
Grey-Wilson, Ch. & Hewer, 892 (tri-tri).
Griffith, W., 6698, 6699 (tri-tri).
Grisebach, A.H.R., s.n. (gen).
Gromakov, s.n. (cra).
Gros, E., 49 (tri-tri), 542 (biu), s.n. (gen, tri-tri, ven).
Gross, s.n. (per-bra).
Grossheim, A.A., 274 (cyl), s.n. (biu, cra, cyl, kot, neg, tau, tri-tri, umb).
Grossheim, A.A. & Jaroschenko, P.D., s.n. (tri-tri).
Grossheim, A.A. & al., 3653 (tri-tri), s.n. (biu, col, cyl, tau, tri-tri).
Groves, H., s.n. (biu, gen, neg, per-bra, per-per, tri-tri).
Grunder, 26 (cyl).
Grundl, s.n. (cyl).
Grzonka & Reichling, s.n. (spe-spe).
Guadagno, M., s.n. (biu, gen, tri-tri).
Guebhard, Ch., 171, 469 (cyl), s.n. (gen).
Guero, s.n. (gen).
Guest, E.Rh., 1819 (kot), 4380 (juv), 13351 (cra).
Guest, E.Rh. & al., 5118 (cra), 14071, 16828, 16846, 16922, 17052, 17551, 19115 (kot).
Guichard, CYR/63/58 (kot), CYR/68/58 (bic-ana), CYR/73/58 (bic-bic), CYR/134/58 (bic-ana), KG/LIB/158 (gen).

Hennecart, J., s.n. (gen, neg, ven).
Hennipman, E., 1181 (kot).
Hennipman, E. & al., 156, 283 (umb), 415 (neg), 564 (per-per), 574 (kot), 585 (neg), 876 (neg, umb), 1175 (spe-lig), 1385 (spe-spe), 1519 (neg), 1523 (neg, tri-tri).
Henrard, J.Th., s.n. (cyl) .
Henrard, J.Th. & Oostroom, S.J. van, 8147 (gen).
Hepper, F.N., FNH 3518 (gen).
Héribaud, J., 120 (gen), s.n. (gen, tri-tri).
Hermann, F., s.n. (cyl, neg, ven).
Hernández, WG0596 (neg), s.n. (gen).
Hertel, W.G., 2763 (gen).
Herter, W.G.F. & Röser, s.n. (tri-tri).
Hervier-Basson, G.M.J., s.n. (gen, tri-tri).
Herviers, s.n. (ven).
Hewer, 1122 (tri-per), 1665 (biu), H3734 (tau).
Heynhold, G., s.n. (gen).
Heywood, V.H., 1115 (gen), 1144, 1198, 1305 (tri-tri), 2642 (gen), 2643 (tri-tri), 2689 (gen), 3091 (tri-tri).
Heywood, V.H. & al., 17 (gen).
Hibon, 4670 (gen), 4671 (neg), s.n. (gen).
Higgins, B.B., 7159, 9317 (cyl).
Hill & Cress, 11193, 11566 (cyl).
Hillegers, s.n. (gen).
Hillman, 2179, 2260b (spe-spe), 2732 (per-per), 2803 (cyl).
Hissar & Post, G.B., s.n. (neg).
Hochreutiner, B.P.G., 213 (gen).
Höff, s.n. (cyl).
Hohenacker, R.F., 137 (tri-tri), 1147 (tau), s.n. (cyl, juv, neg, tau, tri-tri, ven).
Holleman-Haye, A., s.n. (per-per).
Holmberg, O.R., 57 (biu), 123 (kot), 234 (biu), 235 (kot), 317, 357, 358 (tau), 359 (biu), 360 (tri-tri), 418, 458, 459 (tau), 460 (biu, neg), 462, 463 (tri-tri), 464 (kot), 538 (tau), 539 (tri-tri), 605, 606 (tau), 625 (biu), 626 (tri-tri), 627 (kot), 632 (biu), 639 (tau), 881 (biu), 925 (cyl), 926 (tri-tri), 953 (cyl), 975 (tau), 995, 995b, 1023 (tri-tri), 1024 (cyl), 1087 (cyl), 1088, 1089 (tau), 1210 (cyl), 1211 (tri-tri), 1278, 1327 (cyl).
Holmboe, J., s.n. (gen).
Holmgren, 10546 (cyl).
Holström, C.T. & Holström, s.n. (cyl).
Holtz, J.F.L. & Hänel, K., 00.284 (neg).
Holtz, J.F.L. & al., s.n. (cyl, gen, spe-lig, tri-tri).
Holub, J.L., s.n. (biu, per-per, ven).
Holzmann, T., s.n. (com-sub).
Hooker, J.D., s.n. (ven).
Hoover, R.F., 5298 (tri-tri).
Höpflinger, F., s.n. (gen, tri-tri).
Hoppe, D.H., s.n. (gen, neg, tri-tri).
Horasky, s.n. (tri-tri).
Horr, A., 3915 (cyl).
Hossain, 4407 (kot).
Hossain & Soofaji, 44, 45, 47, 76 (neg), 141 (tri-tri).
Host, N.Th., 2283, 2284 (cyl).
Houzeau de Lehaie, J., s.n. (gen).
Howell, 28366 (cyl), 29051, 29107 (tri-tri).
Hozet, s.n. (gen).
Hruby, J., 63 (cyl), 64 (gen).
Hruby, J. & al., s.n. (gen, neg, tri-tri).
Hubbard, Ch.E., s.n. (spe-lig, spe-spe).
Hubbard, Ch.E. & Ellman, E., 68 (gen).
Huber, s.n. (per-per).
Huber-Morath, A., 5701, 5702, 5705 (umb).
Hübl, P., s.n. (gen, tri-tri).
Huddle, A., 111 (gen).
Huet du Pavillon, A., s.n. (biu, gen, neg, tri-tri, ven).
Huet du Pavillon, A. & Hanry, H., s.n. (biu).
Huet du Pavillon, A. & Jacquin, H., s.n. (biu, gen, neg, tri-tri).
Huetbadia & Panareda, s.n. (neg).
Hügel, C.A.A. von, 1299 (tau).
Huguenin, A., s.n. (gen).
Hultén, E.O.G. & Norlindh, L.T., s.n. (gen).
Humbert, J.-H., s.n. (gen, neg, ven).
Hupke, H., s.n. (cyl).
Hürcher, s.n. (com-com).
Hurst, H.A., s.n. (gen, kot).
Husnot, P.T., 24 (gen).
Huter, R., s.n. (neg, tri-tri)
Huter, R. & al., 12 (ven), 430 (tri-tri), 442 (gen).
Huijsman, H.S.C., s.n. (gen).
Hylmö, D.E., s.n. (cyl).

Iankova, s.n. (tau).
Iazarenko, s.n. (tri-tri).
Ibrahim, s.n. (kot).
Ibrahim & al., s.n. (bic-bic).
Ichenko, s.n. (tau).
Ichenko & Kurachov, s.n. (tau).
Ichenko & Yakovleva, s.n. (tri-tri).
Igolkin, G.I., 17, 311 (tau).
Ihssen, s.n. (gen).
Ilarshan, 1227 (umb).
Ilič, G., 351a (tri-tri), s.n. (biu, neg, tri-tri).
Imam, M., s.n. (bic-bic).
Imber, D., 2 (bic-bic).
Imber, D. & Zohary, D., 4 (bic-ana).
Innamorati, s.n. (gen).
Iranshahr, M., 10282E (tau), 10366, 10367 (tri-tri).
Isaäcson, A., s.n. (gen, tri-tri).
Isailovits, s.n. (biu, cyl).

Isajev, J., s.n. (tau).
Ishenko & Kosova, s.n. (tri-tri).
Isle, R.W., 542 (cyl).
Ismail il-Chaikh, s.n. (cra, kot).
Issa, 381 (gen).
Ivanova, K.V., 281, 291 (biu).
Ivanovka, s.n. (tri-tri).
Ivolas, P.L.J., s.n. (tri-tri).

Jackson, 5099 (umb), 15059 (spe-lig).
Jacobs, M., 6269 (kot), 6883 (cra).
Jacquemart, A., 75, 77 (tri-tri), 77/13 (cra), 84, 87 (tri-tri), 98/18 (tau), 114 (tri-tri).
Jacquemoud, F., B-28 (gen).
Jacquett, s.n. (tri-tri).
Jacquin, N.J. von, s.n. (cyl).
Jafri, S.M.H. & Akbar, 1660 (tri-tri), 1708 (tau).
Jahandiez, É., 318 (gen), 439 (ven), 525 (gen), 577 (tri-tri), 595 (ven), 607, 633 (gen), 719b (ven).
Jahn, s.n. (neg).
Jakimova, s.n. (tau).
Jako, 5711 (tri-tri).
Jakobs, 5803 (gen).
Jakobsen, 4 (cau), s.n. (tri-tri).
Jakubziner, M.M., s.n. (tau, tri-tri).
Jakuschevskii, E.S., 96 (cyl).
Jakushkin, 12 (tri-tri).
Jallu, s.n. (gen).
Jamin, s.n. (gen).
Janata, A., s.n. (cyl).
Janev, s.n. (biu).
Janka von Bulcs, V., s.n. (cyl).
Jansen, P., 351, 45419, 45421 (gen).
Jansen, P. & Wachter, W.H., 13877 (gen), 15037-15039 (spe-lig), s.n. (cyl).
Jaquet, F., s.n. (neg).
Jardine, N., 602 (cyl).
Jarmolenko, A.V., 42 (juv), 75 (tri-tri), 162 (tau), 210 (cra).
Jaroschenko, P.D., s.n. (biu, tau, tri-tri).
Javaceff, A., s.n. (biu, cyl, tri-tri).
Javornegy (Javornický?), s.n. (gen, neg).
Javosi, s.n. (gen).
Jeanjean, A.F., s.n. (gen).
Jeanpert, H.É., s.n. (cyl, ven).
Jelitzi(?), s.n. (neg).
Jelter, s.n. (biu).
Jerónimo, H., 122 (gen), 127 (tri-tri).
Jiménez, s.n. (tri-tri).
Joad, G.C., s.n. (cyl).
Jofé & Aaronsohn, A., 336, 337 (lon), 338 (spe-lig).
Joffe, 83, 217, 258, 381, 448 (tau), 485 (tri-tri), s.n. (tau).
Johansson, s.n. (cyl).
Johnson, B.L., s.n. (com-com, cra, juv).
Johnson, B.L. & Hall, s.n. (biu, cau, col, cyl, gen, kot, lon, neg, per-bra, per-per, sha, spe-lig, spe-spe, tri-tri, umb).
Johnston, E.L., 2005 (tri-tri), s.n. (cyl).
Joly, E., s.n. (gen, ven).
Joly, E. & al., 374b (gen).
Jomard, s.n. (bic-bic).
Jones, s.n. (gen).
Jordan, C.Th.A., s.n. (gen, neg, tri-tri, umb).
Jordan, C.Th.A. & Fourreau, J.P., s.n. (neg).
Jordan de Puyfol, s.n. (gen, neg).
Jordanov, D., s.n. (biu, cau, cyl, gen, spe-lig, tri-tri).
Jordanov, D. & Janev, s.n. (cyl, neg, tri-tri).
Jordanov, D. & Kitanov, B.P., s.n. (tri-tri).
Jordanov, D. & Volev, s.n. (cyl).
Josuf, s.n. (spe-spe).
Jourdan, P., s.n. (gen).
Jousset, s.n. (gen, tri-tri).
Juillard, s.n. (gen).
Jul(?), s.n. (cyl).
Julien, A.C., s.n. (neg).
Jungstand, s.n. (tri-tri).
Jurkovski, 26/46, s.n. (cyl).
Jury, S.L. & Warren, J.R., 65 (biu, gen).
Jury, S.L. & al., 8580 (gen), 8854 (tri-tri).
Jussieu, A.H.L. de, s.n. (gen, tri-tri).

K (Kotschy?), 3942 (kot).
Kaae, N., s.n. (gen, tri-tri, umb).
Kabát, J.E., s.n. (gen).
Kajumov, s.n. (tri-tri).
Kajumov & Vvedensky, A.I., s.n. (tri-tri).
Kalinika & Moreva, s.n. (tri-tri).
Kalinin, S., 132 (tau).
Kalshnikova, 81 (tri-tri).
Kamachina, s.n. (tau).
Kamachina & Pachina, s.n. (tau).
Kamal, s.n. (per-bra).
Kamelin, R.V., 164 (tau), 1348 (cra), s.n. (tau)
Kamelin, R.V. & al., 878 (tau).
Kammerer, G., s.n. (tri-tri).
Kaplunovsky, 6 (cyl).
Karamanoglu, K., s.n. (tri-tri, umb).
Karbalajev, s.n. (tau).
Kardin, s.n. (tau).
Karjagin, I.I., 4356 (biu), s.n. (biu, kot, tau, tri-tri).
Karotkina & Vassilkovskaja, A.P., 42 (cra).
Kárpáti, Z.E., s.n. (cyl).
Kasapligil, B., 416 (cyl), 2388 (per-per), s.n. (gen, per-per, tri-tri, umb).
Kasapligil, B. & Mouterde, P., 2277 (per-per), 2674 (per-bra).

Král, M., 1589 (cyl).
Kralik, J.L., 342, 852 (gen), s.n. (gen, kot).
Kramer, K.U., 925 (cyl), 5111 (bic-bic), 6725 (kot, per-per).
Kramer, K.U. & Westra, L.Y.Th., 3386 (gen), 3417 (tri-tri), 4194 (gen).
Krasnov, A.N., s.n. (cyl).
Krause, K., 4344 (neg), 4379 (biu), 4998, 5463 (umb), 5486 (tri-tri), 5500 (spe-lig), s.n. (tau).
Krebs, O., s.n. (gen).
Krendl, F.X., s.n. (gen).
Krieger, K.W., s.n. (uni).
Krilsova, 270 (tri-tri).
Krinievietsky, s.n. (tau).
Kristiansen, J., s.n. (biu).
Krüger, s.n. (gen).
Krul, 184 (kot).
Krumarig, s.n. (neg).
Krummel, s.n. (gen).
Krylov, G.V., s.n. (cyl).
Kryshtofowicz, A.N., s.n. (biu, gen).
Kuckuck, H., 40b (cyl), 56/2212 (tri-tri), 56/2318, 94a3, 94a5, 94a8, 94a10, 94a11, 94a12, 94l1 (cyl), 102, 104m1, 142a, 150b1 (cyl), 150b2 (cyl), 176 (col), 197a1, 197a2, 213f2, 218d, 220e, 223h, 226c, 229c, 230e1, 230e2, 231a, 236e, 241c, 244f, 245d, 247c (cyl), 249h, 249k (umb), 250d, 259c (cyl), 262b (umb), 265e, 266c, 273d, 276c (cyl), 287e2 (per-per), 327f (cyl), 331 (tau), 388e, 391f, 452d (cyl), 457d (umb), 463c (umb), 468b, 479c (cyl), 480c (umb), 499a (col), 499b (cyl).
Kudrjaschev, S.N., 20, 34, 61 (cra), 69 (cyl), 124 (tri-tri), 132 (cyl), 212 (tri-tri), 246 (cyl), 249, 278 (tau), 348 (cyl), 483 (cra), 489 (tri-tri), 501 (cra), 514 (tri-tri), 611 (cyl), 770 (tri-tri), 1198 (cyl), s.n. (cra, kot, tri-tri).
Kudrjaschev, S.N. & Sumnevicz, G.P., 36 (cyl), 190, 311, 331, 333, 338, 339, 359 (cra), 384 (cyl).
Kügler, P., s.n. (per-per).
Kultiasow, M.W., 380 (tau), 475 (tri-tri), 504, 521, 645, 685 (cra), s.n. (tau, tri-tri).
Kultiasow, M.W. & Grannitov, 20, 83 (tau).
Kümmel, 3 (gen), 4 (tri-tri).
Kuntze, C.E.O., s.n. (gen, kot, tau).
Kunz, s.n. (cyl).
Kunze, G., s.n. (gen).
Kurachov, s.n. (tau).
Kurbandurdeev, s.n. (tau, tri-tri).
Kurtto, A., 3243 (tri-tri).
Kuzmanov, B.A., s.n. (biu, cyl).
Kyprianu, 1486 (biu).
Labillardière, J.J.H. de, s.n. (lon, vav).
Labruns, s.n. (ven).
Lacaita, Ch.C., 219b (tri-tri), 432 (biu), 5783 (tri-tri), s.n. (biu, cau, com-com, gen, tri-tri, uni).
Lace, J.H., 3779 (tau).
Ladero, M. & Santos, s.n. (ven).
Lagard, s.n. (tri-tri).
Lagger, F.J., s.n. (neg).
Lagowski, s.n. (cyl, tau, tri-tri).
Lagrèze-Fossat, A.R.A., s.n. (gen, tri-tri).
Laguesse, s.n. (neg).
Laguia, s.n. (ven).
Laguna y Villanueva, M., s.n. (ven).
Lakatoş, s.n. (tri-tri).
Lamarck, J.B.A.P de Monet de, s.n. (ven).
Lambinon, J., 76/162 (per-bra), 85/87 (exsicc. 12772) (tri-tri), 87/461 (gen), 87/462 (neg).
Lambinon, J. & Duvigneaud, J., 76CO541 (gen).
Lamond, J.M., 941 (tau), 2859 (kot), 3136 (tau), 3200 (Rechinger itinera 40172) (biu).
Lamond, J.M. & Transhahr, 3451 (kot).
Lanc, s.n. (biu).
Lancaster, Ch.R., 79 (tri-tri).
Lang, s.n. (cyl).
Lange, J.M.Ch., s.n. ('97') (biu, gen, neg), s.n. ('98') (biu, gen, neg), ('99') (tri-tri), s.n. (biu, gen, neg, spe-spe, tri-tri).
Lányi, B., s.n. (cyl).
Lapp, s.n. (gen, neg).
Larcher, s.n. (neg).
Lardière, J.E., s.n. (gen, tri-tri).
Larsen, 59, 24197 (gen).
Larsen & al., 35865, 36006 (gen).
Lattermann, s.n. (tri-tri).
Laukkonen, 377 (tri-tri).
Laupmann, s.n. (cyl).
Laus, H., s.n. (cyl, spe-lig, ven).
Lavelus, s.n. (tri-tri).
Lavrov, N.N., s.n. (tri-tri).
Lawalrée, A.G.C., 397, 9267 (gen).
Le Cesve, R.L.R., s.n. (ven).
Le Sourd, s.n. (ven).
Le Grand, O., s.n. (ven).
Leadley, E.A. & Petty, 61 (gen).
Leadley, E.A. & al., 369, 378, 436 (gen).
Leal, 350 (gen), 350b (biu).
Leatherdale, D., 19 (tri-tri), 42 (umb).
Lèbre, 293 (gen).
Lebrun, 2794, s.n. (gen, tri-tri).
Leenhouts, P.W., 2183 (gen).
Leeuwenberg, A.J.M., 1466 (gen), 1531 (neg).
Lefebvre, A., 168 (ven), s.n. (cyl, gen).
Lefranc, E., s.n. (biu, gen).
Legitman & Matricevič, s.n. (neg).

Legrain, L., s.n. (tri-tri).
Lehmann, A., s.n. (cyl, neg).
Leins, P., s.n. (gen).
Lemke, W., 6353 (neg), 6677 (gen).
Lemos, s.n. (gen).
Lenander, s.n. (gen, neg).
Lenormand, S.-R., 12 (spe-spe), s.n. (com-sub, gen, neg, spe-lig, tri-tri, uni).
Leonesi, s.n. (neg).
Leonis, Ch., 117 (biu).
Lepeschkin, S.N., s.n. (cra, tau, tri-tri).
Lequders, 1089 (gen).
Leredde, C., s.n. (gen, ven).
Leresche, L.F.J.R., 2 (tri-tri), s.n. (cyl, gen).
Lesnis, 92 (gen, tri-tri).
Lespinasse, J.M.G., s.n. (gen).
Lester-Garland, L.V., s.n. (cyl).
Letourneux, A.-H., 171 (bic-bic), s.n. (bic-bic, gen, kot, per-bra, tri-tri, ven).
Leutwein de Fellenberg, Ph.Ch.L., s.n. (cau, com-sub, neg, tri-tri).
Leuzinger, M., s.n. (gen).
Levandovski, B.G., s.n. (biu, cyl, gen, tau, tri-tri).
Levier, E., s.n. (biu, gen, neg, tri-tri).
Lewalle, J., 6878 (gen), 8317, 8397 (per-per), 8476 (tri-tri), 8536 (ven), 9070 (per-per, tri-tri), 9395, 9536, 9834 (gen) 10185 (per-per), 11476 (gen).
Li, A.D. & Niazov, 153, 430 (cra).
Libra, da, 2248 (neg).
Lichtenberg, s.n. (cyl).
Linczevski, I.A., 126, 535 (tri-tri), 575, 582, 626 (tau), 1097, s.n. (tri-tri).
Linczevski, I.A. & Maslennikova, T.I., 30, 77 (tau).
Linczevski, I.A. & Seifulin, E.M., 534 (cra).
Lindberg, H., 3274 (ven), 3680 (tri-tri), s.n. (biu, tri-tri).
Lindemann, E. von, s.n. (cyl, neg).
Linder, s.n. (gen).
Lindsay, N., 231 (cra), 313 (tri-tri), 943 (tau).
Link(?), s.n. (com-sub).
Linton, s.n. (cau).
Lipsky, W.I., 79 (tau), 430, 461, 649, 894 (tri-tri), 908, 921, 922 (tau), 2789 (tri-tri), s.n. (biu, cyl, neg, tau, tri-tri).
Lisa, D., s.n. (gen, neg).
Liston & Monias, s.n. (gen).
Litvinov, D.I., 216, 216a (tri-tri), 217, 913, 2186 (tau), 2295 (tri-tri), 2296 (tau), 5333c (cyl), 5335 (biu), s.n. (biu, cyl, tau, tri-tri).
Litzler, s.n. (tri-tri).
Lloyd, s.n. (gen, tri-tri).
Lochenies, G., s.n. (gen, neg).
Lodelli, s.n. (gen).
Loftus, W.K., 9 (kot).
Loiseau, s.n. (tri-tri).
Lojacono, M., 105 (tri-tri), 106 (neg), s.n. (tri-tri).
Lombard, H.-C., s.n. (neg).
Long, s.n. (gen, ven).
Loon, van, vL 93 (gen).
Lopez Guillén, J.E., s.n. (gen).
Lorent, J.A. von, s.n. (biu, gen, ven).
Loret, H., s.n. (biu).
Loret, H. & Barrandon, A., s.n. (gen, neg, tri-tri).
Loring, C.G., s.n. (bic-ana, bic-bic).
Losa-Quintana, J.M., s.n. (gen).
Loser, s.n. (neg, tri-tri).
Lott, s.n. (umb).
Loucky, s.n. (ven).
Louis, s.n. (tri-tri).
Lousley, J.E., s.n. (gen, spe-lig, tri-tri).
Lovelius, O.L., s.n. (tau, tri-tri).
Lowne, B.Th., s.n. (gen, per-per).
Loza, 3378 (tri-tri).
Lubau(?), s.n. (gen).
Lucé, J.W.L. von, s.n. (tri-tri).
Ludlow, F. & Sherif, A.S., 8121 (tau).
Lusina, G., s.n. (gen).
Lute, s.n. (cyl).
Luttman, 137 (gen).
Lutkemüller, J., s.n. (gen).
Lyle, s.n. (gen).
Lyshede, s.n. (kot, per-per).

Maesen, L.J.G. van der, 2094 (tri-tri).
Magnin, A., s.n. (biu, neg).
Magulaev, A.Y., s.n. (cyl).
Maier & Den Nijs, J.C.M., 214 (gen).
Maillard, P.N., s.n. (gen).
Maille, A., s.n. (neg).
Maillefer, A., 37059 (cyl).
Maillet, s.n. (gen).
Maire, G., s.n. (kot, lon).
Maire, R.Ch.J.E., 98 (gen), s.n. (bic-bic, cyl, gen, neg, per-per, tri-tri, ven).
Maire, R.Ch.J.E. & Weiller, M., 58 (per-per), 126 (tri-tri), 1637 (gen), 1638, 1639 (kot), 1640 (gen, kot), 1641 (kot), 1642, 1643 (bic-bic), 1644 (gen, ven), 1645 (ven), s.n. (kot, per-per, ven).
Maire, R.Ch.J.E. & Wilczek, E., 58, s.n. (gen, per-per, ven).
Maitland, Th.D., 36 (gen).
Major, F., 62, 62a (biu).
Makki, B., 3294 (biu), 3728 (umb).
Maksad, 263 (tri-tri).
Malato-Beliz, J.V.C., 16300 (tri-tri).
Malicky, H., s.n. (gen).

Petersen, s.n. (gen, ven).
Petit, 3052, s.n. (gen).
Petrov, V.A., 137, 149, s.n. (tri-tri).
Petry, H., s.n. (bic-bic, per-per).
Petter, F., 5, 12 (gen), 13 (tri-tri), s.n. (biu, gen, tri-tri).
Petunnikow, A.N., s.n. (biu).
Peyron, E., 899 (gen), 1516 (spe-spe), 1645 (per-bra), 1646 (sea), 1803 (vav), 5392b (sea), 53927 (tri-tri), s.n. (lon, per-per, sha, spe-lig, spe-spe).
Peyronel, B., s.n. (neg, tri-tri).
Pfund, J.D.Ch., s.n. (bic-bic).
Philippi, R.A., s.n. (neg).
Phillips, 34 (tri-tri), 34A (neg).
Phitos, D., 19706 (com-com).
Picard, E., s.n. (gen).
Piccone, A., s.n. (gen).
Pichler, Th., 691, 692 (cau), 1709 (tri-tri), s.n. (biu, cra, cyl, gen, neg, tri-tri, uni) .
Pilát, A., 2333 (cau), 3754 (umb), 3785 (tri-tri).
Piltz, J., 555 (tau).
Pin, s.n. (gen, tri-tri).
Pinkhof, M., s.n. (cyl).
Pioth, 265 (per-per).
Pirotta, P.R., s.n. (gen).
Pitard, Ch.-J.M., 537, 982 (gen, per-per), 1259, 1260 (per-per), 1261 (gen, ven), 1262, 1263 (gen), 1327 (tri-tri), 1511 (gen), 2306, 2648 (ven), s.n. (gen, per-bra).
Pitzer & al., 863 (tri-tri).
Pjataeva, A.D., 129, 208 (tau), 324, 479 (tri-tri), 1442 (cyl), s.n. (cra).
Pjataeva, A.D. & Abdullaev, 294 (tri-tri).
Pjateava, A.D. & Chonazarov, 59 (cyl).
Pladeck, M., s.n. (neg).
Planche, 85 (biu).
Plante, R., s.n. (bic-bic).
Platt, J.W.O., 438 (biu, gen).
Plitchinsky, s.n. (cyl).
Ploeg, D.T.E. van der & Jansen, P., s.n. (spe-lig).
Podlech, D., 7911 (tri-tri), 10881 (kot), 10996 (tri-tri), 11304 (tau), 11382, 11500, 11895, 12804 (tri-tri), 17654 (tau), 18033 (tri-tri), 18327 (cyl), 20467 (tau), 21487 (cra), 21623, (tri-tri), 28126, 37731 (neg), 37752 (cyl), 38669, 38861 (gen).
Podlech, D. & Jarmal, 29849 (tau).
Poiret J.L.M. (Abbé), s.n. (gen).
Pojarkova, T., 39, 112 (cyl), s.n. (biu).
Polunin, O.V., 6714, 8685 (gen), 13963 (umb).
Pomel, A.N., 171 (ven), s.n. (gen, ven).
Pommergue, s.n. (ven).
Pons, A., s.n. (gen).
Pons-Sorolla, D. & Suzanna, A., 267 (gen).
Poore, M.E.D., 563b (spe-spe).
Poplavskaja, H.S., s.n. (cyl).
Popov, M.G., 49, 102, 119 (tri-tri), 126 (tau), 207, 212, 228, 342, 342a (cra), 357 (tri-tri), 398b (cra), 457 (tri-tri), 462 (cra, tau), 462a, 471 (cra), 541a (juv), 683, 735, 736, 811a (tri-tri), 977, 1457b (tau), s.n. (cyl, tau, tri-tri).
Popov, M.G. & Vvedensky, A.I., 337, 540 (cra), 543, 806 (tri-tri).
Popova, G.M., 250 (tri-tri).
Porbas, de, s.n. (cyl).
Porta, P., s.n. (gen, neg).
Porta, P. & Rigo, G., 489 (tri-tri), 490, 740 (ven), s.n. (gen, ven).
Portenschlag-Ledermayer, F. von, s.n. (cyl, gen).
Post, G.E., 39 (vav), 44 (gen), 135 (biu), 136 (gen), 153, 169 (per-per), 236, 305 (per-per), 333 (tri-per), 345 (spe-spe), 347, 536 (per-per), 612 (tri-tri), 703, 704 (gen), 922 (per-per), 994, 995 (per-per), s.n.(2509) (per-bra), s.n.(5210) (tri-tri), s.n.(5211) (bic-bic), s.n.(5212) (spe-spe), s.n. (bic-bic, biu, col, cra, gen, kot, lon, per-bra, per-per, sha, spe-spe, tri-tri, umb, vav).
Post, B. van Dyke, 441, 458 (spe-spe), A2(1) (com-sub), s.n. (gen, neg, per-per).
Potni(?), s.n. (cyl).
Potts, F.H., s.n. (ven).
Pouzolz, P.M.C. de, s.n. (neg).
Powell, s.n. (gen).
Pratov, N.P., 797 (cyl), 798 (tri-tri).
Pratov, N.P. & al., s.n. (cyl).
Predjechenski, 161 (tau).
Prescott, s.n. (biu, tri-tri).
Presl, C.B., s.n. (tri-tri).
Preston, 49 (biu), s.n. (gen).
Priachin, s.n. (tau, tri-tri).
Price, 973 (biu), 1203 (tri-tri).
Prilipko, L.I., s.n. (kot, tau, tri-tri).
Priobazenski, s.n. (tri-tri).
Prior, s.n. (biu, cyl, gen, tri-tri).
Pripad, 210 (cra).
Probst, R., s.n. (cyl, gen).
Profeta, G., s.n. (per-bra, neg).
Prokhanov, J.I., 180 (tau), 280 (cyl), 281 (tri-tri), 331/549 (tau), 332, 498 (tri-tri).
Prokharova, s.n. (tri-tri).
Proskuryakova, G.M. & Belianina, N.B., s.n. (tau).
Prost, T.C., s.n. (gen, tri-tri).
Puccinelli, B.L., s.n. (gen).
Pugsley, H.W., s.n. (gen).
Puring, N.J., s.n. (cyl).
Putchkova, 30 (cyl).

Romain, Ch., 1838, s.n. (gen).
Roman, N., s.n. (biu).
Romano, G.B., s.n. (gen).
Romeé, s.n. (bic-bic, kot).
Romieux, H.A., 1119, 1120 (gen), s.n. (gen, neg).
Ronniger, K., s.n. (gen, neg, tri-tri).
Ronsivalle, s.n. (gen).
Rosanov, S.M., 173, 214 (tri-tri).
Rose, 71040 (tri-tri).
Roshevitz, R.J., 30 (tau), 299 (umb), 334 (tri-tri), 339 (tau), 686 (cyl, tau), 697 (cra, tau, tri-tri), s.n. (tri-tri).
Roshkova, O.I., s.n. (tau).
Ross, s.n. (neg, tri-tri, umb).
Rossetti, C., s.n. (neg).
Rossi, L., 2239 (gen), 6046 (gen, tri-tri), 6062 (gen), s.n. (gen, tri-tri).
Rossmässler, E.A., s.n. (gen).
Rostan, E., 105 (tri-tri), s.n. (gen, neg).
Roth, A.W., s.n. (gen, tri-tri).
Roth(?), s.n. (gen).
Röthlisberger, s.n. (biu, col).
Rothmaler, W.H.P., 1401, 10930, 15407 (gen), 15408 (tri-tri), 16119 (gen), 17023 (biu).
Rouanet, s.n. (gen).
Rousseau, s.n. (gen).
Rouweler, M., 80-26 (gen).
Roux, H, 4801 (neg), 4802 (tri-tri), s.n. (Exsicc. Billot 2984) (ven), s.n. (biu, cyl, gen, neg, tri-tri, ven).
Roux, H. & Blaisse, s.n. (ven).
Rubtsova, s.n. (tau).
Rudolph, s.n. (gen).
Ruffier-Lanche, R., s.n. (gen).
Ruget, 504, s.n. (tri-tri).
Ruhmer, G.F., 399 (kot), 401 (bic-bic), s.n. ('401') (bic-ana), s.n. (bic-bic, kot, ven).
Ruiz Moura, 752 (gen).
Runemark, H., 1670, 1769 (biu), 1855, 2014, 2158 (gen), 2181 (per-per), 2255, 2326 (gen), 2548 (cau), 2597 (biu), 2693 (gen), 2840 (biu), 2928 (gen), 3149 (biu), 3150, 3150b, 3199, 3305 (cau), 3371 (biu), 3603 (cau), 3608 (biu), 3734 (com-com), 3735 (gen), 3893 (biu), 3894, 4019 (cau), 4087, 4159 (gen), 4238 (biu), 4242 (cau), 20038, s.n. (gen).
Runemark, H. & Bentzer, B., 26107, 26552, 26728, 27371 (biu), 27424, 27999 (per-per), 28776 (com-com), 28777 (tri-tri), 28778, 29222 (biu), 29279 (cau), 29280 (com-com), 29537 (per-per), 29573 (tri-tri), 29660 (cau), 29869 (tri-tri), 29872 (per-per), 29878 (cau), s.n. (tri-tri).
Runemark, H. & Bothmer, R. von, 46548 (com-sub), 46579 (umb), 46598 (com-sub), 46726 (tri-tri), 46867 (gen), 47051, 47068 (biu), 47069 (com-sub), 47149 (biu), 47188 (com-sub).
Runemark, H. & Engstrand, L., 35019, 35258 (tri-tri), 35415 (biu), 35500, 35508 (per-per), 35745, 35827, 35939 (biu), 35957 (gen), 35993 (biu, cau), 36249 (per-per, tri-tri), 36303 (tri-tri), 36323 (per-per), 36470 (cau), 36770 (biu), 36877 (com-com), 37160 (tri-tri), 37189 (com-com), 37206 (gen), 37234 (cau), 37377, 37400 (tri-tri), 37463 (com-com), 37814, 37998, 38071 (cau), 38103, 38142 (tri-tri), 38168 (per-per), 38235 (tri-tri).
Runemark, H. & Nordenstam, B.R., 13075 (per-per), 13145 (tri-tri), 13209 (com-sub), 13286, 13300 (com-com), 13362 (biu), 13458, 13459, 13622 (cau), 13687 (biu), 13752, 14026 (cau), 14320, 14955 (biu), 15760, 15853 (com-com), 16140 (tri-tri).
Runemark, H. & Sardabi, 23395 (tri-per).
Runemark, H. & Snogerup, S.E., 5200 (biu), 5545 (per-per), 6791 (gen), 7238 (biu), 7794 (cau), 8129, 8316 (biu), 8409 (com-com), 8430 (biu), 8449 (com-com), 8463, 8597 (biu), 8648 (com-com), 8950, 9042 (cau), 9081, 9098 (tri-tri), 9098a (biu), 9106, 9734 (tri-tri), 9439 (biu), 9917 (cau), 9982, 10021 (tri-tri), 10112 (per-per), 10123 (com-com), 10123a (cau), 10453 (biu), 10779, 10875 (com-com), 11643 (tri-tri), 11815 (cau), 12156, 17032 (biu), 20766 (neg), 21854 (biu), 47692 (gen), 47725 (cau), 47754 (biu).
Runemark, H. & Svensson, L., 48041 (per-per), 48081 (com-sub), 48161 (tri-tri), 48254 (com-sub), 48633 (tri-tri), 48634, 48704 (com-sub), 48761 (tri-tri), 48768, 48787 (com-com), 48809, 48817, 48869, 48933 (tri-tri).
Runemark, H. & al., 3229, 3876 (tri-tri), 17106 (biu), 17313 (cau), 17341, 17455, 17651, 17784, 17928 (biu), 17965 (cau), 17992 (gen), 18219 (biu, umb), 18282, 18705 (gen), 18793 (neg), 18822, 18955 (gen), 19044, 19212 (umb), 19494 (neg), 19643 (cau), 19775 (umb), 19838 (tri-tri), 40331, 40503 (per-per), 41436 (com-com), 41447 (per-per), 44404 (cau, com-sub), 45184 (neg).
Russell, s.n. (per-per, umb).
Rutten-Pekelharing, C.J., 128, 146 (gen).
Ryves, T.B., s.n. (cyl, tri-tri).

's.coll.': 'A.B.' s.n. (neg), 'B.' s.n. (tri-tri), 'C.B.' s.n. (cyl), 'Col. Chesney's Expedition' 207 (kot), 'F.S.' (Sennen?) s.n. (neg), 'G.V.' s.n. (gen), 'M.T.' s.n. (gen).

Schnell, 63, s.n. (gen).
Schoenmakers, A., 1973 (gen).
Scholz & Baillargeon, G., 88a (ven).
Schöne, s.n. (cyl).
Schousbou, P.K.A., s.n. (gen, tri-tri, ven).
Schultz, F.W., 162 (gen) 163 (gen, neg), 164 (neg, tri-tri), 182 (cyl), 1163 (tri-tri).
Schulz, s.n. (cyl).
Schumann, W., s.n. (cyl, tau, tri-tri).
Schwarz, O., 581 (cau).
Schweinfurth, G.A., s.n. (bic-bic, kot, lon, per-per).
Schweinfurth, G.A. & Riva, D., 139 (kot).
Scriba, L.Ph.K., s.n. (gen).
Seber, s.n. (neg).
Seetzen, U.J., s.n. (gen).
Seffai, s.n. (neg).
Segal, T., 84 (tri-tri), 121 (gen).
Segret, L., s.n. (gen).
Seguenza, G., 59 (tri-tri), s.n. (gen).
Seidlitz, N.K. von, 1406 (tri-tri), s.n. (tau).
Seifulin, E.M., s.n. (cra, neg, tau).
Seifulin, E.M. & Pernijazov, s.n. (tri-per).
Seifulin, E.M. & al., s.n. (cra, tau, tri-tri).
Seitter, s.n. (cyl).
Seler, E.G., s.n. (gen).
Seligman, R.J.S., 8 (gen).
Sellot, s.n. (gen).
Semple, A.T., 12, 23 (per-per), 32 (per-per), 45 (kot), 76 (per-bra), 83 (kot), 277 (gen), 288d (per-bra), 305c (bic-bic), 305f (biu), 402, 427 (tau).
Sennen, frère [= Grenier-Blanc, É.M.], 1045, 1381, 3233, 3234 (neg), 3284 (neg), 4015 (neg, spe-spe), 4065 (neg), 4220 (gen), s.n. (biu, gen, neg, spe-lig, tri-tri, ven).
Sennen, frère & Elias, (frère) H., 4276 (spe-lig), s.n. (tri-tri).
Sennen, frère & Mauricio, (frère) H., 8981, 9622 (ven), 9623 (tri-tri), s.n. (gen, tri-tri).
Semukhova, s.n. (tri-tri).
Setten, K. van, 437 (gen).
Shabetai, J.R., 44 (per-per), 45 (bic-ana), 46 (lon), Z 981 (kot), Z 1032 (bic-bic), Z 2211, Z 3276 (kot), Z 3277 (per-bra), Z 3278 (kot), Z 3280, Z 3281, Z 3727 (bic-bic), F 4667 (kot), F 4806 (bic-ana), Z 5944 (bic-bic), 6067 (kot), Z 7390 (bic-bic), s.n. (bic-bic, kot).
Sharif, G., 438 (tau).
Shchukin, G., 9446 (col).
Sheard, J.W., 33 (tau).
Shelkownikow, A.B., 11943 (tri-tri), s.n. (biu, cyl, tri-tri).
Shelkownikow, A.B. & Kara-Murza, s.n. (tau, tri-tri).
Shelkownikow, A.B. & Schipczinski, N.V., 16 (tau).
Sheluch, s.n. (cyl).
Shipanova, s.n. (tau).
Shonazarov, 520 (tri-tri).
Shtechman, s.n. (tau).
Shuttleworth, R.J., s.n. (gen, neg).
Shuttleworth, R.J. & Huet du Pavillon, A., s.n. (biu).
Sibthorp, J., s.n. (cau).
Sickenberger, E., s.n. (per-bra).
Siddiqi, M.A. & Ramadan, 2428-7 (ven), 2450-Z (gen).
Sieber, F.W., s.n. (cau, gen, tri-tri).
Siegfried, H., s.n. (gen).
Siehe, W., 123 (umb), 477 (spe-spe), s.n. (gen).
Sierra, s.n. (gen, tri-tri).
Sillinger, P. & Deyl, M., s.n. (neg).
Silva, da, 2503 (gen), 2562, 2714 (neg).
Silva, Sinhó da, 6870 (tri-tri).
Silvestre Domingo, S., 2236/68 (tri-tri).
Simenov, 290, 292 (tau).
Simon, Ch., 71-296 (ven), s.n. (cyl, tri-tri).
Simonetti, s.n. (gen).
Simonovicz, I.G., s.n. (cyl).
Simony, F., s.n. (cyl).
Simpson, N.D., 2025 (bic-bic), 2503 (kot), 2523, 2563 (bic-bic), 3145 (bic-bic), 3248 (per-per), 3323 (lon), 3274 (kot), 3946 (bic-bic), 4575 (kot), 4728 (per-per), 4734 (bic-bic), 4750 (lon), 4778 (bic-bic), 36449 (gen), 39095 (kot), 39152 (bic-bic), 39178 (ven), 39460 (kot), 39471 (bic-bic), 39460 (biu), 39486 (per-bra), 332.225(2) (ven), 361197 (gen), s.n. (gen).
Sinjaev, 225 (tri-tri).
Sinserlink, 472 (tau).
Sintenis, P.E.E., 178 (biu), 187 (gen), 187 (umb), 207 (biu), 233 (biu, tri-tri), 233b (neg), 314 (tau), 346 (tri-tri), 362 (gen), 400 (ven), 540 (biu), 542 (tri-tri), 582 (umb), 780 (cyl), 907 (tri-tri), 1070 (spe-spe), 1633 (tri-tri), 1639 (col), 1640, 1870 (tri-tri), 2039 (umb), 2233 (tau), 2234 (tri-tri), 2244 (tau), 2646 (col, tri-tri), 3580 (cau), 4542 (tri-tri), 4543 (spe-lig, spe-spe), 9356 (cau), s.n. (gen, spe-lig, spe-spe, tri-tri, umb).
Sintenis, P.E.E. & Bornmüller, J.F.N., 470 (tri-tri), 1132 (gen).
Sintenis, P.E.E. & Rigo, G., 657 (biu, gen, tri-tri), s.n. (biu, gen).
Sipman, H.J.M., 42, 90 (gen).
Sjöbeck, s.n. (cyl).
Sjöstedt, L.G., 54, 107 (gen).
Skovgaard Christensen, P., 2434, s.n. (gen).

Slageren, M.W. van & Guarino, L., MSLG-89070H, MSLG-89072H (bic-bic), MSLG-89073H (com-com), MSLG-89076H (bic-bic), MSLG-89081H (tri-tri).

Slageren, M.W. van & Humeid, B.O., MSBH-88138H (per-per), MSBH-88145H (lon).

Slageren, M.W. van & Istar, A., MSAI-90114H (ven), MSAI-90115H (gen).

Slageren, M.W. van & Jaradat, A.A., MSAJ-88001H (vav), MSAJ-88002H (kot), MSAJ-88004H (vav), MSAJ-88005H (kot), MSAJ-88006H (kot), MSAJ-88007H (vav), MSAJ-88009H (sea), MSAJ-88010H (vav), MSAJ 88011H, 88012H (gen), MSAJ-88013H (kot), MSAJ-88015H (per-per), MSAJ-88016H (sea), MSAJ-88017H, MSAJ-88019H (sea), MSAJ-88022H (vav), MSAJ-88023H (sea), MSAJ-88025H (vav), MSAJ-88028H, MSAJ-88029, MSAJ-88031H, MSAJ-88033H, MSAJ-88035H (per-per), MSAJ-88037H (kot), MSAJ-88038H (gen), MSAJ-88039H (vav), MSAJ-88040H (sea), MSAJ-88041H (per-per), MSAJ 88043H (biu), MSAJ-88051H (per-per), MSAJ-88052H (sea), MSAJ-88053H (biu), MSAJ-88055H (per-per), MSAJ-88056H (sea), MSAJ-88064H (per-per), MSAJ-88065H (vav), MSAJ-88067H (sea), MSAJ-80o72H (vav), MSAJ-88073H, MSAJ-88075H (kot), MSAJ-88076H (vav), MSAJ-88077H (sea), MSAJ 88083H (biu), MSAJ-88084H (gen), MSAJ-88085H (per-per).

Slageren, M.W. van & Mir-Ali, Gh., MSGM-88097H (per-per), MSGM-88101H (tri-tri), MSGM-88107H (kot).

Slageren, M.W. van & Shibli, R., MSRS-88044H (gen), MSRS-88045H (per-per), MSRS-88046H (biu), MSRS-88048H (per-per), MSRS-88049H (lon).

Slageren, M.W. van & Sweid, F., MSFS-91001H, MSFS-91002H (cra), MSFS-91003H (vav), MSFS-91004H (cra), MSFS-91005H (vav), MSFS-91006H (cra), MSFS-91007H (vav), MSFS-91024H (cra), MSFS-91025H, MSFS-91026H (vav), MSFS-91027H (biu), MSFS-91028H (tri-tri), MSFS-91029H (kot), MSFS-91030H (vav), MSFS-91032H (cra), MSFS-91033H (tri-tri), MSFS-91034H (vav), MSFS-91035H (tri-tri), MSFS-91036H (vav), MSFS-91038H (spe-spe), MSFS-91039H (spe-lig), MSFS-91040H (tri-tri), MSFS-91041H (juv), MSFS-91042H (spe-spe), MSFS-91043H (spe-lig), MSFS-91045H (spe-lig), MSFS-91046H (tri-tri), MSFS-91047H (spe-lig), MSFS-91048H (spe-spe), MSFS-91049H (tri-tri), MSFS-91051H (spe-spe), MSFS-91052H (spe-lig), MSFS-91053H (spe-spe), MSFS-91054H (biu), MSFS-91055H, MSFS-91056H (vav), MSFS-91057H, MSFS-91058H (spe-spe), MSFS-91064H (vav).

Slageren, M.W. van & Zacharieva, M., MSMZ-90237H (spe-lig).

Slageren, M.W. van & al., MSGMNR-88092H (per-per), MSGMNR-88093H (biu), MS-GMKO-88111H (tri-tri), MSGMKO-88112H (cau), MSGMKO-88117H (col), MSGMKO-88122H (tri-tri), MSGMKO-88125H (col), MSBHAJ-88175H (vav), MSBHAJ-88176H (bic-bic), MSBHAJ-88177H (biu), MSBHAJ-88189H (per-bra), MSWRKA-88212H (spe-spe), MSWRKA-88220H, MSWRKA 88227H (neg), MSWRKA-88230H (spe-lig), MSWRKA-88236H (biu), MSWRKA-88238aH (spe-spe), MSWRKA-88238bH (spe-lig), MSWRKA-88239H (per-per), MSWRKA-88266aH (biu), MSBHSS-89H001 (ven), MSBHSS-89001H, MSBHSS-89007H (kot), MSBHSS-89014H, MSBHSS-89017H (bic-bic), MSBHSS-89018H (per-bra), MSBHSS-89039H (kot), MSBHSS-89040H (ven), MSBHSS-89046H, MSBHSS-89047H (kot), MSBHSS-89048H (per-bra), MSBHSS-89058H (bic-ana), MSBHSS-89061H (bic-bic), MSBHSS-89062H (kot), MSBHSS-89063H (per-bra), MSLGAD-89092H, MSLGAD-89100H (bic-bic), MSL-GAD-89107H (tri-per), MSLGAD-89113-aH (tri-tri), MSLGAD-89113-bH (tri-per), MSL-GAD-89115H (tri-tri), MSLGAD-89117H (biu), MSLGAD-89121H (tri-tri), MSRIMZ-89151H (cyl), MSRIMZ-89152H (neg), MSMZNN-90248H (cyl), MSMZNN-90249H (tri-tri), MSMZNN-90283H (biu), MSFSHA-91008H (vav), MSPGZK-91072H (tri-tri), MSPGZK-91074H (cyl), MSPGZK-91075H (cra), MSPGZK-91078H, MSPGZK-91081H (tau), MSPGZK-91082H, MSPGZK-91092H (tri-tri), MSPGZK-91095H (tau), MSPGZK-91098H (tri-tri), MSPGZK-91099H (tau), MSPGZK-91106H (cra), MSPGZK-91116H (cyl), MSPGZK-91123H (tau), MSPGZK-91124H (tri-tri), MSPGZK-91125H (cyl), MSPGZK-91126H (tau), MSPGZK-91128H (cyl), MSPGZK-91130H (tri-tri), MSPGZK-91133H (cra), MSPGZK-91138H (tau), MSPGAP-91179H (cyl), MSP-GAP-91180H (tri-tri), MSPGAP-91181H (tau), MSPGAP-91202H (cyl), MSPGAP-91203H (tri-tri), MSSKKB-93008 (tri-per).

Sleven, s.n. (cyl).

Steven, Chr., s.n. (cyl, tau).
Stiefelhagen, H., s.n. (cyl).
Stock, 986 (tri-tri).
Stöhr, E., s.n. (gen).
Stojanov, N.A., s.n. (biu, cau, cyl, neg, spe-lig, tri-tri).
Stojanov, N.A. & Achtarov, B., s.n. (biu, neg).
Stojanov, N.A. & Kitanov, B., s.n. (biu, gen, tri-tri).
Stojanov, N.A. & Stefanoff, B., s.n. (spe-lig).
Stojanov, N.A. & al., s.n. (biu, cyl, tri-tri).
Stork, s.n. (gen).
Stratton, R., s.n. (cyl).
Strauss, Th., s.n. (cra, cyl, kot, tri-tri).
Stríbrný, V., s.n. (biu, cyl, gen, neg, per-bra, tri-tri).
Strid, P.A.K., 0805, 19615 (biu).
Strobl, P.G., s.n. (gen).
Strobler, 10 (bic-bic).
Strobly, s.n. (gen).
Stulova, s.n. (tri-tri).
Sturau, s.n. (gen).
Stutz, H.C., 46 (cyl), 313 (spe-lig), 3542 (spe-spe).
Suarez, s.n. (gen).
Sudre, H.L., s.n. (gen).
Sümbül, H., 1003 (per-per), 1993A (umb), 2976 (col).
Summerhayes, V.S., s.n. (gen).
Summers, 478 (cyl).
Suter, F.A., s.n. (cyl).
Sutherland, 356 (tau), 358 (kot).
Sutter, L478 (neg).
Sutton, 988 (gen).
Svenson, 8295 (cyl).
Swallen, J.R., 6285b (cyl).
Syngrassides, A., 11 (per-bra), 14 (per-per), 32 (gen), 1206 (bic-bic).
Synnott, D.M., s.n. (tri-tri).
Szépligeti, G., s.n. (cyl).
Szovits, A.J., 213, 463 (tri-tri), s.n. (tri-tri, ven).
Sztehlo, A., s.n. (cyl).

Tabacaru, 382 (biu).
Täckholm, G.V., s.n. (bic-ana, bic-bic, kot).
Täckholm, V., s.n. (bic-bic, kot, per-bra, ven).
Täckholm, V. & al., 8827 (kot, per-per), s.n. (bic-bic, kot, per-bra, per-per).
Tagamlitzky, 126, s.n. (cyl).
Tahir, H.M. & Al-Kaisi, 42579 (kot).
Takhtajan, A.L., s.n. (col, cyl, tau, tri-tri).
Takhtajan, A.L. & al., s.n. (col, cyl).
Talavera, S. & Valdés, B., 2886/74 (ven).
Talbot, s.n. (gen).
Tamamschjan, S.G., s.n. (cyl).
Tamamschjan, S.G. & Araratian, s.n. (tau, tri-tri).
Tamamschjan, S.G. & Maleev, V.P., s.n. (col).
Taubert, P.H.W., 76, 181 (gen), 345 (per-bra), 563 (ven).
Tausch, I.F., s.n. (spe-spe).
Tauscher, G., 14755, s.n. (cyl).
Taye, 3758 (cyl).
Taylor, 2740 (tri-tri).
Tchichatscheff, P.A., s.n. (neg).
Tedd, H.G., 293 (neg), 1578 (cau).
Teles, A. do Nascimento, 1189 (neg).
Teles, A. do Nascimento & Benta Rainha, 837 (tri-tri).
Temple, A.L., 14 (kot).
Tenacciano, s.n. (gen).
Tengwall, T.A., 7 (umb), 285b, 540, 725, 757 (tri-tri).
Tenore, M., s.n. (gen).
Termé, 10335E (tri-tri).
Terré, 3300 (ven).
Tesseron, Y.A., s.n. (gen).
Thellung, A. s.n. (cyl, gen, tri-tri).
Théveneau, A.V., s.n. (gen, neg, tri-tri, ven).
Thibault, s.n. (gen).
Thieret, J.W., 1873, 1874, 2294, 3310 (cyl).
Tholin, A., s.n. (biu).
Thomaphur, s.n. (tri-tri).
Thomas, 8229 (cyl), s.n. (cyl, gen, tri-tri, ven).
Thompson & al., s.n. (cau).
Thoney, s.n. (tau).
Thornberg, s.n. (biu, gen).
Thorne, R.F., 1332 (cyl).
Thorpe, 33157 (spe-lig), 33163, 33164 (tri-tri), 33165 (spe-lig, tri-tri), 33166 (cyl), s.n. (cra, cyl, spe-lig, tri-per).
Thurb, 19652 (spe-spe).
Thuret, G.A., s.n. (gen, neg).
Tichenko & Ferchau, 162, 134 (tau), 730 (tri-tri), 780 (tau).
Tidestrom, I.(F.), 13525 (gen).
Timochenko, s.n. (cra, kot).
Tinku & Redhead, 12282 (neg).
Titov, A.N., 262, s.n. (tau).
Titov, A.N. & Jelisejeva, s.n. (cra).
Tobey, C., 703, 1937 (tri-tri), 1940, 1940A (gen), 2044, 2304, 2674 (tri-tri).
Todaro, A., 1002 (gen), 1202, 1407 (tri-tri), s.n. (gen, ven).
Todor, I. & Molea, s.n. (cyl).
Tolfsrud, s.n. (tri-tri).
Toma, N., s.n. (cyl).
Tomášek, J., s.n. (tri-tri).
Tommasini, M.G.S. de, s.n. (gen, neg, tri-tri, uni).

Amblyopyrum

Birand, H. & Kasapligil, B., 675 (mut-mut).
Birand, H. & Zohary, D., 2669, 2682, 2790, *3006*, *3169*, *3171*, 3177 (mut-mut), 3227 (mut-lol), 3535 (mut-mut).
Bornmüller, J.F.N., 1732 (mut-lol), 1733, 1932 (mut-mut), 2561 (mut-lol).
Bot. Exp. Univ. Kyoto BMUK, 7-1-4-A, 7-1-4-B (mut-mut), 7-1-4-C (mut-lol), 7-1-4-D (mut-mut), 5501 (mut-lol), 5521, 5522 (mut-mut).

Cetik, 47 (mut-mut).
Chadzji-Zadée, s.n. (mut-lol, mut-mut).
Coode, M.J.E. & Jones, 2129A (mut-lol).

Davis, P.H. & Hedge, I.Ch., 31016 (mut-mut).
Davis, P.H. & al., 18881 (mut-lol), 19088 (mut-mut).

Erik, S., 1333 (mut-mut).

Gabrieljan, E.Tz., s.n. (mut-lol, mut-mut).
Gandilyan, P.A., s.n. (mut-lol, mut-mut)
Gassner, J.G., 408, 409, 629 (mut-mut).
Godfrey & Taysi, SH-5 (mut-lol).
Godron, D.A., 46 (mut-mut).

Hennipman, E. & al., 1969 (mut-lol), 1973 (mut-mut).
Holtz, J.F.L. & al., 00616 (mut-mut), 00617 (mut-lol).
Huber-Morath, A., 5545 (mut-lol).

Johnson, B.L. & Hall, s.n. (mut-lol, mut-mut).

Kasapligil, B., 399, s.n. (mut-mut).
Koster, M.J.A. de & al., 474 (mut-mut).

Nijhoff & al., 1969 (mut-lol).

Percival, J., s.n. (mut-mut).
Pilát, A., 2616 (mut-lol).

Scheibe, A., 1070 (mut-lol), 1071, 1236 (mut-mut), 1321 (mut-lol).
Sintenis, P.E.E., 823 (mut-lol, mut-mut), 4352 p.p. (mut-lol, mut-mut).
Slageren, M.W. van & al., MSPGNG-92047H p.p. (mut-lol, mut-mut).
Stutz, H.C., 341 (mut-mut), 342 p.p. (mut-lol, mut-mut), 438 (mut-lol).

Tchichatscheff, P.A., 725 (mut-lol), s.n. (mut-lol, mut-mut).
Touchy, A., 293 (mut-lol), 399 (mut-mut).

Walter, H.(K.), 1220 (mut-lol).

Zhukovsky, P.M., s.n. (mut-lol, mut-mut).
Zimmermann, F., s.n. (mut-mut).
Zohary, D., 67929 (mut-mut), s.n. (mut-lol, mut-mut).
Zohary, D. & al., 117742 (mut-lol).

x *Aegilotriticum*

Albaille, 6454 (trit).
Alioth, F.S., s.n. (trit).
Alleizette, A.Ch. d', s.n. (trit).
André, A., s.n. (gren).
Arnaud, s.n. (trit).
Aubouy, s.n. (trit).
Autheman, A., s.n. (lang, trit).

Bach, M., s.n. (trit).
Badarò, G.B., s.n. (trit).
Balansa, B., s.n. (trit).
Baraize, s.n. (trit).
Barrandon, A., s.n. (gren, lang, trit).
Bécourt, s.n. (spel).
Berliet, s.n. (trit).
Bertoloni, A., (s.n.) (trit).
Biche, s.n. (trit).
Boguslavskii, R.L., 199 (trit).
Bouaré & Roux, H., s.n. (lang).
Bourg, s.n. (trit).
Bourgeau, E., s.n. (trit).
Brooks, 9989 (sanc).

Chevalier, F.F., s.n. (trit).
Citarda, 13 (trit).
Constantin, s.n. (rode).
Cosson, E.S.-Ch., s.n. (trit).
Coste, H.J., s.n. (lang, trit).
Courcière, P., s.n. (trit).
Cuénod, A., s.n. (trit).

Degen, Á. von, s.n. (sanc).
Delavaux, s.n. (trit).
Delmas, J.P., *1823* (*trit*), s.n. (gren, lang).
Delpirard, s.n. (trit).
Diomède, s.n. (trit).
Drevemovsky, s.n. (sanc).
Ducellier, L.O., s.n. (rode).
Duffort, L., s.n. (trit).
Dunal, M.F., s.n. (spel).
Duval-Jouve, J., s.n. (spel, trit).

Fabre, E., s.n. (spel, trit).
Fedorov, A.A., s.n. (lang).

Feraud, s.n. (trit).
Fourès, 4229 (lang), s.n. (lang, trit).

Gandilyan, P.A., s.n. (sanc).
Gandilyan, P.A. & al., s.n. (ereb).
Garroute, s.n. (trit).
Gasparrini, G., s.n. (trit).
Gay, J.É., 539 (gren).
Geier, s.n. (sanc).
Girod, L.A., 14 (trit), s.n. (lang, trit).
Godron, D.A., s.n. (trit).
Govron (D.A. Godron?), s.n. (gren).
Grönland, J., s.n. (rode).
Gussone, G., s.n. (trit).

Haussknecht, H.K., s.n. (trit).
Héribaud, J., s.n. (spel).
Hohenacker, R.F., 699 (spel).
Holly, L. & al., DZA-258 (trit).
Huet du Pavillon, A., s.n. (trit).

Jordan, C.Th.A., s.n. (spel, trit), (s.n.) (spel).
Julien, A.C., s.n. (gren).

Laborie, 1832 (trit).
Lange, J.M.Ch., s.n. (lang).
Lanza, D., s.n. (trit).
Legret, s.n. (trit).
Leredde, C., s.n. (trit).
Lombard-Dumas, s.n. (trit).
Loret, H./Barrandon, A., s.n. (gren).

Magnien, s.n. (trit).
Mandon, E., s.n. (trit).
Martin, s.n. (lang).
McGregor, R.L., 36344 (sanc).
Micherjakov & Azarkuliev, s.n. (sanc).
Mottet, S.J., s.n. (spel).
Mouterde, P., 10290, 10348, 10354 (lang), s.n. (trit).

Perrot, É.C., s.n. (trit).
Peyron, E., s.n. (trit).
Planchon, J.É., s.n. (gren, trit).
Pommaret, É. de, s.n. (trit).
Popova, G.M., s.n. (sanc).

Reina, s.n. (trit).
Requien, E., s.n. (trit).
Revelière, E., 381 (trit).
Rolland, S., s.n. (trit).
Roux, H., s.n. (trit).
Roux, H. & Blaisse, s.n. (trit).

s.coll., s.n. (spel, trit).

Salle, Ch., s.n. (trit)
Serres, s.n. (trit).
Slageren, M.W. van & Boguslavskii, R.L., MSRB-90155H (sanc), MSRB-90158H (lang), MSRB-90169H, MSRB-90203H (sanc), MSRB-90204H (lang).
Slageren, M.W. van & Gandilyan, P.A., MSPG-92059 (sanc).
Slageren, M.W. van & al., MSBHAJ-88157H, MSBHAJ-88174H (trit), MSPGAP-91152H, MSPGAP-91159H, MSPGAP-91163H (sanc), MSPGNG-92051 (sanc), MSMNNL-93168H (sanc).
Stankevich, A.K. & Dorofeev, V.F., 2397 (sanc).

Thérébaud, (spel).
Théveneau, A.V., s.n. (trit).
Timbal-Lagrave, P.M.É., s.n. (trit).
Todaro, A., 1202, s.n. (trit).
Touchy, A., s.n. (trit).
Trabut, L., s.n. (gren, rode, trit).
Trin. (C.B. von Trinius?), s.n. (trit).

Van Heurck, H.F., (s.n.) (spel).
Vavilov, N.I., 55918-55920 (trit), s.n. (sanc).
Vilmorin, (A.L.)M. de, s.n. (spel).
Vilmorin, (A.L.)M. de & Grönland, J., 180, 183, 270, 318, 396, 235, 236, 259, 296, 391, 392 (trit).

Zinchenko, 379 (sanc).

Index to scientific names

Accepted names are in roman face; new combinations are in **bold face**; synonyms and invalid names are in *italics*. Page numbers of principal entries are in **bold face**; those of figures and photographs in *italics*. Binomials and 'generic' names from before 1 May 1753 (see Chapter 3.1) are *not* included, except when used after that date to name taxa.

It must be noted that the synonymy at the generic level as listed below may be disputed. For instance, *Anthosachne* Steud., *Elytrigia* Desv., and *Roegneria* K.Koch are all considered synonyms of *Elymus* L. by Clayton & Renvoize (1986), although Baum (1977) and others would not agree here. Likewise, *Crithodium* Link is synonym under *Triticum* L. but, e.g., Bowden (1959) and Löve (1982, 1984) argue for a separate generic status. Besides taxonomic decisions taken in this publication, synonymy of genera follows Clayton & Renvoize's (1986) *Genera Graminum.*

Index to types

This index is extracted from the nomenclature treatments throughout this publication. Its aim is to enable curators of the 61 herbaria involved to easily identify their type specimens. The species of *Aegilops*, *Amblyopyrum* and x *Aegilotriticum* are arranged alphabetically within each genus; infraspecific taxa alphabetically within each species. Names of accepted taxa are in **bold**. All names with identified types are listed here irrespective whether they apply to taxa that are accepted, synonymized or excluded. In several cases types have not been seen or could not be identified from the literature, which, however, does not mean they do not exist. Abbreviations concerning the types used are as follows: 'T' = type, 'LT' = lectotype, 'NT' = neotype, 'PT' = paratype, 'ST' = syntypes.

Aegilops L.

agropiroïdes Godr. – T: (France, Hérault) Port Juvénale, *Touchy 291* (holo: NCY, not seen; iso: LY-Gandoger, MPU). = *Ae. speltoides* Tausch var. *speltoides*.

algeriensis Gand. – T: Algeria, in incultis circa Constantine, *Choulette 398* (holo: LY-Gandoger). = *Ae. neglecta* Req. ex Bertol.

ambigua Hausskn. – Type: (Greece, Attica, Lávrion, Kamárizos) distr. Laurion, prope Kamariza, 1885, *Haussknecht s.n.* (holo: JE, not found; iso: B (now †) *fide* Eig, 1929a: 109). = *Ae. comosa* Sm. in Sibth. & Sm. var. *comosa*.

aromatica Walter. – T: '*Aegilops* 387' (holo: BM-Walter). = *Ctenium aromaticum* (Walter) A.Wood.

aucheri Boiss. – T: (Syria, Aleppo) in agro halepensi, *Aucher-Éloy 2980* (holo: G-BOIS; iso: G, K, MPU, P). = *Ae. speltoides* Tausch var. *speltoides*.

aucheri Boiss. forma *hirtiglumis* Nábělek. – ST: (Iraq) Assyria, ad pagum Mâr Jakub supra pagum Simel, dit. Mosul, in steppis, 7.VI.1910, *Nábělek 3361* (BRA (not seen), SAV); (Iraq) distr. Serizor, ad pagum Baba Gigik inter Erbil (Arbela) et Rewandûz, in steppa, 20.V.1910, *Nábělek 3361a* (BRA (not seen), SAV). = *Ae. speltoides* Tausch var. *speltoides*.

aucheri Boiss. var. *hirto-hispida* Zhuk. – T: (Turkey) Cilicia littoralis, ad vias, *Zhukovsky s.n.* (holo: WIR, not found). = *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori.

aucheri Boiss. forma *nudiglumis* Nábělek. – T: (Iraq) Assyria, ad Altunköpri inter Kerkuk et Erbil (Arbela), ad fossam irrigationis, 17.V.1910, *Nábělek 3308* (holo: BRA, not seen; iso: SAV). = *Ae. speltoides* Tausch var. *speltoides*.

aucheri Boiss. var. *polyathera* Boiss. – ST: (Lebanon) in arenosis maritimis mobilibus ad Tripoli Syriae, *Blanche 47* (G-BOIS); (Lebanon) in arenosis maritimis mobilibus ad Tripoli Syriae, 21.V.1866, *Blanche 609* (BEI, E, G-BOIS, JE, P). = *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori.

aucheri Boiss. var. *schultzii* Nábělek. – T: (Iran) 'Persica austro-occidentalis', ad oppidum Kasr-i-Sirîn, dit. Hanikîn, prope confines Turcica, in steppa, 7.V.1910, *Nábělek 3351* (holo: BRA, not seen; iso: SAV). = *Ae. speltoides* Tausch var. *speltoides*.

aucheri Boiss. var. *striata* Zhuk. – ST: several *Vavilov* colls.; not found at WIR. = *Ae. speltoides* Tausch var. *speltoides*.

aucheri Boiss. var. *unicolor* Zhuk. – T: not indicated; also not found at WIR. = *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori.

aucheri Boiss. var. *vellea* Zhuk. – T: not indicated; also not found at WIR. = *Ae. speltoides* Tausch var. *speltoides*.

biaristata Lojac. – T: (Italy, Sicily) colli maritimi, Messina Tin, Cefalù Tin, *Lojacono (?, probably) s.n.* (holo: PAL, not seen). = *Ae. biuncialis* Vis

bicornis (Forssk.) Jaub. & Spach. – T: Egypt, Alexandria, *Forsskål s.n.* (holo: C).

bicornis (Forssk.) Jaub. & Spach var. **anathera** Eig. – LT: (Libya) Cyrenaica, Juliana (Djouliana), near Benghasi, 3.IV.1883, *Ruhmer s.n. (401?)* (holo: B, not found, probably †; lectotype: PR; isolectotypes: BR, FI, JE, MPU-Maire, P).

bicornis (Forssk.) Jaub. & Spach var. *exaristata* Eig. – T: Palestine, Rafah, 30.IV.1925, *Eig s.n.* (holo: HUJ, not seen). = *Ae. bicornis* (Forssk.) Jaub. & Spach var. *anathera* Eig.

bicornis (Forssk.) Jaub. & Spach forma *hirtiglumis* Nábělek. – T: (Iraq) Assyria, ad pagum Mâr Jakub supra pagum Simel dit. Mosul, in steppis, 10.VI.1910, *Nábělek 3265* (holo: BRA; iso: SAV; both not seen). = *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori.

bicornis (Forssk.) Jaub. & Spach var. *major* Eig. – T: (Palestine) environs de Migdal (Magdi'el), près de Tel-Aviv, 2.V.1923, *Eig s.n.* (holo: HUJ, not seen; iso: MPU). = *Ae. sharonensis* Eig.

bicornis (Forssk.) Jaub. & Spach var. *minor* Eig. – T: Palestine, Rafah, 30.IV.1925, *Eig s.n.* (holo: HUJ, not seen). = *Ae. bicornis* (Forssk.) Jaub. & Spach var. *bicornis*.

bicornis (Forssk.) Jaub. & Spach var. *mutica* Post. – T: (Palestine) Haifa, sands, 12.IV.1891, *Post s.n.* (holo: BEI; iso: K, Z). = *Ae. sharonensis* Eig.

bicornis (Forssk.) Jaub. & Spach forma *nudiglumis* Nábělek. – T: (Iraq) Assyria, ad pagum Mâr Jakub supra pagum Simel dit. Mosul, in steppis, 7.VI.1910, *Nábělek 3257a* (holo: BRA; iso: SAV; both not seen). = *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori.

biuncialis Vis. – LT: the illustration with dissection presented in R. de Visiani's, *Flora dalmatica*, Vol. 1, Tab. 1, fig. 2 (1842).

biuncialis Vis. var. *archipelagica* Eig. – ST (five collections cited by Eig, 1929a; inspected ones listed): (Cyprus) in monte Pentedactylos, *Sintenis & Rigo s.n.* (B (not seen), K); (Greece) island Syra (Thira), *Octave & Denis s.n.* (G); (Greece) island Cea (Kéa), Episkopi, 21-24.V.1898, *von Heldreich s.n.* (G, Z); (Greece) island Karpathos, in collibus aridis prope Menelaes, 27.V.1886, *F.(Forsyth-?) Major 62* (G); (Greece) island Karpathos, in incultis montis Melloura a prope Yoladha, 9.V.1886, *F.(Forsyth-?) Major 62a* (G). = *Ae. biuncialis* Vis.

biuncialis Vis. var. *velutina* Zhuk. – T: (Turkey) Asia Minor, Galatia, prope Angora, in collibus herbosis, *Zhukovsky s.n.* (holo: WIR). = *Ae. biuncialis* Vis.

brachyathera Pomel. – T: (Algeria) friches du Sersou, Aïn Toucria, Bourbaki, 14.V.1860, *Pomel s.n.* (holo: AL, not seen; iso: MPU). = *Ae. geniculata* Roth.

bushirica Roshev. – T: (Iran) Bushire, 3.III.1937, *Köie 1042* (holo: C; iso: LE). = *Aegilops cylindrica* Host x *Triticum* L. sp. (4n).

calida Gand. – ST: (Italy) Italia orient., in monte Brisighella prope Faenza, VI.1875, *Caldesi s.n.* (LY-Gandoger); (Croatia) Dalmatia, ad Salona, *de Visiani s.n.* (LY). = *Ae. neglecta* Req. ex Bertol.

campicola Gand. – T: (France, Bouches du Rhône) in campis ad Martigues, *Autheman s.n.* (holo: LY-Gandoger; iso: B, BEI, FI, LY). = *Ae. neglecta* Req. ex Bertol.

caudata L. – NT: (Greece, Crete) Gramen spicatum, creticum, gracili, in duas aristas longissimas et asperas abeunte, *de Tournefort 4940* (P-TRF; isoneotype: LE ('Herb. Fischer, e hb. Tournef.')).

caudata L. var. ('γ') *heldreichii* Holzm. ex Boiss. – T: (Greece, Attica) in montis Parnethis prope Dekeleiam (Tatoï hodie), VI.1881, *Holzmann s.n.* (holo: G-BOIS; iso: LE). = *Ae. comosa* Sm. in Sibth. & Sm. var. *subventricosa* Boiss.

caudata L. var. α *langeana* Amo: see x *Aegilotriticum langeanum* (Amo) van Slageren.

caudata L. var. *paucispiculigera* O.Schwarz. – T: (Turkey) Smyrna, Burnova, in collibus calcareis, Mai 1933, *Schwarz 581* (holo: B). = *Ae. caudata* L.

caudata L. var. ('β') *polyathera* Boiss. – ST (fide Boissier, 1884): (Turkey, Phrygia) forêt de quercus *Aegilops* située entre Tatar-Keuï ed Boulgas-Keuï (Phrygia), VI.1857, *Balansa s.n.* (G-BOIS, L); (Turkey) Lycia, in collibus, Elmalu, 3.VI.1860, *Bourgeau 277* (A, C, E, G, G-BOIS, K, LY, LY-Jordan, P, US; see note 2); (Turkey, 'Iter Syriaco-Armenianum') Tauro Cataonicus, in agris ad Surug, V.1865, *Haussknecht s.n.* (G-BOIS). = *Ae. caudata* L. – Notes: 1. Excluded syntype: Turkey, Cappadocia, ad Caecaream, *Balansa s.n.* (42) (G-BOIS) = *Ae. cylindrica* Host. 2. The collection *Bourgeau 277* in JE, LY, LY-Gandoger, MPU, W = *Ae. cylindrica* Host.

ciliaris J.König (ex Rottler) ex Roem. & Schult. – T: (India, probably Tamil Nadu) in India orientalis, Muritsur, 30.Nbr.1799, *Klein s.n. (792?)* (holo: B-W 2282). = *Eremochloa muricata* (Retz.) Hack. in A.DC.

columnaris Zhuk. – LT: (Turkey, 'Asia Minor') Galatia, near foot of Dizgurt-Dagh, on dry places, *Zhukovsky s.n.* (WIR 635).

columnaris Zhuk. var. *glabriuscula* Eig. – ST (two collections cited by Eig, 1929a; inspected one listed): (Turkey) Aintab (= Gaziantep), *Post s.n.* (BEI). = *Ae. columnaris.*

comosa Sm. in Sibth. & Sm. – T: (Greece) 'In insulis Græciæ frequens', *Sibthorp s.n.* (holo: OXF, not seen).

comosa Sm. in Sibth. & Sm. var. *achaica* Eig. – T: (Greece) Achaia, Mt. Kyllenes, near Pellene, 1887, *von Heldreich 986* (holo: B †; iso: BC, BM, C, FI, G, GE, JE, K, LD, LE, LY, LY-Gandoger, MPU, P, PR, SO, TO, W, Z). = *Ae. comosa* Sm. in Sibth. & Sm. var. *subventricosa* Boiss.

comosa Sm. in Sibth. & Sm. var. *biaristata* Eig. – ST: (Greece) Morea (= Peleponnesus), *Chaubart s.n.* (G); (Greece) Sparta, 1844, *Lenormand s.n.* (G-BOIS). = *Ae. comosa* Sm. in Sibth. & Sm. var. *subventricosa* Boiss.

comosa Sm. in Sibth. & Sm. var. *brachyathera* Post. – T: (Jordan) 'Plantae Moabiticae', El-Ghôr, 24.IV.1886, *Post s.n.* (holo: BEI). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *brachyathera* (Boiss.) Eig.

comosa Sm. in Sibth. & Sm. var. ('a)') *major* Hausskn. – ST: (Greece, 'præcipue in Pentilico, Phalero, Thessalia') Pentelikon, *Haussknecht s.n.* (BR, JE (not found), LE, PRC). = *Ae. comosa* Sm. in Sibth. & Sm. var. *comosa.*

comosa Sm. in Sibth. & Sm. var. ('b)') *minor* Hausskn. – T: (Greece, Attica) 'In collibus aridis Att.', *Haussknecht s.n.* (holo: JE, not found). = *Ae. comosa* Sm. in Sibth. & Sm. var. *subventricosa* Boiss.

comosa Sm. in Sibt. & Sm. var. ('β') **subventricosa** Boiss. – LT: (Greece) in collibus aridis Atticae ad radices montis Parnethis prope Khasia, 6.VI.1857, *von Heldreich 606* (G-BOIS; isolectotypes: A, C, G, FI, JE, K, L, LE, LY, LY-Gandoger, LY-Jordan, MPU, P, PI, W).

comosa Sm. in Sibth. & Sm. var. *thessalica* Eig. – ST: (Greece) Thessalia, Aïvali, 1888, *Haussknecht s.n.* (B †, JE (not seen)); (Greece) Attica, Phaleron, 1885, *Haussknecht s.n.* (B †). = *Ae. comosa* Sm. in Sibth. & Sm. var. *comosa.*

connata Steud. – T: (Greece) Epidaurus, *von Steudel s.n.* (holo: P; iso: L). = *Ae. biuncialis* Vis.

crassa Boiss. – T: (Iran) ad canales in planitie prope ruinas urbis Persepolis, 16.IV.1842, *Kotschy 248* (holo: G-BOIS; iso: BM, C, FI, G, K, L, LE, MO, OXF, P, PI, PRC, TUB, W).

crassa Boiss. var. *flavescens* Pop. – T: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. crassa* Boiss.

crassa Boiss. var. *fuliginosa* Pop. – T: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. crassa* Boiss.

crassa Boiss. var. *glumiaristata* Eig. – T: (Turkmenistan / Uzbekistan) Amu-Darja, 30.IV.1915, *Popov s.n.* (holo: LE, not found). = *Ae. crassa* Boiss.

crassa Boiss. var. *palaestina* Eig. – T: (Palestine) Jerusalem, V.1924, *Zohary s.n.* (holo: HUJ, not seen). = *Ae. vavilovii* (Zhuk.) Chennav.

crassa Boiss. var. *rubiginosa* Pop. – T: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. crassa* Boiss.

croatica Gand. – T: (Croatia, Dalmatia) in siccis ad Fiume (= Rijeka), Martinsčica, *Rossi 6046* (holo: LY-Gandoger; iso: BC, ERE, GE, JE, L, PRC, SO, W). = *Ae. triuncialis* L.

cylindrica Host. – LT: (Hungary) Buda Pesthini [= Budapest], in Cttu [= Comitatu = County] Békésiensi, *Kitaibel 226* (BP; isolectotype: B-W 18878-1).

cylindrica Host var. *albescens* Pop. – T: (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. cylindrica* Host.

cylindrica Host ssp. *aristulata* Zhuk. – ST (fide Zhukovsky, 1928): (Azerbaijan) Nakhichevan, *Kuleschov s.n.*; (Russia) Daghestan, prope Derbent, *Zherdeva s.n.*; Afghanistan, Chadjatchit-Chazar, *Bukinitch s.n.* (all WIR?, not found). = *Ae. cylindrica* Host.

cylindrica Host var. *brunnea* Pop. – T: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. cylindrica* Host.

cylindrica Host var. *ferruginea* Pop. – ST: (Russia) Saratov, *Vilenski s.n.* (LE/TASH/WIR?, not found); (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (LE/TASH/WIR?, not found). = *Ae. cylindrica* Host.

cylindrica Host var. *flavescens* Pop. – T: (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. cylindrica* Host.

cylindrica Host var. *fuliginosa* Pop. – T: (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. cylindrica* Host.

Aegilops caudata Host var. *hirsuta* (Binz) Hegi. – T: not indicated. = *Aegilops cylindrica* Host.

cylindrica Host var. *kastorianum* Karataglis. – Type: (Greece) Kastoria, *Karataglis 9* (holo: TAU, not seen). = *Ae. cylindrica* Host.

cylindrica Host var. *multiaristata* Jansen & Wacht. – T: (the Netherlands) Gorinchem, VII.1912, *Henrard s.n.* (holo: L-Jansen & Wachter 7084). = *Ae. cylindrica* Host.

cylindrica Host var. *pauciaristata* Eig. – ST (five collections cited by Eig, 1929a; inspected ones listed): Turkey, Cappadocia, Caesarea ('Caesareebene'), 1886, *Balansa s.n.(42)* (G-BOIS, L, P); Bulgaria, near Sliven, Mt. Baramuk, 1907, *Schneider s.n.(1426)* (B, not seen, probably †, BM, G, K, MO, PH, W); Ukraine, Cherson, near Limane, *Rehmann s.n.(174)* (B, not seen, probably †, NY). = *Ae. cylindrica* Host.

cylindrica Host var. *prokhanovii* Tzvelev. – T: (Russia) Daghestan, distr. Machacz-Kala, jugum Narat-Tjube, 22.VI.1955, *Prokhanov s.n.(280)* (holo: LE). = *Ae. cylindrica* Host.

cylindrica Host var. *pubescens* (Kloos) Jansen. – LT: (the Netherlands) Wormerveer, bij de meelfabriek Mercurius, 27.VI.1914, *Kloos s.n.* (holo: L 953.200-231). = *Ae. cylindrica* Host.

cylindrica Host var. *rubiginosa* Pop. – T: (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. cylindrica* Host.

cylindrica Host var. *rumelica* Velen. – T: (Bulgaria) in colle arido Džemdem Tepe ad Philippopolin [= Plovdiv], VI.1890, *Keck & Pichler s.n.* (holo: PRC; iso: BR, G, K, LD, LE, W). = *Ae. cylindrica* Host.

divaricata Jord. & Fourr. – NT: (Italy, Sicily: 'In incultis Siciliæ') Palermo, cultivé à Lyon, fl. 4 juin 1869, *Jordan s.n.* (MPU-Coste; isoneotype: LY-Gandoger). = *Ae. geniculata* Roth.

echinata C.Presl. – T: (Italy, Sicily) in arvis aridis Messina, VII.1817, *C. Presl s.n.* (holo: PRC). = *Ae. triuncialis* L.

echinus Godr. – T: (France, Hérault) Port Juvénale, 17.VII.1851, *Touchy 294* (holo: NCY, not seen; iso: K, MPU). = *Ae. geniculata* Roth.

erigens Jord. & Fourr. – NT: (France, Aude: 'In incultis Galliae australis: Mas-Cabardès (Aude) etc.') Mas-Cabardès, cultivé à Lyon, fl. 28 mai 1869, *Jordan s.n.* (MPU-Coste; isoneotype: LY-Gandoger). = *Ae. geniculata* Roth.

erratica Jord. & Fourr. – NT: (France, Vaucluse: 'In incultis Galliæ australis: Valrèas (Vaucluse) etc.') Valrèas, cultivé à Lyon, fl. 3 juin 1865, *Jordan s.n.* (LY-Jordan; isoneotype: K). = *Ae. geniculata* Roth.

exaltata L. – T: India, *Koenig 10* (holo: LINN 1218.15). = *Ophiuros exaltatus* (L.) Kuntze.

fonsii Sennen. – T: (Spain) Barcelona, Rubí, chemin de S. Mus, 5.VI.1921, *Sennen (Plantes d'Espagne) 4220* (holo: BC; iso: BM, G, L, LE, MPU, MPU-Coste, P). = *Ae. geniculata* Roth.

fragilis Parl. – ST: (Italy, Puglia) in pascuis apuliae, VI.1848, *Gasparrini s.n.* (FI, PAV (not seen)); (Italy, Sardinia) in pascuis aridis, *Moris s.n.* (FI, TO (not found)). = *Ae. ventricosa* Tausch.

geniculata Roth. – T: 'Germany', *Roth s.n.* (holo: B-W, not seen; iso: BM, LE, TUB).

geniculata Fig. & De Not. – T: (Egypt?) 'In depressis humidis convallium', *Figari & de Notaris s.n.(?)* (not seen). Probably at FI or GE (Stafleu & Cowan, 1976: 830, state that Figari's Egypt and Sudan herbarium is partly in FI, partly in GE). = *Ae. kotschyi* Boiss.

glabriglumis Gand. – T: (Azerbaijan) Mare Caspi, Swatoï island, *Becker s.n.* (holo: LY; iso: LE). = *Ae. kotschyi* Boiss.

grenieri (K.Richt.) Husn.: see x *Aegilotriticum grenieri* (K.Richt.) P.Fourn.

gussonii Link. – T: not indicated. = *Ae. neglecta* Req. ex Bertol.

hordeiformis Steud. – T: (Iraq?) 'Mesopotamia', ex hb. *Lenorman 10* (holo: P). = *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell.

hystrix Nutt. – T: (U.S.A.) 'on the arid plains of the Missouri', *Nuttall s.n.(?)* (holo: PH, not found). = *Sitanion hystrix* (Nutt.) J.G.Smith.

incurva L. – T: four collections in LINN (1218.10-13). = *Parapholis incurva* (L.) C.E.Hubb.
intermedia Steud. – T: (Syria) in lapicidinis prope Aleppum, *Kotschy s.n.* (Pl. Alepp. Kurd. Moss. 176) (holo: P; iso: BM, G-BOIS, K, LE, LY-Jordan, TUB, US). = *Ae. biuncialis* Vis.

juvenalis (Thell.) Eig. – T: (France, Hérault) Port Juvénale, V.1857, *Touchy s.n.* (holo: MPU; iso: W).
juvenalis (Thell.) Eig var. *aristata* Pop. – T: not indicated. = *Ae. juvenalis* (Thell) Eig.
juvenalis (Thell.) Eig var. *mutica* Pop. – T: not indicated. = *Ae. juvenalis* (Thell) Eig.

kotschyi Boiss. – LT: (Iran) ad canales prope pago Sabst-Buschom, majo m. 1842, *Kotschy 366a* (holo: G-BOIS; iso: BM, C, E, FI, G, K, LE, OXF, P, PI, PRC, TUB).
kotschyi Boiss. var. *brachyathera* Eig. – T: (Jordan) Transjordan, 40 km S Ma'an towards Aqaba, 18.IV.1929, *Eig s.n.* (holo: HUJ, not seen). = *Ae. kotschyi* Boiss.
kotschyi Boiss. var. *caucasica* Eig. – T: (Azerbaijan) Transcaucasia, Mardakiany, near Baku, 1927, *Sorokina s.n.* (holo: HUJ, not seen; type specimen(s) cultivated from seed from WIR). = *Ae. kotschyi* Boiss.
kotschyi Boiss. var. *hirta* Eig. – T (Azerbaijan) Transcaucasia, Mardakiany, near Baku, 1927, *Sorokina s.n.* (holo: HUJ, not seen; type specimen(s) cultivated from seed from WIR). = *Ae. kotschyi* Boiss.
kotschyi Boiss. forma *nuda* Maire & Weiller. – T: (Libya) Tripolitania, in lapidosis aridis ad Aras Philaenorum, 17.IV.1938, *Maire & Weiller 1639* (holo: MPU). = *Ae. kotschyi* Boiss.
kotschyi Boiss. var. *palaestina* Eig. – ST (14 specimens cited by Eig, 1929a; inspected ones listed): Egypt, Mariut, 1903, *Schweinfurth s.n.* (B, BR); Libya, Cyrenaica, Benghasi-Lihadabna, 1869, *Rohlfs s.n.* (B, not found, probably †, P); Libya, Benghasi, 1883, *Ruhmer 399* (B, not found, probably †, E, G, LD, LE, Z), *s.n.* (B, not found, probably †, BR, JE, P, Z); Tunisia, Tunis, 1854, *Kralik s.n.* (LE). = *Ae. kotschyi* Boiss.

longissima Schweinf. & Muschl. – LT: Egypt, Mariut-Mergheb, Abd el Qader, bei Alexandria, an Ackerrändern, 30.IV.1903, *Schweinfurth s.n.* (B; isolectotypes: CAIM, MPU, US).
longissima Schweinf. & Muschl. var. *polycarpa* Zhuk. – ST: Palestine: near Tel-Aviv, *Vavilov s.n.* (WIR, not found); Ishar, *Aaronsohn s.n.* (WIR, not found); Jaffa, Haifa, in arenosis maritimis, *Bornmüller 1744* (B, BM, BR, G, JE, K, LD, LE, MPU, OXF, P, PR, PRC, W, Z), *1745* (B, G, JE, W). Not found in WIR. = *Ae. sharonensis* Eig.
longissima Schweinf. & Muschl. var. *solaris* Zhuk. – ST: Palestine, Hedera, *Vavilov s.n.* (WIR?, not found); Palestine, Rafah, *Vavilov s.n.* (WIR?, not found). = *Ae. longissima* Schweinf. & Muschl.
lorentii Hochst. – T: (Turkey) prope Seleuciam, *von Lorent s.n.* (holo: TUB). = *Ae. biuncialis* Vis.

macrochaeta Shuttlew. & A.Huet ex Duval-Jouve. – T: (France) Mont Faron près Toulon, lieux secs et pierreux, 15 mai 1864, *Huet du Pavillon et Jacquin s.n.* (holo: MPU-Duval-Jouve). = *Ae. biuncialis* Vis.
macrochaeta Shuttlew. & A.Huet ex Duval-Jouve ssp. *pontica* Degen. – T: (Bulgaria) Bulgarica. In decliv. septentr. monti Ma Tepe prope Burgas, 5-20 m, 11.VI.1929, *Pénzes s.n.* (holo: BP). = *Ae. biuncialis* Vis.
macrura Jaub. & Spach. – T: (Syria) in agro Halepensi, *Aucher-Éloy 2980* (holo: P). = *Ae. speltoides* Tausch var. *speltoides*.
mesantha Gand. – T: (Italy, Toscana) Italia, secus vias pone Florence, *Sommier s.n.* (holo: LY-Gandoger). = *Ae. neglecta* Req. ex Bertol.
muricata Retz. – T: [s.loc.] *König(?) s.n.* (holo: LD, sub '[127] *Rottboellia muricata* Nob.'). = *Eremochloa muricata* (Retz.) Hack. in A.DC.
mutica Boiss. forma *gandiljanii* Hammer. – T: (Armenia) RSSA Armeniae, prope pagis Dschervesch, Vochtschabert et Gegadir (distr. Abovjan), 1.VIII.1972, *Gandilyan s.n.* (holo: YAI; iso: WIR). = *Amblyopyrum muticum* (Boiss.) Eig var. *muticum*.
mutica Boiss. var. *nual* Gandilyan. – T: (Armenia) RSSA Armeniae, prope pagis Dschervesch, Vochtschabert et Gegadir (distr. Abovjan), 1.VIII.1971, *Gandilyan s.n.* (holo: YAI; iso: WIR). =

Amblyopyrum muticum (Boiss.) Eig var. *loliaceum* (Jaub. & Spach) Eig.

mutica Boiss. var. *nurub* Gandilyan. – T: see *mutica* var. *nual*. = *Amblyopyrum muticum* (Boiss.) Eig var. *loliaceum* (Jaub. & Spach) Eig.

mutica Boiss. var. *nuruni* Gandilyan. – T: see *mutica* var. *nual*. = *Amblyopyrum muticum* (Boiss.) Eig var. *loliaceum* (Jaub. & Spach) Eig.

mutica Boiss. var. *pual* Gandilyan. – T: see *mutica* forma *gandiljanii*. = *Amblyopyrum muticum* (Boiss.) Eig var. *muticum*.

mutica Boiss. var. *puluci* Gandilyan. – T: see *mutica* forma *gandiljanii*. = *Amblyopyrum muticum* (Boiss.) Eig var. *muticum*.

mutica Boiss. var. *puruni* Gandilyan. – T: see *mutica* forma *gandiljanii*. = *Amblyopyrum muticum* (Boiss.) Eig var. *muticum*.

neglecta Req. ex Bertol. – T: (France) Avignon, misit *Requien*, 1833 (holo: BOLO-Bertoloni (Fl. ital.); iso: MPU-Duval-Jouve).

nigricans Jord. & Fourr. – NT: (Turkey) Lycia ('In incultis Lyciæ, ex clar. E. Bourgeau'), cultivé à Lyon, fl. 30 mai 1865, *Jordan s.n.* (holo: LY-Jordan). = *Ae. umbellulata* Zhuk.

notarisii Clem. – T: (Turkey) crescit rara in sylvulis collinis circa Ciamlicia culta Scutarium asiatium, 25.VI.1850, *Clementi s.n.* (holo: PI, left-hand specimen only; iso: G-BOIS). – Note: the right-hand specimen of the holotype sheet in PI is *Aegilops speltoides* var. *ligustica* (Savign.) Fiori (coll. *Blanche 2026* from Saïda, Lebanon). = *Ae. uniaristata* Vis.

ovata L. *pro parte*. – T: the illustration presented at Tab. 1, fig. 2A, B, C. from Scheuchzer's (1719) *Agrostographia*. Designated by Greuter (in Greuter & Rechinger, 1967: 170). = *Ae. neglecta*. – Note: the other part of '*Ae. ovata*' is not typified but the taxon intended is now *Ae. geniculata*. See note 2 at 10.12.

ovata L. var. *africana* Eig. – ST (two collections cited by Eig, 1929a; inspected one listed): Libya, Cyrenaica, in lapidosus primae regionis morien Derra (Derna?) oppidi, 5.IV.1887, *Taubert 181* (G, JE, P). = *Ae. geniculata* Roth.

ovata L. var. *anatolica* Eig. – ST (three collections cited by Eig, 1928a; inspected ones listed): (Turkey) Amasia, *Bornmüller 468* (JE, K, LD, LE, OXF, PH, SO); (Syria) Aleppo, *Haussknecht s.n.* (B, BM, K, P). = *Ae. umbellulata* Zhuk.

ovata L. ssp. *atlantica* Eig. – T: not indicated. = *Ae. geniculata* Roth.

ovata L. var. *eventricosa* Eig. – ST (six collections cited by Eig, 1929a; inspected ones listed): Morocco, Bekrit, 1925, *Jahandiez s.n.* (G); Algeria, Cala Rana, méridional du Lalla Khelidja, Dept. d'Alger, 30.VI.1879, *Duhamel du Monceau s.n.* (G, G-BOIS (?, not found)). = *Ae. geniculata* Roth.

ovata L. ssp. *gibberosa* Zhuk. – ST: (France) Gallia australis, Toulon, *Vavilov s.n.* (WIR, not found); (Italy) Sardinia, *Vavilov s.n.* (WIR, not found). = *Ae. geniculata* Roth.

ovata L. ssp. *globulosa* Zhuk. – T: Tunisia, prope Maktar, 10.VIII.1926, *Vavilov s.n.* (holo: WIR 2723). = *Ae. geniculata* Roth.

ovata L. var. *hirsuta* Eig. – T: not indicated. = *Ae. geniculata* Roth.

ovata L. forma *hirtiglumis* (Nábělek) Parsa. – ST: (Iraq) Assyria, ad pagum Mâr Jakub supra pagum Simel ad septentr. ab urbe Mosul, in declivibus lapidosus aridis, 8.VI.1910, *Nábělek 3314* (BRA (not seen), SAV); (Turkey) 'Mesopotamia', Gebel at-Tûr (Tur Abdîn), in steppis ad urbem Midiat, *Nábělek 3368a* (BRA (not seen), SAV); (Turkey) ad pagum Chandûk ad Tigridem inter Hassan Keyf et Gezîret, in steppis, 12.VII.1910, *Nábělek 3315a* (holo: BRA (not seen), SAV). = *Triticum monococcum* L. ssp. *aegilopoides* (Link) Thell.

ovata L. var. *lanuginosa* Zhuk. – ST: collections from Spain and Sicily from *Vavilov* (WIR, not found). = *Ae. geniculata* Roth.

ovata L. var. ('β') *latearistata* Lange. – T: (Spain) in campis ad Jaén, 5.V.1852, *Lange s.n. ('Pl. Eur. Austr. 1851-52 no. 97')* (holo: C). = *Ae. biuncialis* Vis.

ovata L. forma *nudiglumis* Nábělek. – T: Palestine, Jericho, in declivibus aridis, 19.III.1909, *Nábělek 3166* (holo: BRA, not seen; iso: SAV) *pro parte*. – Note: the type specimen is a mixture of *Ae. geniculata* Roth and *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

ovata L. ssp. *planiuscula* Zhuk. – LT: Spain, Morede, near Granada, near barley fields, 23.VI.1927, *Vavilov 55130* (holo: WIR 938). = *Ae. geniculata* Roth.

ovata L. var. *puberulla* Zhuk. – T: Algeria, s.loc., *Vavilov s.n.* (holo: WIR, not found). = *Ae. geniculata* Roth.

ovata L. var. *quinquearistata* Post. – ST: (Turkey) Akherdagh, 13.IX.1884, *Post s.n.* (BEI); (Turkey) Aintab (= Gaziantep), V.1887, *Post s.n.* (BEI); (Turkey) Marash, V.1886, *Post s.n.* (BEI). = *Ae. umbellulata* Zhuk.
ovata L. subvar. *subbiaristata* Trab. – T: (Algeria) Kabylie, *Trabut s.n.* (holo: AL, not seen). = *Ae. neglecta* Req. ex Bertol.
ovata L. ssp. *umbonata* Zhuk. – LT: Palestine, upper Galilea, 6.IX.1926, *Vavilov 29512* (holo: WIR 960). = *Ae. geniculata* Roth.
ovata L. var. *vernicosa* Zhuk. – ST: (Algeria) Algiers, Frenda, *Vavilov 239* (WIR 2725); Tunisia, s.loc., *Vavilov s.n.* (WIR, not found). = *Ae. geniculata* Roth.

parvula Jord. & Fourr. – NT: (Italy: 'In Italia. Ex Horto botan. heidelbergensi olim acceptum') cultivé à Lyon, fl. 28 mai 1865, *Jordan s.n.* (LY-Jordan). = *Ae. geniculata* Roth.
peregrina (Hack. in J.Fraser) Maire & Weiller. – LT: (U.K., Scotland) Leith Docks, Edinburgh, 3.IX.1906, *J. Fraser s.n.* (E; isolectotypes: K, RNG).
peregrina (Hack. in Fraser) Maire & Weiller var. **brachyathera** (Boiss.) Maire & Weiller. – LT: (Lebanon) 'Syria', prope Tripoli, *Blanche 805* (holo: G-BOIS).
platyathera Jaub. & Spach. – T: (Turkey / Syria / Iraq; but probably Iraq as BM, FI, G-BOIS labels give 'Mossul') 'Mesopotamia', inter Mardin et Mosul, *Aucher-Éloy 2913* (holo: P; iso: BM, FI, G, G-BOIS, K, MPU, OXF). = *Ae. crassa* Boiss.
procera Jord. & Fourr. – NT: (France, Hérault: 'In incultis Galliæ australis: circa Monspelium, ex dom. E. Revelière') cultivé à Lyon, fl. 3 juin 1869, *Jordan s.n.* (MPU-Coste). = *Ae. geniculata* Roth.
pubiglumis Jord. & Fourr. – NT: (France, Alpes-De-Haute-Provence: 'In incultis Galliæ australis: Digne (Basses-Alpes) etc.') cultivé à Lyon, fl. 16 juin 1865, *Jordan s.n.* (LY-Jordan; isoneotype: K). = *Ae. geniculata* Roth.

saccharina Walter. – T: '*Aegilops*' (holo: BM-Walter). = *Dactyloctenium aegyptium* (L.) P.Beauv.
sancti-andreae Degen: see x *Aegilotriticum sancti-andreae* (Degen) Soó.
searsii Feldman & Kislev ex Hammer. – T: Palestine, Judean hills, Yattir, Sarcopoterietum spinosi semistepposum, terra rossa mixed with loess, 15.VI.1976, *Feldman, Kislev & Kushnir s.n.* (holo: HUJ, not seen; iso: K).
sharonensis Eig. – T: Palestine, environs de Migdal (Magdi'el), près de Tel-Aviv, 2.V.1923, *Eig s.n.* (holo: HUJ, not seen).
sicula Jord. & Fourr. – NT: (Italy, Sicily: 'In incultis Siciliæ') cultivé à Lyon, fl. 4 juin 1869, *Jordan s.n.* (LY-Jordan; isoneotypes: LY-Gandoger, MPU-Coste). = *Ae. geniculata* Roth.
singularis Steud. – T: (Iran) Persia, inter Afswaer et Tschalaya, ex hb. *Lenormand 12* (holo: P). = *Ae. speltoides* Tausch var. *speltoides*.
speltaeformis Jord.: see x *Aegilotriticum speltaeforme* (Jord.) van Slageren.
speltoides Tausch. – NT: (Turkey, Anatolia) Yozgat to Corum, *Bornmüller 1735* (B; isoneotypes: BM, FI, G, JE, K, L, LD, LE, LY-Jordan, LY-Gandoger, NY, OXF, P, SO, W, Z).
speltoides Tausch var. ('β') **ligustica** (Savign.) Fiori. – NT: (Italy, Liguria, Genoa) dri (tri?) colli freari la porta Montaldo presso Genova, 1847, *Savignone s.n.* (FI; isoneotype: LY-Gandoger).
speltoides Tausch var. *macrostachys* Eig. – T: (Palestine) banks of Wadi Kurn, 30.V.1926, *Eig s.n.* (holo: HUJ, not seen). = *Ae. speltoides* Tausch var. *speltoides*.
speltoides Tausch var. *muricata* Zhuk. – LT: Turkey ('North Mesopotamia'), 40 km south of Maraş vilayet, in abundance, 11.VII.1927, *Zhukovsky s.n.* (holo: WIR 981). = *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori.
speltoides Tausch var. *scandens* Zhuk. – T: not indicated; also not found at WIR. = *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori.
speltoides Tausch ssp. *submutica* Zhuk. – T: (Turkey) 'Syria borealis', inter Maraş – Aintab [= Gaziantep], ad vias, *Zhukovsky s.n.* (holo: WIR). = *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori.
squarrosa L. – LT: squarrosa 3 ('in Oriente'?) (holo: LINN 1218.9). = *Ae. triuncialis* L.
squarrosa L. var. *albescens* Pop. – T: (Uzbekistan) 'Turkestan', Samarkand, Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. tauschii* Coss.
squarrosa L. var. *anathera* Eig. – ST (four collections cited by Eig, 1929a; inspected ones listed): (Rus-

sia) Daghestan, 1898, *Alexeenko s.n.* (LE); (Turkey) Cataonian Taurus, 1865, *Haussknecht s.n.* (G-BOIS). = *Ae. tauschii* Coss.

squarrosa L. var. *brunnea* Pop. – ST: (Uzbekistan) 'Turkestan', Samarkand, Syr-Darja, *Popova s.n.* (LE/TASH/WIR?, not found; (Iran) Persia, Hamadan, *Vavilov s.n.* (WIR, not found). = *Ae. tauschii* Coss.

squarrosa L. var. β *comosa* Coss. – T: (Algeria) in pascuis Algeriae prope Oran, *Durieu de Maisonneuve s.n.* (holo: P, not seen). = *Ae. ventricosa* Tausch.

squarrosa L. var. *ferruginea* Pop. – T: (Uzbekistan) 'Turkestan', Samarkand, Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. tauschii* Coss.

squarrosa L. var. β *meyeri* Griseb. ex Ledeb. – T: (Azerbaijan) in campis aridis subsalsis prope Sallian, *C.A. von Meyer s.n.* (holo: LE, not seen). = *Ae. tauschii* Coss.

squarrosa L. var. ('γ') *pubescens* Regel. – T: (Uzbekistan / Tadzhikistan) valley of the river Sarawschan (= Zeravshan), Luz (= Ulus, Uluss) to Dzhan (= Djam), 20.III.1869, *O. Fedtschenko s.n.* (holo: LE; iso: G). = *Ae. tauschii* Coss.

squarrosa L. ssp. *salinum* Zhuk. – T: (Azerbaijan) in campis aridis subsalsis prope Sallian, 30.IV.1830, *Hohenacker s.n.* (holo: WIR 2726). = *Ae. tauschii* Coss.

squarrosa L. var. *strangulata* Eig. – ST: (Iran) ('Côtes du golfe d'Astrabad, Perse') Gorgan (Asterabad), *s.coll., s.n.* (LE, P); (Azerbaijan) Apcheron peninsula, *s.coll., s.n.* (ex hb. Fischer) (LE). = *Ae. tauschii* Coss.

squarrosa L. var. γ *truncata* Coss. – S: (Algeria) in pascuis Algeriae prope Oran, *Durieu de Maisonneuve s.n.* (P, not seen); (Algeria) prope Ghelma, *Kremer s.n.* (P (in hb. Durieu, cf., Cosson, 1850), not seen). = *Ae. ventricosa* Tausch.

subulata Pomel. – T: (Algeria) lieux herbeux des montagnes Aflou, 6.VI.1860, *Pomel 171* (holo: AL, not seen; iso: MPU, W). = *Ae. ventricosa* Tausch.

tauschii Coss. – LT: the illustration of Tab. 50, fig. 1 in Buxbaum's (1728) *Plantarum minus cognitarum Centuria* I.

tauschii Coss. convar. *paleidenticulata* Gandilyan. – T: (Armenia) RSS Armenia, in angustiis fl. Rasdan (prope opp. Erevan), VII.1969, *Gandilyan s.n.* (holo: WIR – N 1554, not seen; iso: YAI). = *Ae. tauschii* Coss.

triaristata Willd. ssp. *attenuata* E.Schiem. – T: not indicated. = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. var. *brachychaeta* Font Quer. – T: (Spain, Burgos) Gamoral, near Burgos, *Font Quer 235* (holo: BC). = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. ssp. *contorta* Zhuk. – LT: (Turkey) 'Asia Minor', Lydia, Boz-Dagh, 500 m, 20.VI.1927, *Zhukovsky s.n.* (holo: WIR 1154). = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. ssp. *contracta* Eig. – T: (Turkey) Cilicia, Trache(?), IV.1872, *Péronin s.n.* (holo: G-BOIS, not found). = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. ssp. *elongata* E.Schiem. – T: not indicated. = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. forma *glabrescens* Podp. – T: not indicated. = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. var. *hirtula* Zhuk. – T: not indicated. = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. forma *intercedens* Bornm. – T: Lebanon, bei Bhamdun, *Bornmüller 13041* (holo: B). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

triaristata Willd. ssp. *intermixta* Zhuk. – T: not indicated. = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. forma *kabylica* Battand. & Trab. – T: (Algeria) Kabylie, *Trabut 167* (holo: AL, not seen; iso: MPU). = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. var. *macrochaeta* K.Mey. – T: not indicated. = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. var. *ochreata* Zhuk. – T: (Turkey) Tauria littoralis, *Busch s.n.* (holo: WIR, not found). = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. ssp. *quadriaristata* Eig. – T: (Turkey) Taurus, 1926, *Baur s.n.* (holo: M, not seen). = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. ssp. *recta* Zhuk. – LT: (Algeria) Algiers, Kabylie, Fort National, on stony soils, 29.VII.1926, *Vavilov 246* (holo: WIR 1160). = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. forma *submutica* Battand. & Trab. – T: (Algeria) Djebel Amour, Aïn Mansour, près d'Aflou, 10.V.1888, *Clary 236* (holo: MPU). = *Ae. geniculata* Roth.

triaristata Willd. var. *trispiculata* Hack. ex Trab. – T: (Algeria) Jebl Mouzaïa, 21.IV.1878, *Trabut s.n.* (holo: MPU). = *Ae. biuncialis* Vis.

triaristata Willd. var. *trojana* Eig. – T: (Turkey) Thymbra, près de Troja, 1889, *Calvert s.n.* (holo: B, not found, probably †). = *Ae. neglecta* Req. ex Bertol.

triaristata Willd. forma *velutina* Podp. – T: not indicated. = *Ae. neglecta* Req. ex Bertol.

triticoides Req. ex. Bertol.: see x *Aegilotriticum triticoides* (Req. ex Bertol.) van Slageren.

triuncialis L. – LT: (Spain) Hispania, 701 *β*, *Loefling* (holo: LINN 1218.8).

triuncialis L. var. *anathera* Hausskn. & Bornm. – T: (Iran) Persia, in segetibus ad Bushir, bei Bahmeni, 7.III.1893, *Bornmüller 772* (holo: B; iso: JE). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *brachyathera* (Boiss.) Eig.

triaristata Willd. subvar. ('S.-V.') *robusta* Trab. – T: (Algeria) Kabylie, Fort National, *Trabut s.n.* (holo: AL, not seen; iso: MPU). = *Ae. neglecta* Req. ex Bertol.

tripsacoides Jaub. & Spach. – T: (Turkey) Phrygia, prope Thermes Hieropolitanas (hodie Pambouk Calessi), 1839, *Jaubert s.n.* (holo: P, not seen). = *Amblyopyrum muticum* (Boiss.) Eig var. *muticum*.

triuncialis L. var. *albescens* Pop. – ST: (Iran) Persia, *Vavilov s.n.* (WIR?, not found); (Kazakhstan / Uzbekistan), Syr-Darja, *Popova s.n.* (LE/TASH/WIR?, not found). = *Ae. triuncialis* L.

triuncialis L. var. *assyriaca* Eig. – ST: (Iraq) Kurdistan, Erbil reg., Kuh-Sefin Mt., Shaqlawa, 4.VI.1893, *Bornmüller 1899* (G, JE, LE, US, W, Z); (Iraq) Assyria, ad Kerkuk, 26.IV.1893, *Bornmüller 1900* (B, JE, K), *1903* (B). = *Ae. triuncialis* L.

triuncialis L. var. *breviaristata* Hack. in Groves. – T: (Italy) Gallipoli, *Groves s.n.* (holo: FI (probably), not found; iso: BM, GE, LE, LY-Gandoger, OXF). = *Ae. triuncialis* L.

triuncialis L. var. *brunnea* Pop. – T: (Turkmenistan?) 'Turkestan', Turkomania, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. triuncialis* L.

triuncialis L. ssp. *caput-medusae* Zhuk. – LT: Turkey, Lydia, Boz-Dagh, *Zhukovsky s.n.* (holo: WIR 1328). = *Ae. triuncialis* L.

triuncialis L. var. *constantinopolitana* Eig. – T: (Turkey) insula Chalki, 1876, *Murmann s.n. (117?)* (holo: G-BOIS; iso: G). = *Ae. triuncialis* L.

triuncialis L. ssp. *fascicularis* Zhuk. – LT: Spain, 1927, *Vavilov s.n.* (holo: WIR 1372). = *Ae. triuncialis* L.

triuncialis L. var. *ferruginea* Pop. – T: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. triuncialis* L.

triuncialis L. var. *flavescens* Pop. – ST: (Iran) Persia, Hamadan, *Vavilov s.n.* (WIR, not found); (Uzbekistan) 'Turkestan', Turkomania, Syr-Darja, Samarkand, *Popova s.n.* (LE/TASH/WIR?, not found). = *Ae. triuncialis* L.

triuncialis L. var. *glabrispica* Eig. – ST: (Lebanon / Syria) Mt. Hermon, plain of Ein-Jinneh, about 1500 m, 21.VII.1924, *Eig s.n.* (HUJ, not seen); (Lebanon / Syria) summit of Mt. Hermon, 18.VI.1924, *Eig s.n.* (HUJ, not seen). = *Ae. triuncialis* L.

triuncialis L. subvar. *glauca* Miczynski. – T: not indicated. = *Ae. triuncialis* L. var. *persica* (Boiss.) Eig.

triuncialis L. forma *hirsuta* H.Lindb. – ST: (Spain) Sierra Nevada, Jollos del Purche supra oppidum Granada, in colle sicco, *H. Lindberg s.n. (?)* (H, not seen); Morocco, Atlas major, in convalle fluminis Reraia, in declivibus calcareis aridissimis contra deversorium La Bonne Auberge prope pagum Asni, 6.VI.1926, *Lindberg 3680* (CAI, H (not seen), K, LD, MPU, W). = *Ae. triuncialis* L.

triuncialis L. var. *hirta* Zhuk. – T: not indicated. = *Ae. triuncialis* L.

triuncialis L. subvar. *hispida* Miczynski. – T: not indicated. = *Ae. triuncialis* L. var. *persica* (Boiss.) Eig.

triuncialis L. var. *leptostachya* Bornm. – T: (Iraq) Assyria, in collibus, Jebl Hamrin, 26.IV.1893, *Bornmüller 1904* (holo: B; iso: G, JE, US). = *Ae. kotschyi* Boiss.

triuncialis L. var. *muricata* Zhuk. – T: not indicated. = *Ae. triuncialis* L.

triuncialis L. var. *nigriaristata* Flaksb. – T: (Turkmenistan) Prov. Transcaspica, distr. Aschabad, in jugo Kopet-Dagh, Tchuli, 28.V.1914, *Golbeck s.n.* (holo: LE, not found). = *Ae. triuncialis* L.

triuncialis L. var. *nigro-albescens* Pop. – ST: (Iran) Persia, *Vavilov s.n.* (WIR, not found); (Uzbekistan) 'Turkestan', Syr-Darja, Samarkand, *Popova s.n.* (LE/TASH/WIR?, not found). = *Ae. triuncialis* L.

triuncialis L. var. *nigro-ferruginea* Pop. – T: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. triuncialis* L.

triuncialis L. var. *nigro-flavescens* Pop. – ST: (Iran) Persia, Hamadan, *Vavilov s.n.* (WIR, not found); (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (LE/TASH/WIR?, not found). = *Ae. triuncialis* L.

triuncialis L. var. *nigro-rubiginosa* Pop. – T: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. triuncialis* L.

triuncialis L. var. **persica** (Boiss.) Eig. – T: (Iran) ad radices montis Sabst-Bushom prope urbis Schiras, *Kotschy 365* (holo: G-BOIS; iso: BM, C, E, FI, G, JE, K, LE, LY-Gandoger, MO, MPU, OXF, P, PI, PRC, TUB). – Note: excluded isotype: a collection in W, carrying the same, printed label *Kotschy 365 = Aegilops kotschyi* Boiss.

triuncialis L. var. *pubispica* Eig. – ST: (Lebanon / Syria) Mt. Hermon, plain of Ein-Jinneh, about 1500 m, 21.VII.1924, *Eig s.n.* (HUJ, not seen); (Syria) east of Banias, 10.V.1911, *Meyers & Dinsmore 1801* (E, HUJ (not seen)). = *Ae. triuncialis* L.

triuncialis L. var. *rubiginosa* Pop. – T: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. triuncialis* L.

triuncialis forma *subglabra* H.Lindb. – T: Morocco, Atlas medius, prope pagum Azrou, in siccis in valle Tioumliline, *Lindberg s.n.(?)* (holo: H, not seen). = *Ae. triuncialis* L.

turcica Azn. – LT: (Turkey) Constantinople, lieux herbeux des collines près de Kartal, 27.VI.1897, *Aznavour s.n.* (G; isolectotypes: B, BM, G, JE, LD, LY, LY-Gandoger, MPU, P, US, W). = *Ae. comosa* Sm. in Sibth. & Sm. var. *subventricosa* Boiss.

turcomanica (Roshev.) Roshev. – ST (fide Roshevitz, 1928): (Iraq) iter Syriaco-Armeniacum, in deserto Singaroe (= Sinjar), 1867, *Haussknecht s.n.* (BM, JE, LE, W); (Turkmenistan) 'Turcomania', Bami, in steppis, *Antonov s.n.* (LE, not found). = *Ae. juvenalis* (Thell) Eig.

umbellulata Zhuk. – LT: (Turkey) Asia Minor, Galatia, Dizgurt-Dagh Mt., at the height of 1000 m., in abundance, X.1925, *Zhukovsky s.n.* (holo: WIR 1439).

umbellulata Zhuk. var. *pilosa* Eig. – T: (Turkey) Lycia, Elmalu, VI.1860, *Boissier s.n.* (holo: G-BOIS, not found). = *Ae. umbellulata* Zhuk.

umbellulata Zhuk. ssp. *transcaucasica* Dorof. & Migush. – T: (Azerbaijan) Origo-Transcaucasus, Azerbajdzhan, regio Axu (= Achsu), 21.VII.1963, *Dorofeev s.n.* (holo: WIR, not found). – PT: (Azerbaijan) Origo-Transcaucasus, Azerbajdzhan, regio Axu (= Achsu), 1970, *Migushova s.n.* (holo: WIR, not found). = *Ae. umbellulata* Zhuk.

umbellulata Zhuk. var. *tuluni* Gandilyan & Arut. – T: (Azerbaijan) Nakhichevan, reg. Ordubad, pag. Bilav, 1000-1350 m, VI.1986, *Gandilyan & Arutyunyan s.n.* (holo: YAI; iso: ERE). = *Ae. umbellulata* Zhuk.

uniaristata Vis. – T: (Croatia, Dalmatia) in herbidis circa Zara (= Zadar), unde communicavit Prof. Alschinger, *de Visiani s.n.* (holo: PAD; iso: W).

uniaristata Steud. – T: Greece, *Lenormand s.n.* (ex hb. von Steudel) (holo: P). = *Ae. uniaristata* Vis.

variabilis Eig. – ST (13 collections cited by Eig, 1929a; inspected ones listed): Palestine, Herzliah, V.1928, *Zohary s.n.* (HUJ (not seen), L); Greece, Crete, Chania, 1883, *Reverchon 180* (BM, BR, G, JE, K, LD, LE, P, PRC, Z). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

variabilis Eig var. *aristata* Eig & Feinbrun. – ST (five collections cited by Eig, 1929a; inspected ones listed): Italy, Gallipoli, 1881, *Gross s.n.* (G, G-BOIS); Morocco, Chaonia, Fedhala, 1912, *Pithard s.n.* (G). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *brachyathera* (Boiss.) Eig.

variabilis Eig var. *elongata* Eig & Feinbrun. – T: (Palestine) Wadi Kefrin Schitimebene, dry places, -200 m, 20.IV.1911, *Dinsmore s.n.* (holo: HUJ, not seen; iso: E, K). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *brachyathera* (Boiss.) Eig.

variabilis Eig var. *intermedia* Eig & Feinbrun. – ST (seven collections cited by Eig, 1929a; inspected ones listed): Greece, Athens, 1926, *Vavilov s.n.* (HUJ); Egypt, Mariut, Abdel Qadr, Alexandria, 18.III.1903, *Schweinfurth s.n.* (B). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

variabilis Eig var. *latiuscula* Eig & Feinbrun. – ST: Palestine: Karmel, IV.1927, *Smoly s.n.*; Hedera, IV.1927, *Smoly s.n.* (both HUJ, not seen). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

variabilis Eig var. *multiaristata* Eig & Feinbrun. – ST (five collections cited by Eig, 1929a; inspected ones listed): Lebanon, Beirut, 6.VI.1898, *Post 994* (BEI); Lebanon, Beirut, 10.IV.1898, *Post 995* (BEI, K); Tripoli, 1868, *Blanche s.n.* (BEI (?, not found), E). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

variabilis Eig var. *mutica* Eig & Feinbrun. – ST (fide Eig, 1929a): Palestine: Schechunath Bochorov, V.1927, *Zohary s.n.*; Hedera, IV.1927, *Eig s.n.* (both HUJ, not seen). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

variabilis Eig var. *planispicula* Eig & Feinbrun. – ST (fide Eig, 1929a): Palestine: Galilea, Jebl Jermak, VI.1926, *Eig s.n.*; Wadi Kala'at el Kadi, VI.1926, *Zohary s.n.* (both HUJ, not seen). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

vavilovii (Zhuk.) Chennav. – LT: Syria, Salamie ('Salamich'), near the road, 30.IX.1926, *Vavilov 29028* (WIR 747).

ventricosa Tausch. – NT: (Spain, Granada) Sierra Nevada, *Boissier s.n.* (G; isoneotypes: A, BR, C, E, F, G, JE, K, LE, MPU, NY, P, PI, TUB, W).

ventricosa Tausch var. *obscura* Miczynski. – T: (Algeria) Constantine, Berteaux, *Ducellier s.n.* (holo: AL, not seen). = *Ae. ventricosa* Tausch.

ventricosa Tausch var. *prostrata* Sennen & Mauricio. – T: (Morocco) Beni-Said, au Pont du Kert, *Sennen & Mauricio 9622* (holo: BC; iso: BM, G, MPU, RAB, RNG, W). = *Ae. ventricosa* Tausch.

virescens Jord. & Fourr. – ST: (Algeria: 'circa Bône') cultivé à Lyon, fl. 3 juin 1869, *Jordan s.n.* (MPU-Coste); (France, Var, Toulon: 'in incultis Galliæ australis, circa Telonem') cultivé à Lyon, 1869, *Jordan s.n.* (LY-Gandoger). = *Ae. neglecta* Req. ex Bertol.

viridescens Gand. – T: (France, Var; with Gandoger as: 'Gallia, Hérault'), pone Les Arcs, *Verriet-Litardière s.n.* (holo: LY-Gandoger). = *Ae. neglecta* Req. ex Bertol.

Infraspecific taxa of *Aegilops* with uncertain status:

comosa Sm. in Sibth. & Sm. var. *confusa* Eig. – T: not indicated. = *Ae. comosa* Sm. in Sibth. & Sm. var. *subventricosa* Boiss. – Note: see at 10.5b.

comosa Sm. in Sibth. & Sm. var. ('d)') *polyathera* Hausskn. – T: not indicated (a few Greek locations mentioned only: Phaleron, Orman Magula, Aïvali). = *Ae. comosa* Sm. in Sibth. & Sm. var. *subventricosa* Boiss. – Note: see at 10.5b.

crassa Boiss. var. *brunnea* Pop. – T: (Turkmenistan / Uzbekistan) 'Turkomania', *Vavilov s.n.* (holo: WIR?, not found). = *Ae. crassa* Boiss. – Note: see at 10.6.

crassa Boiss. var. *lutescens* Pop. – T: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. crassa* Boiss. – Note: see at 10.6.

crassa Boiss. var. *obscura* Pop. – T: (Uzbekistan) 'Turkestan', Samarkand, Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. juvenalis* (Thell) Eig. – Note: see at 10.9.

crassa Boiss. var. *rufescens* Pop., Bull. Appl. Bot. & Pl. Breeding 13: 477 (1923). – Type: (Kazakhstan / Uzbekistan) 'Turkestan', Syr-Darja, *Popova s.n.* (holo: LE/TASH/WIR?, not found). = *Ae. juvenalis* (Thell) Eig. – Note: see at 10.9.

Amblyopyrum (Jaub. & Spach) Eig

muticum (Boiss.) Eig. – T: (Turkey) Cappadocia, ad Euphratem, *Aucher-Éloy 2977* (holo: G (not seen); iso: [the hispid specimens of:] BM, FI, G-BOIS, K, MPU, OXF, P).

muticum (Boiss.) Eig var. **loliaceum** (Jaub. & Spach) Eig. – T: [the glabrous specimens of:] (Turkey) Cappadocia, ad Euphratem, *Aucher-Éloy 2977* (holo: P; iso: BM, G (not seen), G-BOIS, MPU, OXF).

Taxa from other genera, now synonyms under *Aegilops* or *Amblyopyrum* species:

Agropyron tournefortii Savign. – LT: (Italy, Liguria, Genoa) in alveo Feritoris prope La Foce, *Savignone s.n.* (BOLO-Bertoloni). = *Ae. speltoides* Tausch var. *speltoides*.

Phleum aegylops Scop. – T: (Italy) circa Tergestum (= Trieste), *Scopoli s.n.* (probably) (holo: ?). = *Ae. geniculata* Roth. – Note: for this species relevant Scopoli material may be in C, LINN, MPU, UPS, and PAV. See at 10.8.

Triticum emarginatum Godr. – T: (France, Hérault) Port Juvénale, 12.VII.1837, *Touchy 293* (holo: NCY, not seen; iso: MPU). = *Amblyopyrum muticum* (Boiss.) Eig var. *loliaceum* (Jaub. & Spach) Eig.

Triticum markgrafii Greuter. – LT: (Greece) in insula Creta, *Sibthorp s.n.* (OXF-252). Designated by Davis (1985: 237). = *Ae. caudata* L.

Triticum (*Agropyrum*) *obtusatum* Godr. – T: (France, Hérault) Port Juvénale, *Touchy 292* (holo: NCY, not seen; iso: MPU). – PT: (France, Hérault) Port Juvénale, *Grenier s.n.* (holo: P). = *Ae. speltoides* Tausch var. *ligustica* (Savign.) Fiori.

Triticum ovatum (L.) Rasp. var. *bispiculatum* Kuntze. – T: Azerbaijan, Baku, V.1886, *Kuntze s.n.* (holo: NY). = *Ae. kotschyi* Boiss.

Triticum ovatum (L.) Rasp. ssp. *violaceum* Braun-Blanq. & E.Wilcz. – T: (Morocco) in sabulosis prope Kenitra, in imperio Maroccano, ubi floret mense Aprili, 7.IV.1921, *Wilczek s.n.* (holo: LAU, not seen; iso: MPU). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

Triticum sylvestre Cesalpino ex Bubani. – T: not indicated. = *Ae. geniculata* Roth.

Triticum triaristatum (Willd.) Gren. & Godr. forma *brachyathera* Hack. in Kneuck. – T: (Palestine) Wilhelma, near Jaffa, 23.V.1904, *Kneucker 948* (holo: KR, destroyed; iso: A, B (not seen), BM, C, G, K, L, LD, LE, MO, NY, PR, US). = *Ae. peregrina* (Hack. in J.Fraser) Maire & Weiller var. *peregrina*.

x Aegilotriticum P.Fourn.

erebunii (Gandilyan) van Slageren. – T: Armenia ('URSS, RSS Armeniae'), in Instituti agriculturae RSS Armeniae anno 1982, 24.VI (area experimentalis) *P.A. Gandilyan, Zh.O Schakarjan et E.A. Petrosian* creavit (holo: WIR 0104546, not seen; iso: YAI).

grenieri (K.Richt.) P.Fourn. – ST: (France) Bord des champs de blé à Agde, à Montpellier, à Avignon, 1 Juin, *Godron s.n. / Grenier s.n.(?)* (Hb. Godron (NCY) and/or hb. Grenier (P), respectively; not seen). – Note: as this species is accepted a lectotype remains to be chosen (see Chapter 4.2.2.2).

langeanum (Amo) van Slageren. – LT: (Spain) in agris prope Matritum, 27.V.1852, *Lange s.n.* (C; isolectotypes: K, P).

rodetii (Trab.) van Slageren. – T: (Algeria) à Brassa, champs cultivés à Radjradj (propriété Rodet), 1.VII.1918, *Trabut s.n.* (holo: AL, not seen; iso: F, MPU).

sancti-andreae (Degen) Soó. – LT: (Hungary, Budapest) Commit. Pest, ad viam inter St. Andream et montem Köhegy (22 Jun. 1913), *von Degen s.n.* (BP, not seen; isolectotype: W, with '*Ae. nova* x *T. sativum*' on the label).

speltaeforme (Jord.) van Slageren. – NT: (France, Rhône) cultivés à Villeurbanne (Rhône) provenant d'Agde (Hérault). Rec. par *A. Jordan s.n.*. Fleurs le 15 Juin, fruits le 14 Juillet 1857. (Fl. Gall. et Germ. Exsiccata de C. Billot no. 2187) (LY-Jordan; iso-neotypes: BM, F, G, JE, LE, LY, MPU, MPU-Duval-Jouve, OXF, P, PI, WAG).

triticoides (Req. ex Bertol.) van Slageren. – T: (France, Vaucluse) environs d'Avignon, *Requien s.n.* (holo: BOLO-Bertoloni (Fl. ital.); iso: AV (not seen), G, K, MPU, NY, P, PI, TO).

Taxa from other genera, now basionyms of x *Aegilotriticum* species:

Triticum erebunii Gandilyan: see x *Aegilotriticum erebunii* (Gandilyan) van Slageren.

x *Triticum grenieri* K.Richt.: see x *Aegilotriticum grenieri* (K.Richt.) P.Fourn.

x *Triticum rodetii* Trab.: see x *Aegilotriticum rodetii* (Trab.) van Slageren.

Index to tables and figures

All tables of this publication are listed here, but only those figures presented in the General Part and the generic description of *Aegilops*. Figures in the Taxonomic Part are indicated under the Index to plant names.

Tables

Figures