A REVISION OF THE GENUS ALLIUM L. (LILIACEAE) IN AFRICA

Dit proefschrift met stellingen van

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De Rector Magnificus van de Landbouwhogeschool,
J. P. H. VAN DER WANT

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BRIGITTA E. E. DE WILDE-DUYFJES

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PROEFSCHRIFT

TER VERKRIJGING VAN DE GRAAD
VAN DOCTOR IN DE LANDBOUWWETENSCHAPPEN
OP GEZAG VAN DE RECTOR MAGNIFICUS,
DR. IR. J. P. H. VAN DER WANT,
HOOGLERAAR IN DE VIROLOGIE,
IN HET OPENBAAR TE VERDEDIGEN OP
WOENSDAG 26 JANUARI 1977
DES NAMIDDAGS TE VIER UUR IN DE AULA VAN DE
LANDBOUWHOGESCHOOL TE WAGENINGEN

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STELLINGEN

I

De Linneaanse naam *Allium ascalonicum* moet geaccepteerd worden; de Linneaanse naam *Allium magicum* moet verworpen worden.

LINNAEUS, C. [Strand]. 1756. Flora Palaestina.
LINNAEUS, C. 1759. Syst. Nat.
LINNAEUS, C. 1762. Spec. Plant. ed. 2.
STEARN, W. T. 1960. Bull. Brit. Mus. (Nat. Hist.) Vol. 2, no. 6: p. 182.
Int. Code Bot. Nom. 1972, Art. 69, 70.

II

Bij het aanwijzen van het type van Linneaanse soortnamen waarvan geen authentieke door Linnaeus geziene exemplaren aanwezig zijn, kan een bij een literatuur-citaat uit de protoloog behorend herbariumexemplaar als lectotype aangewezen worden.

DE WILDE-DUYFJES, B. E. E. 1973. Taxon 22(1): p. 57–91.

III

Een definitieve indeling in subgenera en/of secties van het genus *Allium* moet wachten tot dit genus als geheel in al zijn aspecten evenwichtig bestudeerd is; hieraan lijkt ook de bouw van de honingklieren in de septa van het vruchtbeginsel een waardevolle bijdrage te kunnen leveren.

IV

Bij het aannemen van gegevens omtrent de ouderdom van taxa uit fossielen, en het trekken van conclusies daaruit, wordt niet zelden de regel veronachtzaamd dat uit fossielen slechts een minimum ouderdom kan worden vastgesteld. Voorts verdient het persen van botanische gegevens in het keurslijf van geofysische hypothesen geen aanbeveling.

RAVEN, P. H. & T. E. RAVEN. 1976. The genus Epilobium in Australasia. New Zealand D.S.I.R. Bull. 216: in het bijzonder p. 68–73.
SCHUSTER, R. 1976. Plate tectonics and its bearing on the geographical origin and dispersal of Angiosperms. In: Origin and Early Evolution of Angiosperms. ed. C. B. Back. Columbia Press: p. 48–138, 45 fig., in het bijzonder p. 53, 54, 58, 69, 76, 119, 121.

V

Bij taxonomische studies voor het Middellandse-Zeegebied moeten onderzoekers die werken voor Europa rekening houden met de mogelijkheid dat ook soorten met een klein areaal eveneens kunnen voorkomen in Afrika, en vice versa; dit geldt vooral voor de zuidelijke Griekse eilanden en de Cyrenaica, en voor Zuid-Spanje en het er tegenover liggende gedeelte van Noord-Afrika.

Sandwith, N. Y. & N. D. Simpson. 1941. Additions to the flora of the Cyrenaica. Journ. Bot. Vol. LXXIX: p. 33–44, in het bijzonder p. 34.
Rechinger, K. H. 1950. Grundzüge der Pflanzenverbreitung in der Aegäis I. Vegetatio Vol. II: p. 55–120.
Greuter, W. 1971. Betrachtungen zur Pflanzengeographie der Südaegäis (ed. Arne Strid). Opera Bot. No. 30: p. 22–24.

VI

Door Löve & Löve wordt de cytoloog getypeerd, niet de taxonoom.

Löve, A. & D. Löve. 1974. Cytotaxonomical Atlas of the Slovenian Flora (in het bijzonder p. XI).

VII

Het is voorbarig om op grond van verschillen in de vroege embryonale ontwikkeling van de *Anura* en de *Urodela* te besluiten tot een diphyletische oorsprong van de recente *Amphibia*.

Nieuwkoop, P. D. & Lien A. Sutasurya. 1976. Embryological evidence for a possible polyphyletic origin of the recent amphibians. J. Embryol. exp. Morph. Vol. 35, 1: p. 159–167.

VIII

Bij het introduceren van chemische bestrijdingsmiddelen in bepaalde niet-Westerse gebieden, geeft men zich dikwijls onvoldoende rekenschap van het feit dat, als gevolg van socio-culturele omstandigheden, bedreigende vormen van misbruik voor de gezondheid van mens en milieu voor de hand liggen.

IX

Het is zeer waarschijnlijk dat Orang Utans voor hun voortbestaan grote arealen primair, niet uitgekapt, (laagland-)regenbos nodig hebben; hetzelfde geldt, mutatis mutandis, voor *Rafflesia* en vele andere plante- en diersoorten.

Tegen: Wilson, C. C. & W. L. Wilson. 1975. The influence of selective logging on Primates and some other animals in East Kalimantan. Folia Primatol. 23: 245–274.

X

Om de recreatieve en natuurwetenschappelijke functie van het Groene Hart van Holland te behouden, moet o.a. het jaarlijks toegestane accres van woningen in de aldaar gelegen dorpen, drastisch verminderd worden.

XI

In weerwil van de mening van Stearn, was Rabelais bekend met de narcotiserende werking van hennep.

STEARN, W. T. 1974. Typification of Cannabis sativa L. Bot. Mus. Leafl. Harvard Un. Vol. 23, No. 9: p. 325–336.

XII

Biologen zijn de ergsten.

(Uitspraak van verscheidene boswachters).

Aan de nagedachtenis van mijn Vader
Aan mijn Moeder

CONTENTS

Alphabetical index of accepted section- and species names

INTRODUCTION

Being well acquainted with the Laboratory for Plant Taxonomy and Plant Geography of the Agricultural University at Wageningen after nearly 4 years of botanical activities in tropical Africa, and after having received the degree of M.Sc. at the University of Leyden in 1966, I was glad to start, at the instigation of Prof. dr. H. C. D. DE WIT, a revision of the genus *Allium* for Africa. The rich assortment of *Allium* taxa grown in the botanical garden had drawn my attention and led towards this decision. During the several years of the present study on *Allium* still more specimens from Europe and North Africa were taken into cultivation, which, in addition to the rich herbarium collections examined in the major European and North African herbaria, proved very helpful for a good understanding of the species.

Allium in Africa is largely confined to the Mediterranean region which implied that the North African taxa could not be satisfactorily delimited and named without an accompanying study of the taxa occurring in the northern and eastern parts of the Mediterranean vegetation. All more recent treatments of North African *Allium* were in local floras, e.g. PAMPANINI (1931) for the Cyrenaica, CUÉNOD (1954) for Tunisia, QUÉZEL & SANTA (1962) for Algeria, and TÄCKHOLM & DRAR (1954) for Egypt, apart from the several precursory papers by MAIRE c.s., resulting in MAIRE's treatment of the genus for the whole of North Africa in the 'Flore d'Afrique du Nord' (1958). Besides these works, several recent papers by FEINBRUN and KOLLMANN for the Near East, mainly Israel, and by VON BOTHMER and EKBERG for the Aegean area were of great importance.

The above mentioned earlier botanists dealing with African *Allium* had paid but little attention to the taxa described from Europe and the students of European or eastern Mediterranean *Allium* hardly took notice of those from Africa. The present study, including the examination of a great part of the European-Mediterranean material, forced me to accept a rather broad species concept, and therefore brought about several name changes and the reduction into synonymy of many names as compared to MAIRE's treatment.

Nomenclature, first of all, demanded that the Linnean binomials for *Allium* species possibly found in Africa be typified, which led to a previous publication by me on the subject: 'Typification of 23 *Allium* species described by LINNAEUS and possibly occurring in Africa', (Primitiae Africanae 9), in Taxon 22(1), 1973, p. 57–91. This article forms the first part of my present doctor's thesis.

SYSTEMATIC POSITION OF ALLIUM

The genus *Allium* occupies, together with a few related genera, as there are the South American genus *Nothoscordum* KUNTH, and many other small South American genera including *Ipheion* RAFINESQUE, the SW. Asian genus *Nectaroscordum* LINDLEY, and possibly the South African genus *Tulbaghia* L., a rather intermediate position between *Liliaceae* and *Amaryllidaceae*. HUTCHINSON (1973) placed *Allium* and related genera in *Amaryllidaceae*, mainly because of its umbel-like inflorescence surrounded by scarious spathes or bracts.

For convenience's sake, the genus *Allium* has recently been placed into a separate family *Alliaceae*, a family proposed by AGARDH (1858), and reinstalled by AIRY SHAW (1966, 1973). WENDELBO in Flora Iranica (1971), followed by NASIR (1975) in the flora of West Pakistan, accepts the family *Alliaceae* for practical reasons. As briefly pointed out by WENDELBO l.c., several fields of study other than morphology, e.g. chemistry (HEGNAUER, 1963), and parasitology (SAVILE, 1962, fide WENDELBO 1971:1) point to a closer relationship to *Liliaceae* than to *Amaryllidaceae*. In passing it should be mentioned that one of the unifying characters of *Alliaceae* possibly should be the typical *Allium* smell.

The *Liliaceae*, however, most likely are a heterogeneous family, which possibly in the future better should be split up into smaller families, including *Alliaceae*. For the time being I prefer to retain *Allium* in *Liliaceae* (subfamily *Allioideae*, tribe *Allieae*), following ENGLER in ENGLER & PRANTL (1887), mainly because of the superior ovary, a character prevailing in *Liliaceae*.

THE CHARACTERS IN ALLIUM

The determination of *Allium*, living or dried specimens, is usually not difficult, provided that complete material is at hand. Collectors should therefore be attentive to gather the specimens as complete as possible. Besides leaves and flowers, especially the outer bulbcoat-leaves and the spathe, which is often caducous, should be collected.

In the following a concise list is given of the morphological characters most valuable for identification, with discussion, and when necessary in addition with a short explanation of some terms used in the key and the species description.

Habit and growth

All *Alliums* are perennial, except for some cultivated races of *A. cepa* and *A. ampeloprasum*, which can be regarded as biennial. A number of species is rhizomatous (Sect. *Rhizirideum*, not in Africa), but most species have distinct bulbs, either solitary, or a few together, or, in other species (e.g. *A. roseum*, *A. sphaerocephalum*) gregarious due to the production of many increase bulbs (see below). The size of the plants, low or medium sized, or tall, may be characteristic, e.g. *A. chamaemoly* is always a small plant; representatives of sect. *Melanocrommyum*, e.g. *A. nigrum*, are usually robust plants, etc. Cultivated *A. ampeloprasum (A. 'porrum')* may reach a height of over 1.5 m.

Most *Alliums* are glabrous. In sect. *Molium* several species are hairy, viz. *A. subhirsutum*, *A. erdelii*, *A. papillare*, *A. chamaemoly*, and *A. longanum*; in sect. *Codonoprasum* 2 species in Africa are hairy: *A. cupani* and *A. trichocnemis*.

Bulb and leaves

The shape and the size of the bulbs have certain significance, but for determination of species especially the texture of the outer bulbcoat-leaves, and the presence or absence of increase bulbs, as well as their shape and situation are important.

Mann (1960) gives an excellent and readily comprehensible scheme of the bulb structure of *A. neapolitanum*, representing the bulb structure in sect. *Molium*. It is reproduced here in fig. 1. This scheme is largely followed in several publications e.g. by Jones & Mann (1963), by Ekberg (1972: 82–101) in the study of the bulb structure for instance for section *Anguinium* (subgen. *Rhizirideum* with Wendelbo), and sect. (subgen.) *Melanocrommyum*, and by von Bothmer 1974: 7 in his study on the *A. ampeloprasum* complex in the Aegean area.

In general the arrangement of the various leaf types as recognized by MANN l.c., holds for all *Allium* species. He recognizes respectively protective leaves (called presently by me outer bulbcoat-leaves), storage leaf (leaves), sprout leaf (leaves), and foliage leaves. The branching of the plant is essentially sympodial. For details and discussion of fig. 1 the reader is referred to MANN l.c.

The sproutleaf is usually tubular, without a blade, and decays early. It facilitates the penetration of the foliage leaves, and usually has a length in accordance with the depth of the bulb under the soil surface.

OUTER BULBCOAT-LEAVES

These are the protective leaves (bulb-tunics or bulb-envelopes) as in fig. 1. They are usually greyish or brownish, and apparently serve for the protection of the bulb in and when above the ground. In species of sect. *Molium* they are thickish and have often a characteristically pitted structure when old; in other species they are membranous (e.g. in *A. cepa*), or distinctly fibrous (e.g. in *A. vineale*) or not, and in some species very conspicuously fibrous and netted, e.g. in *A. ascalonicum*, *A. baeticum*, and *A. guttatum* (sect. *Allium*), and in *A. cupani* and *A. trichocnemis*, both of sect. *Codonoprasum*.

INCREASE BULBS

Increase bulbs are produced in the axils of the foliage leaves (fig. 1), solitary or several collaterally. In some species they are sessile or subsessile, in other species they are characteristically longly stiped and then they appear above the bulb within the leaf sheaths, e.g. in *A. sphaerocephalum*. Each increase bulb is wrapped in a usually coriaceous, pale brownish prophyll; according to EKBERG (1972) the prophyll is lacking in sect. *Melanocrommyum*. VON BOTHMER 1974: 8, describes the increase bulbs for species of the *A. ampeloprasum* complex.

LEAF BLADES

Very important is to know whether the leaf blades are flat, or terete (or semiterete and canaliculate) and hollow. In dry specimens a piece of the leaves should be boiled for properly checking this. Flat as well as hollow or fistulose leaves occur in both sect. *Allium* and sect. *Codonoprasum*.

All leaves are morphologically radical, inserted on the stem plate, but it is significant whether the blades are spaced along the scape (sect. *Codonoprasum*, sect. *Allium*), or more or less approximate at the soil surface (sect. *Molium*, sect. *Briseis*, sect. *Melanocrommyum*). In most species the phyllotaxis seems scattered, but in some species (e.g. in *A. ampeloprasum*) it is clearly distichous, a condition which is probably essentially the case in all or most *Alliums*. In

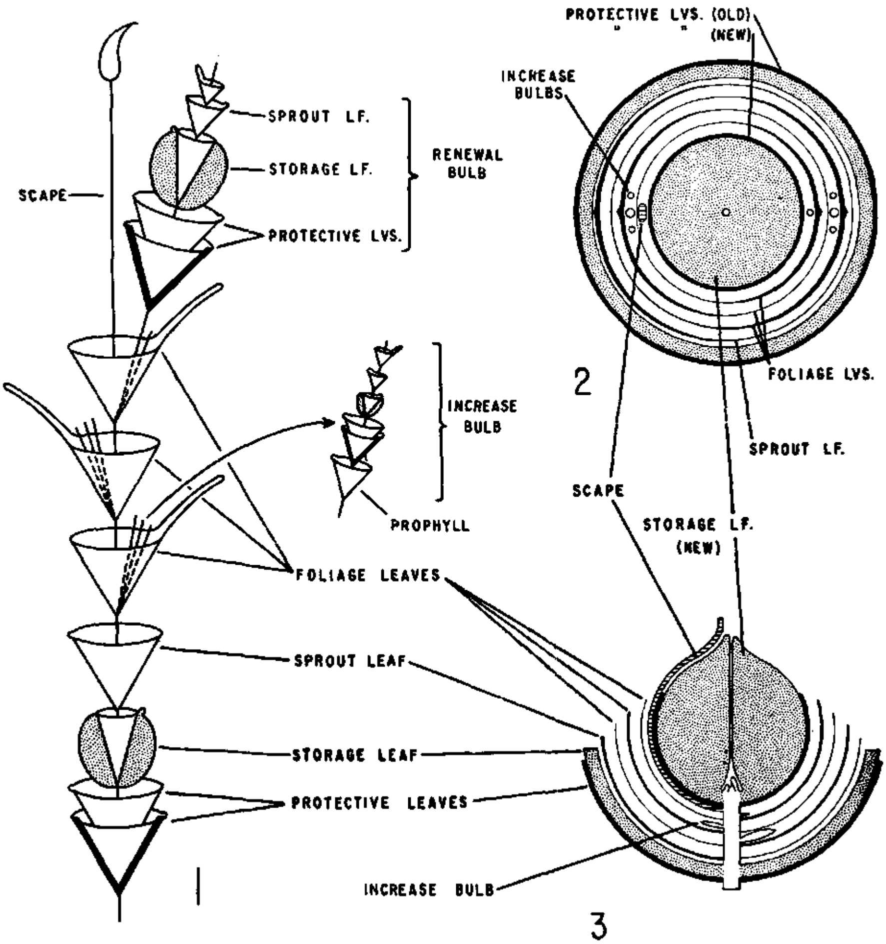


FIG. 1. Bulb structure of *Allium neapolitanum*. – 1. Diagram of a plant at the time of flowering; the internodes have been elongated to show the individual leaves. This plant developed from a renewal bulb of the previous year such as now appears in the axil of the third foliage leaf. By flowering time the old sprout leaf, the storage leaf, and the parenchymatous parts of the outer bulbcoat-leaves (= protective leaves; the 4 leaves at the plant base) would have decayed; 2–3. Diagrammatic cross- and longitudinal sections of the same plant. In these sections the 2 protective leaves are shown as a single black line. – After MANN 1960: 767, fig. 1–3.

several species the leaves have faded before the plant is in full anthesis. Usually the leaf tip withers early. In certain species, e.g. *A. ampeloprasum*, there is, at the transition of sheath and blade a more or less distinct ligule, but I have found no diagnostic characters in the ligule.

SCAPE

This is usually erect and distinct, in some species it is very short as if the inflorescence is sessile, viz. in *A. chamaemoly* and *A. tourneuxii.* In cross-section it is usually terete, (hollow or not, sometimes inflated in *A. cepa*), but sometimes angled and triquetrous (in Africa *A. triquetrum*). The scape is always glabrous.

INFLORESCENCE

Besides the shape and the size of the inflorescence, which is of limited systematic value, the shape and morphology of the spathe surrounding the inflorescence is of utmost importance (see below).

The inflorescence is umbellate, usually spherical or hemispherical, sometimes more or less ellipsoidal *(A. sphaerocephalum)*, or tufted or double (part of the specimens of *A. guttatum*); in *A. vineale* the inflorescence is often composed of two or more partial heads of bulbils, or of flowers and bulbils. In a part of the species the pedicels of the flowers are subtended by a small lacerated whitish bracteole, or in other cases several pedicels have a common bract, with in addition bracteoles or not (sect. *Allium*, sect. *Codonoprasum*, sect. *Schoenoprasum* p.p.), in still other species the bracts and bracteoles are lacking (sect. *Molium*, sect. *Briseis*, and sect. *Melanocrommyum*).

Many earlier authors, as well as MANN 1959: 730–739, (with detailed literature references), and VON BOTHMER 1974: 11, pointed out that the umbellate inflorescence is in fact a composition of several bostryxes (or helicoid cymes). According to MANN l.c., in sect. *Molium* the common spathe of the inflorescence appeared to be produced by the fusion of 4 coalesced bracts each of which bears in its axil a bostryx of 3–7 flowers. Central to these peripheral bostryxes are several smaller ones which differentiate later. He gives ample illustration by line drawings, schemes, and photographs.

SPATHE

There are 1 (sect. *Allium*, *Schoenoprasum*, *Molium*, and *Melanocrommyum*) or 2 spathes (sect. *Codonoprasum* and *Briseis*). It is either caudate or not, splitting or not into valves or lobes, in some species caducous. In some species of sect. *Allium*, e.g. in *A. ampeloprasum* and *A. sativum*, the single spathe is often 2-topped and there is a longitudinally line of suture indicating that it has possibly originated out of two spathes. The spathe can best be studied when young, i.e. when it still envelopes the not yet fully developed flowers.

FLOWERS

The shape of the flowers is often difficult to define. It appeared that when fully flowering, in the sunshine or warmth, the flowers are either fully expanded and stellate (e.g. sect. *Molium*, sect. *Melanocrommyum*, *A. cepa*, and others), or the flowers remain more urceolate or campanulate as e.g. in *A. ampeloprasum* (sect. *Allium*) or *A. paniculatum* (sect. *Codonoprasum*). Still the shape and the curving of the tepals is of some significance. KOLLMANN (1973a, 1975) divides the section *Molium* on the shape of the perianth into 2 series, viz. ser. *Patentes* for the species with patent tepals, and ser. *Campanulatae* with more erect tepals causing the perianth bell-shaped. VON BOTHMER 1974: 12–13, fig. 3, emphasized the diagnostic value of the flower shape of several species of sect. *Allium*. The tepals of the species of the *A. ampeloprasum* complex as well as of some related species are shown to have characteristic microscopical papillation. It should be kept in mind that during the drying of specimens with immature flowers for the herbarium, these flowers may become atypical in size and shape, and hence these flowers are rarely characteristic. The flower colour, at least as far as African species are concerned, appeared to be very variable, and of little significance. In most species it varies from almost white to pink or purplish, with a broad or narrow darker, often greenish or purplish, midvein.

STAMENS

These are either simple, flattened and usually much broadened at the base, or tricuspidate in the upper half. The length of the cusps, as well as the length of the whole filament, is of diagnostic value. In some species the anthers are almost always all exserted (e.g. *A. sativum*, *A. fistulosum*, *A. sphaerocephalum* ssp. *sphaerocephalum*, *A. guttatum*, and *A. subhirsutum* ssp. *subvillosum*), in other species the length appeared to be variable, included or exserted (e.g. *A. ampeloprasum*, *A. paniculatum*, and *A. ascalonicum*), in still others the anthers are always included (*A. roseum*, *A. neapolitanum*, and most other members of sect. *Molium*, and in *A. dregeanum*, and *A. nigrum*). These characters appear not to be fully correlated with the accepted sections.

PISTIL

The shape of the 3-locular ovary is not very characteristic. The slender style is inserted in the ovary towards its base, and hence almost gynobasic. The stigma is very inconspicuous; in only two species, *A. triquetrum* and *A. erdelii*, the stigma is clearly 3-lobed. The number of ovules per locule is an important character; in most sections it is 2, in sect. *Melanocrommyum* there are 3–14 ovules per locule. The ovary is finely papillate in sect. *Melanocrommyum*, but this feature disappears in the fruits.

Nectaries

These are situated in the septa of the ovary, and the opening of the glands can be seen towards the base of the septa. Unpublished anatomical data by Mrs. van Geffen-Roseboom (Wageningen, 1974) based on many longitudinal and cross-sections through the septas of the ovaries of many species in different sections of *Allium* revealed that the shape of the nectary, the course of the afferent canal, and the shape of the opening are characteristic for the sections. In sect. *Molium* and *Briseis* the canal is almost absent, and the nectar secrets directly; the secretion opening is directly visible, not screened off by a small cap. In the sections *Schoenoprasum*, *Codonoprasum*, and *Melanocrommyum* the nectar secrets through a distinct canal towards the opening which is screened off by a small cap. The canal is longest (as long as the whole inner tissue of the nectary) in sect. *Codonoprasum*; in the other two sections the canal is much shorter. The nectar assembles in the flower between the ovary and the base of the stamens, and can be seen as glossy droplets in the flower.

Fruits

The shape of the ripe fruit, a loculicidal capsule, is of some value for the distinction of the species, and used for instance by von Bothmer (1972) for species of sect. *Allium* in Greece, and by Szelubsky (1950) for species of sect. *Melanocrommyum* in Israel. For Africa I found little help in the shape of the fruits for taxonomic purposes.

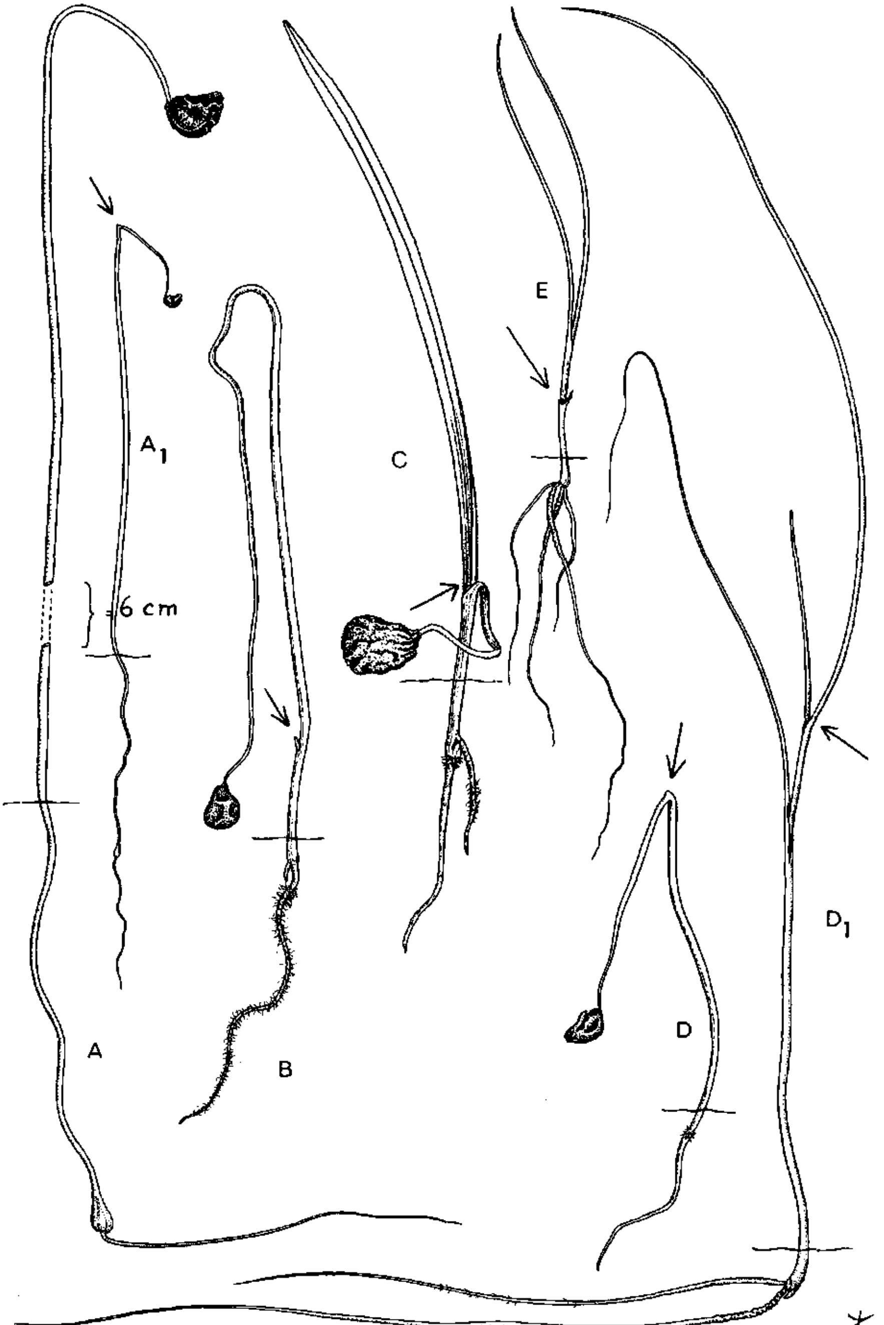
As a result of the many ovules per locule in sect. *Melanocrommyum* there are usually more than two seeds per locule, a character of major importance for the species of this section.

Seeds

The seeds are usually more or less flattened and irregularly (2–)3-angled; often they are curved or somewhat triangular in shape. Dry fertile seeds are dull blackish, but in some species, namely *A. ascalonicum*, *A. baeticum*, *A. guttatum*, *A. trichocnemis*, and *A. cupani*, they have a golden gloss. All these species have also very distinctly fibrous and netted outer bulbcoat-leaves. After magnification the seedcoat (testa) often shows a possibly characteristic texture which is illustrated for most species in the species-drawings.

SEEDLINGS

Not much is known of the germination of *Allium* seeds of the wild species. The germination and development of the seedlings is best known from the commonly cultivated species *A. cepa* (with many races propagated by seeds), *A. ampeloprasum* (*A. 'porrum'*), *A. fistulosum*, and *A. schoenoprasum*. Of seedlings from seeds of four wild species belonging to four different sections, germinated in the Wageningen botanical garden, viz. *A. nigrum* (fig. 2a), *A. subhirsutum* (fig. 2b), *A. triquetrum* (fig. 2c), *A. sphaerocephalum* (fig. 2d), and *A. paniculatum* (fig. 2e) detailed drawings are presented. From the figures it appears that the seedlings of the different sections do not show essential differences. The mode of germination is briefly described in EAMES 1961: 333, in BOYD 1932: 7, and in REINDERS & PRAKKEN 1964: 547, fig. 596; of the older literature I may refer to KLEBS 1885:573. BOYD l.c. described the germination under 'Type A', to which belongs also the germination of *Allium*, as follows: 'The radicle and base of the cotyledon grow vertically downwards. The elongating zone of the cotyledon, which caused their emergence, increases in length, resulting in arching up of the cotyledon above the surface. The cotyledon consists of a short base, the plumular bud merging into the photosynthetic region, the lamina or blade, which may be cylindrical (fig. 2a, 2b, 2d, 2e) or flattened (fig. 2c) and tapers to the suctorial tip bearing the seed. As the endosperm is exhausted and growth proceeds, the cotyledon becomes erect (fig. 2d1), and the remains of the seed drop from the tip. The first leaf emerges towards the base of the cotyledon, through a lateral slit.'



A$_1$
C
E
6 cm
A
B
D
D$_1$

ANATOMY

The following survey of the most important publications covering the main lines of enquiry that have been followed so far was kindly provided by Mrs. MARY GREGORY of Kew. She wrote that most research has been done on either crystal and sclerenchyma type in bulb scales or distribution of vascular bundles and laticifers in bulb scales and/or leaves.

JACCARD & FREY (1928) examined 35 species, including living and herbarium material and specimens from different habitats. Their general conclusion was that crystal types in bulb scales are more closely connected with ecological conditions than with the systematic position in *Allium*, although systematically related plants appeared often to be similar in their ecological requirements, and had similar crystal types.

CHARTSCHENKO (1932) examined about 50 species from Turkestan and Siberia (several specimens of each species). He disagreed with JACCARD & FREY's conclusions that crystal types are useful for specific diagnosis but not for systematics. The most variation in crystal type was found in sect. *Molium*, which CHARTSCHENKO therefore suggested was the oldest section in *Allium*.

RICCI (1963) examined 35 species, 20 of which had been previously studied, and listed them under CHARTSCHENKO's crystal types, adding two more. He concluded that crystal type is a valuable aid to determination of species, but did not comment on the fact that he put several species in quite different groups than those in which they were included by JACCARD & FREY or CHARTSCHENKO. Since most of RICCI's plants were grown in a botanic garden, this might account for some of the discrepancies if environmental conditions are important.

A more promising group of characters for systematic purposes seems to be the distribution of the vascular bundles and laticifers in the foliage leaves. TRAUB (1968) rapidly surveyed a large number of species and found that, with few exceptions, species with $x=7$ had 1 row of vascular bundles, while those with $x=8$ mostly had 2 or more rows (one row inversely orientated) or a circle. He later (1972) used this as one of the characters in his division of *Allium* into 3 subgenera. TRAUB (1968) describes a simple technique for use with herbarium material.

Although TRAUB doesn't mention it, MENZ (1922) had already used the arrangement of vascular bundles in one row in the leaf as a character separating

FIG. 2. Seedlings. – a–a 1. *Allium nigrum*, ×2 and ×$^2/_3$ resp. (WAG 288/68, spirit mat.); b. *A. subhirsutum* subsp. *subhirsutum*, ×2 (DE WIT 12520); c. *A. triquetrum*, note the flat petiole of the cotyledon and the relatively broad and flat first leaf, ×2, (MULLER 10284); d–d 1. *A. sphaerocephalum*, ×2 (WAG 311/73 and 317/73, spirit mat.); e. *A. paniculatum*, ×$^2/_3$ (VAN DER MAESEN 1491, spirit mat.).

The arrows indicate the place from where the shoot with the first leaf develops.

sect. *Molium* from the other sections she studied, and also the distribution of laticifers, which are subepidermal, narrow and crowded in MOLIUM (except *A. nigrum*), 2–3 layers below epidermis and larger in the other sections examined.

HUANG & STERLING (1970) have used the position of the laticifers in the bulb scales as a character to distinguish different sections of the genus; they have added other characteristics, e.g. the number of walls of the laticifers in transverse section and the number of pits in the end walls.

Mrs. GREGORY herself examined mainly leaf anatomy of about 60 species of *Allium* to be published in the Kew series 'Anatomy of the Monocotyledons', and found that the distribution of vascular bundles and laticifers are useful characters, but she is more doubtful about the numbers of walls and pits in the laticifers, which, at least in leaves, seem to be more variable than HUANG & STERLING found in bulb scales.

In herbarium material it is found difficult to study laticifers but vascular bundle distribution can be investigated.

More anatomical data are presented by SAGHIR & MANN 1969: 52, fig. 3–6. They found that the mesophyll of the foliage leaves contains a large number of laticifers. When the tissues are injured, the laticifers exude a characteristic latex. In the leaf blades of *A. sativum* and other $x=8$ *Alliums*, the laticifers appeared to be separated from the epidermis by one or two layers of parenchymal cells. In *A. subhirsutum*, a $x=7$ species, the laticifers appeared to be strictly subepidermal. Measurements and discussions are added.

EKBERG 1972: 98, fig. 4, found that the orientation of the vascular bundles of *A. giganteum* and other species of sect. *Melanocrommyum* is different from that in sect. *Molium*. In *Melanocrommyum* there is primarily one row which divides in the leaf blades into two rows; in other *Allium* species of sect. *Molium* two rows in the blade originate from a circular leaf basis by flattening.

PALYNOLOGY

BEUG 1961: 54–55, 57–58, Taf. 7, fig. 10, and Abb. 16, fig. d–g, described the pollen of 25 *Allium* species from Europe. The differences between the species are little, and the pollen type of *Allium* appeared to occur in other *Monocotyledons* as well.

The pollen grains are monosulcate and rectate-reticulate. Their average size varies between 30 and 40 μm.

Based on a slight difference in length of the aperture two groups can be distinguished, the first comprising species all belonging to sect. *Allium* (*A. ampeloprasum*, *A. porrum*, *A. rotundum*, *A. scorodoprasum*, *A. sphaerocephalum*, *A. vineale*); the second comprising species of several other sections (*A. angulosum*, *A. ascalonicum*, *A. carinatum*, *A. cepa*, *A. fistulosum*, *A. flavum*, *A. globosum*, *A. moschatum*, *A. narcissiflorum*, *A. ochroleucum*, *A. oleraceum*, *A. pulchellum*, *A. schoenoprasum*, *A. senescens*, *A. strictum*, *A. suaveolens*, *A. triquetrum*, *A. ursinum*, *A. victorialis*).

For the *A. ampeloprasum* complex VON BOTHMER 1974: 17, described the pollen as l-colpate with a punctate surface. Shape and surface sculpture of the pollen grains are very uniform. There is a certain amount of variation in size which seems to be correlated to the degree of polyploidy. In *A. commutatum* at least the tetraploids always have larger pollen grains than the diploids.

CARYOLOGY

Of the more recent cytological studies concerning species of *Allium* which are identical or much related to those occurring in Africa I may mention FEINBRUN 1948, SZELUBSKY 1950, SAGHIR & MANN 1969, KOLLMANN 1969, 1970, 1973, VON BOTHMER 1970, CELA RENZONI & GARBARI 1970, 1971, and GARBARI & SENATORI 1975.

The basic chromosome number in *Allium* is x=7, 8, and 9. Polyploidy is a common phenomenon.

The chromosome numbers found are mostly 2n=16 (n=8) for species of sect. *Melanocrommyum (A. orientale)*. In various species of sect. *Codonoprasum* is found 2n=16 (n=8); for sect. *Allium:* 2n=16, 32, 40, 48 (n=8, 16, 20, 24).

In sect. *Molium* it is variable: 2n=14, 21, 28, 35 (n=7, 14) in *A. neapolitanum;* 2n=14 (n=7) in *A. papillare;* 2n=14, 21, 28 (n=7, 14) in *A. subhirsutum;* 2n=16, 32, 40, 48 (n=8, 16, 20, 24) in *A. roseum;* 2n=16 (n=8) in *A. erdelii;* 2n=18 (n=9) in *A. zebdanense;* 2n=20 (n=10) in *A. negevense.*

For sect. *Briseis* is found: 2n=14, 18 (n=7, 9) in *A. pendulinum*, 2n=18 (n=9) in *A. triquetrum.*

Most of the authors give idiograms and descriptions of the caryotypes, with discussion. VON BOTHMER 1970: 524, when treating the cytology of several species of sect. *Allium*, gives a good general discussion on the caryotype in the whole genus.

Much research on sect. *Molium* is done by KOLLMANN 1973. Intraspecific polyploidy and the structural changes of the chromosomes are described.

CELA RENZONI & GARBARI 1970, 1971, and GARBARI & SENATORI 1975, amply report on chromosome morphology of various species. Also STEARN in Flora Europaea (in press) gives many chromosome numbers.

More information on the caryology is given in the notes with the treatment of the species.

DISTRIBUTION

Allium is essentially a genus of the northern hemisphere, Asia, Europe, and North America, where it occurs not south of Mexico. In the Old World its main centre of development is Turkey, S. Russia, Afghanistan, Iran, and the Near East. In Africa it occurs wild mainly in North Africa (Canary Is., Morocco, Algeria, Tunisia, Libya, Egypt, Sudan, Ethiopia, and Somalia), growing as far south in eastern Africa as to northern Somalia, c. 10°N *(A. subhirsutum* ssp. *spathaceum)*; in western North Africa the most southern localities lie at about 31°N in Morocco and Algeria.

I have accepted *A. dregeanum*, a species closely related to but distinct from *A. ampeloprasum*, as indigenous to the Republic of South Africa, as it is only known there as occurring wild from various localities.

Most species have a large distributional area, often occupying the whole or a great part of North Africa and reaching far beyond into large parts of Europe (e.g. *A. ampeloprasum, A. paniculatum, A. roseum*), but there are several quite distinct species confined to restricted areas. Especially the Cyrenaica (with e.g.: *A. longanum, A. ruhmerianum*) and Egypt (with e.g.: *A. blomfieldianum, A. crameri)* have several endemic species, as is readily seen from the distribution maps.

Cultivated *A. cepa* occurs all through Africa, including the tropical zone.

A detailed account of the occurrence of the African species is given under distribution in the treatment of each species.

ECOLOGY AND FLOWER BIOLOGY

With each species I have given under habitat a short summing up of the various ecological data, as there are habitat, soil type, flowering time, etc., as found on the herbarium labels.

Most species seem to be protrandrous – the three inner stamens ripening before the three outer stamens –, which can be regarded as pointing to entomophily (pollination effected by insects). This is sustained by the fact that most *Alliums* have showy flowers, which are often fragrant, and usually produce nectar. VON BOTHMER 1974: 27–35, amply describes the reproduction of some species of the *A. ampeloprasum* complex, from flower development to seed production. There is an interesting treatise on pollination biology. STEARN 1944: 23, described the curious case of the species of sect. *Briseis*: *A. triquetrum*, *A. pendulinum*, and *A. paradoxum*, which have carunculate seeds which are ant-dispersed. The caruncle or elaiosome is developed from the sarcotesta. In relation to the dispersal by ants the scape with the infructescence of *A. triquetrum* is known soon to become limp and lying flat to the ground, whereas in other species with non-carunculate seeds, the scape remains erect. EKBERG (1970) reports on wind dispersal of bulbs of *A. stocksianum* BOISSIER in sub-desertic conditions in Afghanistan; its bulbs are well protected against drying out by thick layers of reticulate tunics similar as found in several unrelated other *Allium* species. In *A. schubertii* from the Cyrenaica and the Near East, I suppose that the large spherical inflorescences, which easily break off when fruiting, also may serve for wind dispersal.

It is well-known that many *Allium* species propagate by the often numerous increase bulbs (e.g. *A. roseum*) or by the bulbils in the inflorescence (e.g. *A. vineale*, certain polyploid forms of *A. roseum*, and others). As a rule most wild *Alliums* have a good seed set, and I have no indication, as far as African species are concerned, of the occurrence of interspecific hybrids. Intraspecific hybrids are supposed to occur in e.g. *A. subhirsutum* and *A. roseum* (fide KOLLMANN, 1973).

The asexual reproduction and dispersal for species of the *A. ampeloprasum* complex is amply discussed by VON BOTHMER 1974: 35–49.

USES AND PHYTOCHEMISTRY

Besides the well-known cultivated species *A. cepa* and *A. ampeloprasum*, used as vegetable and a source of carbohydrates, and *A. sativum*, *A. schoenoprasum* and *A. fistulosum*, used as a condiment, several wild species are incidentally also used as such; this is, when found on the herbarium labels or in the literature, given with the treatment of species. *Allium* has also various medicinal and other properties, as discussed extensively by WATT & BREYER-BRANDWIJK (1962).

The characteristic onion-smell (allicin) is caused by sulphides. It is absent, or apparently not detectable by its smell in a part of the species, e.g. in sect. *Codonoprasum*, and sect. *Melanocrommyum*. The phytochemistry is fully treated and discussed by HEǴNAUER (1963). The placing of *Allioideae* by HUTCHINSON with *Amaryllidaceae* seems unnatural, as in *Allioideae* no *Amaryllidaceae*-alkaloids are known, but in contrary steroid-sapogenine, typical for *Liliaceae*.

Volatile constituents in sect. *Molium* were analysed by SAGHIR & MANN 1969: 51–55; they found a high level of methyl-sulfides. The typical gas-liquid chromatograms of *A. roseum* (x = 8) and *A. zebdanense* (x = 9) suggest a close relationship between these species (both in sect. *Molium*), despite the difference found in their basic chromosome number. TÄCKHOLM and DRAR 1954: 93–136, in the Flora of Egypt, give extensive notes on *Allium* of ancient and modern Egypt including linguistic notes, the use as food, *Allium* in art and religion, in mummification, and the uses as drug. Also HELM (1956) gives ample information on cultivated species.

Many *Alliums* are highly valued as ornamental plants in various ways. The African wild *Alliums* have no particular ornamental value, except for the well-known *A. roseum*, *A. neapolitanum*, *A. triquetrum*, and *A. schubertii* which latter is rare in Africa.

TYPIFICATION

Though I have found most type-specimens in the relevant herbaria consulted, of a number of often subspecific names presently put into synonymy, mostly described from Europe, I could not trace the types. In these cases the identity of the names was clear from the description or the accompanying figures. In all such cases the reason why it is put into synonymy is briefly discussed in the notes under the species. I have refrained from designating neotypes for these synonyms of which I could not trace the original types, which in several cases apparently never where extant or indicated, because of the reasons given below.

According to the International Code of Botanical Nomenclature, 1972: 19, 75, 76, 'a neotype is a specimen or other element to serve as nomenclatural type as long as all of the material on which the name of the taxon was based is missing. If none of the specimens cited in the protologue nor any duplicates of them are extant, a neotype (art. 7, par. 7) may be designated.' In the guide for the determination of types the Code mentions: 'In selecting a neotype even more care and critical knowledge are essential, as the reviewer usually has no guide except his own judgment as to what best fits the protologue. If this selection proves to be faulty it will inevitably result in further change. A neotype may be designated only when all the originally cited material and its duplicates are believed lost or destroyed.'

Thus, the neotypification is not obligatory, and in most cases not necessary at all. As stated above most of the synonyms of which I have not found the types are names described from Europe, not Africa. Future authors may wish for reasons whatsoever, including biosystematics, to use the name presently put into synonymy, and I am of opinion that these authors should have the liberty to chose the neotypes themselves. These names possibly to be used in the future will often belong to local forms or races, and of course I was not always able to find suitable neotypes from the same precise localities as from where the names were described. In addition, in several cases, it was not always decisively sure that type-specimens or duplicates are really no longer extant in any herbarium.

ADDITIONAL REMARKS ON THE PRESENTATION OF DATA

Much on the presentation of data as given in the taxonomic treatment is explained in the preceding chapters. In addition I give the following miscellaneous remarks:

Citation of literature. As a rule all references to authors are given by the authors' name, followed by the year of publication, and, after a colon, the page number. It refers to the general bibliography at the end of the present work, where full titles and references are given.

Enumeration of specimens studied. All specimens seen from Africa are cited; material from outside Africa is only partly enumerated, usually as far as desirable as concerning fine illustrative specimens, or specimens from interesting localities. The abbreviations of the herbaria are in accordance with STAFLEU, Index Herbariorum.

Measurements. The sizes given in the species description are mainly drawn from dried specimens. The many specimens cultivated in the Wageningen botanical garden proved very useful to study variation, development, biology, etc. The length of the filaments are measured along the filament from the base to the tip of the central, anther-bearing cusp, irrespective if in 3-cuspidate specimens the lateral cusps are exceeding the central cusp.

Vernacular names. These are cited with each species, and collected from the herbarium labels or the literature. As a rule they seem not very indicatory or reliable for the species. The most commonly encountered name is '*Thoam*' (or a derivative of it), which is the arabic word for onion.

SUBDIVISION INTO SECTIONS

The number of accepted species for Africa being rather limited, 27 wild species in proportion to the estimated total number of 500–600 species for the whole genus, the grouping of the African species into subgeneric entities has not been subject of my special concern. Actually, as is also shown in the general key to the species, the African representatives are subdivided into 6 more or less natural groups, accepted by me as sections. I have tried as much as possible to let correspond my grouping with the existing ones, namely the sectional division provisionally recognized by STEARN (1944), and the sectional divisions by MAIRE (1958), and TÄCKHOLM & DRAR (1954), and the divisions given in the recent treatments by WENDELBO (1966, 1969, 1971), and STEARN (in press).

WENDELBO (1969) argues that the practice of subdividing this large genus into relatively few sections is outdated, and he prefers to accept several subgenera with many new sections to accomodate the great diversity. Almost all subdivisions hitherto proposed occur to me as still not quite natural, rather inconsistent, and hence provisional. As the species attributed to the sections often differ with the various authors for the various areas of study, quite often these authors should in fact be cited as pro-parte. Most likely only a future student of the whole genus may provide a satisfactory subdivision. For Africa I have still accepted sections, which will be shortly defined and commented below, together with an enumeration of the corresponding species. Synonyms, type-species, and short descriptions are given within the taxonomic treatment of the species, at the beginning of the corresponding species of each section.

Sect. *Allium*

This section comprises all species with distinct tricuspidate inner filaments. The leaves can be flat, or semiterete and hollow. It corresponds with sect. *Porrum* as accepted by MAIRE (1958) and TÄCKHOLM et DRAR (1954) To this section belongs *A. ampeloprasum*, including its cultivated form, commonly known as *A. porrum*.

1. *A. vineale*
2. *A. guttatum*
3. *A. mareoticum*
4. *A. sphaerocephalum*
5. *A. ascalonicum*
6. *A. sativum*
7. *A. ampeloprasum*
8. *A. dregeanum*
9. *A. baeticum*

Sect. *Schoenoprasum* (HUMBOLDT, BONPLAND et KUNTH) DUMORTIER

The species belonging to this section for Africa are all only cultivated, and well known. WENDELBO (1971) placed, in my opinion ques-

10. *A. cepa*
11. *A. fistulosum*
12. *A. schoenoprasum*

tionably, *A. schoenoprasum* as well as *A. oschaninii*, the putative ancestor of *A. cepa*, in subgen. *Rhiziridium* (KOCH) WENDELBO. STEARN (1944), distributed the species presently enumerated under three different sections, respectively sect. *Cepa* (MILLER) PROKHANOV, sect. *Phyllodolon* (SALISBURY) PROKHANOV and sect. *Haemoprason* F. HERMANN.

Sect. *Codonoprasum* (REICHENBACH) ENDLICHER

13. *A. trichocnemis*
14. *A. paniculatum*
15. *A. cupani*

This section is easily recognized by the two caudate spathes, in combination with the filaments all simple. With MAIRE (1958) these species go in sect. *Macrospatha* G. DON, a name which is nomenclaturally debatable as pointed out by STEARN (1944).

Sect. *Briseis* (SALISBURY) STEARN

16. *A. triquetrum*

This is a well defined entity, mainly because of the triquetrous scape, and the seeds provided with an elaiosome. Here belongs also the East European and Persian *A. paradoxum* (M. BIEBERSTEIN) G. DON, which is often found running wild in other parts of Europe.

Sect. *Molium* G. DON ex KOCH

17. *A. erdelii*
18. *A. subhirsutum*
19. *A. longanum*
20. *A. papillare*
21. *A. tourneuxii*
22. *A. chamaemoly*
23. *A. neapolitanum*
24. *A. massaessylum*
25. *A. roseum*
26. *A. ruhmerianum*
27. *A. blomfieldianum*

This section, which has the most species in Africa, is characterized amongst other characters by that the outer bulbcoat-leaves (bulb tunics) have as a rule a certain sculpture which is characteristic for the species, e.g. typically pitted in *A. roseum*, *A. chamaemoly*, etc. Furthermore, the leaves are flat and usually rather broad. All filaments are simple. Several authors, e.g. MANN 1959, EKBERG 1972, KOLLMANN 1973a, have shown that section *Molium* is a distinct entity, on morphological and anatomical characters, as well as on the basis of karyology. KOLLMANN (1973a) recognizes two series, viz. ser. *Patentes* and ser. *Campanulatae*, respectively with saucer-shaped and bell-shaped perianth. Both series have some differences in the karyotype, and in chromosome number, ser. *Patentes* (with *A. neapolitanum* and *A. subhirsutum* and others) having x=7, and ser. *Campanulatae* (with *A. roseum*, and others) having x=7, 8, 9, or 10. See further under the next section.

ENDLICHER (1836) based the sect. *Moly* on the genus *Moly* of MOENCH (1794), with as type-species *A. magicum* L., a species presently referred to *A. nigrum* L., which belongs in the next sect. *Melanocrommyum*. The species *A. moly* L., in Europe mainly known as an ornamental, belongs, according to STEARN (1944), in a separate sect. *Xanthoprason* F. HERMANN, but I see no reason why this species should not be included in sect. *Molium*.

Sect. *Melanocrommyum* WEBB et BERTHELOT

28. *A. schubertii*
29. *A. nigrum*
30. *A. orientale*
31. *A. crameri*

In the preceding five sections there are only 2 ovules in each locule of the ovary; in the present section there are always more, 4–14. The leaf sheaths are open to the base. According to EKBERG (1972) the structure of the bulb is uniform, and different from that in the sect. *Molium;* furthermore the section is said to be distinct by some characters in leaf anatomy and in the development of the leaves. In sect. *Melanocrommyum* the typical *Allium*-smell is faint or apparently lacking. KOLLMANN (1973) found different kayotypes in sect. *Molium* (x=7) as compared to sect. *Melanocrommyum* (x=8). It are generally coarse plants, but in *A. orientale* also often slender specimens occur. Section *Melanocrommyum* is best represented in the Near East and western Asia, including Russia.

DESCRIPTION OF THE GENUS ALLIUM

Allium L.

Allium L., Sp. Pl. 1, 1753: 294; id. Gen. Pl. 5, 1754: 143; LAMARCK 1778: 255; DESFONTAINES 1798: 285; SIBTHORP et SMITH 1809: 221; G. DON 1827: 3; GUSSONE 1827: 395; KUNTH 1843: 379; J. GAY 1847: 195; WEBB et BERTHELOT 3, 1848: 342; WILLKOMM et LANGE 1862: 206; SALISBURY 1866: 90 (p.p.); REGEL 1875: 10; BOISSIER 1882: 229; BENTHAM et HOOKER F. 1883: 802; BATTANDIER et TRABUT 1884: 150; ENGLER in ENGLER et PRANTL 1887: 55; BATTANDIER et TRABUT 1895: 56; BAKER in THISELTON-DYER 1898: 515; BATTANDIER et TRABUT 1902: 331; ASCHERSON et GRAEBNER: 1905: 95; HEGI 1908: 213; BOULOUMOY 1930: 329; KRAUSE in ENGLER et PRANTL 1930: 319; POST in DINSMORE 1933: 633; FEINBRUN 1943: 1; STEARN 1944: 11–34; VVEDENSKY (translated by AIRY SHAW) 1944: 67; VINDT 1953: 109; CUÉNOD 1954: 210; TÄCKHOLM et DRAR 1954: 58; MAIRE 1958: 244; MANSFELD 1959: 554; HUTCHINSON 1959: 642; QUÉZEL et SANTA 1962: 209; TRAUB 1968: 147–163; WENDELBO 1971: 3; AIRY SHAW 1973: 43; HUTCHINSON 1973: 793; TÄCKHOLM 1974: 647; STEARN, in press.
Type-species: *A. sativum* L.

Cepa ADANSON 1763: 50; *Porrum* ibid.: 50; *Saturnia* MARATTI 1772: 18; *Moly* MOENCH 1794: 286; *Porrum* ibid. 1892: 263; *Schoenoprasum* HUMBOLDT, BONPLAND et KUNTH 1816: 277; *Ophioscorodon* WALLROTH 1822: 129; *Codonoprasum* REICHB. 1830: 114; *Aglitheis* RAFINESQUE-SCHMALTZ 1836: 18; *Endotis* ibid.: 21; *Geboscon* ibid.: 19; *Getuonis* ibid.: 20; *Gynodon* ibid.: 19; *Kalobotis* ibid.: 19; *Kepa* ibid.: 19; *Kromon* ibid.: 21; *Longostemon* ibid.: 21; *Maligia* ibid.: 19; *Panstenum* ibid.: 20; *Plexistena* ibid.: 20; *Stemodoxis* ibid.: 20; *Trigonea* PARLATORE 1839: 161; *Berenice* SALISBURY 1866: 89; *Briseis* ibid.: 92; *Butomissa* ibid.: 91; *Calliprena* ibid.: 89; *Camarilla* ibid.: 91; *Canidia* ibid.: 92; *Hexonychia* ibid.: 88; *Hylogeton* ibid.: 91; *Iulus* ibid.: 92; *Molyza* ibid.: 91; *Phyllodolon* ibid.: 90; *Raphione* ibid.: 89; *Schoenissa* ibid.: 91; *Xylorhiza* ibid.: 89.

Herbs glabrous or hairy, usually with onion-smell, usually perennial, mostly provided with bulbs, sometimes with short rhizomes (sect. *Rhizirideum* G. DON ex KOCH, not in Africa), growing gregarious or not. *Leaves* linear to elliptic, radical, sheathing the scape, the blades subapproximate or scattered along the scape, flat, or terete or semiterete and hollow. Scape terete or angular. *Inflorescence* umbellate, usually many-flowered, sometimes with bulbils, hemispherical to spherical or $\pm$ ellipsoid, enveloped by 1 or 2 green or scarious, persistent or caducous, spathe(s), splitting into valves or spathe-lobes or not. *Flowers* relatively small, white to pinkish or purplish, or yellowish, stellate to campanulate or urceolate, the pedicels usually distinct, at base with scarious bracteoles or not. Tepals 6, (sub)equal in length, elliptic to lanceolate, 1-nerved, free or usually shortly connate at base, usually persistent. Stamens 6; filaments subulate or flattened, simple or tricuspidate (rarely, in *A. sativum*, with more cusps), at base usually broadened and mutually connate and adnate to the bases of the tepals; anthers ellipsoid to oblong, dorsifixed, 2-locular, introrse, opening with longitudinal slits. Pistil 1; ovary superior, spherical to ovoid or obovoid, 3-locular; style slender, erect, inserted towards the base of the ovary (gynobasic); stigma usually inconspicuous, single or 3-lobed; nectaries in the septa of the ovary; ovules axillary, 2–14 per locule, anatropous. *Fruit* a 3-valved loculicidal capsule. Seeds 1–4 per locule, flattened, irregularly angled, blackish, sometimes provided with an elaiosome (sect. *Briseis*); embryo cylindrical, often curved, endosperm fleshy.

A genus of 500–600 species mainly in the northern hemisphere, Europe, Asia, N. Africa south to Ethiopia, 1 species in S. Africa, in America not south of Mexico.

Notes.

1. *Nothoscordum inodorum* (AIT.) NICHOLSON is a species of early introduction from South America, and is sometimes found running wild in Africa. It superficially resembles *Allium*, especially *A. roseum* L., but it is readily distinguished by its two spathes which distinctly overlap at their bases; it furthermore is distinct e.g. by more ovules per locule, and the morphology of the nectaries.

2. The synonymy contains all names relevant for Africa, and most names for Europe. For practical reasons I have refrained from typifying these synonyms. For other references on the generic level one is referred for instance to BENTHAM et HOOKER F. 1883: 803, and to MANSFELD 1956: 554. Synonyms and references on the subgeneric level are given under the sections.

KEY TO THE SECTIONS AND SPECIES

1. Leaf blades terete or semi-terete, or canaliculate, usually hollow, without distinct leaf margin; blades scattered along the scape, i.e. those of upper leaves inserted well above the ground, or in cultivated species *(A. cepa, A. fistulosum* and *A. schoenoprasum)* leaf blades subapproximate at base of scape.
   2. All filaments simple, though sometimes filaments abruptly contracted towards the top, or near the top with one or two minute teeth, c. 0.5 mm long; or inner filaments with small lateral teeth towards the base.
      3. Spathes 2. . . . . **Sect. Codonoprasum p.p.**
         4. Protective bulbcoat-leaves conspicuously fibrous, distinctly netted; inner filaments rather broad and usually abruptly contracted towards the top, or near the apex with one or two minute teeth, c. 0.5 mm long . . . . **13. A. trichocnemis**
         4. Protective bulbcoat-leaves smooth, not fibrous, or fibrous to various degree, never netted; inner filaments narrower, gradually tapering . . . . **14. A. paniculatum**
      3. Spathe 1, though usually splitting into spathe-valves.
         5. Spathe persistent, opening with one slit; leaves scattered; protective bulbcoat-leaves conspicuously fibrous and netted; flowers 10–20 per inflorescence. . . . . **Sect. Codonoprasum p.p.** . . **15. A. cupani**
         5. Spathe usually persistent, partially splitting into 2–4 spathe-valves; leaves usually subapproximate; protective bulbcoat-leaves smooth; or plants without distinct bulbs; flowers (20–)40–100 per inflorescence. . . . . **Sect. Schoenoprasum**
            6. Plants usually coarse, growing solitary or gregarious, provided with bulbs; leaf blades and scape fistulose, thick, usually more than 5 mm diam., the scape partly swollen or not.
               7. Bracteoles present; perianth 3–5 mm long; inner filaments at base abruptly much broadened with or without small lateral teeth. Cultivated . . . . **10. A. cepa**
               7. Bracteoles absent; perianth 6–10 mm long; inner filaments simple, at base not broadened, without teeth. Cultivated . . . . **11. A. fistulosum**
            6. Plants of finer habit, growing in tufts, usually no distinct bulbs present; leaf blades and scape fistulose, usually less than 5 mm diam., blades and scape not swollen. Cultivated . . . . **12. A. schoenoprasum**
   2. Inner filaments tricuspidate, the cusps distinct, situated in the upper half. . . . . **Sect. Allium p.p.**
      8. Spathe 1, soon or later on tearing at the base and caducous; spathe caudate for 0.5–6 cm, not opening by a slit or sometimes laterally torn showing one irregular slit.

9. Inflorescence provided with bulbils; composed either of bulbils only, or of mixed bulbils and flowers . . . . **1. A. vineale**
9. Inflorescence composed of flowers only.
   10. Increase bulbs sessile or up to 1.5 cm stiped, the stipe ± flattened; each bracteole subtending several flowers; tepals smooth . . . . **2. A. guttatum**
   10. Increase bulbs 1–4 cm stiped, the stipe thread-like. Each bracteole subtending a single flower; tepals outside finely but distinctly papillate or scabrid . . . . **3. A. mareoticum**
8. Spathe 1, persistent; spathe acuminate for 0.1–0.3 cm, splitting by 2(–4) slits into 2(–4) spathe-valves.
   11. Protective bulbcoat-leaves membranous, with age breaking up into fibres or not, never netted . . . . **4. A. sphaerocephalum**
   11. Protective bulbcoat-leaves conspicuously fibrous and always netted . . . . **5. A. ascalonicum**

1. Leaf blades flat, not hollow, sometimes folded or keeled, the leaf margin distinct; blades scattered along the scape, or approximate close to the ground.
   12. Inner filaments tricuspidate; leaf blades ± scattered along the scape. . . . . **Sect. Allium p.p.**
      13. Protective bulbcoat-leaves smooth, not fibrous and netted.
         14. Inflorescence provided with bulbils; increase bulbs usually several, large, all of the same size as the main bulb. Cultivated . . . . **6. A. sativum**
         14. Inflorescence usually without bulbils; in S. Africa and on the Canary Is. with bulbils or not; increase bulbs either many, and small, very much smaller than the main bulb, or 0–2, and large, of about the same size as the main bulb.
            15. Outer filaments, as well as anther-bearing cusps of inner filaments usually exceeding the tepals, or rarely shorter than the tepals; leaf margin usually crenulate. Mediterranean region, S. and Middle Europe. (Cultivated *A. 'porrum'*) . . . . **7. A. ampeloprasum**
            15. Outer filaments, as well as anther-bearing cusps of inner filaments, not exceeding the tepals; leaf margin entire. S. Africa . . . . **8. A. dregeanum**
      13. Protective bulbcoat-leaves fibrous and netted . . . **9. A. baeticum**
   12. All filaments simple; leaf blades ± approximate.
      16. Scape sharply triquetrous; seed provided with a caruncle; spathes 2. . . . . .Sect. **Briseis** . . . . . **16. A. triquetrum**
      16. Scape terete, or sometimes faintly angled; seed without caruncle; spathe 1.
         17. Plants rather slender, with rather narrow leaves; outer leaf sheaths usually closed; ovules 2 per locule . . . . **Sect. Molium**
            18. Leaves hairy, sometimes only on the margin of the blades, or

only in the basal part, sometimes inconspicuously.
19. Scape long, (8–)10–70 cm.
20. Hairs scattered, slender, not papilla-like.
21. Tepals subacute to subobtuse, the inner tepals about as long as or longer than the outer tepals; increase bulbs sessile.
22. Open flowers campanulate; tepals 9–15 mm . . . . **17. A. erdelii**
22. Open flowers stellate; tepals 5–8.5 mm . . . . **18. A. subhirsutum**
21. Tepals broadly obtuse, the inner tepals distinctly shorter than the outer tepals; increase bulbs longly stiped . . . . **19. A. longanum**
20. Indumentum consisting of retrorse papilla-like hairs in small bundles . . . . **20. A. papillare**
19. Scape short, up to 8 cm.
23. Prophyll distinct, persistent . . . . **21. A. tourneuxii**
23. Prophyll soon withering, and hence absent . . . . **22. A. chamaemoly**
18. Leaves glabrous.
24. Protective bulbcoat-leaves with a fine sinuate structure, not pitted.
25. Leaf blades 5–35 mm wide; spathe with 1 slit . . . . **23. A. neapolitanum**
25. Leaf blades 2–9 mm wide; spathe with 2 slits . . . . **24. A. massaessylum**
24. Protective bulbcoat-leaves pitted.
26. Tepals ovate to lanceolate.
27. Tepals 7–14 mm long . . . . **25. A. roseum**
27. Tepals 4–5.5(–7) mm long . . **26. A. ruhmerianum**
26. Tepals suborbicular . . . . . . **27. A. blomfieldianum**
17. Plants usually stout, usually with broad leaves; outer leaf sheaths open to the base; ovules (3–)4–14 per locule. . . . . **Sect. Melanocrommyum**
28. Inflorescence large, globose; longest mature pedicels 10–20 cm . . . . **28. A. schubertii**
28. Inflorescence smaller, umbellate to subglobose; mature pedicels 2–4 cm.
29. Leaves large, 10–45 mm wide, always straight; gemmiferous leaf present; ovules 4–6 per locule . . **29. A. nigrum**
29. Leaves usually smaller, narrow to broad, 4–45 mm wide, usually more or less contorted or curved, often with wavy edges, rarely straight, but then rather narrow. Ovules 6–14 per locule.
30. Leaves 2–7, linear to strap-shaped, 4–20 mm wide, top

et GRAEBNER 1905:109; VINDT 1953:118; MAIRE 1958:262; *A. vineale* subsp. *compactum* RICHTER 1890:198.
Type: not indicated.

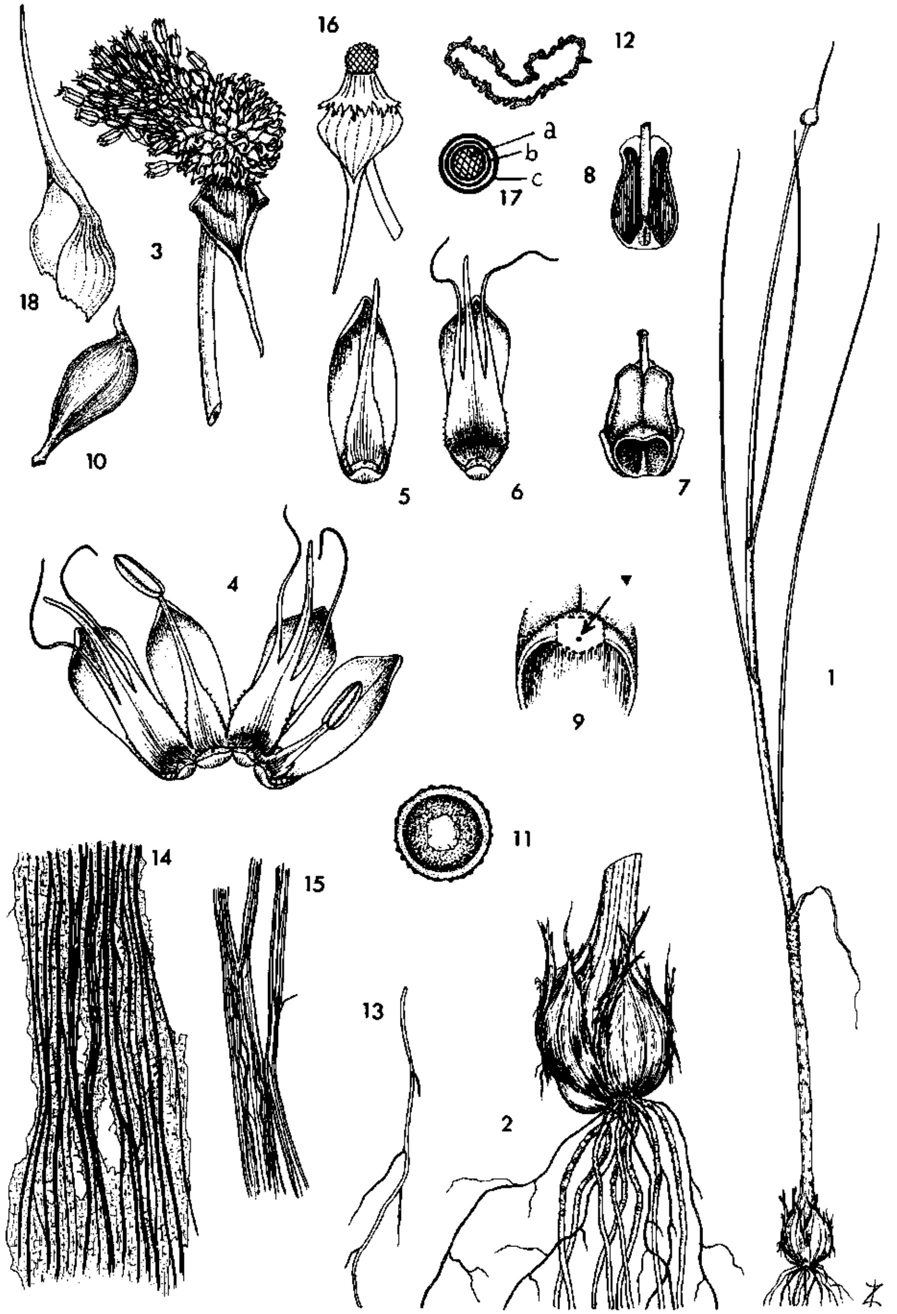
A. affine BOISSIER et HELDREICH 1859:114.
Syntypes: Greece, Mt. Parnasso, 9–10 August 1852, DE HELDREICH s.n. (lectotype: G; isotype: B); & Mt. Veluchi, SAMARITANI et GUICCIARDI in Herb. DE HELDREICH 705 (G, L).

A. margaritaceum SMITH var. *compactum* BATTANDIER et TRABUT 1895:61; LINDBERG 1932:32; JAHANDIEZ et MAIRE 1934:869; VINDT 1953:118; MAIRE 1958:266.
Type: Algeria, Le Corso, BATTANDIER s.n. (holotype: MPU).

A. margaritaceum SMITH var. *bulbiferum* BATTANDIER et TRABUT 1904:353; MAIRE 1958:266.
Type: Algeria, forêt d'Afir, BATTANDIER s.n. (holotype: P).

Bulb depressed globose to ovoid, 20–30 × 15–35 mm. Roots glabrous, not or sparingly branched. Increase bulbs 1–6, hemi-globose to oblong, usually flattened or hollowed at one side, 5–20 × 4–11 mm, beaked for 3–5 mm, sessile or up to 8 mm stiped, wrapped in one firm, straw-coloured prophyll, the stipe flattened, 1–2 mm wide. Protective bulbcoat-leaves 1–3, thin, membranous or usually breaking up into fibres, not netted, greyish brown or yellowish. Sproutleaf 1, soon wilting, 2–10 cm long, top oblique, hardly emerging above the ground. *Foliage leaves* 3–5, glabrous; blades scattered along scape, terete or canaliculate, hollow, rather strong-nerved, 10–50 cm × 1–5 mm, the apical part soon wilting and breaking off, top acute; sheaths unequal in length, those of upper leaves longest, extending for a large part above the ground, 5–75 cm long, whitish green or green, the sheaths of the lowest leaves more or less breaking up into fibres. Scape 1, shorter to longer than the leaves, erect, terete, hollow, 50–100 cm long, 2–5 mm diam. *Inflorescence* spherical to subellipsoid, 1–4 cm diam., either without flowers and only composed of many subsessile bulbils, or composed of subsessile bulbils together with few to many flowers, or, in Europe, rarely with flowers only. *Spathe* 1,

FIG. 3. *Allium vineale* – 1. Habit of plant with young inflorescence still enclosed by the spathe, $\times 1/4$; 2. bulb, $\times 2/3$; 3. inflorescence composed of bulbils and flowers, spathe still attached, $\times 2/3$; 4. perianth and stamens, partly, $\times 6$; 5–6. outer and inner tepal with corresponding filaments, $\times 6$; 7. pistil, $\times 6$; 8. ditto, longitudinal section showing nectarial tissue at the base, $\times 6$; 9. basal part of ovary with hooded rim covering excretion opening of nectary, $\times 12$; 10. increase bulb, $\times 2$; 11. transverse section of scape, $\times 6$; 12. transverse section of leaf, $\times 6$; 13. root, $\times 2/3$; 14–15. detail of outer bulbcoat-leaf, $\times 8$ and $\times 16$ resp.; 16. inflorescence, flowers removed, showing receptacle and the single circular lacerated bract, the spathe still attached, $\times 2/3$; 17. diagram of inflorescence: a. receptable, b. bract, c. spathe; 18. spathe, detached, $\times 1$. (1. DE WILDE & DORGELO 2787; 2–18. WAG 172/69, spirit mat.).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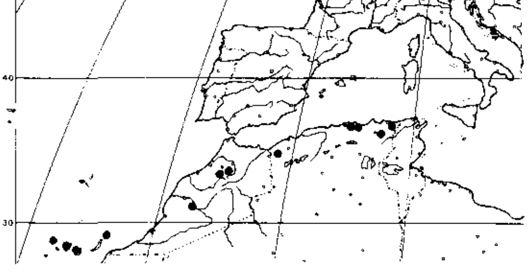
caudate, caducous in early anthesis, the broad basal part 5–10 mm long, c. 15-nerved, hyaline, the caudate part 0.5–3.5 cm long, top acute, seldom 2-tipped. Bract 1, large, surrounding the basal part of the inflorescence, membranous, 5–8 mm long, with irregularly lacerated edge, and usually later on splitting into 2 or 3 parts. Bracteoles absent. Pedicels equal to unequal, 5–25 mm long, slender, mostly straight, in fruit slightly thickened at the top. Bulbils sessile or subsessile, globose to fusiform, 4–10 × 2–5 mm, c. 1 mm beaked, often viviparous. *Flowers* campanulate to urceolate. Tepals adnate to the bases of the filaments for 0.2–0.5 mm, persistent, greenish to dark purple, with a greenish or purplish midvein; outer tepals ovate to oblong, 3–5 × 1.3–2.2 mm, top subacute to obtuse, often shortly mucronate; inner tepals equal or slightly longer and narrower, the top broadly obtuse, sometimes shortly mucronate. Stamens as long as to longer than tepals, finely serrulated towards the base; outer filaments simple, 3–4.5 mm long, at base c. 0.8 mm wide, connate with inner filaments for 0.3–0.4 mm; inner filaments tricuspidate, 4–5 mm long, at base c. 1.5 mm wide, anther-bearing central cusp 1–2 mm long, lateral cusps 2.5–3 mm long, exceeding the perianth for c. 1.5–2 mm. Anthers 1–1.3 × 0.3–0.4 mm, yellow. Pistil shorter to longer than the tepals; ovary ovoid to ellipsoid, 2–3 × 1.5–2 mm; style 3.5–4.5 mm, slender, inserted at about one fourth from the base of ovary; stigma inconspicuous, rounded. *Fruits* ovoid, 2–3.5 × 1.5–3 mm. Seeds apparently always poorly developed and not viable.

Habitat. Found in fields and meadows, in scrub, and forests; in dry, but most frequently in moister places, also in marshes. Altitude 0–1800 m, in Europe up to 2600 m. Flowers: May–September, with most collections in June and July.

Distribution. Azores (no collections seen; fide PALHINHA 1966: 137); Canary Islands; Morocco; Algeria; Europe; N. America.



MAP. 1. African localities of *Allium vineale*.

CANARY IS.: Gran Canaria and Lanzarote, fields, ANONYMOUS 9 (FI); Tenerife, La Laguna, July 1845, BOURGEAU 1001 (BM, FI, K, P); Tenerife, Orotava, July 1855, DE LA PERRAUDIÈRE s.n. (P).

MOROCCO: Ifrane, border of Oued Tziguit, 1600 m, July 1937, GATTEFOSSÉ 21 (MPU); Grand Atlas, Glaoua, 1800 m, July 1924, MAIRE s.n. (P); near Ifrane, 1600 m, MAIRE s.n. (MPU); Oued Ifrane, near Meknes, grassy moist streambed, June 1961, DE WILDE c.s. 2787 (L, WAG).

ALGERIA: Le Corso, July 1885, BATTANDIER s.n. (MPU, type of *A. margaritaceum* SMITH var. *compactum* BATTANDIER et TRABUT); Fôret d'Afir, BATTANDIER s.n. (P, type of *A. margaritaceum* SMITH var. *bulbiferum* BATTANDIER et TRABUT); between Bône and La Calle, marshes of Beni Urgel, June 1844, Herb. COSSON s.n. (P); marshes of Beni Urgel, near Bône, June 1849, Herb. COSSON s.n. (P); & June 1852, Herb. COSSON s.n. (P); Province of Constantine, Herb. COSSON s.n. (P).

EUROPE: selected specimens. England, S. Devon, Torquay, limestone slope, July 1957, BRENAN 9925 (L); Sweden, Småland, Kronobäck, fields, July 1893, DUSÉN s.n. (L); Switzerland, Genève, June 1851, HUET DU PAVILLON s.n. (L); France, Rouffach, June 1951, VAN OOSTSTROOM 15372 (L); Sicily, 1841, PARLATORE s.n. (FI); Germany, Berlin, Cöpenick, July 1879, RUHMER s.n. (L); Greece, Mt. Veluchi, August 1857, SAMARITANI c.s. 705 (G, L, type of *A. affine* BOISSIER et HELDREICH); Turkey, Cappadocia, June 1898, SIEHE 132 (WU).

UNITED STATES OF AMERICA: Kansas, Williamstown Junction, June 1938, HORR E 200 (L).

Notes.

Allied and resembling species. *A. vineale* is usually easily recognized by the presence of bulbils in the inflorescence. It is closely allied to *A. guttatum* in which the bulbils are lacking. Both species have the following characters in common, viz. the outer bulbcoat-leaves becoming fibrous with age, terete leaves, one single caducous spathe, and the inner filaments tricuspidate.

All specimens seen by me from Europe as well as from Africa have inflorescences composed either of only bulbils or of bulbils and flowers. According to several authors, e.g. HEGI 1908: 218, in Europe rarely specimens with only flowers occur, described as var. *capsuliferum* KOCH. These may be confused with *A. sphaerocephalum*. The latter differs, however, by one persistent spathe, which is split into 2(–4) spathe-lobes, a compact many-flowered inflorescence, and by the usually longly stiped increase bulbs.

Inflorescence and bulbils. As given in the description of the species the inflorescence is very variable, and may be composed of mixed flowers and bulbils, or of bulbils only. Most of the European specimens are usually readily recognized by the inflorescences composed of bulbils only, and these inflorescences are not rarely subdivided into a few smaller inflorescences. In the mixed inflorescences, thus with flowers together with bulbils, the flowers are often poorly developed and sterile.

Spathe and bracts. The single spathe usually falls off during early anthesis, after which the rather large lacerated and sometimes split-up bract becomes visible. This bract may be suggestive of one or a few small spathes, which may lead to confusion with the identification.

2. A. guttatum Steven **Fig. 4, Map 2.**

A. guttatum Steven in Mémoires de la Société Impériale des Naturalistes de Moscou 2, 1809: 173, tab. 11, fig. 1; Vvedensky (translated by Airy Shaw) 1944: 182.

A. margaritaceum Smith var. *guttatum* J. Gay 1847: 223.

Type: SW. Russia, Odessa, Steven s.n. (isotypes: FI, WAG).

[*A. margaritaceum* Smith in Sibthorp et Smith 1809: 224, nom illeg.]; ibid. 1823: 14, tab. 315; Gussone 1842: 394; Kunth 1843: 390; J. Gay 1847: 220 (excl. var. *guttatum*); Willkomm et Lange 1862: 209; Munby 1866: 32; Battandier et Trabut 1884: 154; ibid. 1895: 61; Bonnet et Barratte 1896: 412; Halácsy 1904: 245; Maire 1921: 51; Jahandiez et Maire 1931: 124; Markgraf in Hayek 1932: 40; Rechinger f. 1943: 716; Cuénod 1954: 212; Quézel et Santa 1962: 212.

A. margaritaceum Smith var. *typicum* Regel 1875: 50; Vindt 1953: 117; Maire 1958: 267.

Syntypes: Turkey, Bursa, Sibthorp et Smith s.n. (not seen); Greece, Mt. Athos, Sibthorp et Smith s.n. (not seen); & I. of Naxos, Sibthorp et Smith s.n. (not seen); Cyprus, Sibthorp et Smith s.n. (not seen); Cimolo, Sibthorp et Smith s.n. (not seen).

A. amethystinum Tausch in Hornschuch 1828: 255; von Bothmer 1972: 70, fig. 1C, 2D–E, 5C, 8A, 8C, 11, 12A–C, 13.

Type: Yugoslavia, Dalmatia, in Herb. Sieber (not found; fide von Bothmer lectotype: ε Dalmatia, Herb. Tausch, PRC).

A. segetum Jan ex Schultes et Schultes f. in Roemer et Schultes 1830: 1020; Kollmann 1971: 119, fig. 1a, 2a–e, 3; Jan 1831: 25 (as *A. segetale*).

Type: Italy, Sicily, Jan s.n. (not found).

A. margaritaceum Smith var. *tenorii* Parlatore 1852: 569.

A. margaritaceum ssp. *tenorii* Richter 1890: 200.

Type: Italy, Tenore s.n. (holotype: FI).

A. gaditanum Perez-Lara ex Willkomm 1882: 81, tab. 54; ibid. 1893: 51.

Type: Spain, Jerez de la Frontera, near Dehesa de Malduerme and Malabrigo, Perez-Lara s.n. (not seen).

A. involucratum Wellwitsch ex Coutinho 1896: 98.

Syntypes: several specimens, see Coutinho l.c. (not seen).

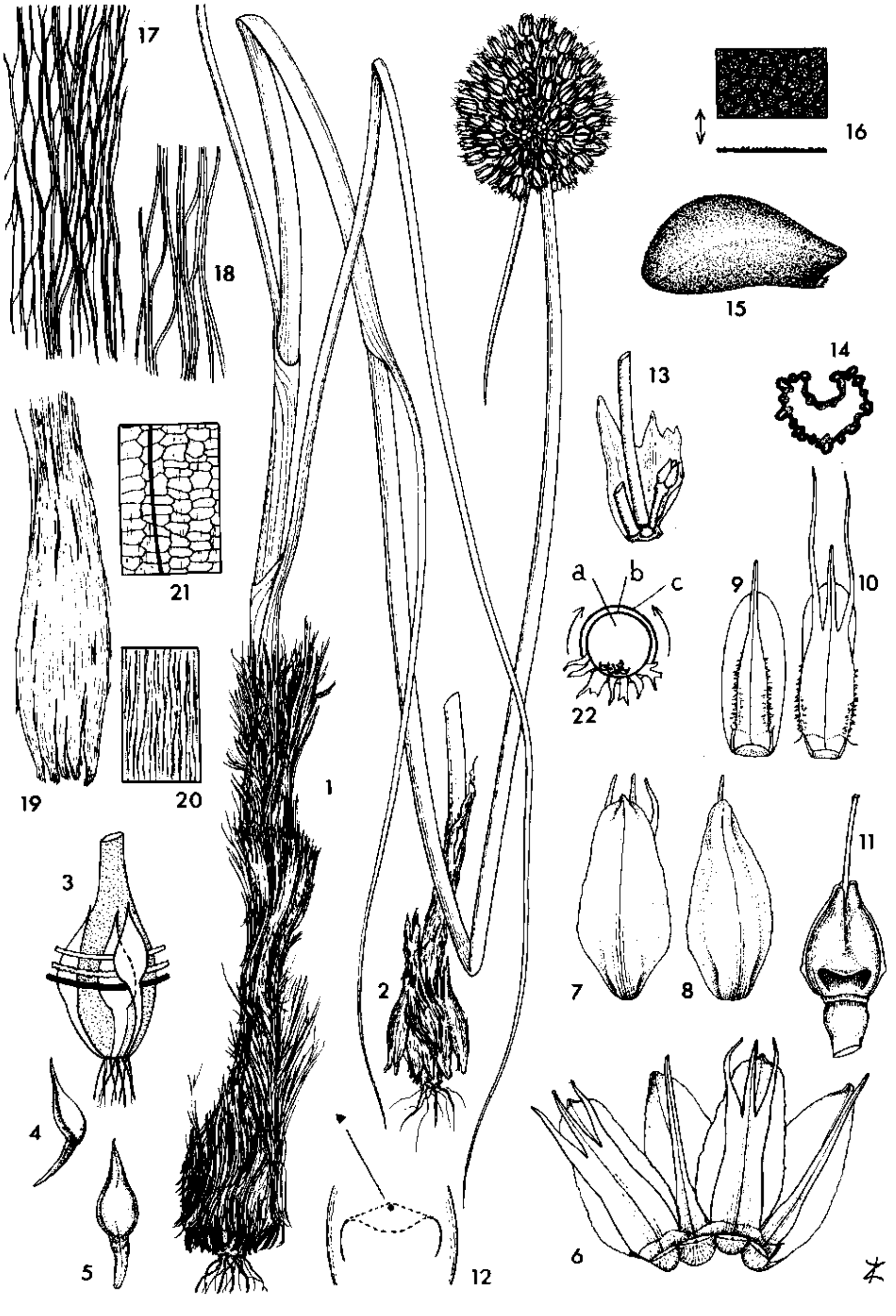
A. margaritaceum Smith var. *faurei* Maire 1937: 381, no. 2354; Emberger et Maire 1941: 956; Vindt 1953: 118; Maire 1958: 267.

Type: Morocco, Colline de Taghit, 17 May 1933, FAURE s.n. (holotype: MPU; isotype: P).

A. negrianum MAIRE et WEILLER in MAIRE 1939: 304, no. 2893 bis: MAIRE 1958: 264, fig. 896.
Type: Libya, Cyrenaica, Ouadi Kouf, MAIRE 1739 (holotype: MPU).

A. margaritaceum SMITH var. *battandieri* MAIRE et WEILLER in MAIRE 1958: 267; BATTANDIER 1910: 87 (as *Allium* species).
Type: Algeria, between Oussengh and Itema, BATTANDIER s.n. (holotype: MPU; isotype: P).

Bulb globose to ovoid, 10–30 × 6–20 mm. Roots unbranched, glabrous. Increase bulbs 0–3, ovoid, flattened or hollowed at one side, 8–12 × 4–8 mm, 2–5 mm beaked, sessile or up to 15 mm stiped, wrapped in a firm pale yellowish or brown prophyll, the stipe flattened. Protective bulbcoat-leaves several, 3–12, membranous to coriaceous, broken up into netted fibres or not, yellowish, grey-brown, or brown. Sproutleaf 1, 2–10 cm, top oblique, with a 1–2 mm long blade, emerging above the ground. *Foliage leaves* 2–6, glabrous or with minute stiff hairs on the nerves, blades scattered along the scape, terete, or canaliculate, hollow, 10–60 cm long, 1–4 mm diam., top acute, usually soon wilting; sheaths unequal in length, those of upper leaves longest, extending largely above ground, 2–45 cm long, the basal subterranean part 3–12 cm long, persistent, later on breaking up into netted fibres or not. Scape 1(–3), exceeding the leaves or not, erect, terete, hollow, 30–120 cm long, 2–6 mm diam. *Inflorescence* spherical to ellipsoid, sometimes forming a 'secondary inflorescence' (see notes), compact, many-flowered, 2–5(–9) cm diam., without bulbils. *Spathe* 1, soon falling off, the broad basal part membranous, not hyaline, 7–15 mm long, faintly nerved, the caudate part firm, 1–6 cm long. Bract one, when young entire, surrounding the basal part of the inflorescence, membranous, 5–7 mm long, with lacerated edge, with age splitting into several lobelets. Bracteoles 0 – many, ± obovate, lacerated, c. 4 mm long, each subtending 2–4 flowers. Pedicels subequal to very unequal, 8–35(–45) mm long, slender, in anthesis ± straight, in fruit becoming more rigid. *Flowers* subcampanulate. Tepals adnate to bases of filaments for 0.2–0.5 mm, towards the top slightly curved or not, slightly saccate at base, persistent, purplish or usually white with a purplish or greenish midvein, smooth without; outer tepals ovate to oblong, (2–)2.5–4.5 × 1.0–2.4 mm, top obtuse to acute; inner tepals usually as long as or shorter and slightly narrower than outer tepals, obovate or ovate, or oblong, top broadly obtuse, shortly acuminate or not. Stamens in full anthesis well exserted, finely serrulated towards base or not; outer filaments simple, or rarely shortly 2–3-cuspidate, 2.8–5.5 mm long, at base 0.5–0.8 mm wide, connate with inner filaments for 0.2–0.8 mm; inner filaments tricuspidate, 3–6 mm long, at base 1.0–1.8 mm wide, anther-bearing central cusp 1.5–2.6 mm long, lateral cusps 2–6 mm long, 1.5–4.5 mm exceeding the perianth.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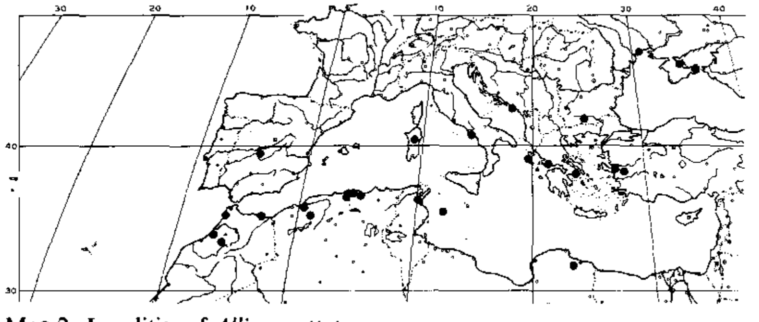
Anthers 1–1.2 × 0.5–0.7 mm, yellow or purplish. Pistil longer than the tepals; ovary globose to ovoid, 1.5–3 × 1–2 mm; style 4–6 mm, slender, inserted near the base of the ovary; stigma inconspicuous. *Fruits* globose to obovoid, 2.8–4 × 2–4 mm. Seeds 2–3 × 1–1.4 mm, black, with a faint golden glow.

Habitat. Mostly on dry localities; recorded from sandy and calcareous soils, moving sands, deep sands, roadsides, stony places, steppe, scrub, fields, and also in forests. Altitude 0–1500 m. Flowers: (May–)June–July(–September) (Africa).

Distribution: Morocco; Algeria; Tunisia (acc. to CUÉNOD, one collection of BONNET in Kessera District, and one somewhat doubtful collection from Djebel Zaghouan); Libya; S. Europe, from Portugal east to SW. Russia, W. Turkey and Cyprus.



MAP 2. Localities of *Allium guttatum*.

MOROCCO: Larache, maquis, GATTEFOSSÉ 23 (MPU); Hidum, July 1934, MAURICIO s.n. (BM); between Midelt and Ansegmir, 1500 m, June 1939, MAIRE C.S. 897 (P); Rabat, sands, July 1964, SAUVAGE 521 (MPU); Melillo, Hidum, sands, July 1933, SENNEN C.S. s.n. (BM); Taghit, FAURE s.n. (MPU, P).

ALGERIA: Forêt de Reghaïa, June 1904, CHEVALLIER s.n. (P); Mostaganem, dry places, 1848, Herb. COSSON s.n. (P); near Tiaret, 1845, DELESTRE s.n. (P); without locality, DESFON-

FIG. 4. *Allium guttatum*. – 1. Habit, note conspicuously fibrous and netted outer bulbcoat-leaves, $\times^2/_3$; 2. bulb and lower part of scape, note outer bulbcoat-leaves not conspicuously fibrous and netted, $\times^2/_3$; 3. scheme of bulb with stiped increase bulbs; 4–5. increase bulbs, lateral and dorsal view, $\times^2/_3$; 6. perianth and filaments, partly, ×6; 7–8. inner and outer tepals with exserted filaments, outer view, ×6; 9–10. inner and outer tepals with corresponding filaments, ×6; 11. pistil, note rim in the lower part which screens off the excretion opening of the nectary, ×6; 12. excretion opening of nectary, schematic; 13. bracteole subtending a small cluster of flowers, ×6; 14. transverse section of leaf, ×6; 15. seed, lateral view, ×12; 16. detail of testa, seen from above and in profile, ×40; 17–18. details of outer bulbcoat-leaf, ×4 and ×8 resp.; 19–20. details of bulbcoat-leaf not yet fully fibrous and netted, ×1 and ×2 resp.; 21. detail of a more membranous bulbcoat-leaf, ×20; 22. diagram of inflorescence: a. receptacle with a part of the bracteoles, b. lacerated bract, partly drawn, c. spathe. (1. MAURICIO s.n., 4 July 1934 and SAUVAGE 521; 2. JAMIN s.n. Algeria, 1850; 3–5. SAUVAGE 521; 6–8, 11–14, 17–22. MAURICIO s.n., 4 July 1934; 9–10. AGRICULTURAL SERVICE LIBYA 131; 15–16. SENNEN & MAURICIO s.n., 8 July 1933).

TAINES s.n. (P, in Herb. DESFONTAINES); near Birkadem, fields, June, JAMIN s.n. (P); 53 km W. of Bougie, Sept. 1971, V. D. MAESEN 1519 (WAG); Dellys, July 1848, SALLE 146 (P); Cheddad, BATTANDIER s.n. (MPU, P).

TUNISIA: Djebel Zaghouan, May 1883, COSSON c.s. s.n. (P, incomplete material).

LIBYA: Cyrenaica, Ouadi Kouf, MAIRE 1739 (MPU, type of *A. negrianum* MAIRE et WEILLER); & Ouadi Derna, May 1937, SERVIZI AGRARI CIRENAICA 131 (FI).

EUROPE, selected specimens: Spain, Toledo, July 1841, REUTER s.n. (FI); Sardinia, Oliena, July 1894, MARTELLI 424 (FI); Lampedusa I, AIUNTI s.n. (FI); & GUSSONE s.n. (FI); Italy, cultivated in botanical garden at Naples, TENORE s.n. (FI, type of *A. margaritaceum* SMITH var. *tenorii* PARLATORE); Yugoslavia, Macedonia, VANDAS s.n. (FI); Greece, Mt. Hymettus, August 1847, DE HELDREICH s.n. (FI); & Mt. KLOKOS, above Phteri, July, ORPHANIDES 1190 (G); & Korfoe, Pantokrates, 800–900 m, July 1967, VAN STEENIS 21194 (L); & Magoula near Aitolikon, May 1963, WOLFF s.n. (L); Bulgaria, near Philippopel, August 1897, STŘÍBRNÝ s.n. (L); SW. Russia, near Odessa, HOHENACKER s.n. (FI); & Ukraine, Krym, August 1925, SCHALYT 115 (FI, M); & Odessa, STEVEN s.n. (FI, WAG, type of *A. guttatum* STEVEN); & Arabat., STEVEN c.s. s.n. (WAG); Turkey, Tmolus, above Birghui, July 1854, BALANSA 147 (FI, WAG); & Smyrna, near Burnova, July 1933, SCHWARZ 889 (B).

Notes

Nomenclature. The present species was for Africa and southern Europe hitherto commonly known under the name *A. margaritaceum* SMITH, 1809, described on plants from Greece, Turkey and Cyprus; also described and figured in SIBTHORP et SMITH 1823, fig. 315. I have not seen the syntypes. However, SMITH's name is a later homonym of *A. margaritaceum* MOENCH 1802: 80. The types of MOENCH are no longer extant, but from the description it is clear that MOENCH's species pertains to the different species *A. scorodoprasum* L., hence SMITH's name is illegitimate. The correct name for the present species is *A. guttatum* STEVEN, 1809: 173, tab. 11, fig. 1, described from Odessa, SW. Russia.

Variation. The species as presently conceived is fairly variable in several respects, but in all these I found not sufficient correlation for a practical subdivision. Variation in the following features can be mentioned.

Outer bulbcoat-leaves. In specimens from the whole range of the species the outer bulbcoat-leaves or bulb tunics are usually rather membranous and only moderately fibrous, and sometimes merely membranous and hardly or not fibrous. Some of the specimens from northern Africa, however, viz. two collections by SENNEN et MAURICIO, both from Hidum in Morocco, and SAUVAGE 521, from Rabat, rather strongly deviate by very conspicuous fibrous and netted bulb tunics, extending for a considerable length along the basal part of the scape (Fig. 4). This strong netting merges, however, with that of otherwise almost similar specimens from north Africa and Europe. The specimens with strongly netted bulb tunics have slightly coarser scapes, and rather large flowers (tepals 3.5–4.5 mm), and are not identical with *A. margaritaceum* var. *robustum* MAIRE.

Leaves. Specimens from the eastern part of the distributional area, i.e. from Turkey and SW. Russia (including the type specimen of *A. guttatum*), differ from specimens from SW. Europe and North Africa by the presence of minute but distinct stiff hairs on the nerves of the leaves, which make these leaves rough to the touch, especially in the lower part of the blade. All specimens from Africa and SW. Europe have smooth leaves, but in the Aegean area and Bulgaria specimens with serrate leaf nerves as well as with completely smooth leaves can be found. For instance, specimens with serrated or denticulate or stiff-hairy nerves are: SW. Russia, Odessa, STEVEN s.n.; Turkey, Tmolus, BALANSA 147. The specimen STŘÍBRNÝ s.n., 2 August 1897, from Bulgaria, has glabrous leaves. For the present synonym *A. amethystinum*, small teeth on the leaf edges are described by VON BOTHMER 1972.

Shape of the inflorescence. This is usually spherical, but not rarely it becomes more or less ellipsoid, or, as it is sometimes described (KOLLMANN, 1971; VON BOTHMER, 1972) it becomes 'double', by forming a 'secondary inflorescence' by the later elongation of the pedicels of the central flowers. This feature also occurs in the African material. As a rule the inflorescence is many-flowered, but in some of the African material the inflorescence tends to become less densely-flowered; very many-flowered specimens occur in Africa as well.

Flowers. In the majority of the specimens the flowers are conspicuously small, the tepals measuring only 2–3.5 mm. In some African plants the flowers are somewhat larger, with tepals of 3–4.5 mm long.

VON BOTHMER 1972: 72–76, gives for *A. amethystinum*, treated in this paper as a synonym of *A. guttatum*, a fine account of the variation in the inflorescence, the tepals and stamens, and the shape of the fruit. For a further discussion of the characters and variation of *A. amethystinum*, see the notes to the synonyms.

Notes to the synonyms. *A. amethystinum* TAUSCH was recently extensively treated by VON BOTHMER (1972, l.c.). Its variation and affinities to related species are discussed. *A. amethystinum* is regarded as a separate species besides *A. margaritaceum*, which latter species, however, is for some reason not fully treated in his paper. According to VON BOTHMER *A. amethystinum* is best characterized by the narrow inner tepals, reticulate increase bulbs, the white and rough outer bulbcoat-leaves, and the pedicels of the central flowers prolonging after fertilisation to about double length, forming a 'secondary inflorescence' in the fruiting stage. For *A. margaritaceum*, VON BOTHMER states as other useful characters by which it is distinguished from *A. amethystinum* the triquetrous seeds (flattened in *A. amethystinum*) and the more or less smooth increase bulbs which are reticulate in *A. amethystinum*. Both these characters occur to me as rather irrelevant in relation to the variability as seen by me in the specimens from the whole distributional area of the species.

A. segetum JAN ex SCHULTES et SCHULTES F. This name was accepted by KOLLMANN (1971) and rather extensively treated besides the related *A. davisianum* FEINBRUN from Israel.

A. gaditanum PEREZ-LARA ex WILLKOMM. I have not seen the syntype-specimens. The figure belonging to the protologue depicts the inflorescence without a spathe; the organ which is described and figured in the protologue as being torn asunder before anthesis, shorter than the pedicels, membranous and whitish, is not the spathe but the bract inside it. The single spathe was already fallen off during early anthesis. The figure together with the description doubtlessly refer to specimens of *A. guttatum* s.l. The protologue gives further characters of *A. guttatum* s.l., namely the hollow leaves, the fibrous bulbcoat-leaves, etc.

A. involucratum WELWITSCH ex COUTINHO. This name was proposed for specimens from southern Portugal, and agree, according to the description with the present *A. guttatum*. It was described as closely allied to, but of a smaller stature than, *A. gaditanum*, discussed above.

A. negrianum MAIRE et WEILLER. I have seen the type in MPU, as well as a specimen, Serv. Agr. Cyr, FI, from the vicinity of the locality of the type. Also the figure 896 in MAIRE 1958, clearly points to a plant very close to *A. margaritaceum* auct. (MAIRE 1958, fig. 897), which is presently a synonym of *A. guttatum*.

A. margaritaceum SMITH var. *battandieri* MAIRE et WEILLER. The type, BATTANDIER s.n. (P), has neither leaves nor a bulb. Judging the remnants of the leaves the blades are in all probability terete.

Allied and resembling species. *A. vineale*. Though somewhat surprisingly, *A. vineale* seems the most closely allied species to *A. guttatum*. In fact both species have the protective bulbcoat-leaves which usually become fibrous with age, the sessile or shortly stiped increase bulbs, the (sub)terete leaves, the similar and caducous spathe, and the general architecture and shape of the inflorescence and flowers in common. The best character to distinguish *A. vineale*, at least in Africa, seems to be the presence of bulbils in the inflorescence in *A. vineale*; in *A. guttatum* bulbils in the inflorescence are always lacking. In Europe there is in *A. vineale* a rather rare variety, var. *capsuliferum* KOCH, in which the bulbils are lacking. This variety is to be regarded as the '0-variant' of *A. vineale* in which, in my opinion, bulbils in the inflorescence are always present. It should be mentioned that in distinguishing *A. vineale* from *A. guttatum* one should always carefully check whether scars of early fallen bulbils are present or not. As a rule the inflorescences of *A. guttatum* are much more densely flowered, with somewhat smaller flowers than those of *A. vineale*, but not rarely rather few-flowered plants of *A. guttatum* occur also.

A. sphaerocephalum. This has also (sub)terete leaves and a densely-flowered sperical inflorescence, but it differs by the persistent spathe which splits into 2(–4) spathe valves, and by the often longly stiped, not sessile or shortly stiped, increase bulbs.

A. baeticum, *A. ascalonicum*, *A. cupani*, and *A. trichocnemis* resemble superficially because of the strongly fibrous and netted outer bulbcoat-leaves, a feature which occurs also in a part of the African specimens of *A. guttatum*. The first named species, *A. baeticum*, differs by flat leaves, *A. ascalonicum* has the spathe persistent and splitting into two spathe valves, and both *A. cupani* and *A. trichocnemis* have all filaments simple.

Caryology. According to VON BOTHMER, 1972, in *A. amethystinum* the karyotype differs markedly from the usual one in section *Allium*. On the whole the karyotype in the genus *Allium* is more or less symmetrical and stable, and conclusions on relationships of species based on the karyotypes should be drawn with caution (VON BOTHMER 1970). GARBARI 1975: 1, found 2n = 16.

3. A. mareoticum BORNMÜLLER et GAUBA **Fig. 5, Map 3.**

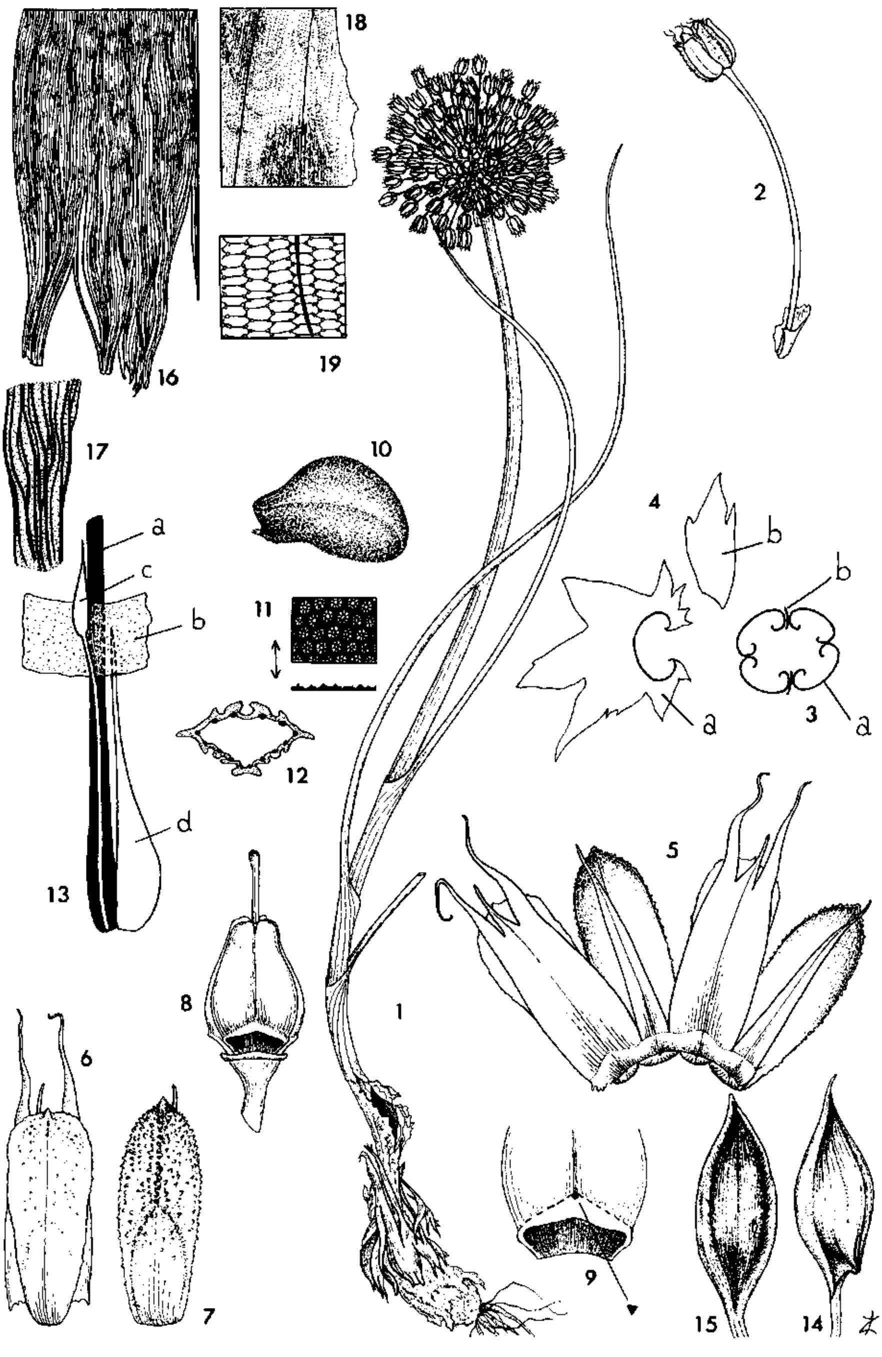
A. mareoticum BORNMÜLLER et GAUBA in Repertorium specierum novarum regni vegetabilis 31, 1933: 396; TÄCKHOLM et DRAR 1954: 70; TÄCKHOLM 1974: 650.

Type: Egypt, El Omaîd, 23 March 1930, GAUBA s.n. (not found in B, probably destroyed; neotype: DRAR, Agr. Mus. 17/250b, CAIM).

Bulb ovoid to oblong, 15–25 × 8–15 mm. Roots glabrous, unbranched. Increase bulbs 1–3, ovate to oblong, flattened and somewhat hollowed at one side, 7–12 × 4–6 mm, 1–2 mm beaked, with a 1–4 cm long thread-like stipe, situated within the leafsheaths, and wrapped in one firm, yellow to orange-brown prophyll. Protective bulbcoat-leaves 2–6, the outer ones firmly coriaceous to cartilaginous, not breaking up into fibres, orange-yellowish to brown, the inner ones papery, whitish. Sproutleaf 2–5 cm, cylindrical, top oblique, reaching to the soil surface. *Foliage leaves* 3–5, smooth, glabrous; blades scattered along the scape, linear, subterete, canaliculate, hollow, 5–15 cm × 0.5–2.5 mm, top acute, the apical part soon withering and breaking off; sheaths unequal in length, those of upper leaves longest, extending for the larger part above ground, 2–12 cm long, greenish-white, purplish nerved, not breaking up into fibres. Scapes 1–2, longer than or equalling the leaves, erect or somewhat curved at base, terete, hollow, 12–30 cm long, 1–4 mm diam. *Inflorescence* rather lax to densely spherical to hemispherical, many-flowered, 2.5–4 cm diam., without bulbils. *Spathe* not seen, caducous. Bracts 2–6, subcircular to elliptic, 2–3 mm long, membranous, lacerated. Bracteoles many, each subtending a pedicel, c. 1–2 mm long, membranous. Pedicels subequal to unequal, 10–20 mm long, slender to ± straight. *Flowers* campanulate to urceolate. Tepals adnate to bases of filaments for 0.5–0.8 mm, persistent, white, with a pink or green midvein, the outer surface, including the keel finely papillate or scabridulous, the margins sometimes slightly serrulate; outer tepals ovate to ovate-oblong, 3–4 × 1.5–1.7 mm, top subacute; inner tepals obovate to oblong, as long as outer tepals, but slightly narrower. Stamens ± equalling the tepals or slightly longer; outer filaments simple, 2.8–4 mm long, at base c. 0.8 mm wide, connate with inner filaments for 0.5–0.8 mm; inner filaments tricuspidate, 3–4.5 mm long, at base 1.2–1.5 mm wide, the anther-bearing cusp c. 1 mm long, the lateral cusps c. 2 mm long, and exceeding the perianth for up to c. 1.5 mm. Anthers c. 1 × 0.4 mm, yellow. Pistil equalling the perianth; ovary ovoid, c. 2 × 1 mm; style 3–4 mm, slender, inserted nearly at the base, exceeding the ovary for 1–1.5 mm; stigma inconspicuous, rounded. *Fruits* ovoid, c. 3 × 2 mm. Seeds c. 2 × 1 mm, black with a golden gloss.

Vernacular names. Egypt: *Thoam, Uâllass.*

Habitat. In lowland and in low hills. Near the coast, in loamy and sandy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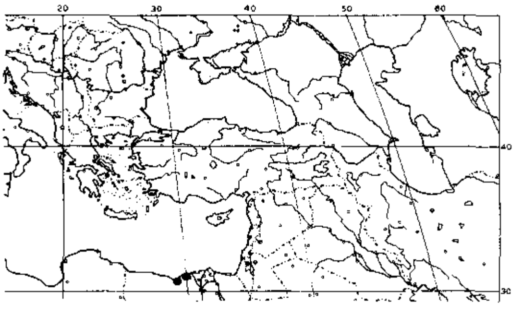
soil, on limestone hills, and also in cornfields. Altitude 0–100 m. Flowers: March–April; fruits in April–July.

Distribution. Egypt; a local endemic species in a restricted area in the vicinity of Lake Mariut near Alexandria.



MAP 3. Localities of *Allium mareoticum.*

EGYPT: El Dab'a, Mariut, April 1930, DRAR 17/250b (CAIM, neotype of *A. mareoticum* BORNMÜLLER et GAUBA); El Omayid, April 1940, DRAR 256 (CAIM); Lake Mariut, near Mex, cornfields, April 1877. LETOURNEUX 138 (P).

Notes.

Typification. The type-specimen, a collection by GAUBA, was presumably burnt at B, from which herbarium I examined all *Allium* specimens present. A fine collection of DRAR, Agr. Museum 17/250b (CAIM) from near the type locality, matches fully the original description, and this specimen is designated as the neotype.

Allied and resembling species. *A. guttatum* is closely related, but differs by sessile or only shortly stiped increase bulbs of which the stipes are flattened, not thread-like, and by its bracteoles, which are absent or fewer as compared

FIG. 5. *Allium mareoticum.* – 1. Habit, $\times{}^{2}/_{3}$; 2. flower with bracteole at base of pedicel, $\times 2$; 3. schematic position of bracts in an inflorescence, the bracteoles and pedicels removed: a. broad bracts, b. narrow bracts; 4a–b. broad and narrow bract, $\times 6$; 5. perianth and filaments, partly, $\times 8$; 6–7. inner and outer tepals with exserted filaments, outer view, $\times 8$; 8. pistil, $\times 8$; 9. detail of base of ovary, showing the excretion opening of the nectary, screened off by a hooded rim, schematic; 10. seed, lateral view, $\times 10$; 11. detail of testa, seen from above and in profile, $\times 40$; 12. transverse section of leaf, $\times 8$; 13. scheme of bulb with stiped increase bulb: a. scape, b. piece of membranous bulbcoat-leaf, c. increase bulb, d. part of main bulb; 14–15. increase bulb, dorsal and lateral view, $\times 4$; 16—17. details of coriaceous bulbcoat-leaf, $\times 12$ and $\times 24$ resp.; 18–19. details of membranous bulbcoat-leaf, $\times 4$ and $\times 40$ resp. (1, 2, 5–12, 16–19. DRAR 17/250b; 3–4, 14–15. DRAR 256; 13. DRAR 17/250b and 256).

with *A. mareoticum*, and these subtend each several pedicels, not bracteoles many and each subtending only one pedicel as in *A. mareoticum*. Furthermore, in *A. guttatum* the tepals are smooth, not finely papillate.

A. sphaerocephalum ssp. *curtum* superficially resembles *A. mareoticum* because of its longly stiped increase bulbs. *A. sphaerocephalum* ssp. *curtum* is distinct e.g. by the persistent spathe, which splits into 2(–4) spathes-valves. BORNMÜLLER l.c., presumed the presence of two spathes, though he actually saw only one. This assumption was only based on the resemblance in habit of the present species with *A. sphaerocephalum* ssp. *curtum*, with which he erroneously assumed a strong alliance. See further the note on the spathe below.

Spathe. Apparently the single spathe in *A. mareoticum* is caducous; in all the c. 11 specimens seen on the three sheets at my disposal the spathes had already fallen. As explained above, *A. mareoticum* is closely allied to *A. guttatum*, and therefore I suppose that the spathe of *A. mareoticum* is of about the same shape and size as that of *A. guttatum*, hence calyptriform, and rather shortly caudate. BORNMÜLLER l.c., presumed the presence of two caducous spathes; the single one which he found still attached to the type he described as about two times as long as the inflorescence, 5–7 mm broad at base, and contracted.

Taxonomy. More collections of *A. mareoticum* are needed to establish the true status of this species in relation to *A. guttatum* in its wide sense. However, as there are no recent collections from the now densely populated distributional area, the species will obviously now be very rare, or possibly already extinct.

4. A. sphaerocephalum L. — Fig. 6, 7.

A. sphaerocephalum L., Sp. Pl. 1, 1753:297; for other references and synonyms see under the subspecies.

Bulb depressed globose to ovoid, 10–35 × 10–25 mm. Contractile and smooth roots glabrous, branched or not. Increase bulbs absent, few, or several, up to 10, ovoid to fusiform, conspicuously flattened or hollowed at one side, 5–20 × 5–10 mm, beaked for 2–5 mm, subsessile to 8 cm stiped, situated within the leafsheaths, wrapped by one firm, straw-coloured to bright brown prophyll. Protective bulbcoat-leaves 1–4, rather thin to coriaceous, or cartilaginous, with age breaking up into fibres or not, never netted, whitish or grey to orange-brown or brown. Sproutleaf 1, 1.5–10 cm, hardly emerging above ground, at apex obliquely truncate. *Foliage leaves* 2–5, glabrous; blades scattered along scape, terete or canaliculate, hollow, 7–35 cm × 0.5–4 mm, the apical part soon withering and breaking off, top acute; sheaths unequal in length, those of upper leaves longest, extending largely above the ground, 3–40 cm long, whitish-green or green, the lower ones sometimes purplish tinged, not breaking up into fibres. Scape 1, usually exceeding the leaves, erect or suberect, terete, hollow, 15–85 cm long, 1–5 mm diam. *Inflorescence* spherical to ellipsoid, usually densely and many-flowered, 1.5–5 cm diam., without bulbils. *Spathe* 1, hyaline, persistent, 5–20 mm long, 5–10-veined, opening with one slit up to the base and with 1(or 2–3) shorter slits reaching to one-fourth to one-fifth from the base, and forming 2(–4) spathe-lobes, recurved, 1–3 mm acuminate. Bract 1, axillary within the spathe, 3–5 mm long, membranous, the margin lacerated. Bracteoles absent. Pedicels unequal, 4–25 mm long, slender, the central ones usually straight, the outer ones curved, in fruit becoming more rigid. *Flowers* campanulate to urceolate. Tepals adnate to the bases of filaments for c. 0.5 mm, persistent, somewhat saccate at base, the tepals, especially the keel, finely papillose or not, the tepals white to deep purple with a greenish or pink, or purplish midvein; outer tepals ovate to oblong, 3.2–6 × 1.5–2.5 mm, top acute to subobtuse, often shortly mucronate; inner tepals equalling the outer tepals, or somewhat shorter and narrower, or rarely slightly longer, top acute to broadly obtuse. Stamens slightly shorter to distinctly longer than the tepals, often finely serrulated towards base; outer filaments simple, 4–8 mm long, at base 0.8–1 mm wide, connate with inner filaments for 0.5–0.7 mm; inner filaments tricuspidate, c. 4.5–6 mm long, at base 0.8–1.2 mm wide, anther-bearing cusp c. 1.5–2.5 mm long, lateral cusps 1.5–3.5 mm long, c. 0.5–2.5 mm exceeding the perianth. Anthers 1.3–1.8 × 0.5–0.6 mm, yellow or purple. Pistil longer than the tepals; ovary subglobose to ellipsoid, 2–3.5 × 1–2.5 mm; style 4.5–8 mm, slender, inserted at about the base of the ovary; stigma inconspicuous, rounded. *Fruits* subglobose, 3–3.5 mm diam. Seeds 2–3 × 1.5 mm, black.

Distribution. North Africa, west to the Canary Islands: a large part of Europe; Near East. See further under the subspecies.

Notes.

Inflorescence. As is the case in some other *Allium* species, e.g. in *A. paniculatum*, the flowers of the many-flowered inflorescence develop from inside to outside, or, in other words, from the top to the bottom; see fig. 6.

Spathes. There is only one persistent spathe in *A. sphaerocephalum*, but a deep slit to the base, and 1(–3) slits reaching less deeply, often give the impression as if 2 (or more) spathes are involved.

Bracts. In the descriptions by previous authors, the single, deeply lacerated bract is not mentioned. For instance, MAIRE 1958: 263, described the inflorescence with the outer pedicels as subtended by small thin bracts. In fact these are the lobelets of the incised single bract surrounding all pedicels.

Flowers. Flower buds and young flowers are more or less triquetrous in transverse section, especially so in living plants, caused by the keeled outer tepals. This keel can be smooth or finely serrulated; also the outer surface of the tepals is sometimes slightly rough or papillose. The colour of the filaments ranges from white to purple.

Subdivision. As in several other wide spread species also *A. sphaerocephalum* is rather heterogeneous. Still, for the African material, three different groups, each with its own mutually exclusive distributional area, can be recognized. The differentiating characters of these groups are weak and ill-definable, but after some experience the groups have a fair distinctness in general appearance. For convenience's sake I have accepted these groups as subspecies: ssp. *sphaerocephalum* which occurs in Europe, Turkey, and apparently in the northern part of the Near East, and in Africa only in the Canary Islands, and in Morocco at higher elevations in the Atlas Mountains, ssp. *durandoi* which occurs at lower altitudes, and is confined to Algeria and Tunisia, and thirdly ssp. *curtum* which occurs in Egypt and the Near East. In the area of Libya the species seems to be absent. The ssp. *durandoi* has cartilaginous bulb tunics and the scapes are stiff and of a straw-like constitution; the ssp. *curtum*, which is currently known as *A. curtum* BOISSIER et GAILLARDOT, has small flowers with the filaments not or hardly exserted, and membranous bulb tunics. See further under the notes to the subspecies.

KEY TO THE SUBSPECIES

1. Increase bulbs usually several, usually stiped. Outer bulbcoat-leaves membranous to coriaceous, with age breaking up into fibres or not. Tepals 4–5.5 mm long. Filaments, including lateral cusps, distinctly exserted . . . . **a. ssp. sphaerocephalum**
1. Increase bulbs absent or 1 or 2, sessile.
   2. Bulb more or less ovoid. Outer bulbcoat-leaves coriaceous to cartilaginous, with age not breaking up into fibres. Tepals 4.5–6 mm long. Filaments, including lateral cusps, slightly to distinctly exserted . . **b. ssp. durandoi**
   2. Bulb more or less globose. Outer bulbcoat-leaves membranous, with age not breaking up into fibres. Tepals 3–4.2 mm long. Filaments, including lateral cusps, not or only slightly exserted . . . . **c. ssp. curtum**

a. ssp. sphaerocephalum **Fig. 6, Map 4.**

A. sphaerocephalum L., Sp. Pl. 1, 1753: 297; ibid. 1762: 426; GUSSONE 1842: 392; KUNTH 1843: 387; WEBB et BERTHELOT 3, 1848: 343; WILLKOMM et LANGE 1862: 209; BALL 1878: 690; BOISSIER 1882: 236; RICHTER 1890: 199; HOLMBOE 1914: 46; JAHANDIEZ et MAIRE 1931: 124; MARKGRAF in HAYEK 1932: 42; EMBERGER et MAIRE 1941: 956; CLAPHAM, TUTIN et WARBURG 1962: 278; VON BOTHMER 1972: 62–67, fig. 1B, 2B, 3A–E, 5A, 6, 7; DE LANGHE C.S. 1973: 711; DE WILDE-DUYFJES 1973: 84.

A. sphaerocephalum var. *typicum* REGEL 1875: 46; ASCHERSON et GRAEBNER 1905: 112; VINDT 1953: 117; MAIRE 1958: 263, fig. 895; *A. sphaerocephalum* ssp. *eu-sphaerocephalum* BRIQUET 1910: 288.

Lectotype: 'Nov. MICHELI Gen: *Scorodoprasum* fig. 2 si constata', MICHELI s.n. (FI).

A. arvense GUSSONE 1825:1; ibid. 1842:393; FEINBRUN 1943:12.
Type: Italy, Sicily; no specimens indicated, no material found in NAP, nor in FI.

A. sphaerocephalum var. *viridi-album* TINEO 1827:19, 275; REGEL 1875:47; ASCHERSON et GRAEBNER 1905:112.
Type: Italy, Sicily, near Palermo, no specimens indicated, no material found in NAP, nor in FI.

A. aegaeum HELDREICH et HALÁCSY ex HALÁCSY 1899:195.
Type: Greece, Insula Naxos, LEONIS 275 (holotype: G; isotypes: BAS, G).

A. regnieri MAIRE 1931:317, no. 1145; JAHANDIEZ et MAIRE 1931:125; VINDT 1953:116.
Type: Morocco, Middle Atlas, Kheneg Merzoul, 1 July 1923, MAIRE s.n. (holotype: MPU; isotype: P).

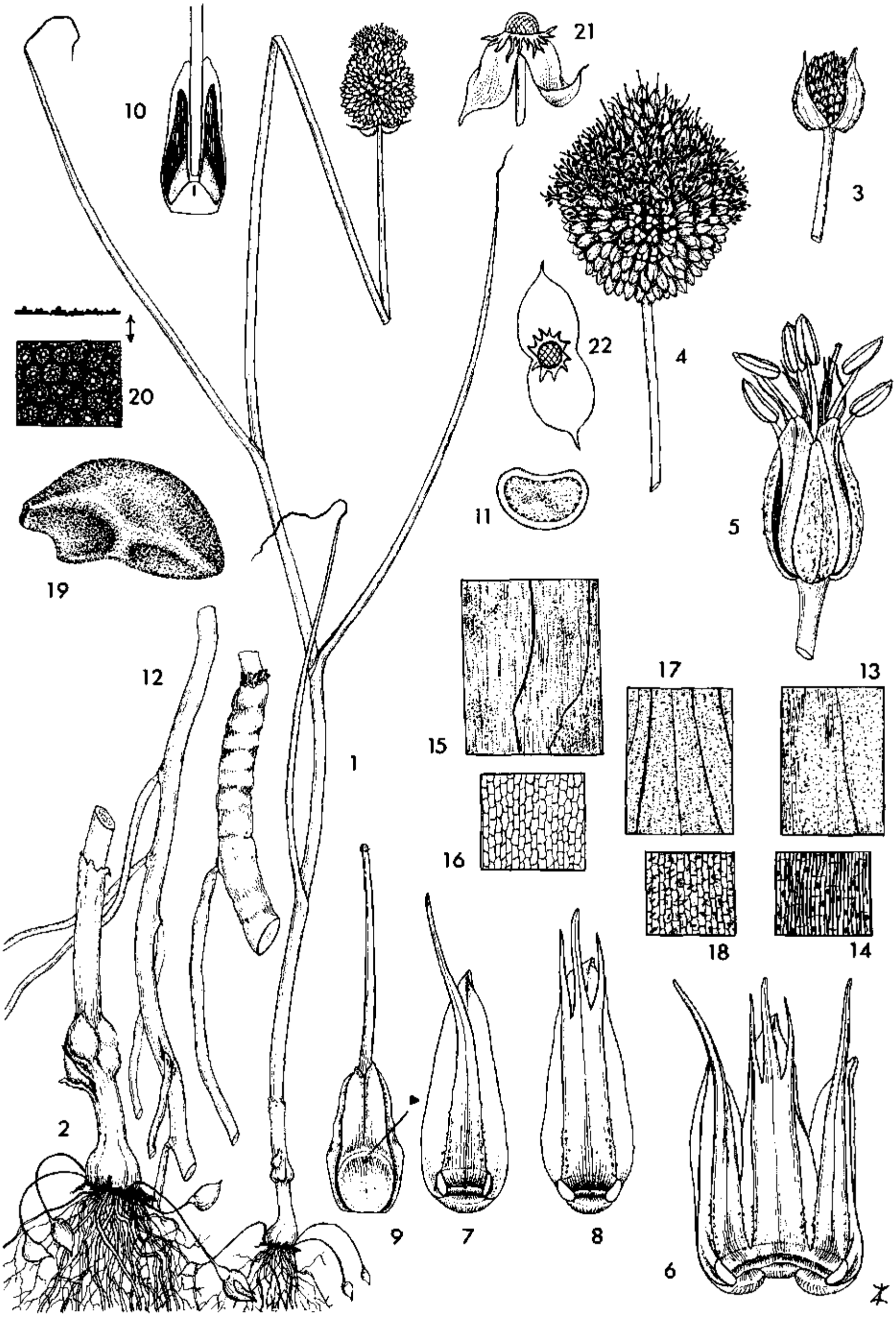
A. margaritaceum SMITH var. *robustum* MAIRE 1938:453, no. 2587; EMBERGER et MAIRE 1941:956; VINDT 1953:118; MAIRE 1958:267.
Type: Morocco, Great Atlas, Plateau des Lacs, MAIRE s.n. (holotype: MPU).

Bulb subglobose to ovoid, 10–30 × 10–25 mm. Outer bulbcoat-leaves membranous to coriaceous, greyish-yellow to greyish-brown, with age breaking up into fibres or not. Increase bulbs up to 10, subsessile or up to 8 cm stiped. Tepals 4–5.5 mm long. Filaments exceeding the tepals for (0.5–)2.5 mm.

Habitat. In lowland and in mountainous regions, in various localities, among which rather dry and wet places, exposed rocks, on grassy and reforested hills, in scrub, and steppe; also in cornfields and vine yards. Recorded from calcareous and sandy soils. Altitude 0–2800 m, in Morocco 1500–2900 m. Flowers: June–August (Canary Islands, Morocco).

Distribution. Canary Islands (one collection); Morocco; South and West Europe as north as England and Belgium, Central Europe; Turkey; northern Near East.

CANARY IS.: Tenerife, E. of Orotava, 500 m, cornfields, August 1862, ANONYMOUS 89 (K).
MOROCCO: Djebel Habibi, June 1908, GANDOGER s.n. (G, L); Middle Atlas, Timhadit, 1800 m, July 1924, JAHANDIEZ 807 (BM, G); Tifernout, above lake Ifin, 2770 m, July 1923, DE LITARDIÈRE s.n. (G); Middle Atlas, Kheneg Merzoul, 1900 m, July 1923, MAIRE s.n. (MPU, P, type of *A. regnieri* MAIRE); eastern Great Atlas, July 1937, MAIRE s.n. (MPU, type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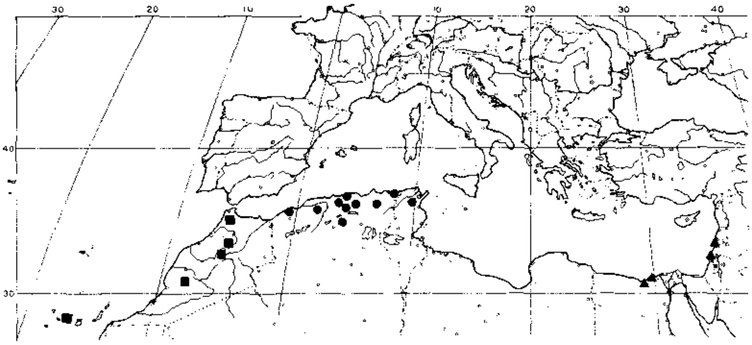


MAP 4. Localities of *Allium sphaerocephalum:* ■ African localities of subsp. *sphaerocephalum*, ● subsp. *durandoi*, ▲ subsp. *curtum*.

of *A. margaritaceum* SMITH var. *robustum* MAIRE).

EUROPE, selected specimens: France, near Bourges, vine yards, May 1851, BOREAU s.n. (FI); Greece, I. of Naxos, July 1897, LEONIS 275 (BAS, G, type of *A. aegaeum* HELDREICH et HALÁCSY ex HALÁCSY); Portugal, Serra de Estrêle, E. of S. Romao, 1600 m, August 1966, MERXMÜLLER c.s. 21608 (M); Italy, without further locality, annotated by MICHELI: 'Nov. MICHELI Gen: *Scorodoprasum* fig. 2 *si constata*', MICHELI s.n. (FI, type of *A. sphaerocephalum* L.); & Prov. Reggio, Pellaro, dry places, 200–250 m, July 1898, RIGO 604 (B); & Sicily, near Palermo, May–July 1901, ROSS 387 (WAG); France, La Massane, 450 m, maquis, June 1959, DE WILDE c.s. s.n.(WAG);Spain, Ermita de las Salinas, Pyrenees, 1300 m, Aug. 1967, DE WIT 11059 (WAG).

TURKEY: Sultandagh, near Akscheher, 1000 m, June 1899, BORNMÜLLER 5600 (B).

SYRIA: Tripoli, May 1878, Herb. PEYRON s.n. (G).

Notes.

Synonyms. *A. arvense* GUSSONE. I have not found authentic material of GUSSONE in NAP, nor in FI. According to the protologue *A. arvense* is very close to *A. sphaerocephalum*. It was described as having white flowers, a subspherical to ovoid inflorescence, and the stamens subequal to the tepals. These characters fall within the variability of the subspecies.

A. sphaerocephalum var. *viridi-album* TINEO. I have not found authentic material of this variety in NAP, nor in FI. It was described as having a lax or a

FIG. 6. *Allium sphaerocephalum* subsp. *sphaerocephalum*. – 1. Habit, $\times^{1}/_{3}$; 2. lower part of plant showing stiped increase bulbs, $\times^{2}/_{3}$; 3. young inflorescence, spathe with 2 valves, $\times^{2}/_{3}$; 4. inflorescence, $\times^{2}/_{3}$; 5. flower, $\times 4$; 6. perianth and filaments, partly, $\times 6$; 7–8. outer and inner tepal with corresponding filaments, $\times 6$; 9. pistil, arrow indicates excretion opening of nectary, $\times 6$; 10. longitudinal section of pistil, $\times 6$; 11. transverse section of leaf, $\times 4$; 12. pieces of roots, $\times 4$; 13–14. details of chartaceous bulbcoat-leaf, $\times 6$ and $\times 40$ resp.; 15–16. details of papery bulbcoat-leaf, $\times 6$ and $\times 20$ resp.; 17–18. details of thin membranous bulbcoat-leaf, $\times 6$ and $\times 20$ resp.; 19. seed, lateral view, $\times 10$; 20. detail of testa, seen from above and in profile, $\times 40$; 21. inflorescence, flowers removed, showing receptacle and single circular deeply lacerated bract and 2 spathe-valves, $\times^{2}/_{3}$; 22. ditto, diagram. (1–12, 19–22. LEYS 17, spirit mat.; 13–18. JAHANDIEZ 807).

compact spherical inflorescence, with white or dark purple flowers with a green carina, and with the stamens always exserted.

A. regnieri MAIRE. This was erroneously described by MAIRE as having flat leaves with an entire margin. The type specimen, however, has terete leaves.

A. margaritaceum SMITH var. *robustum* MAIRE was described as a coarse variety, with the leaves c. 5 mm in diam., the inflorescence compact with large flowers c. 7 mm long. The type-specimen, MAIRE s.n. (MPU), lacks the bulb, the inflorescence bears two persistent spathe-valves and c. 6 mm, not 7 mm, long flowers, and the specimen clearly belongs to *A. sphaerocephalum*.

Resembling species. *A. sphaerocephalum* may resemble specimens of *A. vineale* of which the inflorescences are composed of flowers only, without bulbils, and also to *A. rotundum*. *A. vineale* differs by a loose inflorescence, with a single, not incised, caducous spathe, and by increase bulbs which are only shortly stiped.

A. rotundum is distinct by flat leaves and by the stamens not or only slightly exserted.

Increase bulbs. These can be found within the leafsheaths either accumulated, or in other cases more or less scattered, or arranged in a short row along the scape. The stipes are often flattened. The increase bulbs are released after decay of the leafsheaths.

Caryology. 2n=16, fide CELA RENZONI and GARBARI 1971.

b. ssp. durandoi (BATTANDIER et TRABUT) DUYFJES, *stat. nov.*

Fig. 7, 1–2, **Map 4.**

A. sphaerocephalum var. *durandoi* BATTANDIER et TRABUT 1884:155 (*A. durandoi* JORDAN in litt.); ibid. 1895:61; MAIRE 1958:264.

Type: Algeria, Teniet-el-Haâd, DURANDO s.n. (holotype: G).

A. sphaerocephalum L.: MUNBY 1847:35; ibid. 1859:29; ibid. 1866:33; BATTANDIER et TRABUT 1902:332; QUÉZEL et SANTA 1962:213.

A. sphaerocephalum var. *arvense* auct. non (GUSSONE) PARLATORE: BATTANDIER et TRABUT 1884:155; ibid. 1895:61; VINDT 1953:117; CUÉNOD 1954:212; MAIRE 1958:264 (excl. spec. Morocco).

Bulb more or less ovoid, 15–35 × 10–25 mm. Outer bulbcoat-leaves coriaceous to cartilaginous, brown to orange-brown or yellow, with age splitting but not breaking up into fibres. Increase bulbs absent or 1 or 2, sessile. Tepals 4.5–6 mm long. Filaments exceeding the tepals for up to 2 mm.

Habitat. Hills and rocky places, steppe; on dry and wet places. Clayey and sandy soils. Altitude 0–1500 m. Flowers June–September.

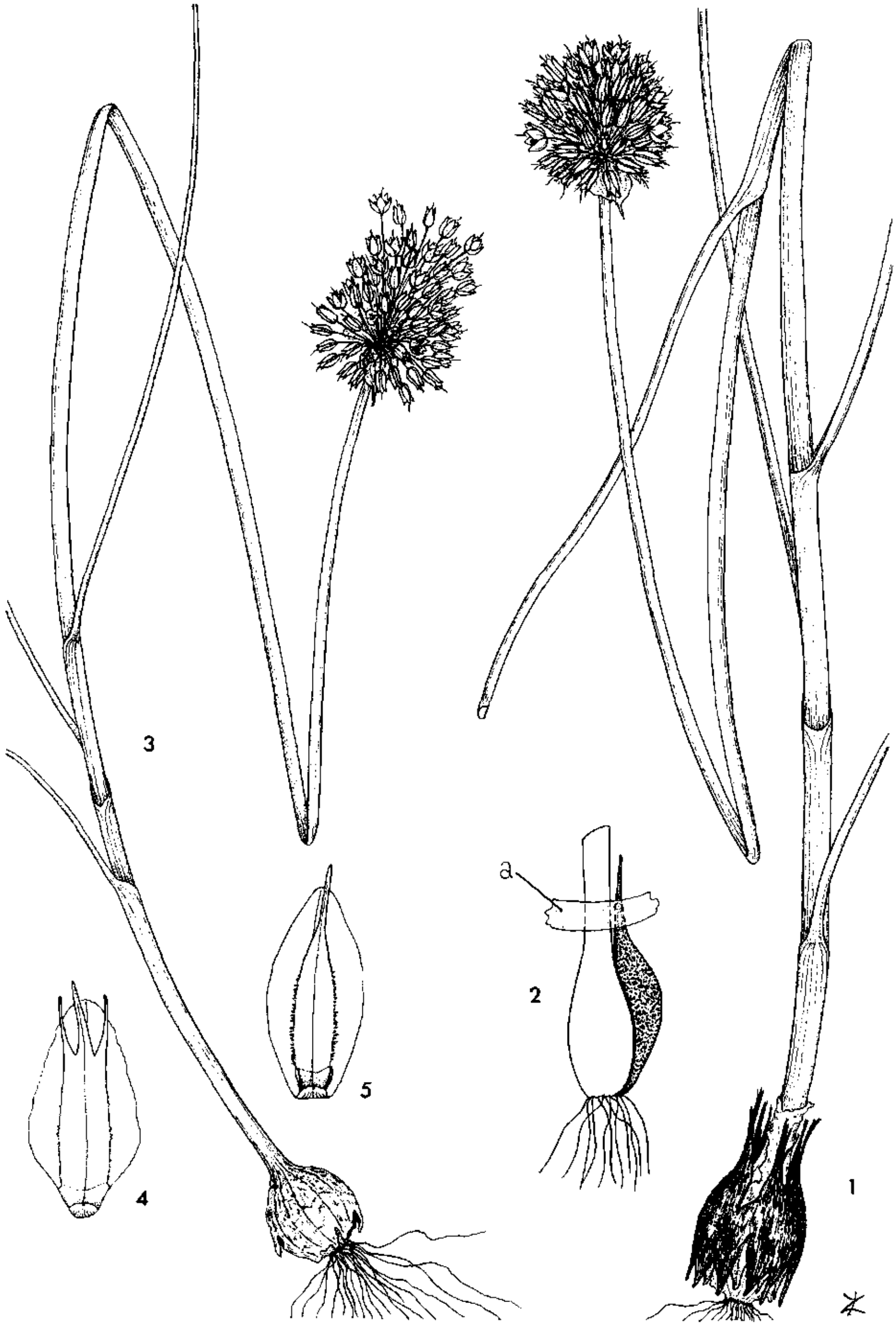


FIG. 7. *Allium sphaerocephalum*. – subsp. *durandoi:* 1. Habit, $\times^2/_3$; 2. scheme of bulb with sessile increase bulb (dotted), a. piece of bulbcoat-leaf, $\times^2/_3$. – subsp. *curtum*: 3. habit, $\times^2/_3$; 4–5. inner and outer tepal with corresponding filaments, $\times 6$. (1–2. COSSON 18; 3–5. DRAR s.n., 1 June 1935).

Distribution. Algeria; Tunisia.

ALGERIA: Constantine, Sept. 1839, BOVÉ s.n. (FI, P); near Aumale, rocks, July 1857, CHAROY 637 (P); Mt. Bouzar, near Alger, July 1854, COSSON s.n. (P); Summit of Mt. Ouarsenis, 830 m, July 1854, COSSON s.n. (P); Djebel Zaccar, near Milianah, July 1854, COSSON s.n. (P); near Boghari, hills, June 1856. COSSON s.n. (P); Teniet-el-Haâd, 1852, DURANDO s.n. (G, type of *A. sphaerocephalum* var. *durandoi* BATTANDIER et TRABUT); La Calle, July 1841, DURIEU DE LA MAISONNEUVE s.n. (P); Constantine, July 1840, GAY s.n. (P); Alger, 1847, GAY s.n. (P); Chréa, 1500 m, July 1935, GOMBAULT s.n. (P); Tlemcen, MUNBY s.n. (K); near Djelfa, June 1854, REBOUD s.n. (P).

TUNISIA: Djebel Zaghouan, August 1854, KRALIK s.n. (FI, P).

Notes

The type was originally collected by DURANDO at Teniet-el-Haâd, Algeria, and described as a variety of *A. sphaerocephalum*. This variety, which is presently treated as a subspecies, was described as a stout plant with large flowers, with the tepals with an almost smooth keel, and with long pedicels curved after anthesis.

Distribution. I saw only one collection from Tunisia, where the ssp. is obviously rare. I have no record for Libya.

Taxonomy. The colour of the flowers is either pinkish-purplish or white. The white-flowered specimens have often erroneously been determined as *A. arvense*, described as a white-flowered species from Sicily. *A. arvense* is presently placed under ssp. *sphaerocephalum*.

MUSCHLER 1912:213, stated the occurrence of *A. sphaerocephalum* in Egypt, near the places Alexandria, Mandara and Mex. Although I have seen all the material of the Cairo herbarium, and a fairly large number of specimens collected by MUSCHLER at Kew, I have not found Egyptian material of the typical subspecies of *A. sphaerocephalum*.

According to FEINBRUN 1943:12, *A. sphaerocephalum* does not occur in Israel, and she doubted its occurrence in Syria, Lebanon and Iraq. FEINBRUN accepts *A. curtum* ssp. *typicum* and ssp. *palaestinum* for this region, both taxa presently under *A. sphaerocephalum* ssp. *curtum*.

c. ssp. curtum (BOISSIER et GAILLARDOT) DUYFJES, *comb. nov.*

Fig. 7, 3–5, **Map 4.**

A. curtum BOISSIER et GAILLARDOT in BOISSIER 1859:116; REGEL 1875:65; BOISSIER 1882:245; MUSCHLER 1912:214; DINSMORE in POST 1933:638.

A. curtum BOISSIER et GAILLARDOT ssp. *typicum* FEINBRUN 1943:14.

Type: Lebanon, Sidonis (= Sayda), May, GAILLARDOT s.n. (holotype: G, in Herb. BOISSIER).

A. sphaerocephalum L.: MUSCHLER 1912:213; TÄCKHOLM et DRAR 1954:66; TÄCKHOLM 1974:648.

A. sphaerocephalum var. *viridi-album* auct. non TINEO: MUSCHLER 1912:214.

A. curtum BOISSIER et GAILLARDOT ssp. *palaestinum* FEINBRUN 1943:14, fig. 6, 25; TÄCKHOLM et DRAR 1954:69; TÄCKHOLM 1974:650.

Type: Palestine, Jordan Valley, between Wadi Far'a and Beit-Shean, 1934, EIG c.s. s.n. (not seen).

A. arvense auct. non GUSSONE: TÄCKHOLM et DRAR 1954:67; TÄCKHOLM 1974: 648.

A. curtum BOISSIER et GAILLARDOT ssp. *aegyptiacum* TÄCKHOLM et DRAR 1954:69; TÄCKHOLM 1974: 650.

Type: Egypt, Um Zegheiw, near El Dekheila, DRAR s.n. (holotype: CAIM).

Bulb depressed globose to globose, 20–25 × 15–35 mm. Outer bulbcoat-leaves membranous, whitish to pale yellowish, with age not breaking up into fibres. Increase bulbs absent or 1 or 2, sessile. Tepals 3.2–4.2 mm long. Filaments included or exceeding the tepals up to c. 0.5 mm.

Habitat. Dry places with sandy, or sandy-loamy, or calcerous soil; also in fields. In Israel found in *Eragrostis-Centaurea* associations. Altitude 0–100 m. Flowers: May–June (Egypt).

Vernacular name. Egypt: *Thoam*.

Distribution. Egypt; Israel; Lebanon.

EGYPT: Umm Zegheiw, near El Dekheila, sands, June 1935, DRAR s.n. (CAIM), type of *A. curtum* ssp. *aegyptiacum* TÄCKHOLM et DRAR); Mex, April 1877, HURST s.n. (BM); Mandara, near Alexandria, sands, May 1877, LETOURNEUX 139 p.p. (P).

ISRAEL: near Tel Aviv, sands, April 1936, BOJKO s.n. (WU); Plain of Sharon, Kefar Vitkin, May 1939, GRIZI c.s. 724 (FI, WAG).

LEBANON: Sayda, May, GAILLARDOT s.n. (G, type of *A. curtum* BOISSIER et GAILLARDOT).

Notes.

Synonyms. I have not seen the type of *A. curtum* ssp. *palaestinum* FEINBRUN. According to the description the tepals are rather long, 4–5 mm. The description and figure cited, however, agree with ssp. *curtum*.

A. arvense auct. non GUSSONE. Under this name TÄCKHOLM et DRAR cite three specimens, of which two collections from LETOURNEUX 139 from Alexandria and Mandara. I have seen these specimens mounted on one sheet, and they appear to be a mixture. The left specimen is *A. paniculatum*; the right specimen is true ssp. *curtum*.

Allied and resembling species. Though I have not seen authentic material of *A. davisianum* FEINBRUN, 1943, from Nablus, Palestine, and *A. damascenum* FEINBRUN, 1943, from Damascus, Syria, these two species appear to me to be closely allied to or possibly identical with *A. sphaerocephalum* s.l.

Taxonomy. TÄCKHOLM et DRAR, 1954, recognize for Egypt, besides *A. sphaerocephalum* the following two related taxa, viz. *A. arvense* GUSSONE and *A. curtum* ssp. *aegyptiacum*. The authors separate these taxa by stating the presence of 2 or 3 spathes in *A. curtum*, contrary to one single deciduous spathe in *A. sphaerocephalum*, and one persistent spathe in *A. arvense*. In my opinion these authors are not correct, and *A. sphaerocephalum*, including *A. arvense* and *A. curtum*, is characterized by one persistent spathe which is split into 2(–4) spathe-lobes.

Increase bulbs. In the protologue of *A. curtum* the bulb is described as provided with a few sessile increase bulbs. In the rather scarce Egyptian material I never observed increase bulbs, but it is possible that when more material is collected these increase bulbs will be found.

5. A. ascalonicum L. **Fig. 8, Map 5.**

A. ascalonicum L. [STRAND], Fl. Palaestina 1756:17; ibid. 1762:429; STEARN 1960:181; DE WILDE-DUYFJES 1973:61.

Type: LINN 419.24, left specimen.

A. scabriflorum BOISSIER 1844:60.

Type: Turkey, eastern Cappadocia. AUCHER 2196 (holotype: G, in Herb. BOISSIER).

A. hierochuntinum BOISSIER 1882:244; NÁBĚLEK 1929:33; BOULOUMOY 1930: 329; OPPENHEIMER 1931:156; DINSMORE in POST 1933:637; FEINBRUN 1943: 20; STEARN 1960:181; KOLLMANN 1970:246; DE WILDE-DUYFJES 1973:61.

Syntypes: between Jerusalem and Jericho, BOISSIER s.n. (G, in Herb. BOISSIER, not seen); Monasterium of St. Saba (SE. of Jerusalem), KOTSCHY 436 (lectotype: G, in Herb. BOISSIER, not seen; isotype: K); Syria, near Palmyra, BLANCHE s.n. (G, in Herb. BOISSIER, not seen).

A. barthianum ASCHERSON et SCHWEINFURTH 1893:670; MUSCHLER 1912: 214; CAVARA 1928:44; PAMPANINI 1931:152; TÄCKHOLM et DRAR 1954:69; FEINBRUN 1943:19.

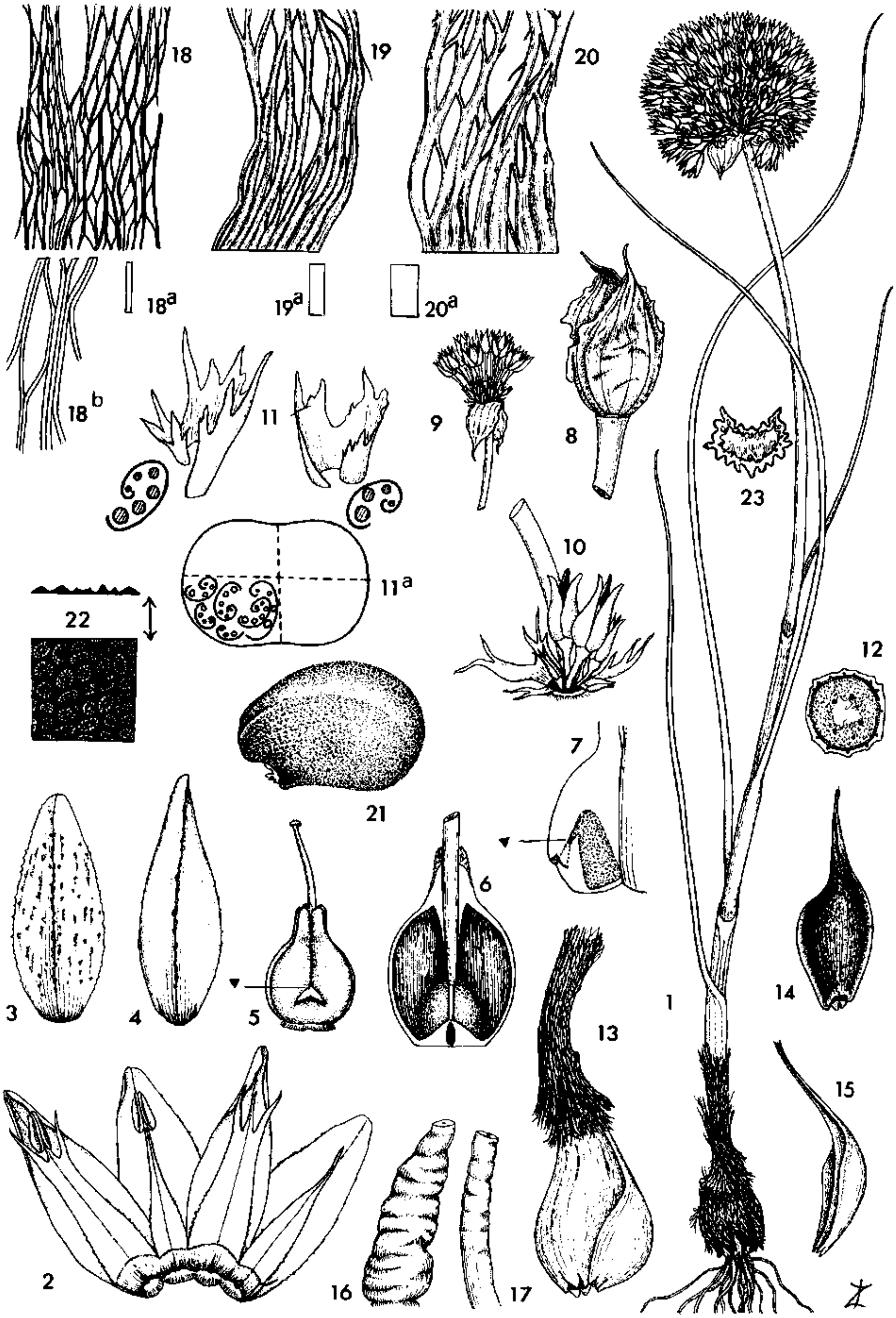
Syntypes: Lybia, Tobruk (Tubruq), SCHWEINFURTH 176 (not seen); & Mirsa Badia, SCHWEINFURTH 114 (lectotype: G); Egypt, Mirsa Matruh, SCHWEINFURTH 232 (not seen).

A. artemisietorum EIG et FEINBRUN in FEINBRUN 1943: 18.
Type: Israel, E. of Beer-Sheba, FEINBRUN 1942 (holotype: HUJ, not seen).

Bulb ovoid to oblong, 10–20 × 10–15 mm. Roots scattered over whole surface of bulbdisk, glabrous, sparingly branched or not. Increase bulbs c. 1–12, one single in the axils of protective-, sprout-, and foliage leaves, oblong, flattened or hollowed at one side, 9–15 × 3–5 mm, beaked for c. 5 mm, not stiped, each wrapped in a firm, brownish, more or less hyaline prophyll, those situated towards the outside of the bulb partly breaking up into dense, finely netted fibres. Protective bulbcoat-leaves 2–numerous, outer surface pale-yellowish or shiny yellowish-orange, or medium brown, the inner surface yellowish or brown, largely breaking up into finely netted fibres. Sproutleaf not seen. *Foliage leaves* 2–4, glabrous, blades scattered along scape, terete, sometimes canaliculate, hollow, 8–25 cm × 0.25–1(–3) mm, sometimes tinged purplish, top acutish; sheaths unequal in length, those of upper leaves longest, extending largely above the ground, 2–13 cm long, yellowish or brownish, sometimes tinged purplish, subterranean part later on breaking up into finely netted fibres. Scape 1–3, shorter to longer than the leaves, erect, terete, hollow, glabrous, 10–35 cm long, 1–3 mm diam. *Inflorescence* umbellate to spherical or ellipsoid, few- to many-flowered, 1–4 cm diam., without bulbils. *Spathe* 1, hyaline, persistent, 6–12 mm, 5–15 purplish-veined, opening with (1–)2(–3) (sub)equal slits reaching to one-third to up to the base, forming (1–)2(–3) spathe-lobes, c. 0.5–2 mm acuminate, without distinct midvein. Bracteoles minute, scale-like, each subtending 3–6 flowers. Pedicels unequal, 2–20 mm, outer ones shortest, in anthesis straight, or the outer ones recurved, in fruit straight, rigid. *Flowers* urceolate. Tepals 0.2–1 mm adnate to bases of filaments, persistent, usually curved towards the top, purplish blue or whitish, with a dark purplish or purplish-brown or greenish serrulated keel, outside scabridulous; outer tepals ovate, 4–7 × 2–2.8 mm, top (sub)acute; inner tepals slightly longer to slightly shorter than outer tepals, ovate, 4–7 × 1.6–2.5 mm, top (sub)acute. Stamens shorter to slightly longer than the tepals; filaments slightly rough or serrulated towards base; outer filaments simple, 3–5 mm long, at base 0.6–1 mm wide, connate with inner filaments for 0.3–0.8 mm; inner filaments tricuspidate, slightly longer and wider than outer filaments, 4.2–5.6 mm long, at base 1.4–2 mm wide, anther-bearing cusp (0.5–)1.2 mm long, lateral cusps 1.5—2 mm long, slightly exserting the perianth or not. Anthers 1–1.6 × 0.3–0.5 mm, yellow. Pistil shorter than to as long as the tepals; ovary globose to ovoid, 2–3.5 × 1.4–2.8 mm; style 0.6–2.8 mm, slender, inserted at the base of the ovary; stigma inconspicuous, with three minute lobes c. 0.1 mm. *Fruits* (sub)globose, c. 4 mm diam. Seeds 2 × 1–1.4 mm, black with a golden shine.

Vernacular name. Israel: *Shoum* (Hebrew).

Habitat. This species is to be found in the eastern Mediterranean region,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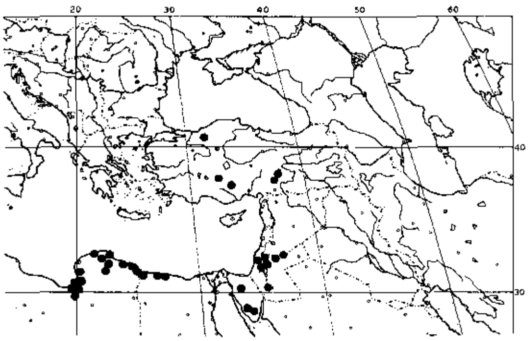
usually not very far inland, but still several collections are known from the interior of Turkey and Jordan. It occurs frequently in rather arid places, in semi-deserts, on dry hillsides, and in fields; it is recorded as found on salt meadows and plains, on hard ground, and in roadsides. There seems to be a preference for sandy soils. Altitude 0–1000 m. Flowers: March–April (Libya, Egypt); June (Turkey); March–May (Syria, Israel, Jordan).

Distribution. Libya (Cyrenaica); Egypt (Marmarica); Turkey; Syria; Israel; Jordan.



MAP 5. Localities of *Allium ascalonicum*.

Libya: Latrun, roadside, 16 April 1954, GUICHARD KG/CYR/144 (BM); 14 km N. of Agedabia, 18 March 1958, GUICHARD CYR/136/58 (BM); Brega, 26 March 1958, GUICHARD CYR/25/58 (BM); El-Gtafia, S. of Agedabia, 13 March 1933, PAMPANINI 1352 (FI, K); Marsa Sus, 20 March 1933, PAMPANINI 1353 (FI); between Tobruk and Bardia, 28 March 1933, PAMPANINI 1354 (FI); Amseat, S. of Bardia, 24 March 1933, PAMPANINI 1355 (FI); between Derna and Mechili, 10 April 1933, PAMPANINI 1359 (FI); Ahmed-el-Magrum, 7 April 1934, PAMPANINI C.S. 1360 (FI); Marsa-el-Brega, 8 April 1934, PAMPANINI C.S. 1361 (FI); Uadi Faregh, near el-Haseiat, 9 April 1934, PAMPANINI C.S. 1362 (FI); between Agedabia and

FIG. 8. *Allium ascalonicum*. – 1. Habit, $\times^2/_3$; 2. perianth and stamens, partly, $\times 6$; 3–4. outer and inner tepal, outer view, $\times 6$; 5. pistil, arrow indicates excretion opening of nectary, screened off by a hooded rim, $\times 6$; 6. ovary, longitudinal section, $\times 10$; 7. nectary, lateral view, schematic, $\times 10$; 8. spathe of young inflorescence, split up into 2 spathe-valves, $\times 2$; 9. inflorescence in full anthesis showing spathe composed of 2 spathe-valves, $\times^2/_3$; 10. deeply lacerated bracteole subtending a cluster of flowers, $\times 4$; 11. bracteoles and the schematic position of bracteoles and pedicels, $\times 4$; 11a. diagram showing position of bracteoles and flowers of a part of the inflorescence; 12. transverse section of scape, $\times 8$; 13. bulb with one increase bulb, inner bulbcoat-leaves removed, $\times 2$; 14–15. increase bulb, inner and lateral views, $\times 2$; 16–17. pieces of contractile and smooth roots, $\times 6$; 18, 18b. details of first outer bulbcoat-leaf, outer view, $\times 6$ and $\times 12$ resp.; 19. detail of second outer bulbcoat-leaf, outer view, $\times 6$; 20. detail of third outer bulbcoat-leaf, outer view, $\times 6$; 18a, 19a, 20a. squares indicating relative thickness of the bulbcoat-leaves, $\times 12$; 21. seed, lateral view, $\times 16$; 22. detail of testa, seen from above and in profile, $\times 40$; 23. transverse section of leaf, $\times 8$. (1–7, 21–23. PAMPANINI 1352; 8–15, 18–20a. SCHWEINFURTH 114; 15–17. GUICHARD CYR/136/58).

El-Haseiat, 9 April 1934, PAMPANINI c.s. 1363 (FI); Saumnu, NE. of Agedabia, 10 April 1934, PAMPANINI c.s. 1364 (FI); between Agedabia and Saumnu, 10 April 1934, PAMPANINI c.s. 1365 (FI); Derna, 16 April 1934, PAMPANINI c.s. 1366 (FI); naer Chaulan, 20 April 1934, PAMPANINI c.s. 1368 (FI); Chaulan, 20 April 1934, PAMPANINI c.s. 1369 (FI); between Derba and el-Mechili, 19 April 1934, PAMPANINI c.s. 1367 (FI); 62 km W. of Agedabia, desert, 29 March 1939, SANDWITH 2127 (K); between Agedabia and Uadi Zaregh, desert, 30 March 1939, SANDWITH 2162 (K); Mirsa Badia (Bardia), 9–10 March 1890, SCHWEINFURTH 114 (G, type of *A. barthianum* ASCH. et SCHWEINF.); Tobruk, coast, stones and sands, 18 April 1912, VACCARI 27 (FI).

Egypt: Mirsa Matruh, 1904, BALL 59 (K); N. Sinai, Wadi El Mizerie, between stones, 25 April 1959, BOULOS s.n. (CAIM); Mersa Matruh, 9 March 1939, DRAR (CAIM); between Matruh and Barrani, sands, common, 11 April 1939, SHABETAI 1678 bis, or F 4737 bis (BM, CAIM, K); Salum, sands, SHABETAI 3289 (CAIM).

Turkey: eastern Cappadocia, AUCHER 2196 (G, type of *A. scabrifolium* BOISSIER); Cappadocia, upper course of Euphrates, 1834, COQUEBERT DE MONTBRET 2102–2214 (FI); Konya, salt places, 18 June 1845, DE HELDREICH s.n. (FI); Eregli, salt meadows, 22 June 1898, SIEHE 150 (G, WU).

Syria, Israel, Jordan: Talat-ed-Damm, wilderness, 19 April 1933, AMDURSKY 221 (FI, G, K, WAG); near Hierochuntinum, desert, April 1846, BOISSIER s.n. (WAG); Jericho, 200 m, sands, BORNMÜLLER 1544 (B, G, K, WU); Transjordan, 24 April 1945, DAVIS 8615 (K); Transjordan, 27 April 1945, DAVIS 9611 (K); near Jericho, sands, 28 March 1905, DINSMORE 909(L); probably between Jericho and Jerusalem, April 1751, HASSELQUIST 419.24 (LINN, type of *A. ascalonicum* L.); Monasterium of St. Saba, 4 April 1855, KOTSCHY 436 (K, type of *A. hierochuntinum* BOISSIER); Dead Sea, Monasterium of St. George, 19 April 1911, MEYERS c.s. 4909 (K); Mashit, dry ground, 25 April 1911, MEYERS c.s. M 909 (K, L); Jerusalem, dry hillsides, 19 April 1911, MEYERS c.s. 6909 (L); between Dead Sea and Marsaba, roadside, 1863, OSBORNO 172 (K); E. of Jordan R., 1873, PAINE s.n. (K); Palaestina, 1846, PINARD s.n. (FI, WAG); between Khân-Hatrûr and Jericho, 23 April 1886, POST s.n. (G); Isbul Busrah, May 1886, POST s.n. (K); between Irbid and Busrah, 6 May 1886, POST s.n. (G); Jordan valley, Uadi-el-Aujah, 30 March 1928, R.R. s.n. (K);

Notes.

Nomenclature. There has been some discord as whether the epithet *ascalonicum* should be accepted or not (STEARN 1960, DE WILDE-DUYFJES 1973). STEARN advocated that the epithet *ascalonicum* should be rejected as being a persisting source of error.

Synonyms. *A. artemisietorum* EIG et FEINBRUN in FEINBRUN 1943:18, fig. 30, from Israel is regarded as synonymous with *A. ascalonicum*, though I have not seen the type. According to the protologue it has densely fibrous bulbcoats, 2 or 3 terete or semiterete leaves, one many-nerved membranous spathe, and flowers 3.5–5 mm long with a rough brownish or greenish keel on each tepal, the filaments are exserted with the lateral cusps being as long as to slightly longer than the anther-bearing cusp. These characters, and the figure as well, agree with *A. ascalonicum*.

Allied and resembling species. *A. deserti-syriaci* FEINBRUN 1943: 17, from Syria and Iraq, is closely related to *A. ascalonicum*, and possibly conspecific. It is mainly distinguished by the lax inflorescence, and a number of other small characters. The type-specimen, in HUJ, however, was not examined by me.

A. dyctioprasum C. A. MEYER ex KUNTH 1843:390, from Armenia, is probably also closely related and conspecific to *A. ascalonicum*. The type was destroyed at Berlin, but according to the protologue it differs from *A. ascalonicum* by having obtuse tepals only.

A. ascalonicum may be confused with *A. gomphrenoides* BOISSIER 1846:114, from Greece. This species differs, however, by its flat leaves, and its smaller, smooth flowers.

Distribution. The species *A. ascalonicum* as conceived in the present revision, comprising several new synonyms, and better known by numerous collections, appears to have a much larger distributional area than formerly known.

Bulbcoats. The often thick cuff of fibrous bulbcoats is apparently accumulated over a period of several years. Each year the outer bulbcoats and the lower parts of the leafsheaths decay into finely netted fibres, whereas the upper parts of the leafsheaths break off and disappear.

Increase bulbs. In the few specimens investigated for this, I found one single increase bulb axillary of all bulbcoats, including those of preceding years. Apparently the increase bulbs remain for a long time attached to the main bulb, and often they sprout only to a limited degree, thus contributing not or only little to the propagation of the plants. In contrast to this, for instance, in *A. roseum* the increase bulbs play an important role in its dispersal.

Colour. The flower colour is variable. It ranges from whitish or whitish-purple, to bluish-purple. In Turkey only bluish-purple flowers are found.

Fieldnotes. All parts of the plant have a strong *Allium* smell, even the boiled bulbs of old herbarium specimens.

Caryology. Kollmann 1970:248 found $2n=16$.

6. A. sativum L.

A. sativum L., Sp. Pl. 1, 1753:297; ibid. 1762:425 (incl. *A. scorodoprasum* L. var. β); for other references and synonyms see under the varieties.

Bulb (depressed) globose to ovoid, 2–7 cm diam., mainly composed of increase bulbs (cloves). Increase bulbs usually several, (1–)4–15, arranged around the insertion of the scape, ± broadly ovoid to ellipsoid-oblong, as long as the main bulb, sessile, wrapped in one cartilaginous prophyll. Protective bulbcoat-leaves papery or chartaceous, smooth, whitish or purplish. Sproutleaf 1, of various length, apex ± sharply oblique. *Foliage leaves* 4–10, ± distichous, glabrous; blades scattered along the scape, 20–50 cm × 4–25 mm, flat, ± carinate or not, or v-shaped in section, margin smooth or crenulate, top acute. Scape 1, exceeding the leaves, erect, straight or once coiled towards the apex, solid, 25–70(–150) cm. *Inflorescence* subspherical, 2–5 cm diam., composed either of only sessile bulbils or of mixed bulbils and flowers. *Spathe* 1, thickish, green, subpersistent or rather late falling, longly caudate, 4–20 cm long, opening towards the base with one slit. Bracteoles present, ± lacerated. Pedicels unequal, 10–40 mm. *Flowers* usually ill-developed, or rudimentary, or absent; perianth subcampanulate, pale pink or greenish, rarely purplish. Tepals lanceolate, acuminate, smooth, (1–)3 mm. Stamens shorter than the tepals; outer filaments c. 1 mm long, simple or with 2 lateral cusps c. 1 mm long; inner filaments equalling the outer filaments, always with 2 or 4 (or 6) lateral cusps, hence 3 or 5 (or 7) cuspidate, the longest cusps 4–5 mm, exserted. Anthers up to c. 1 mm long, yellow. Pistil more or less rudimentary. *Fruits* abortive, without seeds.

A. sativum is only known in cultivation. According to HELM 1956:140–154, who made an extensive study on *A. sativum*, there are three varieties, viz. var. *sativum*, var. *ophioscorodon*, and var. *pekinense*. The first two varieties are widely cultivated all over the world, especially in subtropical areas, the var. *pekinense* (with broad, limp leaves) is restricted to China and Japan. The var. *sativum* is by far the most commonly cultivated, and has commercial value.

KEY TO THE VARIETIES

1. Scape straight. Increase bulbs ovoid-oblong to oblong. Inner filaments on each side with 1–2 lateral cusps of different lengths, the outer filaments simple . . . . **a. var. sativum**
1. Scape towards the top with a distinct curving or coil. Increase bulbs subglobose to ovoid. Inner filaments on each side with 3–4 lateral cusps of different lengths, the outer filaments on each side with one lateral cusp . . . . **b. var. ophioscorodon**

a. var. sativum **Fig. 9.**

A. sativum L., Sp. Pl. 1, 1753:297; ibid. 1762:425; DESFONTAINES 1798:287; DON 1827:4; KUNTH 1843:380; WILLKOMM et LANGE 1862:210; HEGI 1908: 230, fig. 348; DURAND et BARRATTE 1910:231; KRAUSE 1930:320, fig. 125; MARKGRAF in HAYEK 1932: 54; DINSMORE in POST 1933:635; TÄCKHOLM et DRAR 1954:87; HELM 1956:145–149, fig. 2, 3a; MANSFELD 1959:556; WATT et BREYER-BRANDWIJK 1962:674–679; DE WILDE-DUYFJES 1973:81.

Porrum sativum REICHENBACH 1830:110; *A. sativum* var. *vulgare* DÖLL 1843: 1; MAIRE 1958:251, fig. 888; *A. sativum* var. *typicum* REGEL 1875:44.

Neotype: BURSER no. 90, UPS, fide DE WILDE-DUYFJES 1973:81.

Vernacular names. Egypt: *Thoam, Toam, Foam*, (Arabian language: *Toum*), *Titshert*; France: *Ail commun*; Italy: *Aglio*.

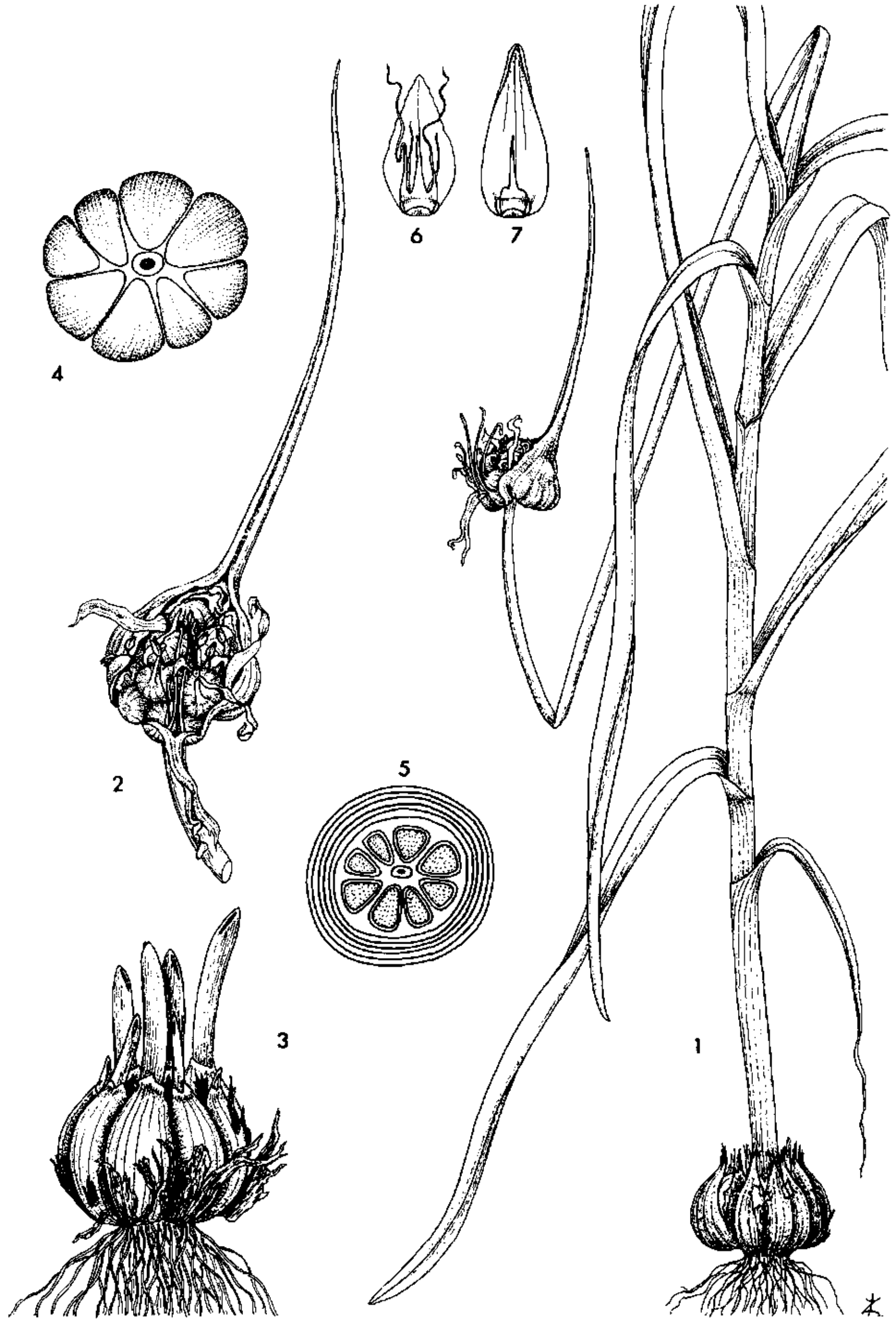


FIG. 9. *Allium sativum*. – 1. Habit, $\times^1/_3$; 2. inflorescence with split open spathe, showing bulbils and sterile flowers, $\times^2/_3$; 3. bulb composed of increase bulbs (cloves), $\times^2/_3$; 4. ditto, transverse section (schematic), $\times^2/_3$; 5. ditto, showing 6 surrounding bulbcoat-leaves, $\times^2/_3$; 6–7. inner and outer tepals with corresponding filaments, $\pm\ \times 7$. (1–2, 6–7. WAG 1008/65, spirit mat.; 3–5. WAG 7 Dec. 1970, ex HORT. BOT. PALERMO, spirit mat.; all culta).

Uses. Widely cultivated since ancient times. The bulbs are used mainly for seasoning, but are also used as drug, for preservation of meat, etc. An extensive account on the uses is given by HELM l.c.; smaller accounts are given by TÄCKHOLM et DRAR, l.c., and by MANSFELD, l.c.; WATT and BREYER BRANDWIJK, l.c. give ample information on the medicinal uses and the chemistry.

Habitat. Only known cultivated; sometimes escaped and running wild locally.

Distribution. All tropical and subtropical countries, also in many temperate countries, all over the world. Place of origin unknown, probably Central Asia, but never found in a wild state. I have seen no specimens from Africa.

b. var. ophioscorodon (LINK) DÖLL

A. sativum var. *ophioscorodon* (LINK) DÖLL 1843:197; HELM 1956:149–152, fig. 3b–d, 4, 5; MAIRE 1958:252; MANSFELD 1959:556.

A. scorodoprasum var. *β* L. 1753:297; DE WILDE-DUYFJES 1973:81; *A. ophioscorodon* [J. BAUHIN] LINK 1821:318; G. DON 1827:5; HEGI 1908:231.

Type: destroyed in B; neotype: BURSER no. 91, UPS, '*Allium sativum alterum, sive Allioprasum caulis summo circumvoluto* BAUH.'; see also DE WILDE-DUYFJES l.c.

A. scorodoprasum auct. non L.: BATTANDIER et TRABUT 1895:61; PAMPANINI 1931:154. For other synonyms see HELM 1956:149.

Vernacular names. France: *Ail Rocambole*; other names as under var. *sativum*.

Uses. The uses are similar to those of var. *sativum*. The present variety is cultivated to a far less extent, mainly only in gardens. The bulbils in the inflorescence are fewer and larger than in var. *sativum*, and these are edible.

Habitat and Distribution. Only known cultivated in gardens in many subtropical and temperate countries.

Note.

Spathe. In most specimens the spathe is simple; in some specimens seen in botanic gardens the apex of the spathe is distinctly two-topped and a clear suture can be observed along the caudate part of the spathe similar to that described for *A. 'porrum'* under *A. ampeloprasum*.

7. A. ampeloprasum L. **Fig. 10, 11, Map 6.**

A. ampeloprasum L., Sp. Pl. 1, 1753:294; ibid. 1762:423; GUSSONE 1842: 391; KUNTH 1843:383; J. GAY 1847:214; WEBB et BERTHELOT 3, 1848:344; MUNBY 1859:29; WILLKOMM et LANGE 1862:209; MUNBY 1866:32; BALL 1878:690; BOISSIER 1882:232; BATTANDIER et TRABUT 1884:155; ibid. 1895:62; HALÁCSY 1904:242; MUSCHLER 1912:213; BÉGUINOT et VACCARI 1914:96; PAMPANINI 1924:204; CAVARA 1928:44; OPPENHEIMER 1930:275; PAMPANINI 1931:152; LINDBERG 1932:32; DINSMORE in POST 1933:634; TÄCKHOLM et DRAR 1954:64; HELM 1956:177; MANSFELD 1959:555; NÈGRE 1961:121, fig. 17a, b, c, d; QUÉZEL et SANTA 1962:213; PALHINHA 1966:136; VON BOTHMER 1970:519–551; KOLLMANN 1971:16; DE WILDE-DUYFJES 1973:59; VON BOTHMER 1974:1–104; TÄCKHOLM 1974:648; VON BOTHMER 1975:267–288.

A. holmense MILLER 1768, ed. 8, no. 4; *A. ampeloprasum* var. *holmense* ASCHERSON et GRAEBNER 1905:105; BRIQUET 1910:288; *A. ampeloprasum* ssp. *holmense* (MILLER) VINDT var. *typicum* REGEL forma *purpurascens* VINDT 1953:120; *A. ampeloprasum* var. *typicum* REGEL 1875:53; JAHANDIEZ et MAIRE 1931:125; CUÉNOD 1954:211; *A. ampeloprasum* ssp. *eu-ampeloprasum* MARKGRAF in HAYEK 1932:39 var. *typicum* REGEL forma *normale* MAIRE et WEILLER in MAIRE 1958:256; *A. ampeloprasum* ssp. *ampeloprasum*, WENDELBO 1971:59.

Lectotype: H.S. 152, folio 153 in the SLOANE Herbarium (BM).

A. porrum L., Sp. Pl. 1, 1753:295; ibid. 1762:423; DESFONTAINES 1798:285; WEBB et BERTHELOT 3, 1848:343; WILLKOMM et LANGE 1862:210; DURAND et BARRATTE 1910:231; DINSMORE in POST 1933:635; TÄCKHOLM et DRAR 1954:83; DE WILDE-DUYFJES 1973:77.

A. ampeloprasum var. *porrum* J. GAY 1847:218; REGEL 1875:55; ASCHERSON et GRAEBNER 1905:107; BRIQUET 1910:288; *A. ampeloprasum* ssp. *porrum* MARKGRAF in HAYEK 1932:39; MAIRE 1958:255.

Lectotype: DODOENS's figure entitled '*Porrum*' in Pemptades 1616:688.

A. multiflorum DESFONTAINES 1798:288; MUNBY 1847:35; REGEL 1875:61; RICHTER 1890:202; ASCHERSON et GRAEBNER 1905:104.

A. rotundum L. ssp. *multiflorum* ROUY 1910:348; VINDT 1953:120; MAIRE 1958:253; QUÉZEL et SANTA 1962:213.

Type: Algeria, DESFONTAINES s.n. (holotype: Herb. DESFONTAINES in P).

A. mogadorense WILLDENOW ex SCHULTES et SCHULTES F. in ROEMER et SCHULTES 1830:1004; KUNTH 1843:384.

A. ampeloprasum forma *mogadorense* MAIRE 1940:43, no. 3229; EMBERGER et MAIRE 1941:957; *A. ampeloprasum* ssp. *holmense* (MILLER) VINDT var. *typicum* REGEL forma *mogadorense* VINDT 1953:120; *A. ampeloprasum* ssp. *eu-ampeloprasum* MARKGRAF in HAYEK var. *typicum* REGEL forma *mogadorense* MAIRE 1958:256.

Type: Morocco, near Mogador, BROUSSONNET s.n. (holotype: Herb. WILLDENOW in B).

A. polyanthum SCHULTES et SCHULTES F. in ROEMER et SCHULTES 1030:1016; WILLKOMM et LANGE 1862:209; JAHANDIEZ et MAIRE 1931:125; EMBERGER et MAIRE 1941:957.

A. ampeloprasum ssp. *eu-rotundum* MAIRE et WEILLER var. *polyanthum* ASCHERSON et GRAEBNER 1905:102; MAIRE 1958:253.

Syntypes: France, several collections (Toulon, Narbonne, Perpignan, Toulouse), no collectors indicated.

A. ascendens TENORE 1831:164.

Type: Italy, Apulia, TENORE s.n. (holotype: NAP).

A. byzantinum C. KOCH 1849:240.

Type: Turkey, Kandili, C. KOCH 404

A. leucanthum C. KOCH 1849:240.

A. ampeloprasum var. *leucanthum* REGEL 1875:54; FEINBRUN 1943:6; TÄCKHOLM et DRAR 1954:65.

Type: Turkey, Schirwanschen Ebene, KOCH s.n. (not seen).

A. alibile STEUDEL ex A. RICHARD 1851:330; REGEL 1875:69; ENGLER 1892:165; BAKER in THISELTON-DYER 1898:516; ANDREWS 1956:286.

Type: Ethiopia, in mountains near Temmbella, Province Chiré or Shire, October, QUARTIN DILLON s.n. (not seen).

A. pyrenaicum COSTA et VAYREDA 1879:87; WILLKOMM 1, 1884:124, tab. 75.

Syntypes: Spain, eastern Pyrenees, Col de Malrem, COSTA c.s. s.n. (not seen); & Bajet, COSTA c.s. s.n. (not seen); & Rocabruna, COSTA c.s. s.n. (not seen); & Talaxá, COSTA c.s. s.n. (not seen); & Sant Aniol de Uija, COSTA c.s. s.n. (iso-lectotype: BAS, FI).

A. ampeloprasum var. *pruinosum* BOISSIER 1882:233; TÄCKHOLM et DRAR 1954:66.

Type: Greece, in scopulo Arpedoni insularum Pharmacusarum Atticae, DE HELDREICH s.n. (not seen).

A. pardoi LOSCOS ex WILLKOMM 2, 1886:6, tab. 96; BATTANDIER et TRABUT 1895:62; CUÉNOD 1954:212; MAIRE 1958:259; QUÉZEL et SANTA 1962:213.

Type: Spain, Castelserás, LOSCOS et PARDO s.n. (not seen).

A. getulum BATTANDIER et TRABUT 1892:75; ibid. 1895:62.

A. ampeloprasum var. *getulum* BATTANDIER et TRABUT 1902:332; *A. ampeloprasum* ssp. *holmense* VINDT var. *getulum* VINDT 1953:120; *A. ampeloprasum*

ssp. *eu-ampeloprasum* MARKGRAF in HAYEK var. *getulum* MAIRE 1958:257.
Type: Algeria, Djebel Mzi, BATTANDIER s.n. (holotype: MPU).

A. tortifolium BATTANDIER et TRABUT 1892:338; ibid. 1895:62.
A. ampeloprasum var. *tortifolium* BATTANDIER et TRABUT 1902:332; *A. ampeloprasum* ssp. *eu-ampeloprasum* MARKGRAF in HAYEK var. *tortifolium* MAIRE 1958:256.
Type: Algeria, Aïn M'lila, BATTANDIER s.n. (holotype: MPU).

A. kurrat KRAUSE 1926:524 [*A. kurrat* SCHWEINFURTH in sched.]; TÄCKHOLM et DRAR 1954:85; MANSFELD 1959:556.
Type: A specimen cultivated in the botanical garden at B, from seeds obtained by SCHWEINFURTH in Egypt, probably from Syrian origin (not seen).

A. ampeloprasum var. *gracilis* CAVARA 1928:44; PAMPANINI 1931:152; TÄCKHOLM et DRAR 1954:66.
A. ampeloprasum ssp. *eu-ampeloprasum* MARKGRAF in HAYEK var. *gracilis* MAIRE 1958:256.
Type: Libya, Cyrenaica, Uadi Derna, Bu Msafer, CAVARA s.n. (not seen).

A. bimetrale GANDOGER 1916:99.
A. ampeloprasum ssp. *bimetrale* MARKGRAF in HAYEK 1932:40; TÄCKHOLM et DRAR 1954:65 (as variety).
Type: Greece, Creta, GANDOGER 4880 (not seen).

A. ampeloprasum var. *combazianum* MAIRE 1935:230.
A. ampeloprasum ssp. *eu-ampeloprasum* MARKGRAF in HAYEK var. *typicum* REGEL forma *combazianum* MAIRE 1958:257.
Type: Algeria, near Châteauneuf, cultivated from a bulb collected by COMBAZ s.n. (holotype: MPU, in Herb. MAIRE).

A. ampeloprasum var. *caudatum* PAMPANINI 1936:21.
A. aschersonianum BARBEY var. *caudatum* TÄCKHOLM et DRAR 1954:82; *A. ampeloprasum* ssp. *eu-ampeloprasum* MARKGRAF in HAYEK var. *caudatum* MAIRE 1958:256.
Syntypes: Libya, Cyrenaica, PAMPANINI 1261 (FI); PAMPANINI c.s. 1263 (FI); ibid. 1264 (FI); ibid. 1265 (FI); ibid. 1266 (FI); ibid. 1267 (lectotype: FI); ibid. 1268 (FI).

A. ampeloprasum var. *truncatum* FEINBRUN 1943:6; TÄCKHOLM et DRAR 1954:65.
Syntypes: Many specimens cited from Palestine (not seen).

Bulb depressed globose to ovoid, 15–35 × 10–50 mm. Contractile roots glabrous, smooth roots sometimes finely densely hirsute, not or sparingly branched. Increase bulbs in specimens from Morocco, Algeria, and Tunisia absent or few, in specimens from the Canary Islands, Libya and Egypt usually numerous, up to 50, subglobose to ovoid, usually flattened at one side, 4–10(–30) × 4–10(–15) mm, top acute or beaked, subsessile or up to 3 cm stiped, situated within the outer bulbcoat-leaves, each wrapped in one firm, usually finely warted or pitted straw-coloured prophyll. Protective bulbcoat-leaves 2–4, papery to membranous, not breaking up into fibres, whitish to pale yellowish. Sproutleaf 1, soon wilting, 2–10 cm long, top obliquely truncate, slightly emerging above the ground. *Foliage leaves* (3–)5–10, distichous, glabrous; blades scattered along scape, suberect or curved, rarely twisted, flat, or more or less v-shaped in section, 10–50 cm × 2–20(–50) mm, the apical part soon wilting and breaking off, top acute, margin and midrib entire or distinctly crenulate or serrulate; sheaths unequal in length, those of upper leaves longest, extending largely above ground, 5–50 cm long, whitish-green or green, the lower ones sometimes purplish tinged, not breaking up into fibres. Scape 1, usually exceeding the leaves, erect, terete, solid, 35–120(–150) cm long, 2–8(–15) mm diam. *Inflorescence* hemispherical to spherical, many-flowered, 4–10(–12) cm diam., in Africa without bulbils, in the Canary Islands and Europe with or without bulbils. *Spathe* 1, shortly to longly caudate, usually caducous, the basal part 2–2.5 cm long, many-nerved, membranous, the contracted caudate part 2–9 cm long, ± leaf-like, acute. Bracts absent. Bracteoles numerous, membranous, ovate, 2–4 mm long, more or less lacerated, each subtending usually one flower. Pedicels unequal, 10–50 mm long, slender, more or less straight. *Flowers* usually campanulate, sometimes urceolate. Tepals adnate to bases of filaments for c. 0.5 mm, persistent, white, or pink to dark purple, with a green or purple midvein, the outer side and especially the keel smooth or papillose to various degree, the margins often slightly serrulate; outer tepals ovate or obovate to lanceolate or oblanceolate, 3–5 × 1.2–1.5 mm, top acute or subacute; inner tepals equalling or slightly longer or shorter than the outer tepals, but at base narrower, obovate to oblanceolate, top acute to obtuse, or subtruncate, often shortly mucronate or acuminate. Stamens slightly shorter to longer than the tepals, often finely serrulate towards the base; outer filaments simple, 2.8–5.5 mm long, at base 0.8–1 mm wide, connate with inner filaments for c. 0.5 mm; inner filaments tricuspidate, c. 4–6.5 mm long, at base (1–)1.2–1.4 mm wide, anther-bearing central cusp 1–1.6 mm long, lateral cusps 1–3.5(–6) mm long, 1–3(–5.5) mm exceeding the perianth. Anthers 1–1.5 × c. 0.5 mm, yellow or purple. Pistil shorter to longer than the tepals; ovary ovoid, 2–3 × 1–2 mm, style 3.5–4 mm, slender, inserted at about the base of the ovary; stigma inconspicuous, rounded. *Fruits* depressed globose to ovoid, 2.5–4 × 2–4 mm. Seeds 2.2–3 × 1.8–2 mm, black.

Vernacular names. Algeria: *Beraca*, *Firass*, *Maatseur*, *Nebata*, *Ail de Perse*; Libya: *Kharrat*; Egypt: *Bassal el 'Afrit* (onion of the demon), *El Kurrath el Bari*, *Lawas*.

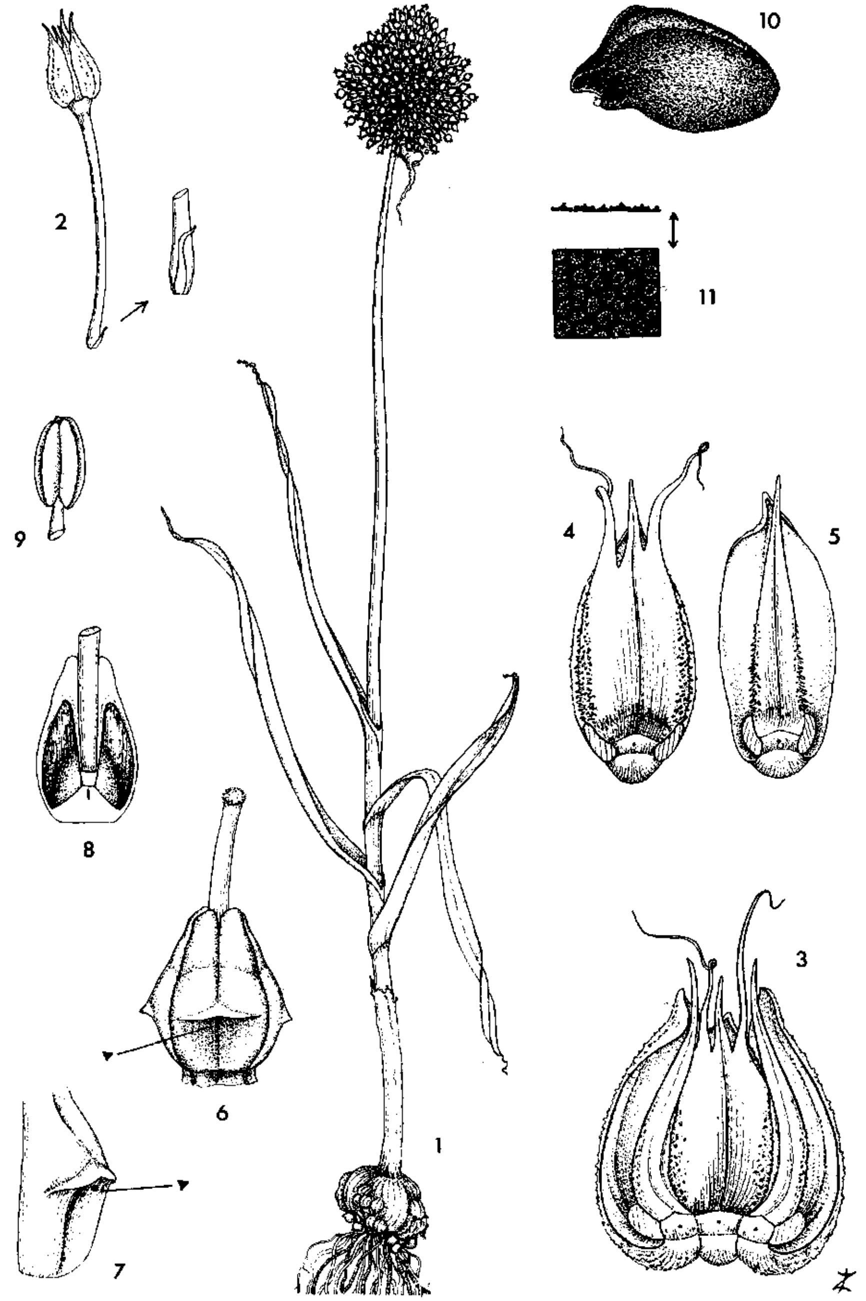
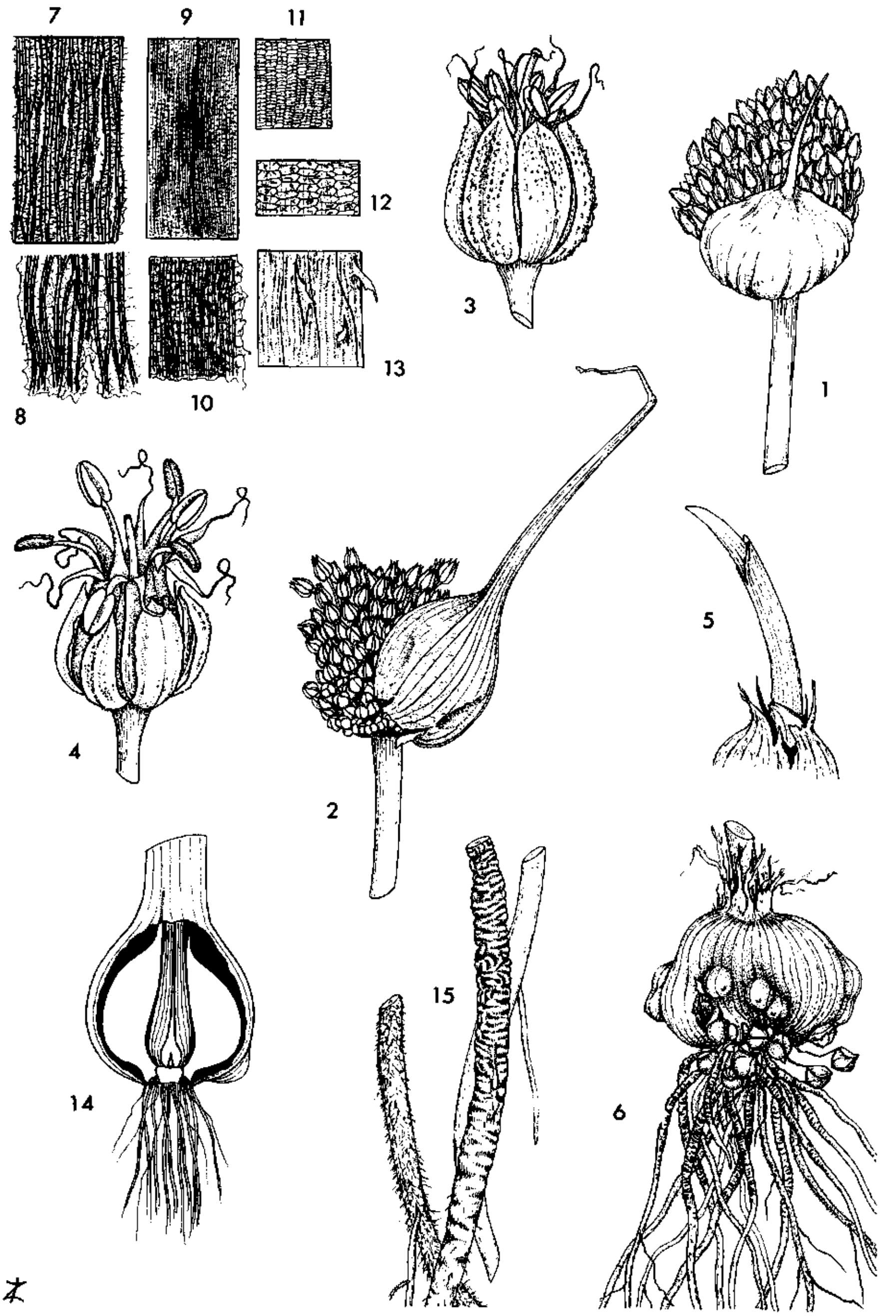


FIG. 10. *Allium ampeloprasum*. – 1. Habit, $\times^1/_4$; 2. flower with bracteole at base of pedicel, $\times 2$; 3. perianth and filaments, partly, $\times 8$; 4–5. inner and outer tepal with corresponding filaments, $\times 8$; 6. pistil, arrow indicates excretion opening of nectary, $\times 8$; 7. ditto, showing excretion opening of nectary, $\times 12$; 8. longitudinal section of ovary, $\times 8$; 9. anther, $\times 12$; 10. seed, lateral view, $\times 8$; 11. detail of testa, seen from above and in profile, $\times 40$. (1, 3–9. DE WIT 13054, spirit mat.; 2. WAG 1246/65, spirit mat.; 10–11. KRALIK 142).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Uses. Cultivated forms of the present species are known as *A. porrum*, and well-known as vegetable and condiment; it also is utilized for its medicinal properties. HELM 1956, l.c., and MANSFELD 1959, l.c., report that occasionally certain wild representatives of *A. ampeloprasum* are sold on local markets, and that it is sometimes taken into cultivation. A collection by BATTANDIER s.n. reads on the label that it is sold on the market of Alger as a leek. MAIRE s.n. records that it is cultivated by the Tell people of Oran Province (Algeria) under the name '*Ail de Perse*' (Persian garlic).

Habitat. Occurs in its whole area, including North Africa, in a very wide range of habitats, on assumingly primary as well as on more or less secondary places, for instance roadsides, ravines, in scrub, on fields and in arable land, oasis, along wadis, in meadows, and on hill sides. It grows on dry as well as on moist places, and is recorded e.g. from *Rubus*-shrubbery, forest edges, dry places with *Artemisia*, and it is also found on the sea shore together with *Tamarix* and *Mesembryanthemum*. Found on calcareous, clayey, and sandy soils, also recorded from rocky soil, and shales and marble soil. Altitude 0–2200 m. Flowers April–July (Canary Islands, Morocco, Algeria, Tunisia), March–June (Libya, Egypt).

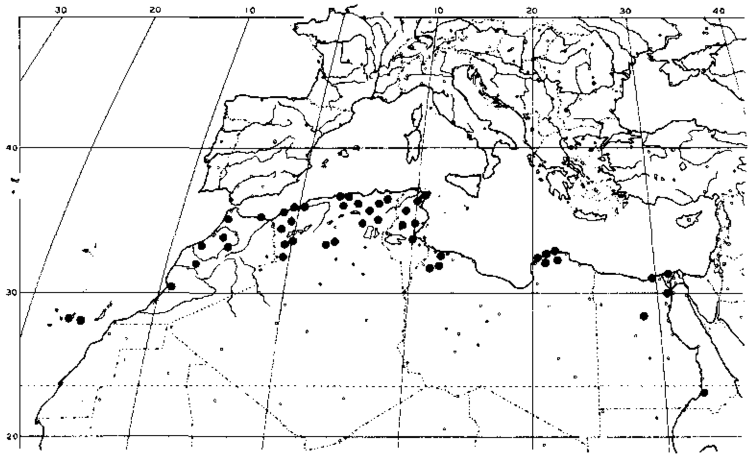
Distribution. Azores; Canary Islands; Morocco; Algeria; Tunisia; Libya; Egypt; South and Middle Europe, north to S. England and the Kaukasus; Near East, east to Iraq. The cultivated representatives, known as *A. porrum*, are grown all over the world.

AZORES: I. of St. Michael, 1845, HUNT s.n. (FI).

CANARY IS.: Tenerife, San Diego, July 1845, BOURGEAU 684 (FI); & BOURGEAU 999 p.p. (FI, G, K); without locality, 1837, DESPRÉAUX 511 (G); Tenerife, 1863, Herb. HOOKERIANUM s.n. (K); Gran Canaria, above Tejeda, 1200 m, Feb. 1960, LID s.n. (O); Tenerife, S. Juan de la Ramble, June 1890, MURRAY s.n. (K); Gran Canaria, near Sta Brigida, May 1902, MURRAY s.n. (K); Gran Canaria, vine yards, WEBB s.n. (FI); Tenerife, vine yards, WEBB s.n. (FI); Gran Canaria, WEBB 511 (FI); without locality, WEBB 512 (FI).

MOROCCO: near Mogador, BROUSSONNET s.n. (Herb. WILLDENOW in B, type of *A. mogadorense* WILLDENOW ex SCHULTES et SCHULTES F.); Ksima, between Agadir and Oued Noun, 1874, BEAUMIER s.n. (K); near El Araix, June 1930, FONT QUER 127 (B, G); near Mekinez (Meknès), June 1888, GRANT s.n. (P); Kasr Pharaon (el Farraoua), July 1888, GRANT s.n.

FIG. 11. *Allium ampeloprasum*. – 1–2. Expanding inflorescences, the single spathe still attached, $\times^2/_3$; 3. young flower, $\times 4$; 4. older flower, $\times 4$; 5. top of sprouting bulb, showing sproutleaf, $\times^2/_3$; 6. bulb with increase bulbs, $\times^2/_3$; 7–8. details of partly withered outer bulbcoat-leaf, $\times 4$ and $\times 20$ resp.; 9–10. details of coriaceous outer bulbcoat-leaf, $\times 4$ and $\times 20$ resp.; 11–12. details of thin membranous inner bulbcoat-leaf, $\times 10$ and $\times 20$ resp.; 13. detail of very thin inner bulbcoat-leaf, $\times 4$; 14. bulb, longitudinal section, showing large and small increase bulbs, schematic, $\times^2/_3$; 15. pieces of smooth and contractile roots, $\times 8$. (1–3, 6, 15. DE WIT 13054, spirit mat.; 4–5. DE WILDE s.n., from a commercially cultivated specimen, spirit mat.; 7–13. CUÉNOD s.n., Tunisia, 10 May 1903; 14. KEITH 615 and GUICHARD TR/44/58).



MAP 6. African localities of *Allium ampeloprasum*.

(WU, K); Casablanca, April 1871, Herb. HOOKER s.n. (K); Shedma, April–May 1871, HOOKER s.n. (K); Middle Atlas, near Azrou, 1500 m, June 1926, LINDBERG 4230 (B); NE of Mogador, June 1939, MAIRE c.s. 12 (MPU); near Casablanca, waist fields and corn fields, May 1888, MELLERIO 267 (P); Dar el Hadj, dry fields, May 1912, PITARD 1414 (P); Melilla, June 1931, SENNEN c.s. s.n. (BM); & May 1933, SENNEN c.s. s.n. (BM); Oued Ifrane, near Meknes, June 1961, DE WILDE c.s. 2786 (L, WAG).

ALGERIA: Bedeau, April 1920, D'ALLEIZETTE s.n. (P); Alger, market. June–July, Herb. BATTANDIER s.n. (MPU); Djebel Mzi, BATTANDIER s.n. (MPU, type of *A. getulum* BATTANDIER et TRABUT); Batna, near Aïn-Mlila, BATTANDIER s.n. (MPU, type of *A. tortifolium* BATTANDIER et TRABUT); near Kouba, common on hills, May 1837, BOVÉ s.n. (FI, G, K, L, P); Médéah, fields, June 1872, CHABERT s.n. (FI); Damiette, June 1872, CHABERT s.n. (FI); Bou-Ismaël, CHEVALLIER s.n. (P); El Biar, May 1894, CHEVALLIER s.n. (P); between El Abiod and Sidi-Cheikh, ravines, May 1899, CHEVALLIER s.n. (P); Branis near Biskra, fields, May 1904, CHEVALLIER 638 (FI, K, MPU, P, TLJ, WU); Colonne Voirol, near Alger, May 1872, COURCIÈRE s.n. (MPU); E. of Fondouk, dry shaley banks, 150 m, June 1971, DAVIS 53206 (E); Hamam bou-Hadjer, calcareous rocks, June 1880, DEBEAUX s.n. (G p.p., MPU); near Mostaganem, DELESTRE s.n. (P); without locality, DESFONTAINES s.n. (P, type of *A. multiflorum* DESFONTAINES); Constantine, May 1840, DURIEU DE MAISONNEUVE s.n. (P); near Oran, June 1842, DURIEU DE MAISONNEUVE s.n. (P); between Noiseux and Sta Cruz, ravines, June 1904, FAURE 1a (G); highlands of Sta Cruz, June 1904, FAURE 19a (G); & FAURE 544 (P); Boukanéfis, along fields, May 1927, FAURE s.n. (BM); near Bedeau, 1100 m, June 1934, FAURE s.n. (P); Kouba, May 1879, GANDOGER 632 (BM); near Tipaza, rocks of Chenoua, May 1914, HIBON s.n. (P); Sidi-bel-Abbès, LEFRANC s.n. (P); Djebel Mzi, 1600–1800 m, June 1913, MAIRE s.n. (P); Mt. Figuig, May 1918, MAIRE s.n. (MPU); Géryville, May 1919, MAIRE s.n. (MPU); Aurès, hills, 1500–1600 m, June 1920, MAIRE s.n. (MPU, P); between El Gor and Bedeau, 1300 m, May 1933, MAIRE s.n. (MPU); Châteauneuf, near Alger, cultivated from bulbs collected by COMBAZ s.n., June 1934, Herb. MAIRE s.n. (MPU, type of *A. ampeloprasum* var. *combazianum* MAIRE); Tibilis, SW of Guelma, June 1937, MAIRE s.n. (MPU); Constantine, nursery, June 1873, MEYER 873 (FI); Oran, Herb. MUNBY s.n. (K); Michelet, pass of Tirouda, 1877 m, SAINT-LAGER s.n. (G); Bône, 1834, STEINHEIL s.n. (P); near Sidi-bel-Abbès, scrub, WARION s.n. (FI).

TUNISIA: Sidi Ben Hassen, May 1903, CUÉNOD s.n. (G); Bir Arrach, April 1884, DOUMET-ADANSON c.s. s.n. (P); Djebel Zaghouan, July 1854, KRALIK s.n. (FI); Djebel Aziza, near

Gabes, May 1854, KRALIK 142 (G, K, P); Djebel Keroua, near Gabes, May 1854, KRALIK 144 (FI, G, P, WAG); Sidi Aïch, June 1884, LETOURNEUX s.n. (P); Oued Ousata, fields, June 1887, LETOURNEUX s.n. (P); Djerba I, E. of Houmt Souk, Sept. 1971, v. D. MAESEN 1527 (WAG); Djebel Bou Hedma, 1100 m, April 1968, YOUNG 45 (BM); & YOUNG 46 (BM).

LIBYA: Oasis Mendonhih, May 1876, ASCHERSON 510 (K, WU); El-Aïn El-Beida, May 1886, DUVEYRIER 413 (P); & May 1886, DUVEYRIER 420 (P); near Aziza, cultivated fields, May 1952, GUICHARD KG/Lib/391 (BM); Sabratha, May 1958, GUICHARD TR/44/58 (BM); Jefren-Garian road, 500 m, May 1958, GUICHARD TR/45/58 (BM); Garian, April 1960, KEITH 615 (K); Cirene, June 1919, MAUGINI s.n. (FI); Rahba, May 1922, MAUGINI s.n. (FI); between Tolmetta and Sidi Dachil, April 1933, PAMPANINI 1261 (FI); E. of Barce, April 1934, PAMPANINI c.s. 1263 (FI); Uadi Hofra, May 1934, PAMPANINI c.s. 1264 (FI); Messa-Umm es-Reham, May 1934, PAMPANINI c.s. 1265 (FI); Brates, May 1934, PAMPANINI c.s. 1266 (FI); between Messa and Negret Said, May 1934, PAMPANINI c.s. 1267 (FI, type of *A. ampeloprasum* var. *caudatum* PAMPANINI); between Tra el-Hanie and Messa Gabr, May 1934, PAMPANINI c.s. 1268 (FI); Tocra Pass, 330 m, May 1958, PARK 473 (K).

EGYPT: Oasis Baharie, April 1876, ASCHERSON 509 (P); Oasis Mendîscheb, May 1876, ASCHERSON 510 (P); Ramleh, May 1913, BOLLAND 119 (CAIM); Oasis Baharia, April 1922, BROWN 17.248 (CAIM); Baharia Oasis at Bawiti, March 1934, DRAR 82/34 (CAIM); & April 1934, DRAR 17/254 (CAIM); Burg el Arab, April 1935, KHATTAB Z 6627 (CAIM); Alexandria, April 1903, MUSCHLER s.n. (K); Kubban, cultivated, May 1914, RAMIS s.n. (CAIM); Cairo, fields, subspontaneous, March 1924, RAMIS s.n., p.p. (CAIM); Mariout, May 1891, SCHWEINFURTH 319 (G, K); grown at Giza by seeds from Mariut, May 1936, SHABETAI Z 3673 (CAIM).

EUROPE: selected specimens. Lampedusa I., April 1873, AIUTI s.n. (FI); Sardinia, Seui, May 1967, ARRIGONI c.s. s.n. (FI); Spain, Puerto Santa Maria, sands, May 1849, BOURGEAU 480 (FI); St. Aniol de Uija, 1000 m, COSTA c.s. s.n. (BAS, FI, type of *A. pyrenaicum* COSTA et VAYREDA); France, Agen, June 1851, DEBEAUX s.n. (FI); England, Steep Holm I., Somerset, 1909, DRUCE s.n. (L); Turkey, Kandili, KOCH 404 (G, type of *A. byzantinum* C. KOCH); France, Montpellier, LEO s.n. (FI); England, Holms Is., NEWTON s.n. (SLOANE Herb., HS 152 folio 153, BM, type of *A. ampeloprasum* L.); Yugoslavia, near Split, July 1940, RADERMACHER 427 (L); Portugal, Bombarral, June 1947, RAINHA 19965 (L); Sicilia, Palermo, May 1902, ROSS 386 (B, L); Pantelleria I., March 1906, SOMMIER s.n. (FI); Gozo I., April 1907, SOMMIER s.n. (FI); Portugal, Praha da Rocha, May 1969, DE WIT 13054 (WAG).

NEAR EAST: Lebanon, near Brummana, July 1897, BORNMÜLLER 1538 (B); Israel, Jerusalem, 800 m, MAY 1908, DINSMORE 2063 (L); between Jaffa and Sawona, May 1904, KNEUCKER 327 (B); Sinai, 1930, KAISER 267 (G); & KAISER 690 (G); & KAISER 756 (CAIM, G); Jordan, Amman, July 1891, POST 131 (G); Israel, Jerusalem, April 1857–1858, ROTH 434 (M).

Notes.

Delimitation of the species. *A. ampeloprasum* as conceived in the present study is extremely variable and complex, and contains an incredible number of specimens of often very different habit, varying from very meagre ones to the coarse and luxuriant plants from cultivation. Several earlier authors, e.g. MAIRE 1958, have tried to define more taxa within the *ampeloprasum*-complex, but in my opinion with rather unsatisfactory results. Characters used for delimitation were for instance the length of the spathe of the inflorescences, the length of tepals and filaments, and the length of the sterile cusps of the inner filaments, the structure of the outer surface of the tepals, and the size of the leaves, as well as various other incidental characters. I have tried to use all these characters for any subdivision, but could not find any of them really useful.

One feature deserves special mentioning, namely the presence or absence of increase bulbs. These seem to be always numerous and very small in size, and up to 2 cm stiped, in all wild specimens from the eastern half of North Africa, i.e. in Libya and Egypt, whereas in the specimens from the West, i.e. Morocco, Algeria, and Tunisia, the increase bulbs are absent or few, and rather large, and subsessile. Both forms, however, occur in the Canary Islands, and furthermore in the whole area of southern Europe. The form with many increase bulbs is described from Spain as *A. pardoi*. In all the abundant herbarium material at my disposal I was not able, however, to evaluate properly this possible character for a subdivision, and I prefer to confine myself to remarking the feature only, without actually using it for a subdivision. Possibly special attention in the field will yield practical taxonomic results in the future.

I should mention here the fine work by VON BOTHMER, 1974, who recognizes for the Aegaean area four species and one subspecies in the *A. ampeloprasum*-complex, on a set of characters among which the shape and the relative size of filaments and tepals, the shape and size of the increase bulbs, the texture of the tepals, and various characters of the leafsheaths and the outer bulbcoat-leaves, whether fibrous or membranous, play an important role.

Notes to the synonyms. *A. porrum* L. This is the leek, which is since ancient time in cultivation. There are no essential differentiating characters with the variable *A. ampeloprasum*. Apparently by selection and favourous soil conditions plants referred to *A. porrum* are as a rule coarse and well-developed.

Already LINNAEUS, in Species Plantarum 1762, noted that *A. porrum* is allied to, and perhaps only a variety of *A. ampeloprasum*.

A. leucanthum C. KOCH. This has smooth white flowers, each tepal with a green midvein. I have not seen the type. TÄCKHOLM et DRAR 1954, l.c., and FEINBRUN 1943, l.c., accept this name as a variety of *A. ampeloprasum*.

A. alibile A. RICHARD. I have not found authentic material or other specimens of this taxon described from Ethiopia. According to the protologue the bulb is globose, as thick as a man's finger, the leaves are unknown, the umbel is dense and many-flowered, the pedicels short and subtended by bracteoles, the spathe is short, many-valved, the inner filaments tricuspidate. To the description is added that it is a very common *Allium*, growing in the mountainous plains all over thė province of Chiré and especially around Temmbella. It is reported as being not cultivated, and said that the local people collect the bulbs to use it as a spice. The Amharic name is Egzier Choagoura. The dense many-flowered inflorescence, the pedicels subtended by bracts, and the tricuspidate inner filaments point in all probability to *A. ampeloprasum*. The species *A. sphaerocephalum* cannot be considered because of the presence of bracteoles, a character unknown for *A. sphaerocephalum*. In my opinion the plants are not indigenous in Ethiopia, but should be regarded as escaped from cultivation.

A. pardoi LOSCOS ex WILLKOMM is characterized by numerous very small increase bulbs, a character already mentioned in the note on the delimitation of the species given above. I have not seen the type, but the fine illustration in WILLKOMM 1886, is very clear. The outer bulbcoat-leaves are depicted as slightly fibrous, not netted, and resemble somewhat the outer bulbcoat-leaves of the related *A. baeticum*. The latter species, however, is characterized by strongly netted and fibrous outer bulbcoat-leaves. In the collections cited by MAIRE 1958, l.c., under *A. pardoi* the many small increase bulbs are wanting; these specimens belong to the form with few increase bulbs which is common in western North Africa.

A. ampeloprasum var. *pruinosum* BOISSIER is described as having pale pink flowers, the tepals scabrous and pruinose on the back side.

A. getulum BATTANDIER et TRABUT, described from Algeria, differs according to the protologue only slightly from *A. ampeloprasum* by the smooth leafsheaths with rather distinct ligules, and small flowers.

A. tortifolium BATTANDIER et TRABUT, also from Algeria, is, according to the description, characterized mainly by contorted leaves. The type-specimen, however, has normal leaves, not distinctly contorted.

A. kurrat KRAUSE is, like *A. porrum*, to be regarded as an old cultiform of *A. ampeloprasum*. I have not found the type in Berlin.

A. ampeloprasum var. *gracilis* CAVARA. According to its description this appears to be only a sterile slightly deviating specimen of *A. ampeloprasum*.

A. ampeloprasum var. *bimetrale* GANDOGER. This name is mentioned in Flora of Egypt by TÄCKHOLM et DRAR 1954, and these authors comment that it occurs on the Balkan and on Crete only. It seems to be a rather robust form. I could not find the protologue nor the type.

A. ampeloprasum var. *combazianum* MAIRE. According to the protologue the bulbs of this variety taste more or less like garlic. The fruits are sterile. The type, a specimen cultivated at Alger from a bulb collected by COMBAZ, lacks the bulb. It has leaves nearly 3 cm wide, and a large spherical inflorescence. It represents a typical cultiform of *A. ampeloprasum*.

A. ampeloprasum var. *truncatum* FEINBRUN is described as having dark purple flowers; the inner tepals are 3–4 mm long, and have a truncate, irregularly lacerated top, and are scabridulous at the back side.

Resembling species. The european species *A. rotundum* L. can be confused with *A. ampeloprasum*, but this species is distinct by a very condensed inflorescence caused by the relatively short pedicels; furthermore the filaments in *A. rotundum* are not or only slightly exserted, and the ovate increase bulbs are blackish, not yellowish, and these are often longly stiped, the stipe reaching up to 5 cm long, so that the increase bulbs appear situated along the lower part of the scape.

I have not found specimens of *A. rotundum* for Africa. MAIRE 1958:252, however, amply mentioned the species, with two subspecies, viz. *A. rotundum* ssp. *eu-rotundum* and *A. rotundum* ssp. *multiflorum* for Africa. On the type subspecies MAIRE comments that it possibly does not occur in North Africa, while the author is of opinion that ssp. *multiflorum* may be only a form of *A. ampeloprasum*.

A. baeticum BOISSIER resembles *A. ampeloprasum*, but differs by strongly fibrous and netted outer bulbcoat-leaves.

A. sativum resembles and is closely allied to *A. ampeloprasum*. *A. sativum* differs not only in the arrangement and attachment of the increase bulbs, the typical garlic-cloves, but also by its taste and smell.

Cultivated specimens. As already noted before, *A. ampeloprasum* is commonly cultivated, and these coarser or more luxuriant cultivated forms usually go under the name *A. porrum*; in Egypt there is recognized besides *A. porrum* a second cultivated form, named *A. kurrat*. As regards the increase bulbs it is worth mentioning that in the cultivated '*porrum*' there are only a few of these, usually 2; they are more or less semi-globose, flattened at one side, 10–30 × 10–15 mm, shortly acuminated at the top, sessile, and wrapped in one firm straw-coloured or whitish prophyll.

Field notes. All representatives of the *A. ampeloprasum*-complex, included the cultivated specimens, have a strong *Allium*-smell and -taste in all parts; the flowers are once reported as smelling like violets.

Inflorescence. The inflorescences of all the North African specimens are without bulbils. In Europe and also in the Canary Is., however, besides specimens without bulbils, also plants with bulbils in the inflorescences are found. A bulbil-bearing specimen of *A. ampeloprasum* from the Canary Is., WEBB 512, in FI, bears two handwritten identifications, *A. halleri* BABINGTON, and *A. babingtonii* BORRER. The first name, *A. halleri* BABINGTON, from 1843, is a later homonym of *A. halleri* G. DON, 1827, which is, according to Index Kewensis, *A. ampeloprasum*. The second name, *A. babingtonii* BORRER, 1849, tab. 2906, belongs to an *Allium* from England, and this is *A. scorodoprasum* L.

Spathe. In cultivated coarse specimens, currently known as *A. porrum*, the single spathe sometimes shows an indication as if it is originated from the fusion of two spathes, as sometimes it has a two tipped apex and a faint lengthwise seam of union.

Filaments. The sterile cusps of the inner filaments are variable in length, 1–6 mm. Usually they are relatively long and threadlike, and coiled. In dry specimens they may be broken off. For the Aegean area VON BOTHMER 1974, found in a part of the material also the outer filaments provided with one or two very small lateral teeth; this does not occur in Africa.

Distribution. *A. ampeloprasum* has a wide distributional area in northern Africa and in Europe, and is also recorded for the Azores. I have seen only one collection from the Azores, collected in 1845, and I agree with PALHINHA, 1966, that the species is possibly introduced there.

Caryology. KOLLMANN 1971, found in *A. ampeloprasum*, mainly from Israel, five ploidy levels: 2 ×, 3 ×, 4 ×, 5 × and 6 × with $2n = 16, 24, 32, 40$ and 48 respectively. Also VON BOTHMER, 1974, found $2n = 32, 40$ and 48 for specimens from the Aegean area; VON BOTHMER, 1975, in a study on the *A. ampeloprasum*-complex on Crete found no distinct correlation between morphology and chromosome numbers.

8. A. dregeanum KUNTH **Fig. 12, Map 7.**

A. dregeanum KUNTH, Enumeratio Plantarum 4, 1843: 382; PHILIPS 1951: 188. Type: Port Natal et Afrique Méridionale, DRÈGE, Herb. Cap. n. 8660a (isotype: G).

A. rotundum auct. non L.: SMITH 1966: 59.

Bulb ovoid, 15–25 × 10–20 mm. Roots glabrous, unbranched. Increase bulbs 0, or 1–3, ovoid, flattened or hollowed at one side, 6–15 × 5–10 mm, 1–3 mm beaked, subsessile to c. 5 mm stiped, wrapped in a firm brown prophyll. Protective bulbcoat-leaves 2–4, thin, chartaceous, entire, or with age slightly tending to break up into fibres, medium brown or reddish brown. Sproutleaf 1, 2–8 cm, at apex oblique, hardly emerging above ground. *Foliage leaves* 2–7, glabrous; blades scattered along the scape, flat, v-shaped in section or not, nerves distinct, top acute, 10–30 cm × 2–10 mm; apical part of blade soon wilting and breaking off; sheaths unequal in length, those of upper leaves longest and extending largely above ground, 12–50 cm long, membranous, not breaking up into fibres. Scape 1, exceeding the leaves, erect, terete, solid, 35–100 cm long, 2–7 mm diam. *Inflorescence* umbellate to spherical, many-flowered, 2.5–6 cm diam., without or with bulbils. *Spathe* 1, caducous, the basal part 10–20 mm long, with a caudate part 2–7 cm long. Bracts absent. Bracteoles numerous, membranous, ovate to lanceolate, 3–8 mm long, usually lacerated. Pedicels subequal, 7–25 mm long, or in bulbiferous inflorescences up to 35 mm, slender, straight. Bulbils sessile, ovate to fusiform, 8–12 × 4–6 mm, 1–3 mm beaked, wrapped by one rather firm brown prophyll. *Flowers* campanulate or urceolate. Tepals for 0.5–1 mm adnate to bases of filaments, persistent, white to pink, with a green or purplish midvein, the dorsal side smooth, the margins sometimes faintly serrated, the keel slightly erose; outer tepals ovate to oblong, 5–7 × 2.5–3 mm, top subacute; inner tepals ovate to oblong, as long as or longer and slightly wider than outer tepals, top subtruncate, obtuse or subacute, often very shortly mucronate. Stamens (excluding lateral cusps) shorter than tepals, serrulate at base; outer filaments c. 5 mm long, at base 0.8–1 mm wide, connate with inner filaments for 0.5–1 mm; inner filaments tricuspidate, c. 5 mm long, at base c. 2 mm wide, anther-bearing cusps 1–1.6 mm long, lateral cusps 2–3.5 mm long, not, or up to 1 mm exceeding the perianth. Anthers 1–1.5 × 0.5–0.6 mm, yellow. Pistil shorter than or equalling the tepals; ovary ovoid, c. 3 × 2 mm, style 5–6 mm long, slender, inserted at about the base of ovary; stigma inconspicuous, capitate. *Fruits* globose, 3–4 mm diam. Seeds c. 3 × 1.5 mm, black.

Vernacular names. *Wilde Uyen*, *Ajuin*, *Ajuinbol*, *Bergajuin*, *See-ajuin*, *Ajuintjie*, *Ajuintjes* (South African language).

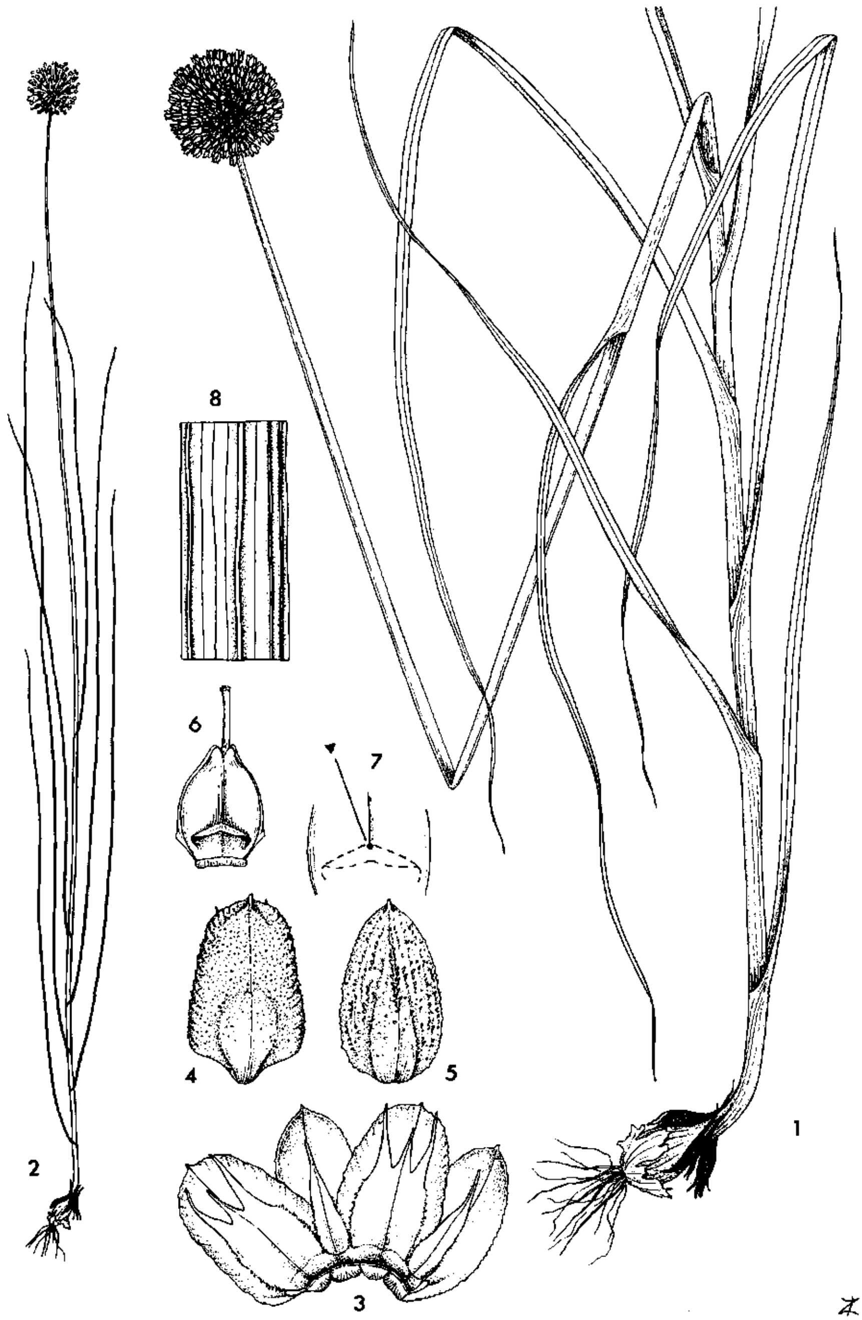
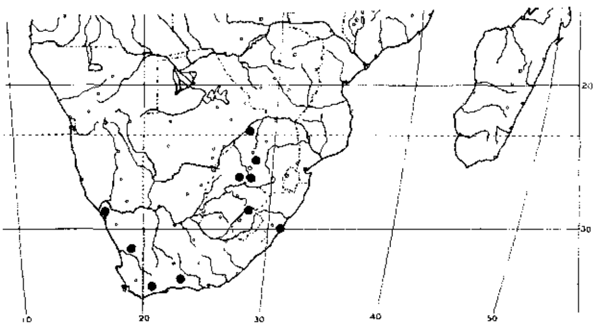


FIG. 12. *Allium dregeanum*. – 1. Habit, $\times^1/_3$; 2. ditto, schematic; 3. perianth and filaments, partly, $\times 4$; 4–5. outer and inner tepal, outer views, $\times 4$; 6. pistil, $\times 4$; 7. detail of pistil showing excretion opening of nectary, schematic; 8. detail of leaf blade, showing entire margin. (1. PEARSON 5594, SCULLY 215, and HARDY & BAYLISS 1108; 3–7. HARDY & BAYLISS 1108; 8. PEARSON 5594).

U s e s. Recorded by BURCHELL 1822, l.c., as used as a condiment by the Hottentots.

H a b i t a t. Along streams and roads, on plains; in deep sands, on stiff soils and on dolomite ridges. Also found on more disturbed places like cornfields. The species is repeatedly recorded as locally frequent. Altitude 100–1000 m. Flowers: October to December.

D i s t r i b u t i o n. Republic of South Africa. PHILIPS, 1951, states: 'A single native species in South Africa, which extends from Namaqualand to the Uitenhage district, but also recorded from the Graaff-Reinet and Queenstown districts and from the Orange Free State.'



MAP 7. Localities of *Allium dregeanum*.

REPUBLIC OF SOUTH AFRICA: Cape, Zandkraal, dolomite ridge, 130 m, Nov. 1948, ACOCKS 14854 (BM); near Duivenhoek, stiff soils, ANONYMOUS s.n. (BM); near Graaff Reinet, 1000 m, Dec. 1869, BOLUS 648 (K); Schietfontein, Oct. 1811, BURCHELL 1547 (K); near Zoetmelks River, Riversdale Division, Nov. 1814, BURCHELL 6626 (K); Port Natal et Afrique méridionale, DRÈGE 8660 a (G, type of *A. dregeanum* KUNTH); Port Natal et Afrique méridionale, DRÈGE 8661 (G); Cape, DRÈGE s.n. (G); Kouga River, at road from Ongelegen, 800 m, Dec. 1928, FOURCADE 4265 (K); Namaqualand, c. 12 km S. of Khamieskroon, Nov. 1962, HARDY C.S. 1108 (K); Orange Free State, Caledon River, Herb. HOOKER s.n. (K); S. Africa, Herb. HOOKER 116 (K); Namaqualand, Brakdam, cornlands, Dec. 1910, PEARSON 5594 (K); Nama'land Minor, SCULLY 215 (K).

N o t e s.

T a x o n o m y a n d h i s t o r y. There is some doubt whether *A. dregeanum* is of true South African origin. It is very closely resembling *A. ampeloprasum* from Europe and North Africa, and also the European *A. rotundum* and *A. scorodoprasum*; for notes on the differentiating characters see below. Though I have accepted it as a species endemic to South Africa, there remains a small possibility that the taxon is a South African modification of specimens of *A. ampeloprasum* of very early introduction from Europe or North Africa. The differences with *A. ampeloprasum* are small. *A. dregeanum* has the filaments (excluded the lateral cusps) always shorter than the tepals, the tepals are smooth or almost so, the inflorescences are more compact and smaller, and the margins of the leaf blades are entire. In *A. ampeloprasum* the filaments are exserted, the tepals often dorsally papillose, and the leaf margins usually finely crenulate.

A. dregeanum has a wide distributional area in South Africa, and occurs frequently in natural habitats, where it often appears to be abundant, also in recent times, according to the label of ACOCKS 14854, and others. In view of the above evidence I have decided to accept *A. dregeanum* as a separate species.

In the year 1822 the plants were found by BURCHELL during his travels through South Africa, and he considered these as wild onions. He wrote the following comment: 'The green leaves of a kind of onion, growing here wild, were plucked by many of the Hottentots, and boiled with their meat. Following their example, I found them as good tasted as garden-onions; and made GERT, who acted in capacity of cook, collect a large bundle for use, as the stock of potatoes, our only vegetable, was already exhausted.'

REGEL 1875: 43, placed *A. dregeanum* in the synonymy of *A. scorodoprasum*, where it certainly not belongs. PHILLIPS 1951, l.c., accepts the species for South Africa. SMITH 1966, l.c., gives the following historical commentary: 'ajuin. Original Dutch name and French "Oignon", literally "onion". The name already found in 16th century literature. The more common form is AJUINTJIE. In VAN RIEBEECK's earliest Cape records (1652) is mentioned AJUIN brought in by some Hottentots and again he mentions AJUYN. The species of these records can be none other than *Allium rotundum* (WILDE-UI). The vernacular name survives in a few compound names such as: AJUINBOL, BERGAJUIN, SEE–AJUIN.' However, the South African plants certainly do not belong to *A. rotundum* (see below).

Resembling and allied species. Besides *A. ampeloprasum*, also *A. rotundum* L. and *A. scorodoprasum* L. are much resembling. These two European species are sometimes rather difficult to recognize, and it is obvious that *A. dregeanum* was formerly placed under *A. scorodoprasum* by REGEL 1875, and under *A. rotundum* by SMITH 1966, or determined as such, by others. *A. scorodoprasum* differs by smaller bulbils in the inflorescence, by the flowers which are more urceolate of shape, and by the crenulate leaf margins. *A. rotundum* differs by a shorter spathe, by longly stiped, small black increase bulbs, and by the absence of bulbils in the inflorescence.

Seeds. Specimens without bulbils in the inflorescence develop normal seeds; in bulbil-bearing inflorescences apparently only not viable seeds are produced.

9. A. baeticum BOISSIER — Fig. 13, Map 8.

A. baeticum BOISSIER in Diagnoses plantarum orientalium novarum, sér. 1, vol. 1, part 7, 1846:113; BOISSIER et REUTER 1852:114; WILLKOMM et LANGE 1862:210; REGEL 1875:56; MAIRE 1921:51; JAHANDIEZ et MAIRE 1931:125; ibid. 1934:870; EMBERGER et MAIRE 1941:957.

A. baeticum var. *genuinum* COUTINHO 1913:129; VINDT 1953:119; *A. baeticum* var. *laeve* MAIRE et WEILLER in MAIRE 1958:261.

Syntypes: Spain, Provence of Malaga, BOISSIER s.n. (not seen); & Granada, BOISSIER s.n. (not seen); & near Cadiz, herb. FAUCHÉ s.n. (not seen).

A. duriaeanum J. GAY 1847:218 (sphalm. *durtaeanum*); MUNBY 1859:29; ibid. 1866:33; BATTANDIER et TRABUT 1884:156; ibid. 1895:62.

A. ampeloprasum var. *duriaeanum* BONNET et BARRATTE 1896:413; BATTANDIER et TRABUT 1902:332; CUÉNOD 1954:211; *A. ampeloprasum* ssp. *eu-ampeloprasum* MARKGRAF in HAYEK var. *duriaeanum* MAIRE 1958:257.

Syntypes: Algeria, near Bône, June 1844, DURIEU DE MAISONNEUVE s.n. (P); & August 1844, DURIEU DE MAISONNEUVE s.n.(lectotype: P).

A. baeticum var. *occidentale* COUTINHO 1896:102; VINDT 1953:119.

Syntypes: Central Portugal, Villa Franca, Monte Gordo, DA CUNHA s.n. (not seen); & near Olisiponem, Serra de Monsanto, DA CUNHA s.n. (not seen).

A. margaritaceum SMITH var. *papillosum* LINDBERG 1932:32; JAHANDIEZ et MAIRE 1934:869; MAIRE 1935:230.

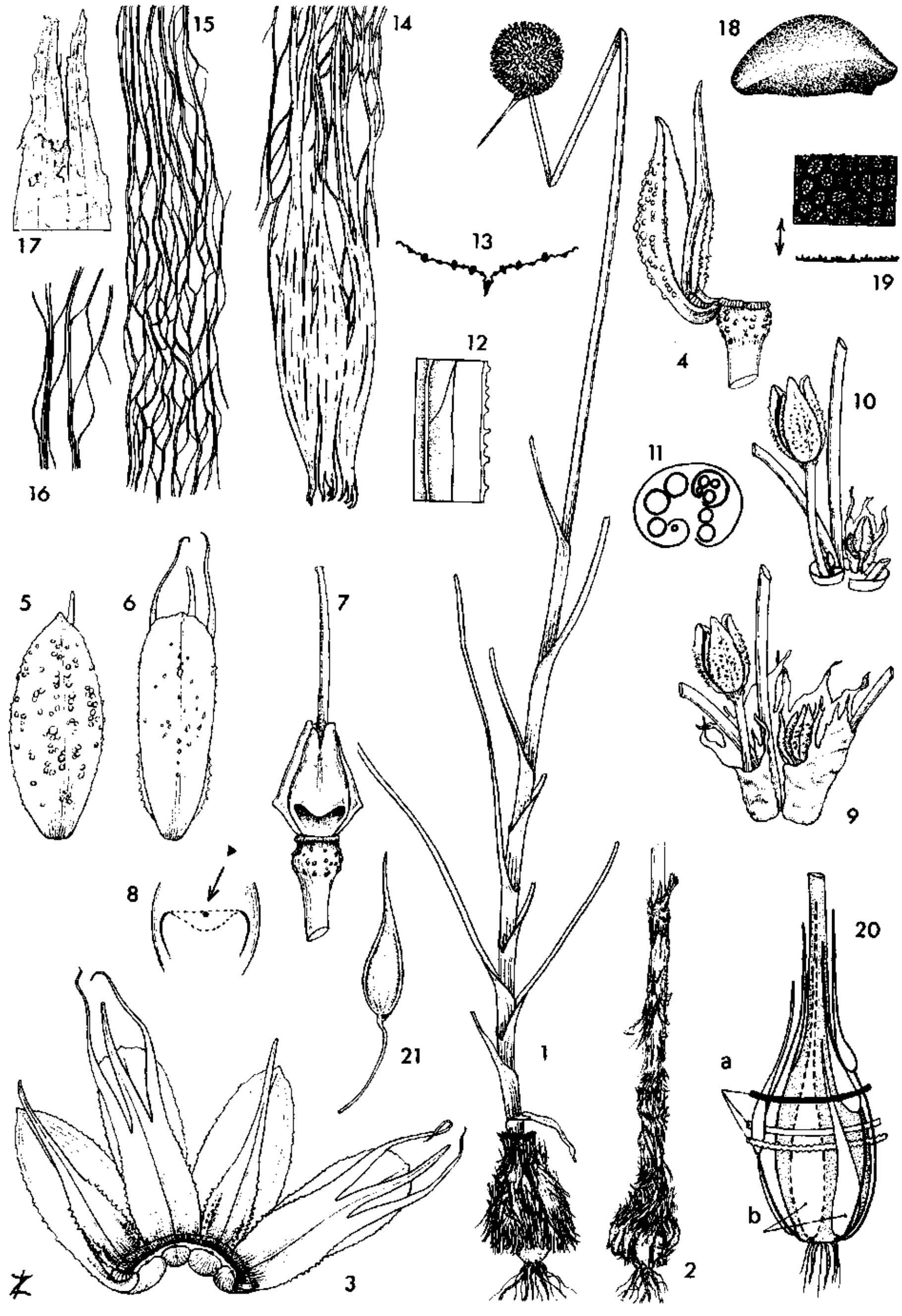
A. baeticum var. *papillosum* MAIRE et WEILLER in MAIRE 1958:261.

Type: Morocco, Great Atlas, 1225 m alt., near Asni, LINDBERG 3622 (holotype: MPU).

A. savarini SENNEN 1933:120, nom. nud.

Type: Morocco, Atlas Rifain, Targuist, SENNEN et MAURICIO s.n. (type: BM).

Bulb ovoid, 10–40 × 8–30 mm. Roots unbranched, glabrous. Increase bulbs 0–6, ovoid to ellipsoid, flattened or hollowed at one side, 6–20 × 4–9 mm, up to 10 mm beaked, sessile or up to 2 cm stiped, wrapped in a firm bright brown prophyll. Protective bulbcoat-leaves several to many, rather thin, broken up into netted fibres, reddish-brown or brown. Sproutleaf 1, thinly membranous, 3–10 cm, at apex obliquely truncate, hardly emerging above the ground. *Foliage leaves* 3–10, glabrous, blades scattered along scape, flat, in section straight or v-shaped, 10–30 cm × 1–7 mm, the apical part soon drying and breaking off; sheaths unequal in length, those of upper leaves longest, extending for the greater part above ground, 3–35 cm long, pale yellowish or brownish, the subterranean part persistent and later on breaking up into netted fibres. Scape 1 (or 2), exceeding the leaves, erect, terete, hollow, 20–75 cm long, 1.5–4 mm diam. *Inflorescence* spherical to hemispherical, or subellipsoid, rather densely many-flowered, 2.5–6 cm diam., without bulbils. *Spathe* 1, rather firm, hyaline or not, subpersistent or later on falling off, the broadened basal part 8–15 mm long, the caudate part 10–50 mm long, c. 10-veined, opening with one slit to the base. Bracts absent. Bracteoles membranous, obovate, lacerate, 3–6 mm long, each subtending 4–10 flowers. Pedicels subequal, 8–25 mm, slender, scabridu-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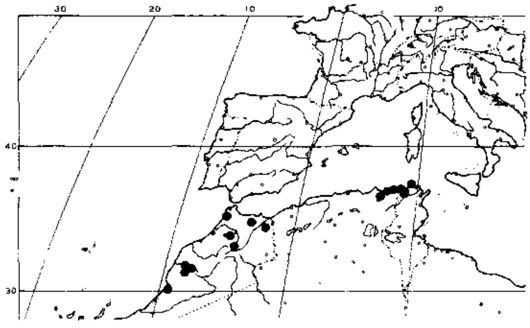
lous near the top, in anthesis straight or curved, in fruit becoming more rigid and often curved upward. *Flowers* urceolate. Tepals adnate to bases of filaments for 0.2–0.8 mm, persistent, white to pale purplish, with a purplish serrulated keel, outer surface smooth or scabridulous or finely papillate, margin irregularly finely dentate; outer tepals ovate to elliptic, 3–5.5 × 1.5–2 mm, top acute to obtuse, shortly acuminate or not; inner tepals equalling outer tepals, obovate to oblong, top (broadly) obtuse. Stamens equalling the tepals or slightly longer or shorter, but lateral cusps exserted; edges of filaments slightly rough or serrulated towards base; outer filaments simple, 3–5.5 mm long, at base 0.8–1 mm wide, connate with inner filaments for 0.2–0.5 mm; inner filaments tricuspidate, 3–5.5 mm long, at base 1.5–2 mm wide, anther-bearing cusp 0.8–2 mm long, lateral cusps 3–4 mm long, exceeding the perianth for 1–2 mm. Anthers c. 1.5 × 0.5–0.6 mm, yellow. Pistil shorter to longer than the tepals; ovary approximately globose to ovoid, 1.5–3 × 1.5–2 mm; style 3–6 mm, slender, inserted near the base of the ovary; stigma inconspicuous, capitate. *Fruits* subglobose to ovoid, 3–4 × 2–3 mm. Seeds c. 3–3.5 × 1.5 mm, black with a golden shine.

Habitat. Hilly country; recorded from waste fields, scrub, and *Juniperus* and *Quercus* forest. Found on sandy and calcareous soil. One specimen (FONT QUER 130) shows distinct traces of burning in the apical part of the netted bulb tunics. Altitude 0–2100 m. MAIRE, 1958, states up to 2500 m. Flowers: May-August (Morocco, Algeria, Tunisia).

Distribution. Morocco; Algeria; Tunisia; in Europe: Portugal (according to COUTINHO, 1913), S. Spain, and probably also Italy, and the Balkans. See further under the notes.

MOROCCO: near El Araix, 30 m, waste fields, May 1930, FONT QUER 130 (B, BM, G, WU); near Asni, 1225 m, June 1926, LINDBERG 3622 (MPU, type of *A. margaritaceum* SMITH var. *papillosum* LINDBERG); between Marrakech and Ouarnak, *Juniperus* forest, August 1971, V. D. MAESEN 1468 (WAG); & V. D. MAESEN 1468 a (WAG); 80 km W. of Oujda, *Eucalyptus* forest, V. D. MAESEN 1512 (WAG); Great Atlas, Ourika, 2100 m, fields, July 1921, MAIRE s.n.

FIG. 13. *Allium baeticum*. – 1. Habit, the outer bulbcoat-leaves at apex burnt off, × 1/4; 2. bulb and lower part of scape with outer bulbcoat-leaves, ×1/4; 3. perianth and filaments, partly, × 6; 4. outer tepal and corresponding exserted filament, lateral view, ×6; 5–6. outer and inner tepal with corresponding exserted filaments, outer view, ×6; 7. pistil, ×6; 8. detail of ovary, showing excretion opening of nectary, schematic; 9. lacerated bract subtending a cluster of flowers, ×4; 10. ditto, outer bract cut off, ×4; 11. diagram showing position of bracts and flowers (circles); 12. detail of leaf blade with crenulate margin, ×16; 13. leaf blade, transverse section, ×4; 14. detail of fibrous outer bulbcoat-leaf, ×2; 15–16. details of inner fibrous bulbcoat-leaf, ×2 and ×4 resp.; 17. detail of thin, chartaceous bulbcoat-leaf, ×2; 18. seed, lateral view, ×6; 19. detail of testa, seen from above and in profile, ×40; 20. bulb with 6 increase bulbs, sessile and stiped, schematic: a. bulbcoat-leaves, b. increase bulbs; 21. stiped increase bulb, inner view, ×1. (1, 3–17, 20–21. FONT QUER 130; 2. JANSEN 552; 18–19. VAN DER MAESEN 1512).



MAP 8. African localities of *Allium baeticum*.

(P); between Midelt and Ansegmir, 1500 m, June 1939, MAIRE c.s. 897 (MPU); Ida Oubakil, 1875, MARDOCHÉE s.n. (P); Djebel Kandar, 1500 m, MOURET 1383 (P); Targuist, near Bab-Izugar, 1330 m, SENNEN et MAURICIO s.n. (BM, type of *A. savarini* SENNEN, nom. nud.).

ALGERIA: Bône, hills, June 1839, BOVÉ s.n. (G); La Calle, 24 June 1844, DURIEU DE LA MAISONNEUVE s.n. (P, type of *A. duriaeanum* J. GAY); & 2 August 1844, DURIEU DE LA MAISONNEUVE s.n. (P, type of *A. duriaeanum* J. GAY); Edough near Bône, scrub, June 1890, LUILFROY 193 (P); along Oued Kouba, near Bône, June 1892, LUILFROY s.n. (P); Mt. Ouach 900 m, June 1934, MAIRE s.n. (MPU).

TUNISIA: Ile de Chiens, May 1888, BARRATTE s.n. (P); Fedj-el-Saha, June 1883, COSSON c.s. s.n. (P); 20 km SE. of Tabarka, *Quercus suber* forest, 600 m, June 1965, JANSEN 552 (WAG).

SPAIN: near Ronda, 10 July 1849, BOURGEAU s.n. (K, from the type locality).

Notes.

Typification and synonyms. I have not found the syntypes of *A. baeticum*, which are presumably at G. The species is, however, well characterized by its original description.

A. baeticum var. *occidentale* COUTINHO. I have not seen the type, but its description which mentions tricuspidate inner filaments, the single spathe valve, flat leaves, and fibrously netted outer bulbcoat-leaves, is sufficiently diagnostic; the variety was proposed because of it having several increase bulbs, and farinose tepals, but these two characters fall within the normal variability of *A. baeticum*.

Delimitation. *A. baeticum* is a readily recognizable species, as appears from the key. Especially the conspicuously fibrous and netted outer bulbcoat-leaves or bulb tunics, which extend on the basal part of the scape in combination with the flat leaf blades is diagnostic.

Allied and resembling species. *A. atroviolaceum* BOISSIER (1846), described from Iran, is according to WENDELBO 1971:58, a species ranging from Turkey to Afghanistan. According to VON BOTHMER 1974:20, GARBARI 1975: 352, the species occurs in SE. and S. Europe as well, where it is rather invariable, and acc. to VON BOTHMER best recognized by the usually intensely purple flowers, the dense inflorescences with rather small flowers, and the reticulate fibres normally present in the basal leaf sheaths. In my opinion the species is very closely related to *A. baeticum*, and possibly identical, but study of more complete material from the transitional areas is needed for a final decision.

A. ampeloprasum and *A. guttatum* are certainly in the alliance with *A. baeticum*. The main difference of *A. ampeloprasum* is its entire, not netted, outer bulbcoat-leaves; *A. guttatum* has terete, not flat, leaf blades. Incomplete specimens may therefore be difficult to identify.

The following species, *A. ascalonicum*, *A. cupani* and *A. trichocnemis*, have a superficial resemblance with *A. baeticum*, mainly because of the presence of strongly fibrous and netted outer bulbcoat-leaves. All three species, however, have terete leaves; *A. ascalonicum* differs furthermore by 1 persistent spathe splitting into 2(–4) spathe-valves, and *A. cupani* and *A. trichocnemis* have all filaments simple.

Distribution. The records for Tunisia are new.

I saw no material from the Iberian Peninsula. The type specimens come from southern Spain.

In the Leiden Herbarium I identified one specimen from Lesin I., Dalmatia, Yugoslavia, ROEMER s.n., provisionally as *A. atroviolaceum*, mainly because of its leaves with distinct crenulate edges, but which could have been almost equally well determined as *A. baeticum*. As I have already alluded to above in the note under allied species, *A. atroviolaceum* and *A. baeticum* should possibly be united, which then results in *A. baeticum* having a very wide range from NW. Africa, through southern Europe, and far into the Near East.

Sect. Schoenoprasum (HUMBOLDT, BONPLAND et KUNTH) DUMORTIER

Sect. *Schoenoprasum* (HUMBOLDT, BONPLAND et KUNTH) DUMORTIER 1827: 140; REGEL 1875: 17, 77; BENTHAM et HOOKER F. 1883: 803; ENGLER 1887: 56; F. HERMANN 1939: 57; TÄCKHOLM et DRAR 1954: 60; MAIRE 1958: 268 (p.p., excl. *A. trichocnemis*).

Schoenoprasum HUMBOLDT, BONPLAND et KUNTH 1815: 277; Sect. *Crommyum* WEBB et BERTHELOT subsect. *Haplostemon* § *Schoenoprasa* BOISSIER 1882: 230.

Type-species: *A. schoenoprasum* L.

Sect. *Cepa* (MILLER) PROKHANOV 1931: 24.

Cepa MILLER 1754; MOENCH 1794: 243, p.p. emend. SALISBURY 1866: 90.

Type-species: *A. cepa* L.

Sect. *Phyllodolon* (SALISBURY) PROKHANOV 1931: 24.

Phyllodolon SALISBURY 1866: 90.

Type-species: *A. fistulosum* L.

Plants glabrous. Outer bulbcoat-leaves membranous, smooth or fibrous, not with a particular sculpture. Leaf blades subapproximate or scattered along the lower part of the scape, terete, canaliculate or not, hollow. Leaf sheaths closed. Scape terete. Spathe 1, at the top acute or acuminate, persistent. Bracts and bracteoles present or absent. Flowers not nodding. Inner filaments simple or at the base shortly tricuspidate, outer filaments simple. Ovules 2 per locule; seeds without caruncle, 1–2 per locule.

In Africa only cultivated; 3 species, nrs. 10–12.

10. A. cepa L. **Fig. 14.**

A. cepa L., Sp. Pl. 1, 1753:300; ibid. 1762:431; DESFONTAINES 1798:291; BARBEY C. et W., 1882:162; DURAND et BARRATTE 1910:233; MUSCHLER 1912:214; POST in DINSMORE 1933:638; TÄCKHOLM et DRAR 1954:89; MAIRE 1958:270, fig. 902; HELM 1956:160, fig. 6 (4 varieties); MANSFELD 1959:558 (4 varieties); WATT et BREYER-BRANDWIJK 1962:671; DE WILDE-DUYFJES 1973:64.

Lectotype: VAN ROYEN s.n. in L, herb. no. 908 105610.

A. angolense BAKER 1880:262; ibid. in THISELTON-DEYER 1898:516.

Type: Angola, Golungo Alto, in pastures, WELWITSCH 3764 (isotypes: BM, K).

A. nigritanum A. CHEVALIER 1913:319, nomen nudum.

Type: Central African Republic, Haut-Chari, Ndellé, cultivated by the Arabs, originating from Ouadaï, 8–12 April 1903, A. CHEVALIER 7989 (not seen).

A. ascalonicum auct. non L.: TÄCKHOLM et DRAR 1954:93; MAIRE 1958:269, fig. 900.

Porrum ascalonicum auct. non (L.) REICHENBACH: REICHENBACH 1830:110.

Bulb depressed globose to ovoid, 2–10(–15) cm diam. Increase bulbs 0 – several, ± ovoid, usually as long as the main bulb, sessile. Protective bulbcoat-leaves several, papery or chartaceous, smooth, white, yellowish, brownish, reddish, or purplish; storage leaves few to many. Sproutleaf 1, of various length, apex oblique, sometimes with a up to c. 1 cm long blade-remnant. *Foliage leaves* 3–8, ± distichous, glabrous, blades ± approximate or scattered in the lower part of the scape, 10–50 cm × 4–20 mm, suberect, fistulose, top acute. Scape 1 – several, usually exceeding the leaves, erect, straight, terete, hollow, 0.5–5 cm thick, inflated in the middle or basal part or not. *Inflorescence* spherical, 2–8 cm diam., composed usually of flowers only, or, in var. *viviparum* of mixed bulbils and flowers, or of bulbils only, and sterile. *Spathe* 1, hyaline, persistent, opening with 2(–4) slits, giving rise to 2(–4) spathe-valves, top acute or up to 15 mm acuminate, in var. *viviparum* up to 15 cm, caudate, green. Bracteoles many, hyaline, various of shape. Pedicels subequal, 8–40 mm. *Flowers* subcampanulate to urceolate. Tepals ovate to oblong, 3–5 mm long, smooth, greenish to whitish, or purplish, top acute to obtuse. Stamens not or slightly ex-

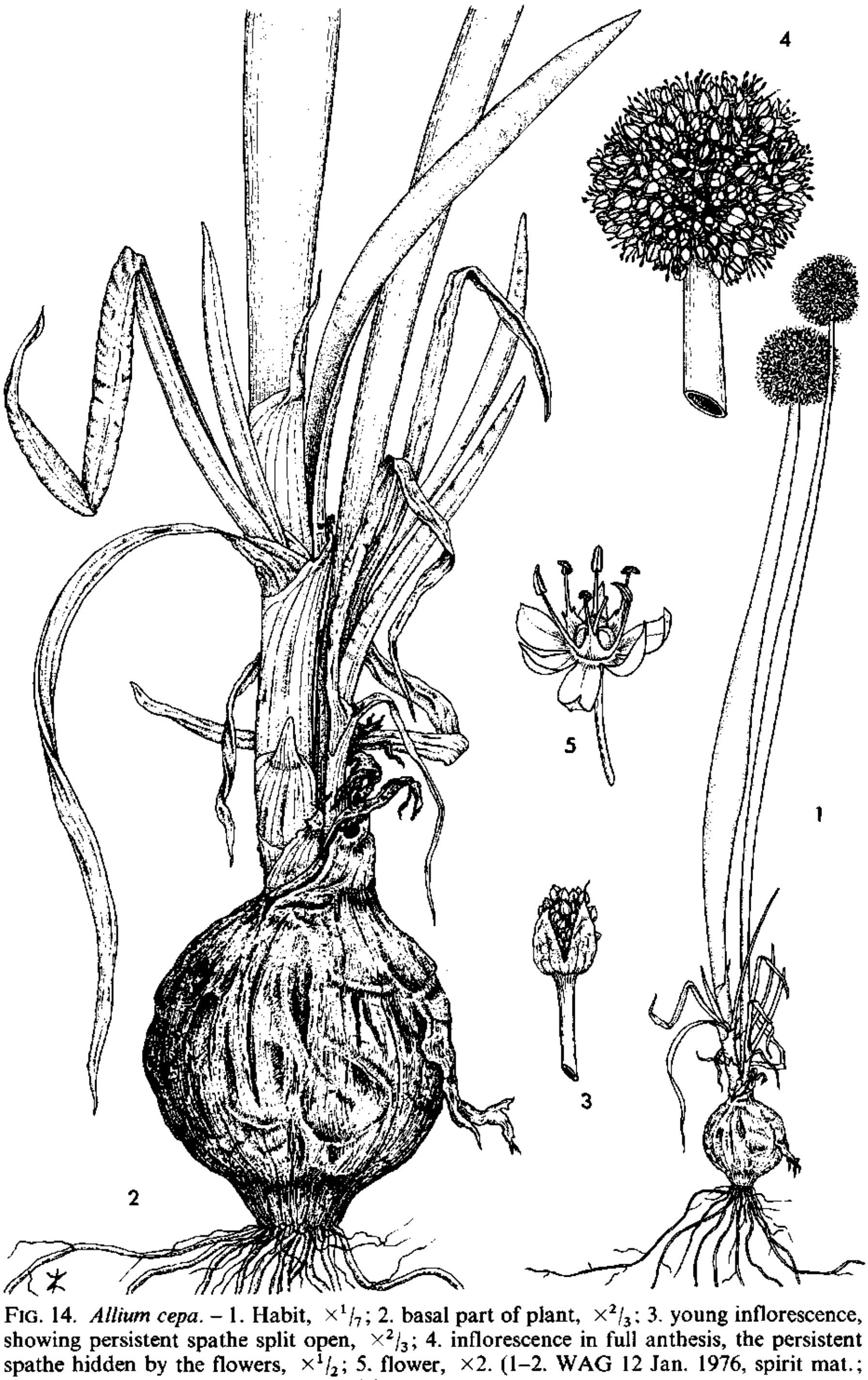


FIG. 14. *Allium cepa*. – 1. Habit, $\times{}^1/_7$; 2. basal part of plant, $\times{}^2/_3$; 3. young inflorescence, showing persistent spathe split open, $\times{}^2/_3$; 4. inflorescence in full anthesis, the persistent spathe hidden by the flowers, $\times{}^1/_2$; 5. flower, $\times 2$. (1–2. WAG 12 Jan. 1976, spirit mat.; 3–5. DE WILDE 26 July 1970, culta, spirit mat.).

ceeding the perianth; outer filaments simple, narrow, 4–6 mm long, at base c. 0.5 mm broad; inner filaments equalling the outer filaments, narrow, but at the base much broadened, 1.5–2.5 mm broad, at each side provided with or without a short tooth or cusp 0.1–0.3 mm. Anthers c. 1.5 mm long, yellow or dirty yellow. Pistil shorter than or exceeding the perianth; ovary depressed globose to ovoid. *Fruits* subglobose, 4–6 mm diam. Seeds 2.5–4 × 1.5–3 mm, black.

Vernacular names. Egypt: *'Asqalán, Basal, Bassal, Efillán*; France: *Onion*.

Uses. On a large scale used as food and condiment all over the world; it has also medicinal properties. See also TÄCKHOLM et DRAR, HELM, and WATT & BREYER-BRANDWIJK, 11. cc.

Habitat. Cultivated in many varieties; occasionally escaped.

Distribution. All over the world; only cultivated.

FRENCH SOMALILAND: without locality, CHEDEVILLE s.n. (FI).

ETHIOPIA: Cheren, 1400 m, Feb. 1909, FIORI 882 (FI); Alemaya, near Harrar, 2160 m, Oct. 1967, WESTPHAL c.s. 2348 (WAG).

SUDAN: Darfur Province, Niurnya, LYNES 37 E (BM); Melit, 40 km NE of El Fasher, in irrigated gardens under date palms, 900 m, Feb. 1922, LYNES 358 (BM).

ZAÏRE: Kisantu, GILLET 2310 (BR); Wanie Rukula, DE WÈVRE s.n. (BR); & DE WÈVRE 1144 (BR).

ANGOLA: Golungo Alto, 300–800 m, May 1855, WELWITSCH 3764 (BM, K, type of *A. angolense* BAKER).

Notes.

Synonyms. In the Paris herbarium I have not found the specimen A. CHEVALIER 7989, collected in the Central African Republic, on which *A. nigritanum*, nomen nudum, is based. For the identity of this name are two possibilities, viz. *A. ampeloprasum* and *A. cepa*. The first, *A. ampeloprasum*, is, to my knowledge, never found so far into the tropics, for which reason I have placed it under *A. cepa*.

A. ascalonicum auct. non L. As pointed out by STEARN 1960:181, and by myself, DE WILDE-DUYFJES 1973:61, the type of *A. ascalonicum* L. belongs to a wild growing species in the Near East and in eastern North Africa, not of commercial value and not cultivated. The 'Shallot' (English) or 'Eschalotte' (French) is nothing more than a variety with rather gregarious bulbs (increase bulbs) of *A. cepa*, and under these names sometimes also go small sized specimens of other cultivars of *A. cepa*.

Variability. There is a remarkable variation in habit of plants, including the bulbs, and in the way of propagation (bulbs or seeds), in *A. cepa*, so that their conspicificy sometimes seems incredible. HELM 1956:161–170, recognizes

4 varieties viz. var. *cepa*, var. *viviparum* (METZGER) ALEFELD [= *A. proliferum* MÄRCKLIN JR. = *A. proliferum* (MOENCH) SCHRADER], var. *cepiforme* (G. DON) REGEL, and var. *aggregatum* G. DON. The last variety is for a large part synonymous with *A. ascalonicum* auct. non L. The variety *viviparum*, never with well-developed flowers, is noteworthy by its viviparous bulbils which are edible (false Rocambole). It is propagated only through its bulbils.

Distribution. The area of the wild ancestors of the cultivated onions is not known. HELM l.c., enumerates a number of authors who suggest that the wild forms originated from Central or southern Asia, namely Persia, Belutschistan, Afghanistan, India, or the Sarowschan Area, but as far as I know truly wild forms have never been found there.

11. A. fistulosum L. — Fig. 15.

A. fistulosum L., Sp. Pl. 1, 1753: 301; ibid. 1762: 432; HEGI 1908: 233, fig. 352; TÄCKHOLM et DRAR 1954: 93; HELM 1956: 170 (5 provarieties); MAIRE 1958: 270, fig. 901; MANSFELD 1959: 558 (5 varieties); DE WILDE-DUYFJES 1973: 67.

Neotype: S 139.7, Linnean Herbarium S.

Bulb ovoid to oblong, up to 10 cm long, gradually passing into the thickish leafy scape. Increase bulbs few to several, narrow and inconspicuous. Protective bulbcoat-leaves several, papery or chartaceous, smooth, reddish, purplish, or brownish. Sproutleaf 1, of various length, apex oblique. *Foliage leaves* 4–6, distichous, glabrous; blades scattered in the lower part of the scape, 10–40 cm × 10–25 mm, terete, hollow, top acute. Scape 1, exceeding the leaves, erect, straight, hollow, 8–25 mm broad. *Inflorescence* hemi-spherical to spherical, 3–7 cm diam., composed either of flowers only, or of bulbils only. *Spathe* 1, hyaline, persistent, up to 10 mm acuminate, opening with (1–)2–3 slits into (1–)2–3 spathe-valves. Bracteoles absent. Pedicels subequal to unequal, the lower ones shortest, 10–30 mm long. *Flowers* narrowly campanulate to urceolate. Tepals ovate-oblong to oblong-lanceolate, 6–10 mm long, smooth, (greenish) white, with greenish midvein, top acute-acuminate. Stamens longly exceeding the perianth; inner and outer filaments ± similar, simple, narrow, also at the base, 8–15 mm long. Anthers c. 1.5 mm long, yellow. Pistil longly exceeding the perianth; ovary globose to broadly obovate; style slender, 10–15 mm long. *Fruits* globose, c. 5 mm diam. Seeds 3–4 × 2–2.5 mm, black.

Vernacular names. France: *Ciboule*; England: *Welsh Onion*; Netherlands: *Grof Bieslook*. More vernaculars in various languages are given by HELM 1956: 170.

Uses. The leaves are eaten as a vegetable, and used as condiment. The plants are also used as fodder.

FIG. 15. *Allium fistulosum.* – 1. Habit, $\times^{1}/_{3}$; 2. transverse sections of leaf blade, a. at base, b. at apex, resp., $\times 1$; 3–4. outer and inner tepal with corresponding filaments, resp., $\times 7$. (1–4. ZEWALD s.n., culta WAG, spirit mat.).

Habitat and Distribution. Only known from cultivation in gardens, sometimes escaped. I have not seen collections from Africa, but it is mentioned by MAIRE l.c., and TÄCKHOLM & DRAR l.c. The species is hardy, and possibly originates from Central Asia (Siberia, Mongolia, or eastern Turkestan).

Notes.
Superficially there is a strong resemblance with *A. cepa*, especially when sterile, i.e. without inflorescences, or when the inflorescences are composed of bulbils only, so that the flowers cannot be checked. The inflorescence of *A. cepa* bears bracteoles, which are absent in *A. fistulosum*. The flowers of *A. cepa* are much smaller, and measure about half the length of those of *A. fistulosum*. In *A. cepa* the filaments are only slightly exserted, and the inner ones are ± abruptly broadened at the base and may bear one or two minute lateral teeth; in *A. fistulosum* the filaments are longly exserted, and all filaments are similar, simple, and narrow. Furthermore, as a rule, the bulb in *A. cepa* is much better developed, i.e. thicker, than in *A. fistulosum*.

Variation. According to HELM and MANSFELD ll. cc., there are several varieties. HELM states that the greatest variability occurs in China and Japan, where the species is most commonly cultivated from ancient times.

Habit. Often gregarious and growing in large tufts.

12. A. schoenoprasum L. **Fig. 16.**

A. schoenoprasum L., Sp. Pl. 1, 1753:301; ibid. 1762:432; HEGI 1908:223, fig. 340; TÄCKHOLM et DRAR 1954:92; DE WILDE-DUYFJES 1973:82.
A. schoenoprasum var. *schoenoprasum;* HELM 1956:155; MANSFELD 1959:557,
A. schoenoprasum var. *vulgare* ALEFELD 1866:298; MAIRE 1958:269, fig. 899.
Type: LINN 419.37.

Bulbs gregarious, narrow, ovoid-oblong to oblong, in cultivated specimens usually inconspicuous, 1–3 cm long, gradually passing into the scape and leaves. Increase bulbs few to several, narrow and inconspicuous. Protective bulbcoat-leaves several, papery or chartaceous, smooth, with age fibrous, light yellowish-brown to pale purplish. Sproutleaf 1, hyaline, of various length, top oblique with an up to 15 mm long, ill-developed leaf-blade. *Foliage leaves* 3–6, dispersed to sub-distichous, glabrous; blades subapproximate or ± scattered in the lower part of the scape, 10–50 cm × 1–5(–7) mm, terete, hollow, top acute. Scape 1(–2), equalling or exceeding the leaves, erect, straight, terete, hollow, 3–5 mm thick, not inflated. *Inflorescence* hemispherical to spherical, 1.5–4 cm diam., without bulbils. *Spathe* 1, hyaline, persistent, 1–3 cm, top acute or up to 3 mm acuminate. Bracteoles absent. Pedicels subequal to unequal, the lower ones shortest, 2–20 mm. *Flowers* narrowly urceolate. Tepals oblong to oblong-lanceolate, 8–10 mm long, smooth, white to purple with a darker purple or

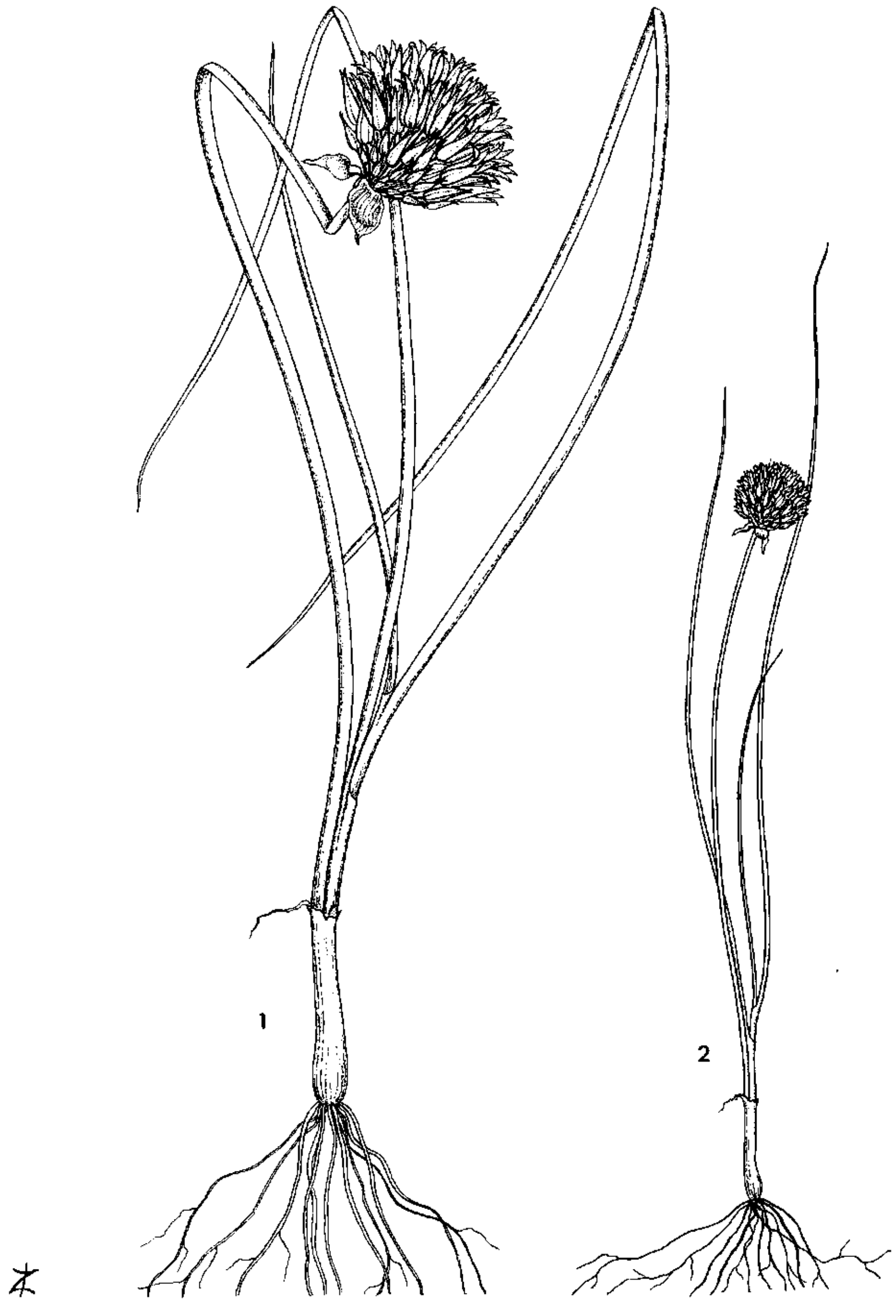


FIG. 16. *Allium schoenoprasum*.–1. Habit, $\times^2/_3$; 2. ditto, $\times^1/_3$. (1–2. ZEWALD s.n., culta WAG, spirit mat.).

brownish midvein, top acute to acuminate. Stamens deeply included in the perianth; inner and outer filaments equalling, ± similar of shape, simple, narrow, at the base slightly broadened, 4–6 mm long. Anthers c. 1.2 mm long, yellow. Pistil included; ovary globose to broadly ellipsoid, 2–2.5 mm long; style slender, 3–4 mm. *Fruits* subglobose to ovoid, c. 4 mm long. Seeds c. 3 × 1.5 mm, black.

Vernacular names. France: *Ciboule*, *Civette*; England: *Chives*. For more vernaculars see HELM 1956:154.

Uses. Chopped leaves are used for seasoning of salads, meat, etc. For further information on the uses, history, and cultivation, see HELM l.c.

Habitat. In Africa not indigenous, and there only cultivated; in Europe widely distributed in various habitats, e.g. damp marshy places, grassland, etc., in lowland up to alpine regions.

Distribution. Europe, temperate Asia, northern Near East, N. America, reaching into subarctic regions. I have seen no specimens from Africa.

Notes.

Allied species. *A. schoenoprasum* seems allied to *A. fistulosum*, despite their strongly differing habit, *A. fistulosum* being a coarse plant, whereas *A. schoenoprasum* is of a much weaker and slenderer habit. The possible alliance lies in the narrow bulbs, the absence of bracteoles, the similar rather long and papery flowers, 6–10 mm long, and the simple inner and outer filaments. In *A. fistulosum* the filaments are far exceeding the perianth, whereas in *A. schoenoprasum* the filaments are deeply included.

Variability. HELM l.c., gives an account of the variability. He accepts two varieties, viz. var. *schoenoprasum*, and var. *alpinum* GAUDIN, the latter occurring in more mountainous areas in Europe and Asia, and reaching far to the North.

Sect. Codonoprasum (REICHENBACH) ENDLICHER

Sect. *Codonoprasum* (REICHENBACH) ENDLICHER 1836:147; STEARN 1944:21; TÄCKHOLM et DRAR 1954:60; WENDELBO 1969:26; ibid. 1971:59.

Codonoprasum REICHENBACH 1830:114; Sect. *Crommyum* WEBB et BERTHELOT subsect. *Haplostemon* § *Codonoprasa* BOISSIER 1882:254; Sect. *Macrospatha* G. DON ex KUNTH 1843:400; G. DON 1827:37; BENTHAM et HOOKER F. 1883: 803; ENGLER 1887:56; MAIRE 1958:273.

Type-species: *A. oleraceum* L.

Plants glabrous. Outer bulbcoat-leaves membranous to coriaceous, smooth or fibrous, not with a particular sculpture. Leaf blades scattered along the lower half of the scape, terete or semiterete, hollow, outside Africa also flat. Leaf sheaths closed. Scape terete. Spathes 1 or 2, each caudate, persistent. Bracts and bracteoles present. Flowers not nodding. All filaments simple. Ovules 2 per locule; seeds without caruncle, 1–2 per locule.

In Africa 3 species, nrs. 13–15.

13. A. trichocnemis J. GAY **Fig. 17, Map 9.**

A. trichocnemis J. GAY in Ann. Sc. Nat. Bot. Sér. 3, 8, 1847:209; MUNBY 1859:29; REGEL 1875:119; BATTANDIER et TRABUT 1884:154; ibid. 1895:60; MAIRE 1958:271, fig. 903; QUÉZEL et SANTA 1962:210.

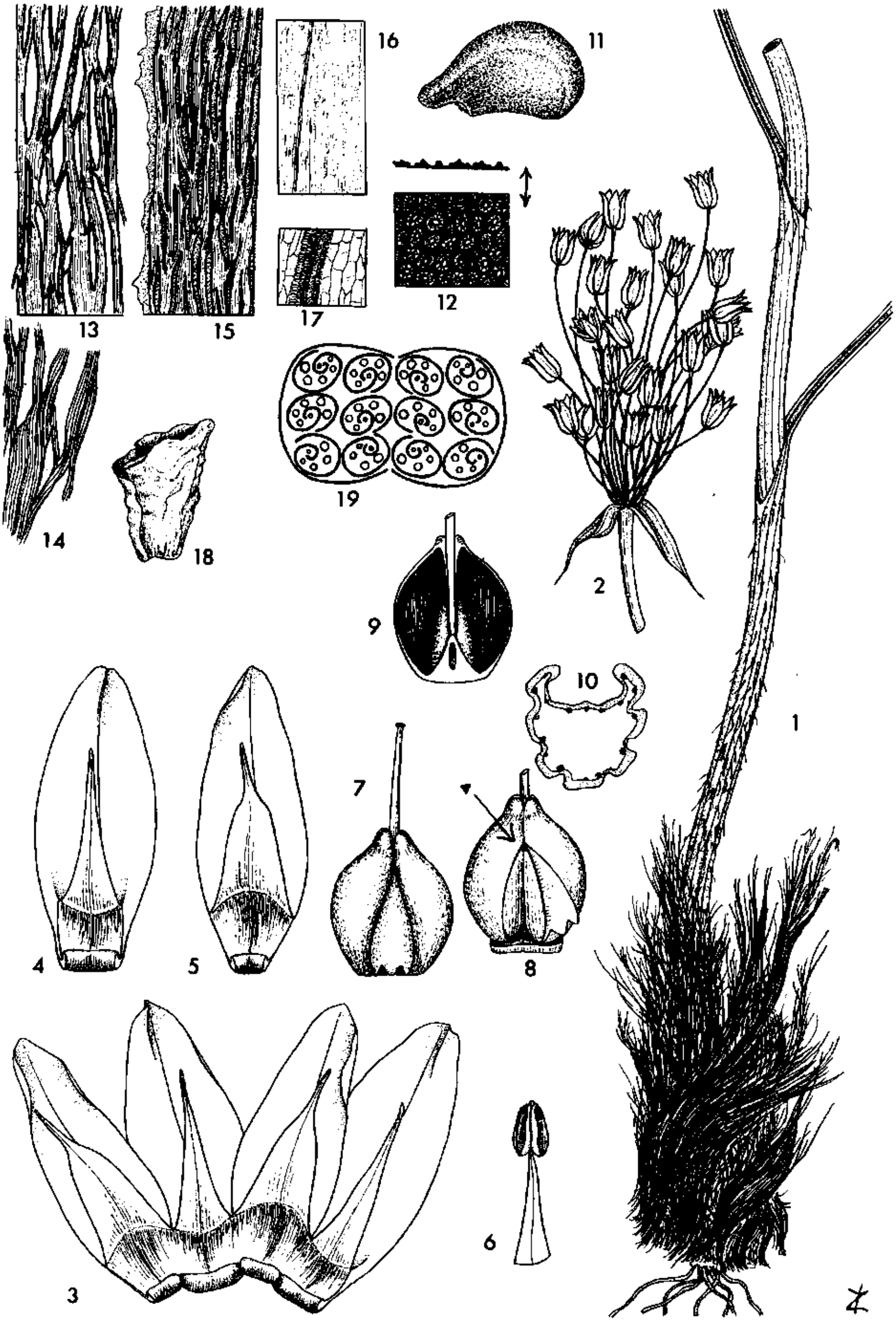
Type: Algeria, Mt. Gouraya, near Bougie, DURIEU DE MAISONNEUVE s.n. (holotype: K).

A. seirotrichum DUCELLIER et MAIRE 1922:23; MAIRE 1958:272, fig. 904; QUÉZEL et SANTA 1962:210.

Type: Algeria, Redjredj near Brazza, July 1921, MAIRE s.n. (not seen); MAIRE s.n., June 1923, cultivated at Alger from bulbs of the type (P).

Bulb ovoid to oblong, 2–4 × 1–2 cm. Roots glabrous, unbranched. Increase bulbs several, in the axils of the fibrous outer bulbcoats, oblong, flattened or hollowed at one side, 9–12 × 5–8 mm, beaked for 1–2 mm, sessile or up to 4 cm stiped, and already provided with roots, wrapped in several bulbcoats of which the two outer broken up into netted fibres. Protective leaves numerous, breaking up into netted fibres, medium brown to orange brown. Sproutleaf one, 2–6 cm, with oblique top, 1–2 mm. *Foliage leaves* 3–6, largely glabrous; blades scattered along scape, terete, or canaliculate, hollow, up to 35 cm long, 2–5 mm wide, glabrous, top acute, apical part soon wilting; sheaths unequal in length, those of upper leaves longest, extending largely above the ground, 7–20 cm long, straw-coloured or tinged purplish, the outer sheaths glabrous or sparingly set with c. 2 mm long grey-white hairs, subterranean part later on

FIG. 17. *Allium trichocnemis*. – 1. Habit of lower part of plant, $\times^2/_3$; 2. inflorescence, $\times^2/_3$; 3. perianth and filaments, partly, ×6; 4–5. outer and inner tepal with corresponding filaments, ×6; 6. stamen, ×6; 7. pistil, note the excretion opening of the nectary hidden by a membrane, ×6; 8. ditto, membrane drawn flapped open, arrow indicates excretion opening of nectary, ×6; 9. longitudinal section of ovary showing nectary at center of base, ×6; 10. transverse section of leaf blade, ×8; 11. seed, lateral view, ×6; 12. detail of testa, seen from above and in profile, ×40; 13–14. details of outer fibrously netted bulbcoat-leaf, ×4 and ×8 resp.; 15. detail of outer bulbcoat-leaf, not yet fibrously netted, ×4; 16–17. details of membranous bulbcoat-leaf, ×4 and ×20 resp.; 18. bract, ×6; 19. diagram of inflorescence, showing the position of spathes, bracts and flowers (circles). (1–19. DURIEU DE MAISONNEUVE s.n., July 1840, Mt. Gouraya, type).



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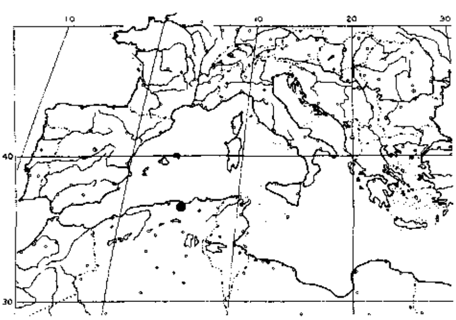
breaking up into netted fibres. Scape 1, exceeding the leaves, erect, terete, solid, glabrous, 25–50 cm long, 1–3.5 mm diam. *Inflorescence* ovoid-ellipsoid, (10–)20–50-flowered, 4–7 cm diam., without bulbils. *Spathes* 2, rather firm, hyaline at base, persistent, oblong to lanceolate, caudate, broadened at base, conspicuously 2–4-nerved, unequal to subequal in length, the shortest 1.5–2 cm long, the longest c. 2.5–2.8 cm long, top acute. Bracteoles 5–12, membranous, 2–3 mm long, each subtending c. 5 flowers. Pedicels very unequal, 1–7 cm, slender, in anthesis straight, in fruit more rigid and longest. *Flowers* sub-urceolate. Tepals 1–1.5 mm adnate to bases of filaments, persistent, usually outward curved towards the top, whitish with a distinct greenish or purplish midvein. Outer tepals ovate to oblong, 7 × 2–3 mm, top obtuse with a minute mucro or not, or retuse; inner tepals slightly shorter and narrower, subobtuse. Stamens shorter than the tepals; filaments simple; outer filaments 4.2–5 mm long, at base 1–1.2 mm wide, connate with inner filaments for 1–1.5 mm; inner filaments as long as outer filaments, at base c. 1.5 mm wide, towards top usually abruptly narrowed, sometimes forming two minute faint blunt teeth. Anthers 1 × 0.6 mm, yellow. Pistil shorter than the tepals; ovary globose-ovoid, 3 × 3 mm, style 1–2 mm, slender, inserted at about one-third from the base of ovary; stigma faintly three-lobed. *Fruits* subglobose, c. 4.5 mm diam. Seeds c. 3.5 × 2 mm, rather flattened, black, with a golden shine.

Habitat. Dry rocky calcareous soil. Altitude 300–600 m. Flowers: June–July.

Distribution. Algeria, apparently endemic.

Algeria: Mt. Gouraya, July 1840, DURIEU DE MAISONNEUVE s.n. (K, type of *A. trichocnemis* J. GAY); Cultivated at Alger from bulbs collected at Redjredj, near Brazza, June 1923, MAIRE s.n. (P, type of *A. seirotrichum* DUCELLIER et MAIRE); Mt. Gouraya, above Saldas, 300–500 m, June 1937, MAIRE s.n. (P); Mt. Gouraya, July 1896, REVERCHON s.n. (G).



MAP 9. Localities of *Allium trichocnemis*.

Notes.

Synonymy. *A. seirotrichum* DUCELLIER et MAIRE. According to the authors this species differs from *A. trichocnemis* mainly by the membranous outer bulbcoat-leaves and by hollow foliage leaves. The specimen MAIRE s.n., cultivated from bulbs taken from the type-collection of *A. seirotrichum* lacks the outer bulbcoat-leaves, but small remnants of the fibrously netted outer bulbcoat-leaves and impressions of these latter on the main bulb are present. Furthermore, contrary to the statement of DUCELLIER and MAIRE, the leaves in the type specimen of *A. trichocnemis* are hollow, not flat.

Resembling species. *A. trichocnemis* resembles both *A. ascalonicum* and *A. cupani* especially because of the fibrous and netted outer bulbcoats and the seeds with a golden shine. *A. ascalonicum* is distinct by its single spathe and by the tricuspidate inner filaments; *A. cupani* differs by having also a single spathe, and by only 2 bracteoles in the inflorescence, and by all filaments simple and gradually tapering.

Taxonomy. The inner filaments were formerly several times described as shortly tricuspidate. I have examined various flowers of the only three existing collections, including the type-specimen, and found the inner filaments merely as abruptly contracted in the apical part.

Because of the shape of the inner filaments, in my opinion formerly often excessively described as tricuspidate, the accomodation of this species in a section has caused some confusion; it was placed by GAY, l.c., in sect. *Schoenoprasum*, by BATTANDIER et TRABUT (1884) in sect. *Codonoprasum*, and again by BATTANDIER et TRABUT (1895) in sect. *Porrum*. In the present revision I have placed it tentatively in sect. *Codonoprasum* as well, but a definite decision should await additional evidence regarding the sectional delimitation of the whole genus.

The flower colour is described by GAY, l.c., as flesh-coloured, pink, or pale pink.

14. A. paniculatum L. — Fig. 18, Map 10.

A. paniculatum L., Syst. Nat., ed. 10, 1759:978; ibid. 1762:428; DESFONTAINES 1798:289; VIVIANI 1824:19; GUSSONE 1842:396; KUNTH 1843:406; MUNBY 1847:35; BALL 1878:691; BOISSIER 1882:259; BATTANDIER et TRABUT 1895:60; HALÁCSY 1904:255; LINDBERG 1932:33; MARKGRAF in HAYEK 1932:59; DINSMORE in POST 1933:640; RECHINGER F. 1943:719; MAIRE 1958:278, fig. 908; NÈGRE 1961:122, fig. 17a, b, c; PALHINHA 1966:136; DE WILDE-DUYFJES 1973:75.

A. paniculatum var. *typicum* REGEL 1875:191; QUÉZEL et SANTA 1962:212 (emend. VINDT 1953:121); *A. paniculatum* subsp. *intermedium* var. *typicum* ASCHERSON et GRAEBNER 1905:139; BRIQUET 1910:295; JAHANDIEZ et MAIRE 1931:123; VINDT 1953:121 (emend., incl. subvar. *purpureum*, f. *genuinum*, f.

grandiflorum, and subvar. *pallens*); *A. paniculatum* subsp. *obtusiflorum* var. *typicum* CUÉNOD 1954:213; MAIRE 1958:280.
Type: LINN 419.21, right specimen.

A. pallens L. 1, 1762:427; DESFONTAINES 1798:290; J. GAY 1847:196; MUNBY 1847:35; BALL 1878:690; BATTANDIER et TRABUT 1884:153; ibid. 1895: 59; BONNET et BARRATTE 1896:411; DURAND et BARRATTE 1910:233; PAMPANINI 1931:153; DE WILDE-DUYFJES 1973:74.

A. paniculatum var. *pallens* GRENIER et GODRON 1855:209; MUNBY 1859:29; ibid. 1866:32; BOISSIER 1882:260; MUSCHLER 1912:215; DINSMORE in POST 1933:640; *A. paniculatum* subsp. *pallens* RICHTER 1890:207; *A. paniculatum* subsp. *intermedium* var. *pallens* ASCHERSON et GRAEBNER 1905:140; BRIQUET 1910:296; JAHANDIEZ et MAIRE 1931:123; EMBERGER et MAIRE 1941:956; *A. paniculatum* subsp. *obtusiflorum* var. *pallens* CUÉNOD 1954:213; MAIRE 1958: 280.
Lectotype: S 139.9 (Linnean Herbarium Stockholm).

A. desertorum FORSKÅL 1775:72; BARBEY C. et W. 1882:162; BOISSIER 1882: 267; MUSCHLER 1912:216; DINSMORE in POST 1933:641; FEINBRUN 1948:155; TÄCKHOLM et DRAR 1954:74; TÄCKHOLM 1974:652; KOLLMANN 1975:439.
Type: Egypt, in desertis Kâhirinis, FORSKÅL s.n. (holotype: C, seen from I.D.C. microfiches; isotypes: C, M).

A. obtusiflorum DC. in REDOUTÉ 2, 1805: tab. 118.
A. paniculatum subsp. *obtusiflorum* BRAND in KOCH 1907:2493; CUÉNOD 1954:213; MAIRE 1958:279.
Type: Italy, originally from Sicily, cultivated in the botanical garden at Paris (lectotype: tabula 118 in DC. in REDOUTÉ 2, 1805).

A. fuscum WALDSTEIN et KITAIBEL 1807:267, tab. 241.
A. paniculatum var. *fuscum* BOISSIER 1882:260; QUÉZEL et SANTA 1962:212; *A. paniculatum* subsp. *intermedium* var. *fuscum* ASCHERSON et GRAEBNER 1905: 140; JAHANDIEZ et MAIRE 1931:123; VINDT 1953:122; *A. paniculatum* subsp. *obtusiflorum* var. *fuscum* MAIRE 1958:281.
Type: Banatus (not seen). According to STEARN (1965) Banatus or Banat is the former Austro-Hungarian Crownland, roughly 20°–23° E, 45°–46° N, Romania.

A. montanum SMITH 1809:225, non SCHMIDT; ibid. 1823:17, tab. 319; BOISSIER 1882:261.
Type: Greece, in herbidis Olympi Bithyni (not seen).

A. longispathum REDOUTÉ 6, 1811:316; KUNTH 1843:407.
A. paniculatum var. *longispathum* REGEL 1875:193; *A. paniculatum* subsp. *longispathum* RICHTER 1890:207; *A. paniculatum* subsp. *intermedium* var.

longispathum ASCHERSON et GRAEBNER 1905:141 (incl. subvar. *dentiferum*); JAHANDIEZ et MAIRE 1934:869; EMBERGER et MAIRE 1941:956; VINDT 1953: 122; *A. paniculatum* subsp. *obtusiflorum* var. *longispathum* MAIRE 1958:281.
Type: France, Nantes and Bordeaux (lectotype: FI. in Herb. WEBB ex Herb. DESFONTAINES).

A. tenuiflorum TENORE 1811:165; GUSSONE 1842:396; KUNTH 1843:409.
A. paniculatum var. *tenuiflorum* REGEL 1875:194; BALL 1878:691; *A. paniculatum* subsp. *tenuiflorum* RICHTER 1890:207; ASCHERSON et GRAEBNER 1905:142; BRIQUET 1910:296; JAHANDIEZ et MAIRE 1931:123; ibid. 1934:869; VINDT 1953:124; MAIRE 1958:279; *A. paniculatum* subsp. *tenuiflorum* var. *tenoreanum* MAIRE et WEILLER in MAIRE 1958:279.
Type: Italy, Castella Mare, TENORE s.n. (holotype: FI).

A. intermedium DE CANDOLLE 1815:318.
A. paniculatum subsp. *intermedium* ASCHERSON et GRAEBNER 1905:139; VINDT 1953:121.
Type: Canary Islands, Tenerife (isotype: in Herb. WEBB, K).

A. coppoleri TINEO 1827:275; PAMPANINI 1931:153; TÄCKHOLM et DRAR 1954:72; TÄCKHOLM 1974:652.
A. pallens var. *coppoleri* PARLATORE 1852:550; BATTANDIER et TRABUT 1895:59; DURAND et BARRATTE 1910:233; PAMPANINI 1917:126.
Type: Italy, Sicily, near Palermo, TINEO s.n. (not seen).

A. pallens var. *purpureum* BOISSIER 1841:615; WILLKOMM et LANGE 1862:207.
Syntypes: Spain, near Estepona, BOISSIER s.n. (not seen); & near Coin, BOISSIER s.n. (not seen); & Mt. Trevenque, BOISSIER s.n. (not seen).

A. myrianthum BOISSIER 1844:59; REGEL 1875:203; BOISSIER 1882:257; DURAND et BARRATTE 1910:233; PAMPANINI 1931:153; TÄCKHOLM et DRAR 1954:71; MAIRE 1958:282, fig. 909; TÄCKHOLM 1974:650.
Type: Northern Syria, Hierapolis, near Nozlibazar, June 1842, BOISSIER s.n. (isotype: FI).

A. fontanesii J. GAY 1847:209; BATTANDIER et TRABUT 1884:154; ib. 1895:60.
Syntypes: Algeria, DESFONTAINES s.n. (not seen); & near Tiaret, DELESTRE s.n. (not seen).

A. dentiferum WEBB et BERTHELOT 3, 1848:345, tab. 234.
A. pallens var. *dentiferum* J. GAY 1847:201; *A. paniculatum* subsp. *obtusiflorum* var. *dentiferum* MAIRE 1858:281.
Syntypes: Canary Islands, La Palma, 27 July 1845, DESPRÉAUX s.n. (lectotype: FI, in Herb. WEBB); & Tenerife, 7 July 1845, BOURGEAU 1000 (BM, FI, K); & 7 July 1845, BOURGEAU 1003 (BM, FI, K).

A. chloranthum BOISSIER 1854:33; ibid. 1882:260; FEINBRUN 1948:153.
Type: N. Syria, Mt. Cassius, June 1846, likely not extant, or possibly an unnumbered specimen in the BOISSIER herbarium without indication.

A. modestum BOISSIER 1854:33; ibid. 1882:261; DINSMORE in POST 1933:640; FEINBRUN 1948:155; TÄCKHOLM et DRAR 1954:640; TÄCKHOLM 1974:652; KOLLMANN 1975:437.
Type: Palestinean Desert, Gaza strip, April 1846, BOISSIER s.n. (not seen).

A. stamineum BOISSIER 1859:119; REGEL 1875:195; BOISSIER 1882:256; OPPENHEIMER 1930:277; DINSMORE in POST 1933:639; FEINBRUN 1948:153; TÄCKHOLM et DRAR 1954:71; TÄCKHOLM 1974:650.
Syntypes: Greece, Laconia, DE HELDREICH 202 (not seen); Turkey, Carid, 1843, PINARD s.n. (lectotype: G; isolectotype: FI); & Lydia near Smyrna, BOISSIER s.n. (G); & Cilicia, BALANSA 813 (G); Syria, KOTSCHY 234 (FI); Lebanon, KOTSCHY (not seen); & GAILLARDOT (not seen); Northern Persia, AUCHER 5387 (not seen).

A. pugeti GANDOGER 1875:216.
Type: France, various localities (near Villefranche, Pommiers, Gleizé etc., not seen).

A. flavum L. var. *tauricum* auct. non KUNTH: BALL 1878:690; BATTANDIER et TRABUT 1884:154; *A. tauricum* auct. non KUNTH: BATT. et TRABUT 1895:60.
No authentic material seen.

A. achaium BOISSIER et ORPHANIDES in BOISSIER 1882:259.
Type: Greece, in Monte Klokos Achaiae prope Vostitza, ORPHANIDES 427 (holotype: G; isotype: WAG).

A. oleraceum auct. non L.: BATTANDIER et TRABUT 1884:154.
No authentic material seen.

A. flavum auct. non L.: BATTANDIER et TRABUT 1895:60; QUÉZEL et SANTA 1962:212.
No authentic material seen.

A. tenuiflorum TENORE var. *pseudotenuiflorum* PAMPANINI 1914:13; ibid. 1914:48.
A. paniculatum subsp. *tenuiflorum* var. *pseudotenuiflorum* MAIRE 1958:279.
Syntypes: Libya, Mesellata, 12 April 1913, PAMPANINI 2968 (lectotype: FI); & Tarhuna, PAMPANINI 2420 (FI); & Mesellata, PAMPANINI 3157 (FI); & 3350 (FI); & Garian, PAMPANINI 3911 (FI); & 3990 (FI); & 4173 (FI).

A. flavum L. subsp. *ionochlorum* MAIRE 1916:277; ibid. 1921:52; JAHANDIEZ

et MAIRE 1931:124; VINDT 1953:114; MAIRE 1958:276.
Type: Algeria, Atlas de Blida, 22 July 1914, MAIRE s.n. (isotypes: G, P).

A. paniculatum subsp. *breviscapum* LITARDIÈRE et MAIRE 1924:21; JAHANDIEZ et MAIRE 1931:123; EMBERGER et MAIRE 1941:956; VINDT 1953:123.
A. paniculatum subsp. *obtusiflorum* var. *breviscapum* MAIRE 1958:279.
Type: Morocco, Great Atlas, Mt. Tachdirt, in Herb. DE LITARDIÈRE (not seen).

A. stamineum BOISSIER var. *nigro-pedunculatum* OPPENHEIMER 1930:277, fig. II.
Type: not indicated.

A. paniculatum subsp. *intermedium* var. *rifanum* MAIRE 1931:317, no. 1144; JAHANDIEZ et MAIRE 1931:123; ibid. 1934:869; EMBERGER et MAIRE 1941:956; VINDT 1953:122 (incl. subvar. *excedens* and subvar. *mauritii*).
A. paniculatum subsp. *obtusiflorum* var. *rifanum* MAIRE 1958:281; *A. paniculatum* var. *rifanum* QUÉZEL et SANTA 1962:212.
Type: Morocco, Souk-el-Had Rouadi, FONT QUER et MAIRE s.n. (holotype: MPU).

A. antiatlanticum EMBERGER et MAIRE 1932:217, no. 1340.
A. paniculatum subsp. *antiatlanticum* MAIRE et WEILLER in JAHANDIEZ et MAIRE 1941:956; VINDT 1953:124; MAIRE 1958:281.
Syntypes: Morocco, near Içafen, 1200–1400 m alt., EMBERGER et MAIRE s.n. (lectotype: MPU); & Mt. Fidoust, 2000–2200 m alt., EMBERGER et MAIRE s.n. (not seen).

A. paniculatum var. *excedens* LINDBERG 1932:33.
Type: Morocco, Great Atlas, Djebel Amsitten near Tis Rarin, LINDBERG s.n. (not seen).

A. pictistamineum O. SCHWARZ 1934:72.
Syntypes: Turkey, Lydia, Burnova, SCHWARZ 695 (B); & Mt. Sipuli, SCHWARZ 696 (lectotype: B).

A. paniculatum var. *grandiflorum* MAIRE et WEILLER in MAIRE 1934:319, no. 1721; EMBERGER et MAIRE 1941:956.
A. paniculatum subsp. *obtusiflorum* var. *grandiflorum* MAIRE 1958:280.
Type: Morocco, Larache (El Araix), FONT QUER 128 (holotype: G; isotypes: B, BM).

A. paniculatum subsp. *intermedium* var. *brachyspathum* FAURE et MAIRE 1935:230, no. 1914; EMBERGER et MAIRE 1941:956; VINDT 1953:122.

A. paniculatum subsp. *obtusiflorum* var. *brachyspathum* MAIRE 1958:280; *A. paniculatum* var. *brachyspathum* QUÉZEL et SANTA 1962:212.

Type: Algeria, near Oran and Aïn-Sefra, FAURE s.n. (holotype: MPU; isotype: P).

A. paniculatum var. *stenanthum* MAIRE 1939:366, no. 3074–bis.

A. paniculatum subsp. *obtusiflorum* var. *stenanthum* MAIRE 1958:281.

Type: Algeria, Aurès, Mt. Faraoun, MAIRE s.n. (holotype: MPU).

A. paniculatum subsp. *mauritii* MAIRE et SENNEN 1932:216, no. 1339; JAHANDIEZ et MAIRE 1934:869; EMBERGER et MAIRE 1941:956.

A. paniculatum subsp. *obtusiflorum* var. *mauritii* MAIRE 1958:280; VINDT 1953:122 (as subvar.).

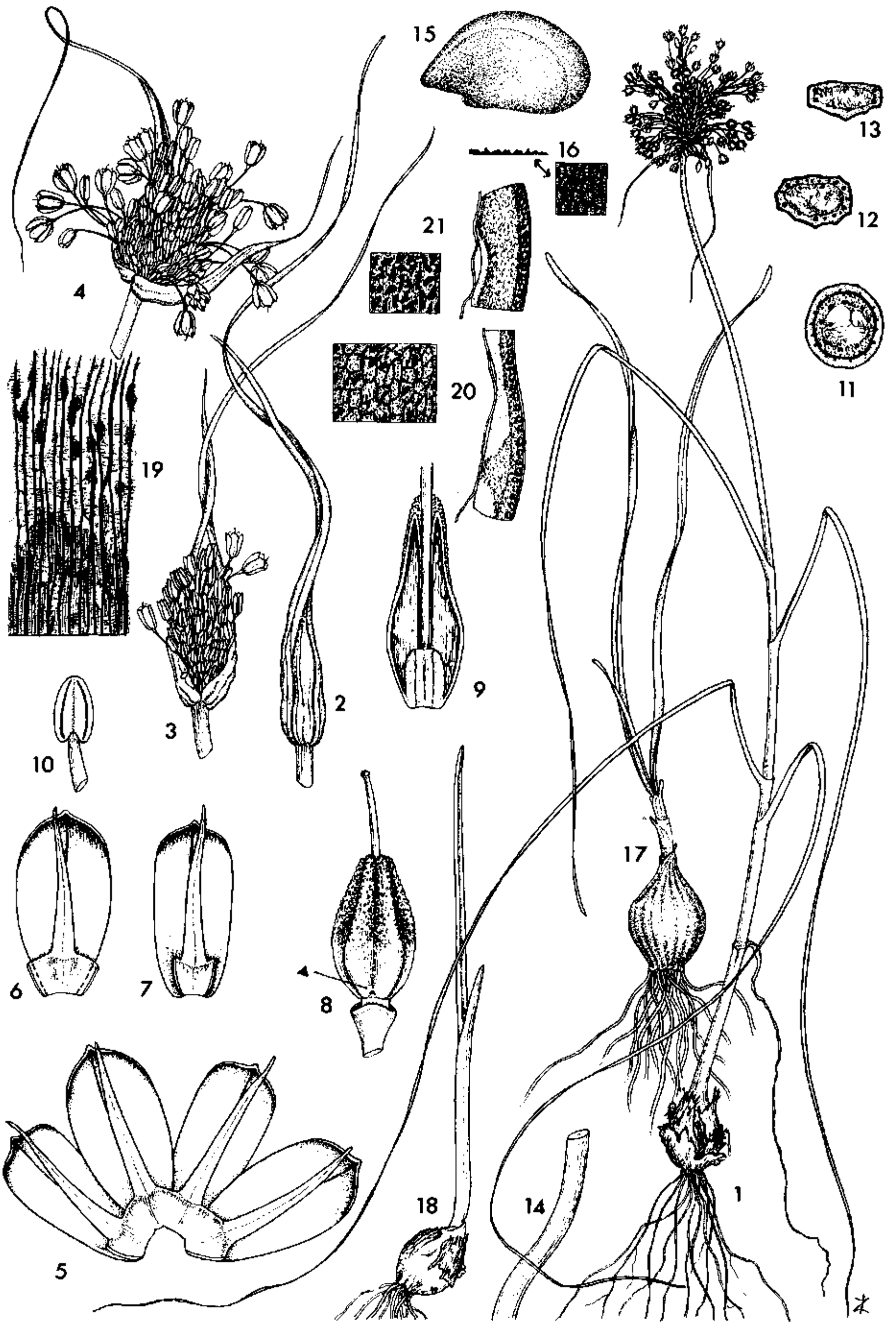
Type: Morocco, near Dar Drious, June 1931, SENNEN et MAURICIO s.n. (holotype: MPU; isotype: BM).

A. valdecallosum MAIRE et WEILLER in MAIRE 1940:43, no. 3230; EMBERGER et MAIRE 1941:956; VINDT 1953:114; MAIRE 1958:277, fig. 907.

Type: Morocco, Todgha, Great Atlas, MAIRE et WEILLER 464 (holotype: MPU).

Bulb subglobose, ovoid, or ellipsoid, 10–35 × 8–25 mm. Roots glabrous, unbranched. Increase bulbs absent or 1–8, globose to ellipsoid to oblong, 5–25 × 2–8 mm, sometimes flattened or hollowed at one side, apical part longly attenuate, sessile or stiped up to 25 mm, wrapped in a firm whitish or straw-coloured prophyll. Protective bulbcoat-leaves 2–6, thin, outer surface greyish to dark brown or blackish, inner surface dull, greyish, more or less tending to break up into weak fibres. Sproutleaves 1(–2), soon wilting or not, unequal in length, 1–5.5 cm long, sometimes the upper provided with a 2–15 mm long blade which emerges above ground. *Foliage leaves* 4–6, glabrous, or minutely crenulate or denticulate on the coarser nerves, blades scattered along scape, terete or semi-terete, hollow, 5–35 cm × 1–3(–4) mm, top acute, the

FIG. 18. *Allium paniculatum*. – 1. Habit, ×$^{1}/_{3}$; 2. two spathes enclosing immature inflorescence, ×$^{2}/_{3}$; 3. ditto, 2 spathes surrounding expanding inflorescence, ×$^{2}/_{3}$; 4. ditto, inflorescence in anthesis, ×$^{2}/_{3}$; 5. perianth and filaments, partly, ×6; 6–7. inner and outer tepal with corresponding filaments, ×6; 8. pistil, arrow indicates excretion opening of nectary, ×6; 9. longitudinal section of ovary, ×8; 10. anther, inner view, ×8; 11. transverse section of lower part of scape, ×4; 12. transverse section of lower part of leaf blade, ×4; 13. ditto of upper part, ×4; 14. piece of smooth root, ×6; 15. seed, lateral view, ×6; 16. detail of testa, seen from above and in profile, ×40; 17. young plant showing two sproutleaves above the bulb, ×$^{2}/_{3}$; 18. young plant showing one sproutleaf, ×$^{2}/_{3}$; 19. detail of thin and subfibrous outer bulbcoat-leaf, outer view, ×8; 20. detail of thicker second bulbcoat-leaf, outer view and in longitudinal section, ×8; 21. detail of third, fleshy bulbcoat-leaf, outer view and in longitudinal section, ×8. (1–11, 14–17, 19–21. VAN DER MAESEN 1520; 12–13, 18. VAN DER MAESEN 1523).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JAHANDIEZ 628 bis (G); Bekrit, June 1924, 1850 m, JAHANDIEZ 744 (G); Great Atlas, Ouenkrim, 2700 m, July 1924, MAIRE s.n. (MPU); Great Atlas, Ras Moulay Ali, 3000 m, August 1933, Herb. MAIRE s.n. (MPU); Great Atlas, Todgha, 1500 m, MAIRE c.s. 464 (MPU, type of *A. valdecallosum* MAIRE et WEILLER); Hidum, calcareous rocks, July 1934, MAURICIO 9586 (BM); Casablanca, sands. May 1913, PITARD 1415 (K); Hadid, REIN c.s. 385 (K); Tanger, Jan. 1916, ROFFEY s.n. (BM); Dar Drius (= Dar Driouch), June 1931, SENNEN c.s. s.n. (BM, MPU, type of *A. paniculatum* subsp. *mauritii* MAIRE et SENNEN); Beni Seddat, 1650 m, June 1931, SENNEN c.s. s.n. (BM); Beni-Bu-Gshi, waste fields, June 1932, SENNEN c.s. s.n. (BM); Metalsa, May 1933, SENNEN c.s. s.n. (BM); Zaio, cultivated fields, April 1934, SENNEN c.s. s.n. (BM); Segangan, June 1934, SENNEN c.s. s.n. (BM); Melilla, Mt. Gourougou, June 1934, SENNEN c.s. s.n. (MPU); near Tanger, Herb. WEBB s.n. (FI); SW of Rabat, dry stony streambed, May 1961, DE WILDE c.s. 2324 (BM, L, WAG); Bab-Bou-Idir-Tazza, June 1961, DE WILDE c.s. 2962 A (WAG).

ALGERIA: Djebel Santo, near Oran, scrub, June 1918, D'ALLEIZETTE s.n. (G); near Arzew, ALSTON c.s. 37808 (BM); Mostaganem, waste fields, April 1851, BALANSA 42 (BM, FI, G, K); E. of Oran, sands, June 1852, BALANSA 227 (BM, FI, K, WAG); Alger, BELANGER s.n. (G); Alger, fields, June 1837, BOVÉ s.n. (FI, K); La Calle, near the sea, June 1839, BOVÉ s.n. (L): Boghari, rocks, July 1872, CHABERT s.n. (FI); between El Abiod and Sidi Cheikh, sands, May 1899, CHEVALLIER 372 (G, P); near Constantine, May 1857, CHOULETTE 283 (BM, K); La Calle, scrub, June 1918, CLAVÉ 3850 (G); Tlemcen, June 1872, Herb. COURCIÈRE s.n. (MPU); Maison Carrée, June 1873, Herb. COURCIÈRE s.n. (MPU); Hammam-Bou-Hadjar, June 1880, DEBEAUX s.n. p.p. (G); Djebel Santo, June 1883, DEBEAUX s.n. (G); between Etélata and Akbou, June 1875, DUHAMEL s.n. (G); Alger, May 1853, DURANDO s.n. (G); Maison Carrée, June 1853, DURANDO s.n. (G); near Aïn-Sefra, rocky meadows, 1100 m, May 1934, FAURE s.n. (MPU, P, type of *A. paniculatum* var. *brachyspathum* FAURE et MAIRE); near Constantine, June 1888, GIROD 19 a (G); Oued Sarno, May 1937, HENRY s.n. (MPU); near Aïn Sefra, May 1901, HOCHREUTINER 276 (G); near Biskra, fields, June 1852, JAMIN s.n. (FI, G, K); Blidah, May 1861, LEFEBVRE s.n. (BM); 45 km W. of Bougie, Sept. 1971, V. D. MAESEN 1520 (WAG); Atlas de Blidah, 22 July 1914, MAIRE s.n. (G, P, type of *A. flavum* L. ssp. *ionochlorum* MAIRE); near Aïn Mimoun, 1300 m, Maire s.n., (MPU, type of *A. paniculatum* var. *stenanthum* MAIRE); Oran, MUNBY s.n. (G, MPU); Tlemcen, MUNBY s.n. (K); Sidi Mecid sandy stony fields, June 1869, PARIS 379 (B, BM, G); near Bougie, 600 m, REVERCHON 150 (G); near Bône, STEINHEIL s.n. (G); near Figuig, May 1934, WEILLER 549.34 (MPU).

TUNISIA: Oudna, June 1905, CUÉNOD s.n. (G); Nabeul, Oct. 1907, GANDOGER 95 (G, K); near Zaghouan, hills, 9 & 19 July 1854, KRALIK 141 & s.n. (BM, FI, G, K); near Laghouat, April 1883, LETOURNEUX s.n. (G); Saida, field, Sept 1971, V. D. MAESEN 1523 (WAG).

LIBYA: Uadi el-Atrun, May 1934, PAMPANINI c.s. 1376 (FI); Tarhuna, Uadi Ksea, April 1913, PAMPANINI 2420 (FI); Mesellata, NW. of Cussabat, hills, April 1913, PAMPANINI 2968 (FI, type of *A. tenuiflorum* TENORE var. *pseudotenuiflorum* PAMPANINI); & near Sliten, April 1913, PAMPANINI 3157 (FI); & near Gherrim, April 1913, PAMPANINI 3350 (FI); Uadi Garian, April 1913, PAMPANINI 3911 (FI); Ras Bu Ganus, April 1913, PAMPANINI 3990 (FI); Uadi el Arbaa, near Tebedut, May 1913, PAMPANINI 4173 (FI); Kasr Daun, limestone rocks, April 1939, SANDWITH 2744 (K); Bardia, March 1937, SERVIZI AGRARI CIRENAICA 101 (FI); Uadi Derna, March 1937, SERVIZI AGRARI CIRENAICA 131 (FI).

EGYPT: N. Sinai, Wadi El Uaghara, April 1959, BOULOS 262? (CAIM); near Cairo, April 1888, DEFLERS s.n. (MPU); Wadi el Hagg, April 1892, DEFLERS s.n. (MPU); s.l. with inscription 'Alipso Forskhålio videtur', FORSKÅL s.n. (M, type of *A. desertorum* FORSKÅL); Burg el Arab, sands, April 1935, KHATTAB 6626 (CAIM); & ibid. May 1956, KHATTAB s.n. (CAIM); petrified forest, near Cairo, April 1904, KELLER 10 (BM); s.l. March 1906, MUSCHLER s.n. (K); Sinai, Mt. St. Catharinae, July 1835, SCHIMPER 258(FI, M); Wadi chafura, April 1887, SCHWEINFURTH s.n. (BM, MPU); Mariut, May 1890, SCHWEINFURTH 318 (G); E. to Suez Road, km 18, March 1945, SHABETAI Z 7479 and Z 6344 (CAIM); above Wadi Rasheed, 330 m, April 1922, SIMPSON 1075 (CAIM); Gebel el Nasûri, S. of Suez Road, hard sand amongst rocks, April 1924, SIMPSON 2778 (CAIM); Burg el Arab, rocky ground, April 1925, SIMPSON 3005 (CAIM); Bahig Quarry, April 1925, SIMPSON 3279 (CAIM).

PORTUGAL: Between Covilhã and Fundão, FERNANDES c.s. 6828 (FI); Coimbra, MATOS c.s. s.n. (FI); between Portimão and Monchique, August 1966, MERXMÜLLER c.s. 21772 (M); between Seixal and Azeitão, June 1851, WELWITSCH 379 (FI).

SPAIN: near Ronda, July 1849, BOURGEAU 481 (FI); near Murcia, dry slopes, June 1852, BOURGEAU 1677 (FI, WAG); near Alcaraz, 700–800 m, June 1891, PORTA c.s. 299 (M); near Malaga, 1826–1828, WEBB s.n. (FI).

FRANCE: Pommiers, 1876, GANDOGER s.n. (FI); Nantes, July 1868, GENEVIER s.n. (C); near Lyon, fields, July 1851, MARTIN s.n. (FI, WAG); near Bordeaux, MERAT s.n. (FI); s.l., REDOUTÉ s.n. (FI, ex Herb. DESFONTAINES, ex Herb. WEBB, type of *A. longispathum* REDOUTÉ); St. Florent, July 1956, SEGAL 247 (WAG); Toulon, WEBB s.n. (FI).

CORSICA: Bastia, sands, REQUIEN s.n. (FI); Ajaccio & Bonifacio, REQUIEN s.n. (FI).

SICILY: near Troina, July 1855, HUET DU PAVILLON s.n. (WAG); near Partinico, 1841, PARLATORE s.n. (FI).

ITALY, many collections: Pisa, ex Herb. DESFONTAINES s.n. (FI); above Castellamare, July 1855, HUET DU PAVILLON s.n. (MPU); Veglia, Sept. 1839, NOË 34 (FI); Calabria, near S. Donato, August 1898, RIGO 531 (B); & ibid., RIGO 538 (B); Castella Mare, TENORE s.n. (FI, type of *A. tenuiflorum* TENORE).

YUGOSLAVIA, GREECE, ROMANIA, HUNGARY, RUSSIA: Thermae of Herkulis, Banat, Sept. 1889, DE DEGEN s.n. (FI); Rhodos, Mt. Profeta, Oct. 1944, FINKE s.n. (M); Pest, Oct., FRIS-VALSZKI s.n. (FI); River Don, 'GERBER 14 Tanais' (LINN 419.21, type of *A. paniculatum* L.); Macedonia, Mt. Khertadj, June 1891, NADJI s.n. (G); & Mt. Corfiati, July 1857, ORPHANIDES 835 (G); Mt. Klokos, near Vostitza, 1330 m, July 1855, ORPHANIDES 427 (G, WAG, type of *A. achaium* BOISSIER et ORPHANIDES); Split, PETTER 13 (WAG).

TURKEY: Anatolia, near Tokat, August 1892, GIRARD DE CÉSARÉE in BOISSIER s.n. (G); Caria, PINARD s.n. (G, Herb. BOISSIER, type of *A. stamineum* BOISSIER); Smyrna (= Izmir), Mt Sipuli, calcareous rocks, June 1933, O. SCHWARZ 696 (B, type of *A. pictistamineum* O. SCHWARZ); near Tasch-Kainadan, June 1892, SINTENIS 4544 (G).

NEAR EAST: ANONYMOUS s.n. (S. 139.9, type of *A. pallens* L.).

SYRIA: near Nozlibazar (ancient town in N. Syria), June 1842, BOISSIER s.n. (FI, type of *A. myrianthum* BOISSIER); Jebel Barûk, 1890, POST 143 (G).

IRAQ: near Kirkük, desert, May 1893, BORNMÜLLER 1866 (G).

IRAN: S. Lorestan-Sheshom, 33° 11. N. 47° 43. E., rocky slope with mixed vegetation, June 1963, JACOBS 6798 (L).

LEBANON: SE. of Beiruth, 800–900 m, July 1880, SCHWEINFURTH 118 (G).

ISRAEL: near Ashkelon, May 1897, BORNMÜLLER 1547 (G); between Jappen (= Jaffa) and Ramleh, May 1884, LETOURNEUX s.n. (G); Ain Karim, fields, June 1913, MEYERS B 64 (K); Ramleh, ROTH cat. no. 431 (FI, M).

Notes.

Delimitation of the species. The type specimen of *A. paniculatum* originates from SW. Russia (see DE WILDE-DUYFJES 1973:75). Already LINNAEUS recorded it for a large area, including Siberia, Austria, Italy, and the Orient, and the species as presently conceived has an extremely wide distribution. Morphologically it contains a very wide range of forms, the variability being especially wide as regards habit, the lengths of the spathes, the shape of the inflorescence, and the shape and the morphology of certain floral organs. Over thirty names at species- or lower level have merged into the present large and complex species. As a matter of fact a number of varieties or forms can be more or less clearly distinguished in certain restricted areas, but, judging from the whole of the evidence, I have deliberately refrained from accepting infraspecific taxa, as it appears to me that a delimination on the lower levels based on our present knowledge and collections is unwarranted. Possibly, cytotaxonomic caryology of *A. paniculatum*, KOLLMANN (1973) tentatively accepts for Israel but one single species, apparently including the present synonyms *A. chloranthum*, *A. stamineum*, and others, as she writes for Israel: '*Allium paniculatum* L. (sect. *Codonoprasum*) is found in Israel mainly in rocky habitats, from the Golan Heights in the north to the Judean Hills and Judean Desert in the south. Populations from different regions vary greatly in shape of inflorescence, length of pedicels, shape and colour of flower, shape of tepals; several infraspecific taxa will probably be distinghuished in this species at a later date.'

A. pugeti GANDOGER. I have not seen the type specimen of *A. pugeti* GANDOGER 1875, but a specimen from the type locality, Pommier, collected by GANDOGER in 1876 is *A. paniculatum*.

A. flavum auct. non L. I have not found african specimens of true *A. flavum* which occurs in S. and E. Europe. Records of *A. flavum* in african literature can be assembled with *A. paniculatum*. The type specimen of the subspecies *ionochlorum* MAIRE has exserted filaments, but this character is not exceptional.

All subspecific entities by MAIRE C.S., as there are subsp. *breviscapum* var. *rifanum*, subsp. *antiatlanticum* (*A. antiatlanticum* EMBERGER et MAIRE), subsp. *mauritii* var. *excedens*, var. *grandiflorum*, var. *brachyspathum*, and var. *stenanthum*, have been placed in the synonymy by reason already largely pointed out earlier.

A. antiatlanticum, from Morocco, has thread-like leaves, rough at the base, and spathes very long and leaf-like, the flowers white with exserted stamens.

A. valdecallosum MAIRE et WEILLER. This is described as an endemic species from Morocco, and is mainly characterized by hard tepals, 5–6 mm long. I have seen the type specimen in MPU.

Allied and resembling species. *A. oleraceum* L. (1753, type specimen from Sweden; holotype: LINN 419. 22 '19 *oleraceum*'), *A. carinatum* L. (1753, no specimen in LINN or S; lectotype: LOBEL Icones 1581, fig. 156), and *A. flavum* L. (1753) are doubtlessly very closely related to *A. paniculatum*. It is stressed here that especially *A. oleraceum* is very close to *A. paniculatum* indeed, and I have considered the desirability of the fusion of both, *A. oleraceum* being the oldest name. In fact the only clear-cut character between both appears to me the presence of bulbils in the inflorescence in *A. oleraceum*; its flowers are relatively large, 5–8 mm long. *A. oleraceum* has a large distributional area in Europe, reaching far to the North and East. Already BATTANDIER and TRABUT (1895:60) mention the similarity of *A. oleraceum* and *A. paniculatum*.

A. carinatum has flat leaves, and is usually provided with bulbils in the inflorescence, the leaves are slightly crenulate at the margin, the stamens are equalling the tepals or shorter. Except for the flat leaves it is almost identical with *A. oleraceum*. It has a wide distributional area in Europe.

A. flavum occurs in S., Central, and eastern Europe. It is a rather coarse sometimes glaucous plant, with bright yellow flowers and longly exserted stamens.

A. pulchellum G. DON 1832:46, described from Russia has bright pinkish-purple flowers, and longly exserted stamens. It is cultivated as an ornamental, and doubtlessly belongs in the close alliance of *A. paniculatum*.

Caryology. For representatives of the *A. paniculatum*-complex in Israel the somatic chromosome numbers were counted in 22 plants from various localities by KOLLMANN (1973). She found in the majority 2n=16, and only a few appeared triploid with 3n=24.

15. A. cupani RAFINESQUE **Fig. 19, Map 11.**

A. cupani RAFINESQUE, Caratteri di alcuni nuovi della Sicilia 1810:86; GUSSONE 1842:396; KUNTH 1843:412; GAY 1847:211; MUNBY 1866:33; REGEL 1875:123; BOISSIER 1882:265; BATTANDIER et TRABUT 1884:153; RICHTER 1890:203; BATTANDIER et TRABUT 1895:59; BONNET et BARRATTE 1896: 412; FIORI et PAOLETTI 1896:198; HOLMBOE 1914:46; MARKGRAF in HAYEK 1932:48; RECHINGER FIL. 1943:717; QUÉZEL et SANTA 1962:210.

A. montanum SMITH var. *subunivalve* TENORE 3, 1824–1829:367; *A. cupani* var. *typicum* HALÁCSY 1904:253; JAHANDIEZ et MAIRE 1931:123; CUÉNOD 1954:213; MAIRE 1958:274; *A. cupani* forma *typicum* VINDT 1953:120.

Syntypes: Sicily, Mt. Etna, RAFINESQUE s.n. (not seen); Sicily, Le Madonie, RAFINESQUE s.n. (not seen). According to STAFLEU (1967) RAFINESQUE's herbarium and types are mostly destroyed, and I presume that the original type specimens are no longer extant.

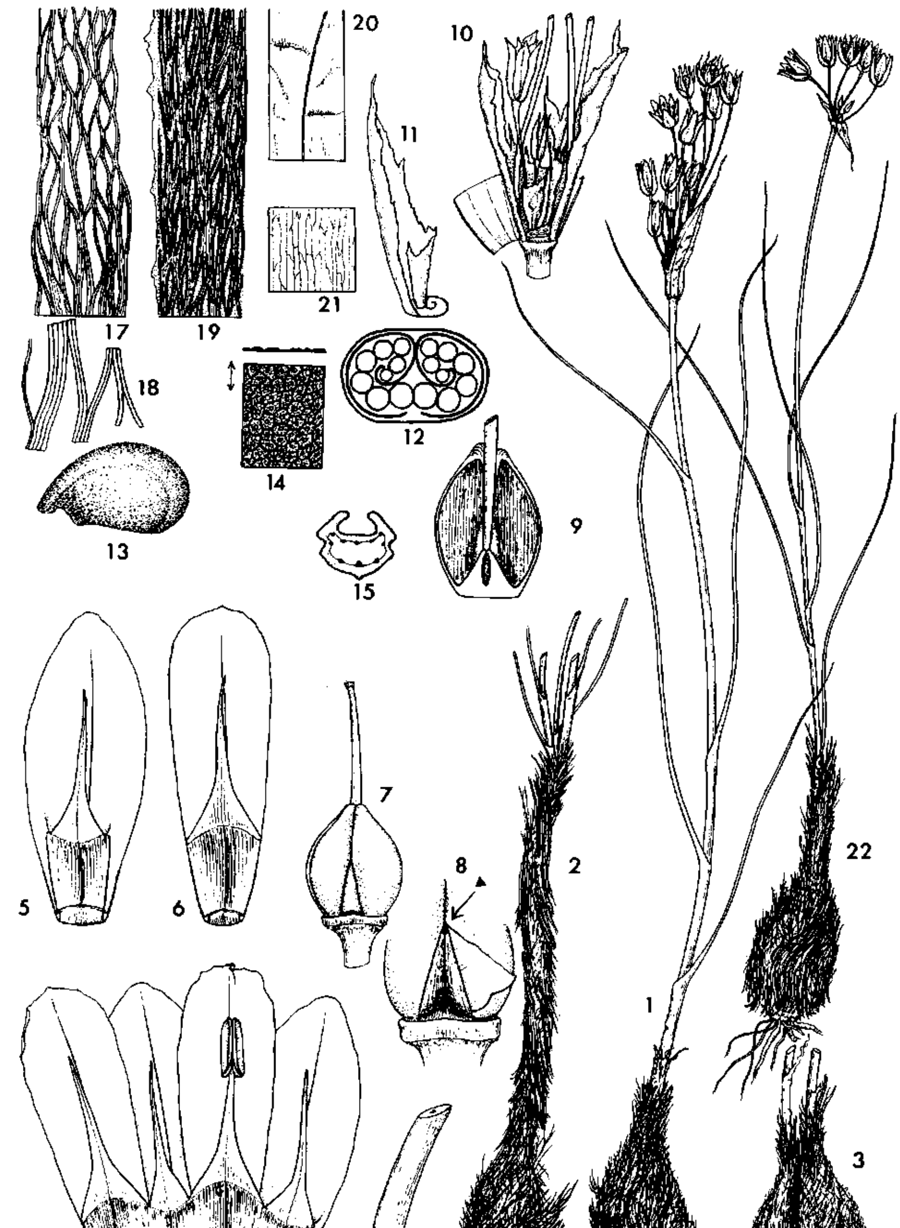
I propose as neotype: Sicily, Mt. Gallo, PARLATORE s.n. (FI).

A. hirtovaginatum KUNTH 1843:412.

A. cupani var. *hirtovaginatum* HALÁCSY 1904:253; JAHANDIEZ et MAIRE 1931:123; MARKGRAF in HAYEK 1932:49; CUÉNOD 1954:213; MAIRE 1958:275; *A. cupani* forma *hirtovaginatum* VINDT 1953:121.

Type: Iran, Tchesme, OLIVIER et BRUGUIERE s.n. (not seen).

Bulb globose to ovoid, 1.5–3.5 × 1–2 cm. Roots glabrous, unbranched. Increase bulbs 1–3, in the axils of the outer bulbcoats, ovoid, ± flattened at one side, up to 2.5 × 1.5 cm, sessile, wrapped in fibrously netted bulbcoats; apparently often replacing the renewal bulb. Protective bulbcoat-leaves several, broken up into netted fibres, yellowish-brown to bright brown, or orange-brown to blackish. Sproutleaf one, c. 5 cm long, top rather bluntly oblique, c. 3 mm long. *Foliage leaves* 3–4; blades scattered along scape, slender, terete or canaliculate, hollow, 3–10 cm, 0.2–1.5 mm wide, glabrous or hairy to various degree, when dry brittle and often partially or entirely broken off, top acute; sheaths unequal in length, those of upper leaves longest and extending for a large part above the ground, 2–12 cm long, yellowish-brown, the outer sheaths glabrous or hairy to various degree, subterranean parts later on breaking up into finely netted fibres. Scapes 1–3, shorter to usually longer than the leaves, erect, terete, solid, glabrous, 8–40 cm long, 0.4–1.5 mm diam. *Inflorescence*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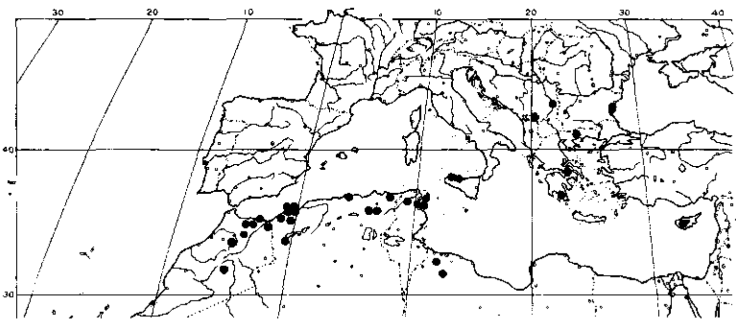
irregularly subellipsoid, loosely 3–10(–15)-flowered, without bulbils. *Spathe* 1, lanceolate to linear, much longer to much shorter than the inflorescence, hyaline, persistent, including 0.5–5 cm caudate upper part 2–7 cm long, broadened in the lower part, 3–5-nerved, top acute, the caudate upper part easily breaking off. Bracteoles (1–)2, membranous, 2–8 mm long, each subtending 3–8 flowers. Pedicels very unequal, 1–6.5 cm, slender, in fruit becoming longer and rather more rigid. *Flowers* narrowly urceolate. Tepals 1–1.5 mm adnate to bases of filaments, persistent, pinkish-white to purplish with a darker conspicuous midvein; outer tepals elliptic to lanceolate, or oblanceolate, 5–7 × 1.8–2 mm, top acute to subobtuse; inner tepals as long as or somewhat longer and narrower than outer tepals, top acute to broadly obtuse. Stamens shorter than tepals; filaments simple, broad at base and gradually tapering; outer filaments 3–4 mm long, at base c. 1 mm wide, connate with inner filaments for c. 1 mm; inner filaments slightly longer and wider than outer filaments. Anthers c. 1 × 0.4 mm, yellow. Pistil shorter than the tepals; ovary subglobose to ovoid, 1.4–1.8 × 1–1.8 mm; style 1.5–2 mm, slender, inserted at one-fourth to halfway from the base of the ovary; stigma inconspicuous. *Fruits* subglobose, 3–4 mm diam. Seeds c. 2.5 × 1.5 mm, black with a golden shine.

Uses. In Libya it was observed that bulbs were collected for consumption.

Habitat. Usually near the coast, but also inland to 150 km. *A. cupani* prefers dry localities and was repeatedly collected from hard grounds. It was found between boulders in hard stony or sandy soils, where it growed in tufts among dry tufted grass, on dry hills, in wadis, ravines, but sometimes also on more humid places like meadows. According to GUICHARD s.n. (BM) it is common but inconspicuous on hard ground. The species was recorded from sandy- as well as from calcareous soiltypes. Altitude 100–2000 m. Flowers June–September (Morocco, Algeria, Tunisia), May–June (Libya), June–January (Europe).

FIG. 19. *Allium cupani*. – 1. Habit, ×$^2/_3$; 2. habit of lower part of plant, ×$^2/_3$; 3. compound bulb, constituted of two bulbs, one of which the increase bulb produced in the preceding year, ×$^2/_3$; 4. perianth and stamens, partly, ×8; 5–6. outer and inner tepal with corresponding filaments, ×8; 7. rather young pistil, note the excretion opening of the nectary hidden by a membrane, ×8; 8. detail of ovary, membrane flapped open, arrow indicates excretion opening of nectary, ×16; 9. longitudinal section of ovary, showing nectarial tissue at centre of base, ×8; 10. two bracts surrounding the inflorescence, spathe and flowers partly removed, ×4; 11. bract, ×4; 12. diagram showing position of spathe, bracts and flowers (circles); 13. seed, lateral view, ×6; 14. detail of testa, seen from above and in profile, ×40; 15. transverse section of leaf blade, ×16; 16. piece of smooth root, ×6; 17–18. details of fibrously netted outer bulbcoat-leaf, ×4 and ×8 resp.; 19. detail of younger bulbcoat-leaf, not yet fully fibrously netted, ×4; 20–21. details of membranous bulbcoat-leaf, ×4 and ×16 resp. – *A. moschatum*: 22. habit, for comaprison; note the two spathes and the subequal pedicels, $^2/_3$. (1, 3, 10–12, 17–21. KRALIK 385; 2. SENNEN 8947; 4–9, 13-14. D' ALEIZETTE s.n., Oran, July 1918; 15–16. DURANDO 164; 22. HUET 2920).

Distribution. Morocco; Algeria; Tunisia; W. Libya; Sicily; Albania; Yugoslavia; Bulgaria; Greece; Cyprus, and furthermore recorded from S. Italy and Asia Minor, but no material seen.



MAP 11. Localities of *Allium cupani.*

Morocco: Berkane, hard sandy soil, 22 June 1932, FAURE s.n. (G); Bab-Bou-Idir, Mt. El Alem, 1600 m, 17 August 1968, FREY 2 (BM); Gorges du Todra, 27 August 1971, V. D. MAESEN 1491 (WAG); between Ifrane and Fez, August 1971, V. D. MAESEN 1504 (WAG); Dar Drius, hard sandy soil, 12 July 1930, SENNEN C.S. 7720 (BM, G); Dar Drius, 25 June 1931, SENNEN C.S. 8044 (BM, G, MPU); Melilla, Hidum, calcareous soil, 8 July 1933, SENNEN C.S. 8947 (BM, G); Riff Oriental, VICIOSO s.n. (BM).

Algeria: Oran, rock crevices, July 1918, D'ALLEIZETTE s.n. (G); Oran, dry fields, August 1918, D'ALLEIZETTE s.n. (G); Batna, hillslopes, 30 July 1853, BALANSA 743 (BM, C, FI, G, K, MPU, WAG); Djebel Antar, June 1886, BATTANDIER s.n. (MPU); Chott Msouri, plain of Melila, 17 May 1853, COSSON s.n. (MPU); near Oran, DURANDO s.n. (FI); Sig, 1850, DURANDO 164 (FI, G); Sig, June–July 1851, DURANDO s.n. (G, WU); Alger, 28 August 1854, DUVAL-JOUVE s.n. (MPU); Oran, rocky places, 26 August 1923, FAURE s.n. (M); Santa Cruz, near Oran, 16 Sept. 1929, FAURE s.n. (K); Oran, ravine of Santa Cruz, 15 August 1888, GARRIGUES s.n. (BM); Fort St. Grégoire, Dec. 1847, MUNBY s.n. (K); Oran, on dry hills, July 1856, MUNBY 4 (BM, K, MPU); near Sidi-Bel-Abbès, 20 July 1873, WARION s.n. (K, MPU).

Tunisia: Ariana, 22 Oct. 1905, CUÉNOD s.n. (G); Nabeul, Oct. 1907, GANDOGER 151 (COI, K); Zaghouan, humid hills, 9 July 1854, KRALIK 385 (BM, FI, G, K, MPU); Djebel Zaghouan, 6 August 1884, KRALIK s.n. (FI).

Libya: Bir Ghnem, air strip, June 1957, GUICHARD s.n. (BM); Wadi Lella, c. 8 km N. of Mizda, 25 May 1958, GUICHARD 47/58 (BM).

Sicily: s.l., GASPARINI s.n. (C); s.l., GUSSONE s.n. (L); Mt. Gallo, stony calcareous places, Oct. 1881, LOJACONO s.n. (L); Mt. Gallo, PARLATORE s.n. (FI, neotype of *A. cupani* RAFINESQUE); near Palermo, PARLATORE s.n. (FI); Mt. Gallo, July, TODARO 1454 (COI).

Albania: Hasi, grassy hillslopes, 1200–1400 m, 2 Sept. 1916, DÖRFLER 335 (C).

Yugoslavia: near Nisch, Sept. 1888, PETROVIC 2587 (COI).

Bulgaria: Mt. Čepan, Bulgaria occidentalis, 28 August 1954, VELČEV C.S. 329 (C, COI, L).

Greece: Acrocorinthum, Jan. 1848, DE HELDREICH s.n. (C); Mt. Malevo, 2000 m, ORPHANIDES 806 (MPU); near Potamoi, 14 June 1880, SINTENIS C.S. 860 (M, MPU).

Cyprus: Akacka, 14 June 1905, HOLMBOE 845 (C).

Notes.

Synonymy. Of *A. hirtovaginatum* KUNTH I have not seen the type specimen. According to the protologue it has fibrously netted bulbcoats, very fine terete leaves with hairy sheaths, a single spathe, a poor-flowered inflorescence, with unequal pedicels, and simple filaments shorter than the tepals; and these characters clearly agree with *A. cupani.*

Resembling species. As is explained under *A. trichocnemis*, the three species *A. cupani*, *A. trichocnemis*, and *A. ascalonicum* are much alike. Furthermore *A. cupani* strikingly resembles *A. moschatum* which is distinct, however, by having two spathes, and an umbellate inflorescence with equal pedicels. *A. moschatum*, moreover, does not occur in Africa. For comparison this species is illustrated together with *A. cupani*, fig. 19.

Outer bulbcoat-leaves. The numerous slowly decaying outer bulbcoats apparently are accumulated during several years, due to the conditions preferred by the species, namely dry, hard stony grounds.

Indumentum. This is a variable character; conspicuous hairiness could not be combined with other characters so as to justify the recognation of a variety.

Distribution. The two gatherings from Libya concern new records for this country. With one of the collections, from Mizda, c. 150 km S. of Tripolis, GUICHARD mentions: 'furthest south any *Allium* seen yet.'

Although I have seen but a few specimens from Europe I have enumerated and mapped these for later references.

Sect. Briseis (SALISBURY) STEARN

Sect. *Briseis* (SALISBURY) STEARN 1944:20; WENDELBO 1969:27; ibid. 1971: 66 (as a section of subgen. *Molium* (KOCH) *Wendelbo*).

Briseis SALISBURY 1866:92.

Type-species: *A. triquetrum* L.

Plants glabrous. Outer bulbcoat-leaves membranous, smooth, not with a particular sculpture. Leaf blades subapproximate at ground level, flat. Leaf sheaths open. Scape triquetrous. Spathes 2, acute-acuminate, persistent. Bracts and bracteoles absent. Flowers nodding. All filaments simple. Ovules 2 per locule; seeds caruncuIate, 1–2 per locule.

In Africa 1 species, nr. 16.

16. A. triquetrum L. — Fig. 20, 21, Map 12.

A. triquetrum L., Sp. Pl. 1, 1753:300; ibid. 1762:431; DESFONTAINES 1798: 287; REDOUTÉ 6, 1811:319; G. DON 1827:87; GUSSONE 1842:387; KUNTH 1843:436; MUNBY 1847:35; ibid. 1859:29; WILLKOMM et LANGE 1862:212; MUNBY 1866:32; SALISBURY 1866:93; REGEL 1875:223; BALL 1878:691; BOISSIER 1882:275; BARBEY 1884:187; BATTANDIER et TRABUT 1884:151; RICHTER 1890:209; BATTANDIER et TRABUT 1895:57; BONNET et BARRATTE

1896:413; HALÁCSY 1904:260; ASCHERSON et GRAEBNER 1905:159; BRIQUET 1910:300; HOLMBOE 1914:47; JAHANDIEZ et MAIRE 1931:122; MARKGRAF in HAYEK 1932:52; STEARN 1944:23; VINDT 1953:111; CUÉNOD 1954:214; MAIRE 1958:291; CLAPHAM, TUTIN et WARBURG 1962:980; QUÉZEL et SANTA 1962:210; CELA RENZONI et GARBARI 1970:61; DE WILDE-DUYFJES 1973:86.

A. triquetrum var. *typicum* REGEL 1875:223; *A. triquetrum* forma *normale* MAIRE et WEILLER in MAIRE 1958:292.

Type: LINN 419.35, '24 triquetrum'.

A. triquetrum var. *bulbiferum* BATTANDIER et TRABUT 1895:57; *A. triquetrum* forma *bulbiferum* MAIRE 1958:292.

Type: not indicated.

A. pendulinum TENORE 1811:168, tab. 31; GUSSONE 1842:387; BALL 1878:691; BATTANDIER et TRABUT 1895:57; BRIQUET 1910:301; MAIRE 1958:292; CELA RENZONI et GARBARI 1970:61.

A. triquetrum var. *pendulinum* REGEL 1875:224; ASCHERSON et GRAEBNER 1905:159; *A. triquetrum* subsp. *pendulinum* RICHTER 1890:209.

Isotypes: Italy, San Rocco, TENORE s.n. (lectotype: FI; isotype: P); & Ponti Rossi, TENORE s.n. (not seen); & Camaldoli, TENORE s.n. (not seen).

Bulb globose to ovoid, 12–20 × 12–17 mm. Contractile roots not seen, smooth roots inserted over whole surface of bulb disk, densely hirsute, sparingly branched. Increase bulbs several, ovoid, 6–17 × 4–12 mm, c. 3 mm acuminate, subsessile, wrapped in a firm prophyll. Outer bulbcoat-leaves 1 or 2, usually soon decaying, outer surface yellowish or brown, inner surface glossy, yellowish, without conspicuous structure. Sproutleaf 1, soon wilting, 2–12 cm long, emerging 10–15 mm above ground. *Foliage leaves* 2–5, glabrous, in fruit lying on the ground and wilting; blades approximate, linear, 15–50 cm × 3–15 mm, at base usually more or less narrowed, triquetrous, towards the top flat, distinctly keeled, top acute, margin entire; sheaths subequal, largely subterranean, 2–12 cm long, whitish. Scapes 1–4, shorter to longer than the leaves, in anthesis erect, in fruit falling over and the fruits lying on the ground, triquetrous, hollow, glabrous, 15–35 cm long, 1–10 mm diam. *Inflorescence* umbellate, mostly lax, with few to many pendent flowers, 4–7 cm diam., usually without bulbils. *Spathes* 2, hyaline, bright green veined, slightly unequal in size, 20–40 × 6–10 mm, top acute, sometimes caducous. Bracteoles absent. Pedicels subequal, 10–20(–40) mm long, slender, 3-angled, thickened near the top into the conical torus, in bud straight, in anthesis and fruit pending. *Flowers* campanulate. Tepals adnate to bases of filaments for 1.5–2.5(–4) mm, persistent, white, with a bright green midvein ending 2–3 mm under the top; outer tepals oblong to lanceolate, 10(–18) × 3–5 mm, top obtuse to acute, sometimes with undulated edge; inner tepals similar to, but slightly shorter or longer and narrower than outer tepals. Stamens much shorter than the tepals; filaments simple, smooth; outer filaments 4–7 mm long, at base 0.5–1 mm wide, connate with inner

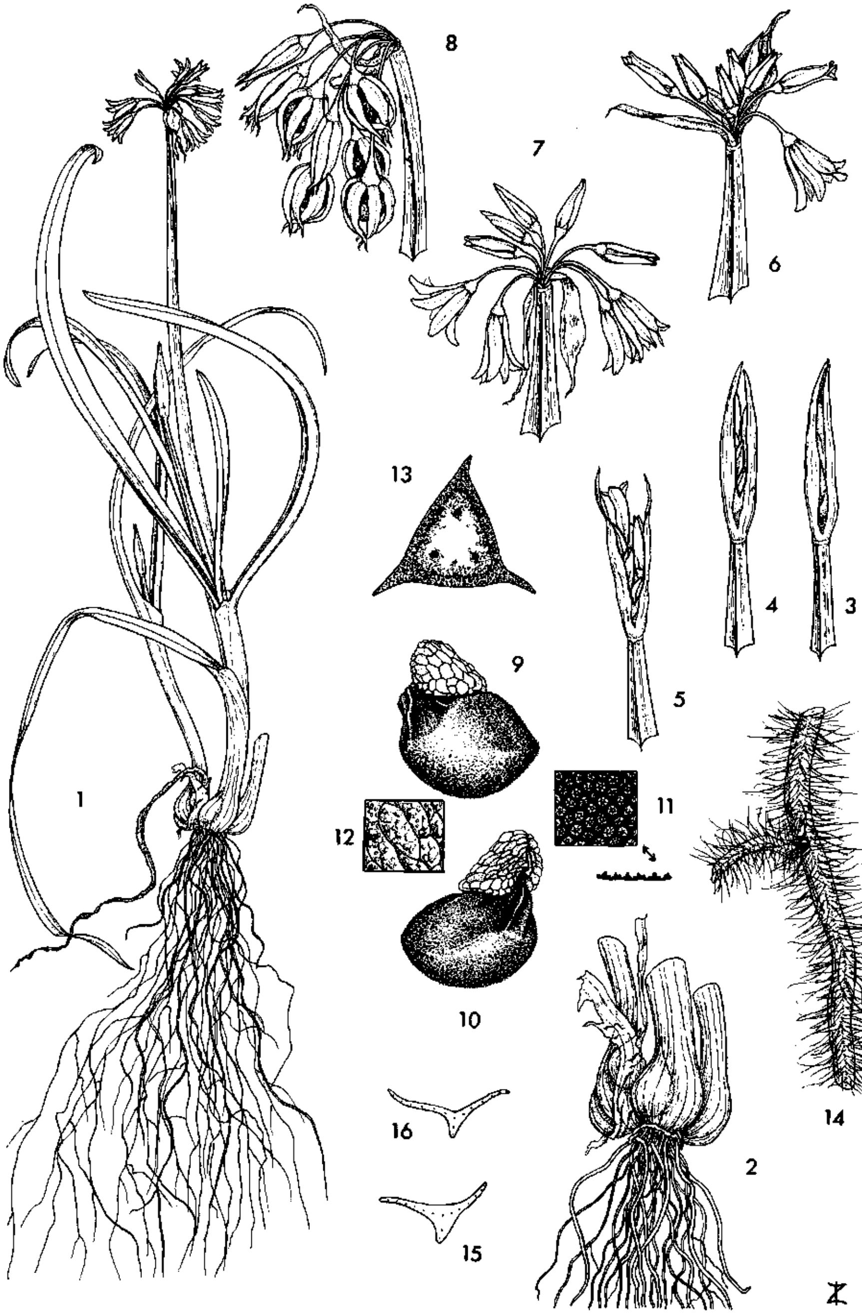
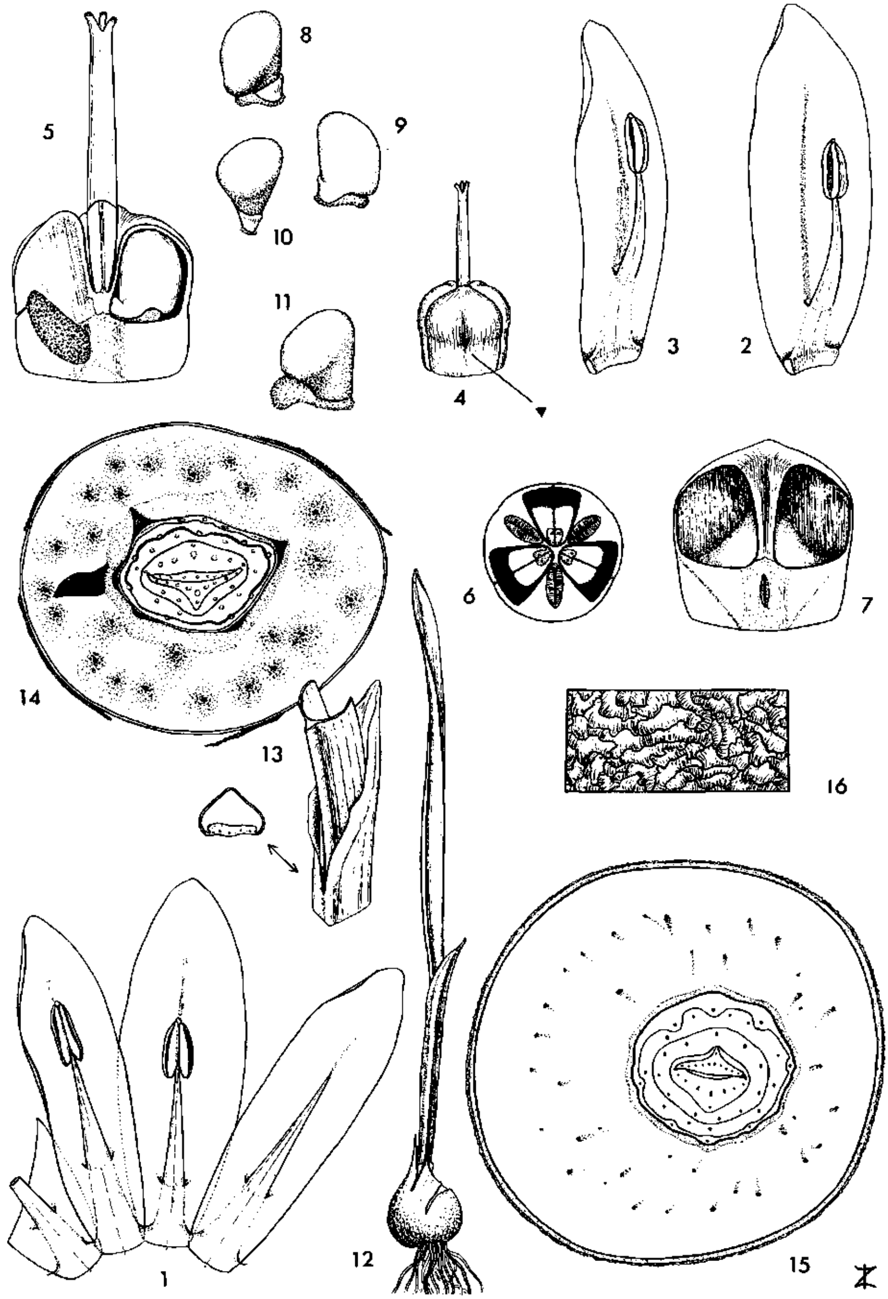


FIG. 20. *Allium triquetrum*. – 1. Habit, $\times^1/_3$; 2. bulb with increase bulbs, $\times^2/_3$; 3–8. different stages of inflorescences from just expanding to fruiting, $\times^2/_3$; 9–10. seeds with caruncle, $\times 6$; 11. detail of testa seen from above and in profile, $\times 40$; 12. detail of caruncle, $\times 20$; 13. transverse section of scape, $\times 4$; 14. piece of smooth root with root hairs, $\times 6$; 15. transverse section of lower part of leaf blade, $\times 2$; 16. ditto, of upper part, $\times 2$. (1–16. VAN DER MAESEN s.n., 1966, Tunisia, spirit mat.).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filaments for 0.5–1 mm; inner filaments equal to or slightly longer than outer filaments. Anthers 1.5–2 × 0.5–1 mm, yellow. Pistil shorter than the tepals; ovary globose to obovoid, 2–3 mm diam.; style 3–5 mm, slender, inserted at or above half-way the ovary; stigma lobes 0.5–1.5 mm. Fruit subglobose, 5–7 mm diam. Seeds 2.5–3 × 2 mm, black, provided with a caruncle, 1–1.5 mm.

Vernacular names. Algeria: *Tsoum er raba, Beçal ed dib, Naum raschu* (arabic); Spain: *Lagrimas de la Virgin.*

Uses. Commonly grown as an ornamental, presently also outside its area, and with commercial value. In N. Africa it is said to be eaten as well.

Habitat. *A. triquetrum* is confined to the western Mediterranean region, not found East of Tunisia and Italy; it occurs apparently not very far inland, though not confined to lowland. It prefers humid and shady places, and was found for instance along streams, in beech-, oak-, and pine-forests, inundated plains and fields, shaded meadows, the vicinity of thermal sources, and in ravines and valleys, also in scrub, hedges, and in roadsides, along wadis, and in sandy places. The species was obviously widely cultivated since ancient times as an ornamental and possibly sometimes escaped, and presently it can be found naturalized on abandoned places of habitation. There seems to be a preference for sandy soil-types, but the species has also been found on limestone. Altitude 0–1800 m. Flowers: March–June (Madeira), February–May (Morocco), January–June (Algeria, Tunisia), March (–June) (Europe).

Distribution. Madeira; Canary Islands (only one collection); Morocco; Algeria; Tunisia; Portugal (a few collections); Spain; Baleares; France; Corsica; Sardinia; Sicily; Italy; naturalized on the Channel Is., SW. England, S. Wales, S. Ireland, and Turkey.

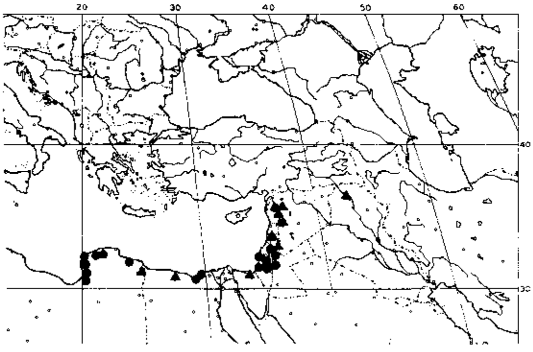
Madeira: s.l., March 1837, LEMANN s.n. (K); Vasco Gil, Bunhi, roadside, 15 March 1855, LOWE s.n. (BM); & 13 March 1835 or 1855, LOWE 575 (K); Sta. Auraro, 9 March 1832, LOWE 575 (K); near Funchal, in cultivation, March–April 1865–1866, MANDON s.n. (BM, G, K, P); s.l., 1857, MASON 152 (P); Monte, April 1914, MENEZES s.n. (LISU); Monte, ca. 1894, MONIZ 35 (BM); Bod Ventura, wooded ravine, 19 June 1895, R.P.M. s.n. (BM): Monte, May 1837, WARD 122 (BM).

FIG. 21. *Allium triquetrum.* – 1. Perianth with stamens, partly, ×4; 2–3. outer and inner tepal with corresponding stamens, ×4; 4. pistil, arrow indicates excretion opening of nectary, ×4; 5. longitudinal section of pistil, nectary at left, dotted, ×8; 6. transverse section of ovary below insertion of style, showing locules and nectaries, ×8; 7. longitudinal section of ovary, ovules removed, showing nectarial gland at centre of base, ×8; 8–10. ovules from different sides, × 8; 11. ovule from young flower bud, caruncle (aril) not yet developed, ×16; 12. sprouting increase bulb with sproutleaf at base, ×$^2/_3$; 13. detail and transverse section of sproutleaf, ×2; 14. transverse section of bulb in winter, ×4; 15. ditto, in autumn, ×4; 16. detail of outer bulbcoat-leaf, inner side, ×40. (1–16. VAN DER MAESEN s.n., 1966, Tunisia, spirit mat.).

Vernacular name. Egypt: *Thoam.*

Habitat. In N. Africa rather bound to the coast, found in the coastal plains, on rocky places, in humid sands near the sea, and in fields, also in desertlike areas. In the Near East it is found also more inland. Most collections are from sand, but some also from calcareous soils. According to the label of KAISER s.n. from the Marmarica it grows in an area characterized by regular winterrains. TÄCKHOLM (1954:76) writes: 'grows on the soil that the Bedouins pile up along their barley fields at the edge of slopes so as to keep the water from running into deeper salty lands. Only on the leeward side of these heaps of soil the bulb is found.' KOLLMANN (1969:70) gives an interesting detailed account of the ecological conditions of *A. erdelii* and its related species in Palestine. In the Mediterranean coastal plain it grows in a climate of 400–700 mm of annual rain, but more inland also under more arid conditions of 200–400 mm. It is mentioned for a variety of mainly lime-containing soils, but also from basalt-derived soils. It was observed that certain soil types e.g. terra-rossa soils are apparently avoided. Related species prefer different soil types. *A. erdelii* grows in a characteristic vegetation type, different from that of related species. Altitude 0–700 m. Flowers: January–April (Libya, Egypt).

Distribution. Libya; Egypt; Israel: Jordan, and according to KOLLMANN 1969, also Lebanon; Syria; Iraq, only one collection.



MAP 13. Localities of *Allium erdelii:* ● specimens examined, ▲ according to KOLLMANN 1969.

Libya: between Agedabia and El Magrun, coastal plain, 3 March 1958, GUICHARD 51/58 (BM); between Selmani and Suani Osman, 12 Feb. 1922, MAUGINI s.n. (FI); Karmu, 28 Feb. 1922, MAUGINI s.n. (FI, K); between Benghazi and Soluch, 10 March 1933, PAMPANINI 1370 (FI); Has esc Sceilabi el Baabas, 11 March 1933, PAMPANINI 1371 (FI, K); Martuba, 8 April 1933, PAMPANINI 1372 (FI); Maraua, steppe with *Artemisia*, 25 April 1934, PAMPANINI C.S. 1373 (FI); Bu Gassal, 29 March 1933, PAMPANINI 1374 (FI); Benghazi, 27 Jan. 1883, RUHMER 333 (FI, G, MPU, P, type of *A. erdelii* var. *papillosum* PAMPANINI); near Zuetina, desert, 31 March 1939, SANDWITH 2196 (K); Got-es-Sas, 1925, SCAETIA s.n. (FI); Tobruk, humid sands near the sea, 28 Feb. 1913, VACCARI 858 (BM, FI); Benghazi, 3 March 1916, ZANON 336 (FI).

EGYPT: Mariut, 4 March 1880, BARBEY 879 p.p. (MPU); Burg el Arab, 15–18 March 1938, BOETJE-VAN RUYVEN 110 (L); Mariut, April 1878, BOISSIER s.n. (FI); Amria, 22 April 1929, DRAR 17/256 (CAIM); Alexandria, desert, FIGARI s.n. (FI); Mex, W. of Alexandria, March 1817, HURST K17 (K); near Alexandria, sandy fields, 24 March 1911, KAISER s.n. p.p. (G); coastal area, 2 March 1913, KAISER s.n. (G); Mariut, March 1877, LETOURNEUX s.n. (BM); near Mariut, fields, 24 March 1878, LETOURNEUX 137 bis (K, type of *A. erdelii* var. *roseum* BOISSIER); Mariut, April 1904, MUSCHLER s.n. (K); Mariut, calcareous fields, 2–5 March 1890, SCHWEINFURTH 235 (G); Mariut, 19 Jan. 1922, SHABETAI s.n. (CAIM); El'Amriya, sandy soil, 24 Feb. 1948, SHABETAI 256 (CAIM); East of Abusir, barley fields, 23 Feb. 1922, SIMPSON 491 (CAIM); West of Mariut, fields, Feb. 1922, SIMPSON 653 (CAIM).

ISRAEL and JORDAN: Djebei Bate, 29 March 1880, BARBEY 883 p.p. (G, MPU); near Gaza, dry sandy hills, April 1846, BOISSIER s.n. (G, type of *A. philistaeum* BOISSIER); Sarona, near Jaffa, and near Jericho, March and April 1897, BORNMÜLLER 1549 (B); E. of Madaba, fields, 770 m, 25 April 1911, MEYERS c.s. M 503 (G, L); W. of Salihi, fields, 500 m, MEYERS c.s. M 2503 (B); Gamala, fields, 200 m, 3 April 1911, MEYERS c.s. 6503 (B, L); Plain of Gaza, 25 March 1882, POST 55 (G); near Hebron, April 1839, 'Iter SCHUBERT', ROTH s.n. (M, type of *A. erdelii* ZUCCARINI); Hierosolyma (Jerusalem), ROTH s.n. (FI); Negev near Asluj, sandy-loess, ZOHARY s.n. (C); Ramath-Gan near Tel-Aviv, sandstone hill, 19 March 1928, ZOHARY 35 (B, C, FI, G).

Notes.

Allied and resembling species. *A. erdelii* is allied to *A. eriophyllum* BOISSIER (1846:112), and to *A. longisepalum* BERTOLONI (1842:429), both described from Iran. These two species differ from *A. erdelii* mainly by the more stouter habit, the more lax inflorescence and by the velutinous-hirsute, not pilose leaves. To this alliance belongs also *A. negevense* KOLLMANN (1969:69) from the Negev and Judean Desert. With its description this species is compared (l.c., p. 61–75) with its close relatives in its area, *A. erdelii* and *A. qasyunense* MOUTERDE. *A. negevense* also is a rather robust species; it has large flowers, 10–13 mm, and velutinous, not pilose, leaves, also the caryotype is presumably different from that of *A. erdelii* (see below). KOLLMANN gives good pictures of habit and leaf details of all three species as well as distributional areas in maps.

Superficially *A. erdelii* can be confused with *A. roseum*, *A. subhirsutum*, and *A. longanum*. The first species differs by its glabrous leaves; *A. subhirsutum* has much smaller flowers; *A. longanum* has its bulbcoats not pitted, and the leaves glabrous except for but a few hairs at the base of the blade.

Leaves. Usually the leaves are longer than the scape; the slender leaf-apexes soon wither and break off, which may give the impression as if the leaves are shorter than the scape.

Flowers. According to KOLLMANN (1969:61) the species in section *Molium* fall apart into two groups according to the shape of the perianth: in *A. erdelii* and related species the perianth is campanulate and the tepals erect, versus a more saucer-shaped perianth of spreading tepals in *A. subhirsutum*, *A. neapolitanum*, and others.

Anthers. The anthers are relatively small as compared with those of species with similarly large flowers. Also the sizes of the fruits and the seeds are relatively small.

Caryology. FEINBRUN (1950:13) records as chromosome number n=7 for

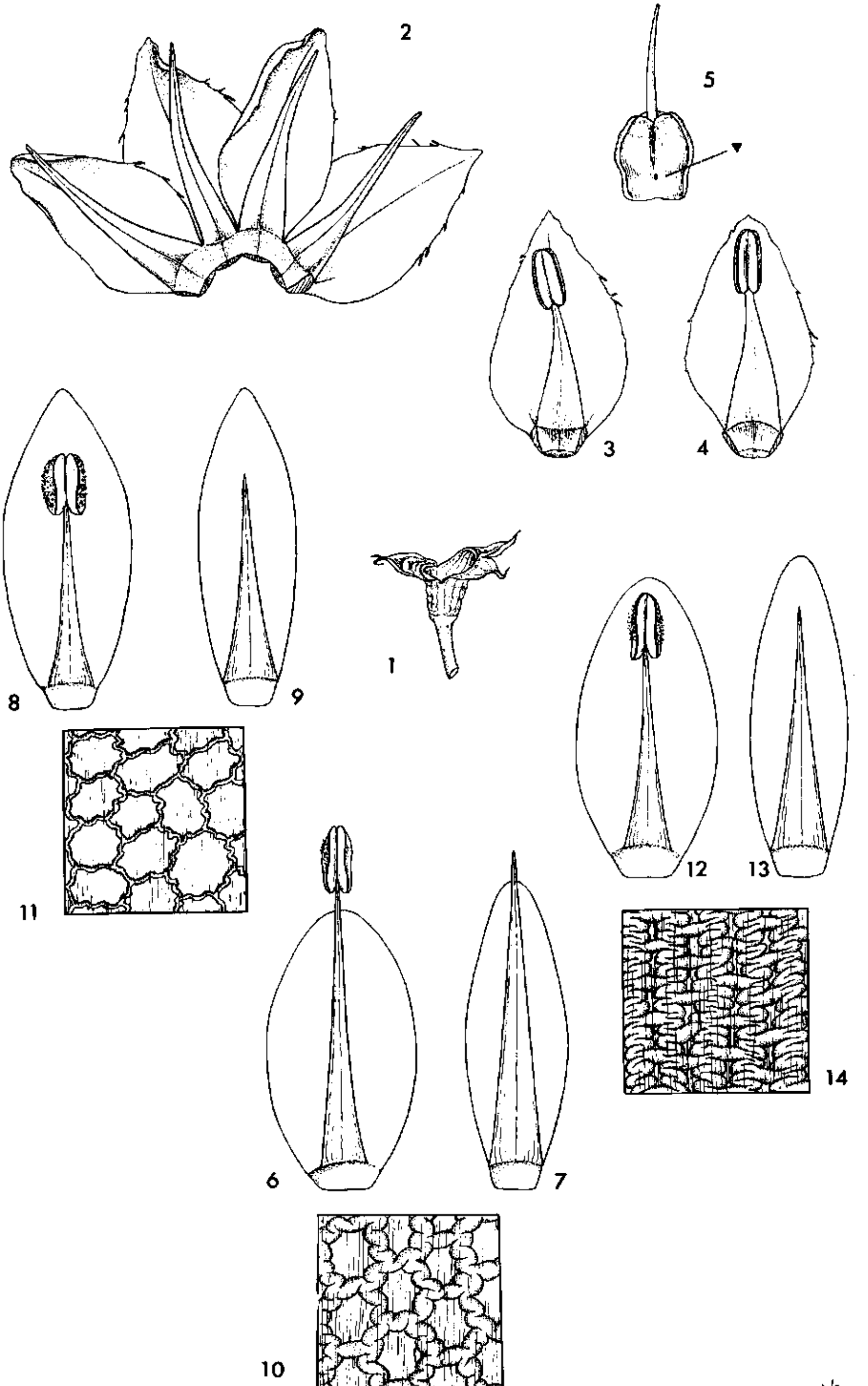
A. erdelii var. *lasiophyllum* NÁBĚLEK (= *A. qasyunense* MOUTERDE). KOLLMANN (1969:73) found for *A. erdelii* and its related species *A. qasyunense* and *A. negevense* different chromosome numbers and caryotypes, viz. *A. qasyunense*: n = 7 (7 metacentric chromosomes), *A. erdelii*: n = 8 (6 metacentric chromosomes and 2 telocentric chromosomes), and *A. negevense*: n = 10 (4 metacentric chromosomes and 6 telocentric chromosomes). In contrast to the difference in chromosome numbers, the number of chromosome arms was found to be equal in the three species, namely 14. The matter is discussed also in an article on the chromosome numbers in section *Molium* by KOLLMANN 1973a:92–112.

18. A. subhirsutum L. — Fig. 23, 24, 25.

A. subhirsutum L., Sp. Pl. 1, 1753:295; for other references and synonyms see under the subspecies.

Bulb globose to ovoid-oblong, 5–20 × 5–20 mm. Contractile roots few, scattered over whole surface of bulb disk, smooth roots inserted laterally on the bulb disk, both finely hirsute, especially near the top, unbranched. Increase bulbs 1–7, none or one single axillary of foliage leaves, globose to ovoid, 5–14 × 3–10 mm, c. 1 mm beaked, (sub)sessile, wrapped in a hyaline prophyll. Outer bulbcoat leaves 2(–18), outer surface dull whitish or yellowish brown, sometimes tinged purplish, inner surface glossy, yellowish, or salmon, or brown, after decay of outer epidermis conspicuously faveolate or sinuate by the sclerified inner layer or not, the cell walls not sinuate. Sproutleaf 1, soon wilting, 1.5–14 cm long, emerging to up to 3 mm above ground. *Foliage leaves* 1–4(–7), hirsute to various degree, or rarely subglabrous; blades approximate, linear, 8–50 cm × 1–20 mm, flat, in vivo slightly keeled, top acute, soon wilting, margin ciliate to various degree, more densely so towards base, hairs 0.3–3 mm, patent or usually retrorse, margin near the top shortly ciliate, or crenulate, or smooth; sheaths 1.5–14 cm long, subequal, largely subterranean, whitish, or yellowish, sometimes tinged purplish, glabrous or hirsute especially towards the

FIG. 23. *Allium subhirsutum*. – subsp. *subvillosum:* 1. spathe with three spathe-lobes, ×$^2/_3$; 2. perianth with filaments of older flower, partly, note the fringed margin which is a rather rare feature in the species, ×4; 3–4. outer and inner tepal with corresponding stamens of young flower, ×4; 5. pistil, arrow indicates excretion opening of nectary, ×4; 6–7. outer and inner tepal of an old flower, filaments exserted, margin not fringed, ×6; 8–9. outer and inner tepal of a specimen from the Canary Is., filaments included, margin of tepals not fringed, ×6; 10–11. details of outer bulbcoat-leaves with faveolated structure of specimens from Algeria and the Canary Is. resp., ×24. – subsp. *subhirsutum:* 12–13. outer and inner tepal with corresponding filaments, ×6; 14. detail of outer bulbcoat-leaf with rather inconspicuously faveolated structure as compared with no. 10 and 11, ×24. (1–5. MULLER 09820; 6–7, 10. BALANSA 228; 8–9, 11. KAAE s.n., 13 Jan. 1965; 12–14. HIBON s.n., 28 May 1914).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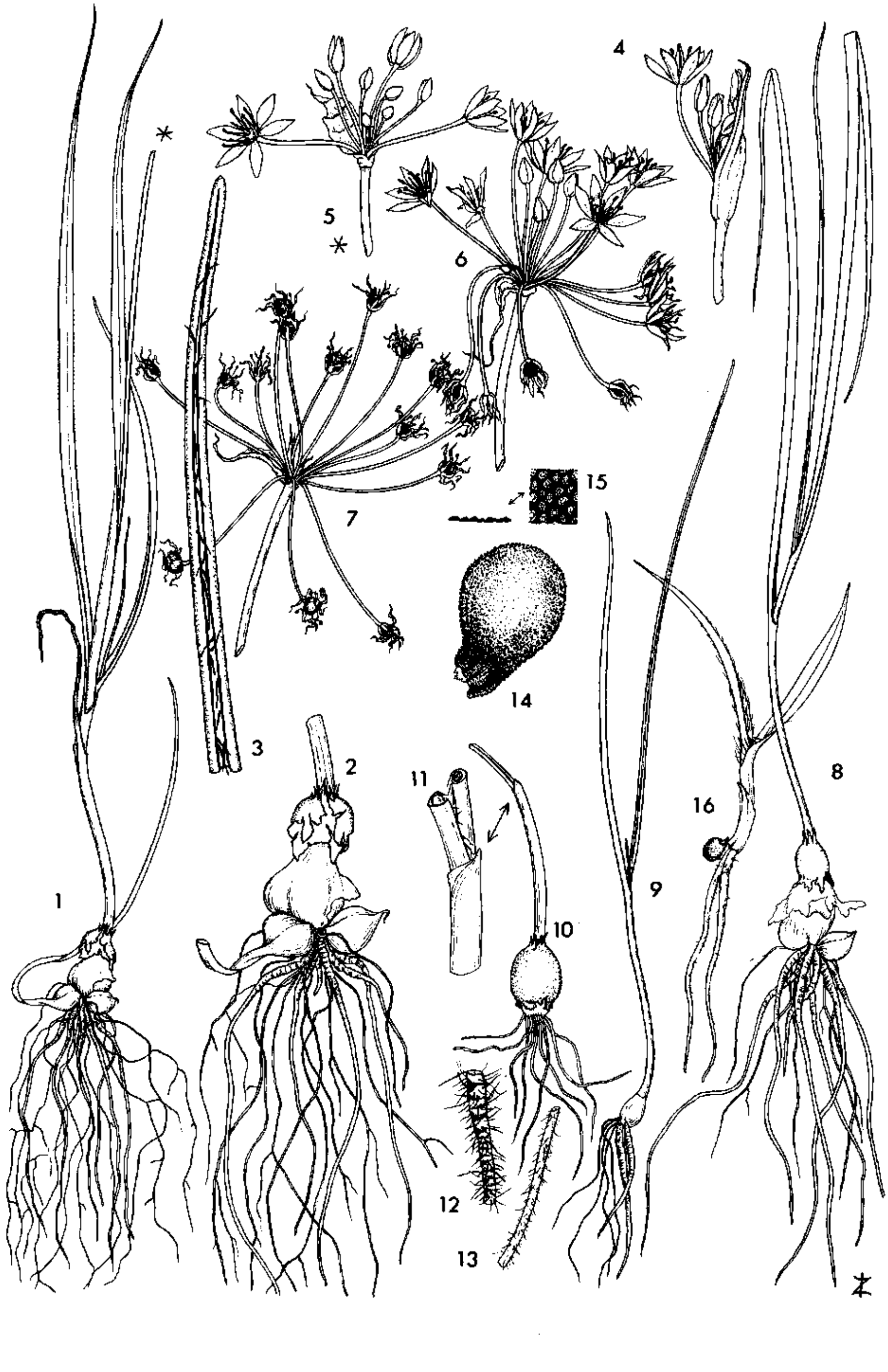
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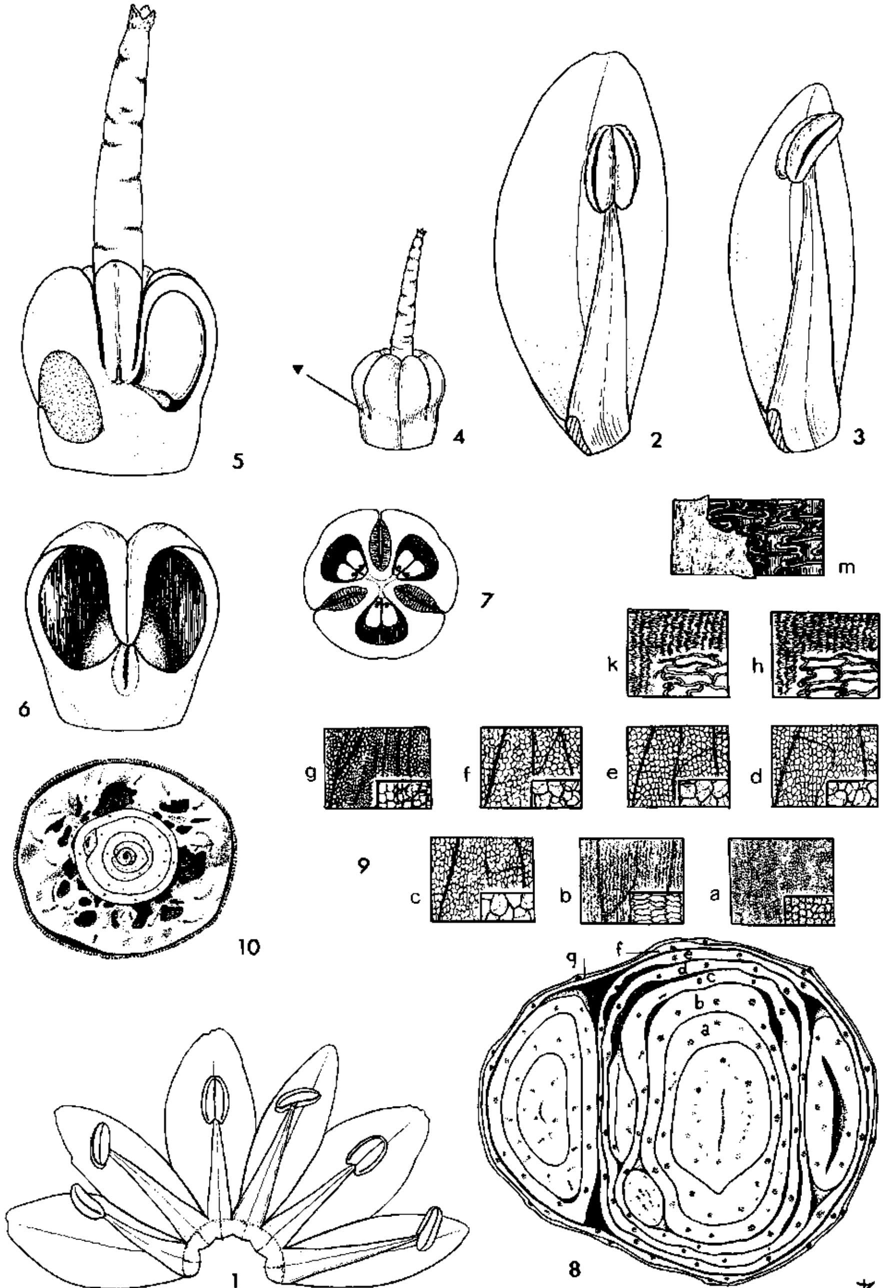
top by retrorse hairs, outer sheath closed, the inner ones open. Scape 1 (or 2, or 3), shorter to longer than the leaves, erect, terete, solid, glabrous, (5–)10–60 cm long, 1–4 mm diam. *Inflorescence* umbellate to spherical, few- to many-flowered, 2–8 cm diam., without, or very rarely with bulbils. *Spathe* 1, hyaline, persistent, 8–25 mm, 4-veined, opening with one slit up to the base, and without or with up to 3 additional shorter slits, reaching up to the base, forming 2 or 3 or 4 spathe-lobes, not or indistinctly recurved, 1–5 mm acuminate, with greenish or purplish midvein. Bracteoles absent. Pedicels subequal, 10–40 mm, slender, in anthesis straight or curved upwards, in fruit rigid, sometimes recurved. *Flowers* subcampanulate, not conspicuously fragrant. Tepals 0.3–1 mm adnate to bases of filaments, persistent, white or creamy white or pink, with a yellowish-green or purplish midvein; outer tepals elliptic to ovate to obovate, 5–8.5 × 2–5 mm, top retuse to obtuse, rarely acute; inner tepals ovate to oblong, as long as or longer and narrower than outer tepals, 5–8.2 × 1.5–4 mm, top acute, rarely retuse. Stamens shorter to slightly longer than tepals; filaments simple; outer filaments 3–7 mm long, at base 0.5–1.5 mm wide, connate with inner filaments for 0.2–1 mm; inner filaments as long as or longer and wider than outer filaments, 3.5–7 mm long, at base 0.8–1.8 mm wide. Anthers 0.8–2 × 0.5–1 mm, yellow or purplish. Pistil shorter to longer than the tepals; ovary globose to obovoid, 1.5–2 × 1.5–2.5 mm; style 3–6 mm, slender, sometimes contorted, inserted at about half-way from the base of ovary; stigma inconspicuous, with 3 minute lobes, c. 0.3 mm. *Fruits* subglobose, 3–6 mm diam. Seeds c. 2.5–3.5 × 1.5–2.5 mm, black.

Notes.

A. subhirsutum is divided into three subspecies mainly by reason of differences in the relative lengths of the filaments (viz. filaments shorter than versus nearly as long as the tepals), and in the structure of the outer bulbcoats (viz. structureless, or faveolate, or sinuate). Ssp. *subhirsutum* is roughly confined to southern Europe and the western part of the Middle East; ssp. *subvillosum* occurs on the Canary Islands, in northern Africa as far east as Libya, in the far south of the Iberian Peninsula, and on Mallorca and Sicily; the third, ssp. *spathaceum*, is limited to the Erkowit region (Sudan), and the highlands of Ethiopia and former British Somaliland.

Variability and synonyms. The type-ssp., as well as ssp. *subvillosum* are very variable entities, accounting for a considerable synonymy. Notes on the synonyms are given under the subspecies.

FIG. 24. *Allium subhirsutum* subsp. *spathaceum*. – 1. Habit, inflorescence detached, ×$^1/_3$; 2. bulb and increase bulbs, ×$^2/_3$; 3. top of leaf, ×4; 4–7. different stages of inflorescences, from just expanding to fruiting, ×$^2/_3$; 8–9. young plants, ×$^2/_3$; 10. sprouting increase bulb with sproutleaf, ×$^2/_3$; 11. apical part of sproutleaf, ×2; 12–13. pieces of contractile and smooth roots resp., ×4; 14. seed, lateral view, ×8; 15. detail of testa, seen from above and in profile, ×40; 16. old seedling, ×2. (1–15. DE WILDE & GILBERT 1, spirit mat.; 16. WAG 20/9/73, spirit. mat.).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Bulbifery. Contrary to e.g. in *A. roseum* this feature is absent or very rare in *A. subhirsutum*. I know of one exception, a collection of SCHLAUBUSCH (L) from Sicily, with a few sessile bulbils in the inflorescence.

Outer bulbcoats. The structure of the outer bulbcoats is not always distinct due to the outer epidermis which may still be present. By scratching the outer epidermis, the structure of the underlying sclerenchymatic layer becomes visible. The outer bulbcoats are rather thick and brittle, but sometimes they are parchment-like (thin and firm), and in this latter case it may be difficult to discern its structure. JAHANDIEZ 295 from Morocco, for example, which belongs to ssp. *subvillosum* has such bulbcoats.

Indumentum. The degree of hairiness is very variable; nearly glabrous, as well as strongly hirsute specimens occur in all the three subspecies.

Colour. The flower colour is variable in all three subspecies; it ranges from white to pink.

Fieldnotes. The flowers are faintly fragrant. All parts when crushed have a soft *Allium*-smell.

Key to the subspecies

1. Outer bulbcoats without any conspicuous structure; filaments c. $^2/_3$ the length of the tepals . . . . **a. ssp. subhirsutum**
1. Outer bulbcoats faveolate or with sinuate structure; filaments about as long as the tepals, or c. $^2/_3$ the length of the tepals 2
2. Outer bulbcoats faveolate; filaments about as long as tepals . . . . **b. ssp. subvillosum**
2. Outer bulbcoats with sinuate structure; filaments c. $^2/_3$ the length of the tepals . . . . **c. ssp. spathaceum**

a. ssp. subhirsutum — Fig. 23: 12–14, Map 14.

A. subhirsutum L., Sp. Pl. 1, 1753:295; ibid. 1762:424; BALL 1878:691; TENORE 1811:155; GUSSONE 1842:389; KUNTH 1843:440; REICHENBACH 1848:

FIG. 25. *Allium subhirsutum* subsp. *spathaceum*. – 1. Perianth and stamens, partly, ×4; 2–3. outer and inner tepal with corresponding stamens, ×8; 4. pistil, arrow indicates excretion opening of nectary, ×8; 5. longitudinal section of pistil, showing nectary at left, ×12; 6. ditto of ovary, slightly turned, nectary at centre of basal part, ×12; 7. transverse section of ovary, showing locules and nectaries, ×12; 8. transverse section of bulb in autumn, ×4; 9. a–g. fragments of bulbcoat-leaves as in 8 (in right bottom corner enlarged), ×4; h–k. ditto of structure of old bulbcoat-leaves of the preceding year which are to be found pushed up along the scape, ×4; m. ditto, ×20; 10. transverse section of bulb in early spring, ×4. (1–9. DE WILDE & GILBERT 1, spirit mat.; 10. Cult. WAG. 22/4/70).

27, fig. DII; PARLATORE 1852:526; WILLKOMM et LANGE 1862:212; BARBEY, C. et W. 1882:163; BOISSIER 1882:270; BARBEY, W. 1884:187; BATTANDIER et TRABUT 1902:331; HALÁCSY 1904:258; DURAND et BARRATTE 1910:233; PAMPANINI 1931:154; LINDBERG 1932:33; MARKGRAF in HAYEK 1932:51; DINSMORE in POST 1933:642; OPPENHEIMER et EVENARI 1940:188; EMBERGER et MAIRE 1941:955; RECHINGER F. 1943:717; NÈGRE 1961:120, fig. 17; DE WILDE-DUYFJES 1973:85; KOLLMANN 1973:92–112; ibid. 1975:201.

A. subhirsutum var. *typicum* REGEL 1875:220; CUÉNOD 1954:214; MAIRE 1958:288.

Type: LINN 419.3.

A. hirsutum LAMARCK 1778:262.
(holotype: P, in Herb. LAMARCK).

A. ciliatum CIRILLO 1792:16, tab. 6; TENORE 1824–1829:366; GUSSONE 1827: 397; TENORE 1831:166; HAUSSKNECHT 1899:30.

A. subhirsutum var. *ciliatum* BRIQUET 1910:303; VINDT 1953:125; *A. subhirsutum* subsp. *ciliatum* HOLMBOE 1914:46.

Type: Italy, Isle of Capri (holotype destroyed in NAP; no isotypes seen).

A. trifoliatum CIRILLO 1792:11, tab. 3; TENORE 1824–1829:366; GUSSONE 1827:397; TENORE 1831:166; GUSSONE 1842:390; PARLATORE 1852:528; BARBEY, C. et W. 1882:163; BOISSIER 1882:270; HALÁCSY 1904:258; DINSMORE in POST 1933:642; MARKGRAF in HAYEK 1932:52; RECHINGER F. 1943: 718; KOLLMANN 1975:204.

A. subhirsutum var. *trifoliatum* BATTANDIER et TRABUT 1884:152; ibid. 1895: 58; BONNET et BARRATTE 1896:414; *A. subhirsutum* subsp. *trifoliatum* ASCHERSON et GRAEBNER 1905:161; HOLMBOE 1914:46.

Type: Italy, Isle of Capri (holotype destroyed in NAP; no isotypes seen).

A. ciliatum ROTH in ROEMER 1798:41, non CIRILLO.

A. clusianum RETZIUS in WILLDENOW 1799:79; HALÁCSY 1904:259; MARKGRAF in HAYEK 1932:51.

Type: not known.

A. niveum ROTH 1800:35.

Type: cultivated by ROTH from seeds, collected by THOUIN (isotype: C).

A. ciliatum SIMS in CURTIS 1804:774, no. 774, non CIRILLO nec ROTH.

Type: S. Africa, Cape of Good Hope, HIBBERT s.n. (not seen).

A. ciliare REDOUTÉ 6, 1811:311.

A. subhirsutum subsp. *ciliare* MAIRE et WEILLER, publ. unknown; CUÉNOD 1954:214; MAIRE 1958:288; QUÉZEL et SANTA 1962:211.

Type: a specimen in FI, annotated '*Allium ciliare*' by REDOUTÉ, in Herb. DESFONTAINES, in Herb. WEBB.

A. brachystemon REDOUTÉ 7, 1812:374.
Type: a specimen in FI, annotated '*Allium brachystemon* Red. Lil.' by REDOUTÉ, in Herb. DESFONTAINES, in Herb. WEBB.

A. graecum URVILLE 1822:293.
A. subhirsutum var. *graecum* REGEL 1875:221; CUÉNOD 1954:214; MAIRE 1958:289; *A. subhirsutum* subsp. *graecum* RICHTER 1890:209.
Type: Greece, Isle of Melo, URVILLE 306 (holotype: FI).

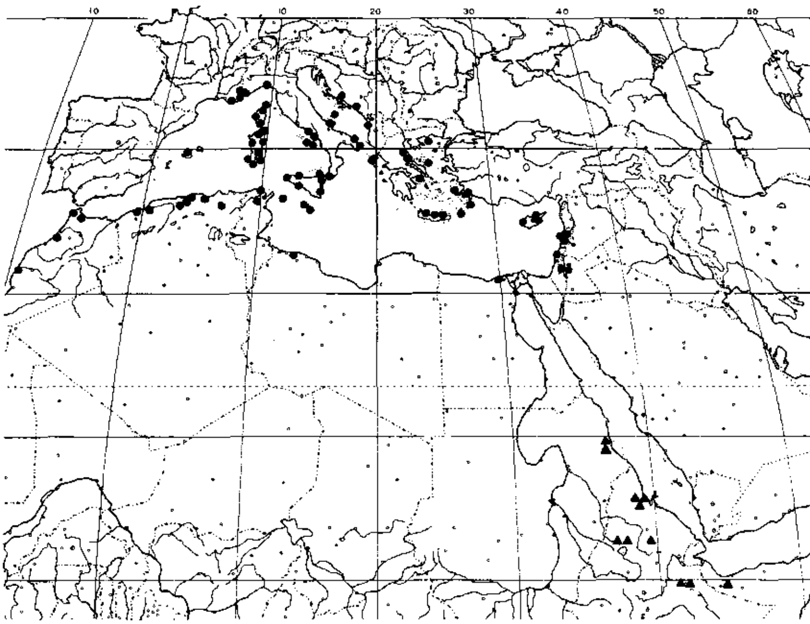
A. hirsutum ZUCCARINI 1843:232, tab. 2, non LAMARCK; BOISSIER 1882:271; HOLMBOE 1914:46; NÁBĚLEK 1929:35; DINSMORE in POST 1933:643; TÄCKHOLM et DRAR 1954:75.
A. subhirsutum var. *hirsutum* REGEL 1875:221; OPPENHEIMER et EVENARI 1940:188; [*A. subhirsutum* subsp. *hirsutum* KOLLMANN 1973:201–204, nom. inval.]; *A. trifoliatum* subsp. *hirsutum* (REGEL) KOLLMANN 1975:201 (incl. var. *hirsutum* and var. *sterile*).
Type: Jordan, near Hebron, SCHUBERT s.n. (holotype: M, in Herb. ZUCCARINI).

A. subhirsutum var. *hellenicum* HAUSSKNECHT 1899:29; MARKGRAF in HAYEK 1932:51; RECHINGER F. 1943:718.
Type: Greece, Isle of Chio, PAULI s.n. (not seen).

Protective leaves of bulb after decay of outer epidermis without conspicuous structure. *Spathe* 1, opening with one slit up to the base, rarely with 1–3 shorter additional slits. *Flowers* white or seldom pink. Filaments c. $(^1/_2-)^2/_3$ the length of the tepals.

Habitat. Largely confined to the Mediterranean region. The subspecies is found mostly along, or not too far from the coast, frequently in more or less secondary localities like olive- and vineyards, along roadsides, among cultivated plots, on dikes, on grazed pastures, and on waist fields. It also grows in ravines, in and on the edge of pine forests, on rocky and grassy places, and in loose sands, KOLLMANN (1973) discussed the ecology of various intraspecific polyploids of *A. subhirsutum* subsp. *hirsutum* for Israel. She found the triploid var. *sterile* to occur mainly on the poorer and disturbed soiltypes, where it propagates mainly vegetatively by means of increase bulbs. The subspecies has a preference for sandy-, stony-, and calcareous soils, and for terra rossa. Altitude 0–1000 m. Flowers: January–May (Morocco, Algeria, Tunisia, and Libya); April–June (Europe); March–April (Near East).

Distribution. Rare in Morocco, Algeria (also known as an alien), Tunisia, Libya, and Egypt. In Morocco and Algeria it is replaced by subspecies *subvillosum*. From Portugal and Spain I did not see specimens myself, but according to WILLKOMM et LANGE (1862:212) common in the whole area of Spain; furthermore Balearic Is.; south coast of France; Corsica; Sardinia; Sicilia; Italy; Pantelleria I.; Maltese Islands; Yugoslavia; Albania; Greece; Cyprus; Turkey (no specimens seen myself, but fide Dr. VAN OOSTSTROOM of Leyden gregarious south of Izmir); Lebanon; Israel; Jordan. In Ethiopia and Sudan the subspecies is replaced by subspecies *spathaceum*.



MAP 14. Localities of *Allium subhirsutum*: ● subsp. *subhirsutum*; ▲ subsp. *spathaceum*.

Mediterranean area: s.l., LINNAEUS 419.3 (LINN, type of *A. subhirsutum* L. ssp. *subhirsutum*).

Morocco: Mogador I., 28 Feb. 1952, BANNERMAN s.n. (BM); s.l., BROUSSONNET s.n. (BM); Tetuan, 1865, Herb. COSSON s.n. (FI); near Tanger, 1865, Herb. COSSON s.n. (FI); Rabat, sands, Jan.–Feb. 1912, MOURET 967 (P).

Algeria: La Hamma, waist field, April 1881, ALLARD 3462 (FI, G, MPU, P); Alger, sands, 'rare', May 1919, D'ALLEIZETTE s.n. (P); Alger, BELANGER s.n. (G); Oran, 9 April 1842, COSSON s.n. (P); La Macta, grassland, alien, April 1910, FAURE s.n. (G); Rift of River Chiffa, 28 May 1914, HIBON s.n. (P); La Hamma, waist field, April 1881, HUSSEIN s.n. (P); Constantine, JULIEN 25 (G); Milianah, 1845, MIALHES 2072 (P); Bougie, wast field, limestone, May 1896, REVERCHON 165 (G, P).

Tunisia: Djebel Sidi-Ali-El-Mekki, 5 May 1888, BARRATTE s.n. (P); Sidi Athman, ravines and escarpments, May 1909, CUÉNOD s.n. (G); 'copiosissime in agris Tuneti', Herb. VAHL s.n. (C).

Libya: Tripoli, 3 April 1866, BLANCHE 657 (P).

Egypt: 1864, Herb. BELANGER s.n. (G); Mariout, March 1880, BARBEY 879 p.p. (MPU).

Balearic Is.: Mallorca, Soller, hills, 4 June 1911, BIANOR 1282 (COI); Soller, May–June

1881, BOISSIER s.n. (G); Serra de Soller, 1 June 1881, BURNAT s.n. (MPU).

France, many collections: Peninsula of St. Jean, oliveyard, 17 May 1865, BUREAU s.n. (P); Monaco, 12 April 1872, BURNAT s.n. (FI); Fort of St. Marguerite, 9 May 1848, BOURGEAU 394 (P); Nice, 16 April 1863, CANUT 92 (FI, P); Toulon, pine forest, 22 May 1883, CHAMBEIRON 5051 (P); Hyères, 25 April 1923, HIBON 3833 (P).

Corse, many collections: Bonifacio, 17 May 1964, BLANCHET s.n. (MPU); near Ajaccio, Punta de Pozzo di Borgo, 22 May 1901, COSTE s.n. (MPU); Cap Corse, 26 May 1908, HIBON s.n. (P); Saint Florent, 28 May 1866, MABILLE 183 (FI, P); Ajaccio, May 1847, REQUIEN s.n. (FI, P); Bonifacio, arable land, 14 June 1880, REVERCHON 387 (G, MPU, P).

Sardinia, many collections: near Cagliari, 5 May 1879, BIONDI s.n. (FI); Cape Spartivento, 17–18 April 1894, MARTELLI s.n. (FI); Mt. Remule, 10 June 1899, MARTELLI s.n. (FI); I. of S. Antioco, 26 April 1894, MARTELLI 429 (FI); Alghero, 17–18 May 1895, MARTELLI 432 (FI); near Aritzo, 1935, PURRU 9 (FI); near Tempio, Santa Teresa Gallura, 14 June 1882, REVERCHON s.n. (COI); Mt. Arrulini, 9 May 1945, SENNI s.n. (FI); I. of Maddalena, April 1893, VACCARI s.n. (FI).

Sicily, many collections: Mandanici, 12 May 1872, AIULI s.n. (FI); Cape of S. Alessio, 1 May 1957, ARENA s.n. (FI); near Palermo, 2 May 1895, BIONDI s.n. (FI); I. of Egadi, 30 April 1935, FRANCINI s.n. (FI); Avola, rocky places, 11 April 1898, RIGO 132 (P); Palermo, grassy places, May 1901, ROSS 289 (FI, L, P, WAG); s.l., 1788, SCHLAUBUSCH s.n. (L); near Agrigento, 12 April 1873, SOMMIER s.n. (FI); Palermo, arable land, 31 May 1890, SOMMIER c.s. s.n. (FI); Palermo, grassy places, May, TODARO 503 (FI, P).

Pantelleria I.: s.l., 19 and 24 March 1906, SOMMIER s.n. (FI).

Maltese Is.: Gozo I., s.l. 15 April 1874, DUTHIE s.n. (FI); Madonna dela Kala, rocks near the sea, 4 Nov. 1874, DUTHIE s.n. (FI); s.l., 20–24 and 27 April 1907, SOMMIER s.n. (FI); Malta I., San Paolo, 3 May 1907, SOMMIER s.n. (FI); Natabile and Tabalda, April 1906, SOMMIER s.n. (FI); s.l., 11–13 April 1906, SOMMIER s.n. (FI); s.l., THURET s.n. (P); s.l., dry places, May, URVILLE s.n. (P); s.l., April 1820, URVILLE c.s. 9 (P).

Italy, many collections: Bordighera, 19 April 1890, BICKNELL s.n. (COI); Mt. Gargano, 21 April 1964, DIETRICH s.n. (COI, M); near Naples, GASPARINI s.n. (P); Genova, vineyard, May 1853, GENNARI s.n. (P); Sorrento, oliveyard, 18 April 1843, DE HELDREICH s.n. (P, WAG); Mt. Catania, near Reggio, sands, 21 April 1877, HUTER c.s. 155 (MPU, P); Capri, April, PARLATORE s.n. (FI); near Otranto, near the see, 9 May 1875, PORTA c.s. 156 (P); Mt. Gargano, limestone, 19 April 1875, PORTA c.s. 313 (MPU, P); Ischia, Mt. Epomeo, 29 April 1820, SCHOUW s.n. (C); near Brindisi, on dikes, among cultivated plots, 5 May 1971, DE WIT 12520 (WAG); In FI many collections of the following provinces: Liguria, Istria, Toscana, Lazio, Campania, Puglie, and Calabria.

Yugoslavia, many collections: Dubrovnik, 29 May 1959, HANSEN s.n. (C); I. Palagruza, 22 July 1878, MARCHESETTI, s.n. (FI); Split, edge of pine forest, 15 May 1956, VAN OOSTSTROOM s.n. (L, WAG); Mt. Marian, near Split, stony and grassy places, PICHLER 1040 (C, COI, P).

Albania: s.l., rocks near the sea, 2 June 1898, BALDACCI 49 (FI).

Greece, many collections: Rhodos, 1836, AUCHER 993 (G); Karpathos, 9 May 1886, BARBEY 70 (G); Mt. Hymettus, April 1842, BOISSIER s.n. (P); Kreta, Iraklion (Candia), 3 May 1915, GANDOGER 10480 (P); Kreta, near Koumistates, April 1846, DE HELDREICH s.n. (FI, P); Leros, 1878, DE HELDREICH s.n. (P); Skopelos, 27 April–18 May 1896, LEONIS s.n. (G); Corfu, April 1878, LETOURNEUX s.n. (P); Thasos, hills, 19 May 1891, SINTENIS c.s. 676 (G); s.l., URVILLE 306 (FI, type of *A. graecum* URVILLE); Kiparissias, in pine forest on loose sands, 14 May 1971, DE WIT 12592 (WAG).

Cyprus: Cap Akamas, grasses, 22 March 1884, DEFLERS 1277 (MPU); Fontana Amorosa, grazed pasture, 20 March 1962, MEIKLE 2289 (C, K); Lapithos, rocky slopes, 24 April 1967, MERTON 1308 (L); Kythrea, 11 April 1880, SINTENIS c.s. 167 (P).

Lebanon: Beyruth, 26 April 1880, BARBEY 875 (G); Nahr el Kalb, 24 April 1880, BARBEY 880 (G); Afqa, 14 May 1882, PEYRON s.n. (G); Aïn Sofar, 11 April 1889, PEYRON s.n. (G); Beyruth, April 1884, POST 222 (G).

Israel: Deir-esh-Sheikh, near Jerusalem, 22 April 1933, FEINBRUN c.s. 222 (C, G, WAG);

Mt. Carmel, LABILLARDIÈRE s.n. (G); Jerusalem, rocky places, 27 March 1915, MEYERS B 2466 (G); Jerusalem, fields, 21 March 1912, MEYERS 6619 (G); Beit Meir, 29 March 1965, STEVELS 93 (WAG).

Jordan: Náur, rocky ground, 28 April 1911, MEYERS c.s. M 1463 (G).

Notes.

Synonyms. I could not trace the type specimens of *A. ciliatum* CIRILLO and *A. trifoliatum* CIRILLO, both described from the Isle of Capri, neither at Naples nor at Florence. CIRILLO lived and kept his herbarium at Naples, and most likely the specimens were destroyed during the Burbundian revolt in Naples in 1799. The illustrations by CIRILLO agree well with the abundant material of ssp. *subhirsutum* from Capri, extant at FI.

A. clusianum RETZIUS in WILLD. The typification of this name is rather unfortunate. First there can be doubt whether it should be typified by a specimen of RETZIUS (there is no specimen at LD), or that the specimens in the WILLDENOW herbarium at B (no. 6509) should be taken as the type. In the protologue by WILLDENOW in two instances is referred to a latter from RETZIUS. In Herb. WILLD. are two sheets both bearing one single specimen, one of which bears the annotation 'Hort. bot. Berol. W', the other 'W', both in WILLDENOW's handwriting. This latter specimen is doubtlessly *A. chamaemoly*, and definitely does not agree with the protologue. The first mentioned specimen agrees better with the protologue, and might be regarded as the type of *A. clusianum*. This specimen, however, lacks the bulb and is furthermore extremely scanty. Its tepals are c. 5 mm, the stamens incl. anthers c. 4 mm; but the scantiness of the specimen does not permit a clear decision of what subspecies of *A. subhirsutum* is concerned. RETZIUS in WILLDENOW refers to *Moly minus* CLUS. hist. 1. p. 192, with the remark 'figura bona', and this figure clearly represents *A. subhirsutum* ssp. *subhirsutum*.

A. ciliatum SIMS, non CIRILLO, nec ROTH described and figured by SIMS as a native of Cape of Good Hope belongs to ssp. *subhirsutum*. SIMS noted that it was imported from South Africa to Clapham (England) by GEORGE HIBBERT, but I doubt whether it is of South African origin. No type material or other material of ssp. *subhirsutum* from South Africa is present at K or BM.

A. trifoliatum CIRILLO ssp. *hirsutum* (REGEL) KOLLMANN. As appears from the article (l.c.) this taxon represents specimens from Israel which are more or less intermediate between two very related species as accepted by KOLLMANN and STEARN, viz. *A. subhirsutum* L. and *A. trifoliatum* CIRILLO, and which are united by me in my *A. subhirsutum* ssp. *subhirsutum*. The differentiating characters between the above mentioned closely related species, appear to be best visible in living plants, and to be hardly notable in dried specimens. KOLLMANN recognizes furthermore two varieties in *A. trifoliatum* ssp. *hirsutum*, viz. var. *hirsutum* and var. *sterile*, the former being diploid ($2n=14$), the latter being triploid ($2n=21$).

Distribution. Only one specimen from Egypt, namely an old collection from Alexandria, came to my attention.

Indumentum. The degree of hairiness is extremely variable. Especially in the material from Israel I found striking examples as for instance MEYERS 6619 from Jerusalem is felty hirsute, whereas MEYERS B2466 from the same area is subglabrous.

Colour. The flower colour is predominantly white with a greenish or brownish midvein on each tepal. In Greece a few pink-flowered specimens have been found. The anthers are purple before anthesis.

Caryology. For several samples from Israel KOLLMANN (1973a) found 2n = 14 (for subspecies *hirsutum* var. *hirsutum*), and 2n = 21 (for var. *sterile*). She reports (p. 105) a counting by DAHLGREN (1971) of 2n = 28 for a specimen from the Balearic Is. CELA RENZONI et GARBARI 1971:99, found 2n = 14.

b. ssp. subvillosum (SALZMANN ex SCHULTES) DUYFJES, *comb. et stat. nov.*
Fig. 23: 1–11, **Map 15.**

A. subvillosum SALZMANN ex SCHULTES et SCHULTES F. 1830:1104; COSSON 1875:50; REGEL 1875:248; WILLKOMM et LANGE 1862:212; RICHTER 1890:210; KOLLMANN 1975:201.

A. subhirsutum var. *subvillosum* BALL 1878:691; BATTANDIER et TRABUT 1895:59; DURAND et BARRATTE 1910:234.

Type: Morocco, near Tanger, SALZMANN s.n. (holotype: M; isotypes: FI, G, K, P).

A. subhirsutum auct. non L.: DESFONTAINES 1798:286; REDOUTÉ 6, 1812:305; MUNBY 1847:34; PALHINHA 1966:136.

A. chamaemoly auct. non L.: VIVIANI 1824:19.

A. vernale TINEO in GUSSONE 1832:96; GUSSONE 1842:390; PARLATORE 1852: 529; MUNBY 1859:29; ibid. 1866:32; BATTANDIER et TRABUT 1884:152; ibid. 1895:58.

A. subhirsutum var. *vernale* BONNET et BARRATTE 1896:414; DURAND et BARRATTE 1910:234; BÉGUINOT et VACCARI 1914:96; ibid. 1915:17; PAMPANINI 1931:154; MAIRE 1958:289.

Type: Italy, Sicily, Palermo, TINEO s.n. (holotype: FI; isotype: P).

A. roseum auct. non L.: WEBB et BERTHELOT 1848:346, p.p.

A. trifoliatum auct. non CIRILLO: WEBB et BERTHELOT 1848:347.

A. subvillosum var. *canariense* REGEL 1875:249.

Type: Canary Is., near San Sebastian, MAXIMOWICZ s.n. (not seen).

A. × *humbertii* MAIRE 1926:124; MAIRE 1958:290; QUÉZEL et SANTA 1962: 211.

Type: Algeria, Zeralda, naer Alger, HUMBERT s.n. (holotype: P).

A. album auct. non SANTI: JAHANDIEZ et MAIRE 1931:122.
A. subhirsutum subsp. *album* auct. non SANTI: MAIRE et WEILLER, publication unknown; CUÉNOD 1954:214; MAIRE 1958:289; QUÉZEL et SANTA 1962:211; *A. subhirsutum* var. *album* auct. non SANTI: VINDT 1953:125.

A. clusianum auct. non RETZIUS in WILLD.: LINDBERG 1932:32.

A. album SANTI var. *purpurascens* MAIRE et WEILLER in MAIRE 1935:121; EMBERGER et MAIRE 1941:956; MAIRE 1958:289.
A. subhirsutum forma *purpurascens* VINDT 1953:125.
Type: Morocco, Tazeroualt, MAIRE et WEILLER s.n. (holotype: P).

Protective leaves of bulb after decay of outer epidermis conspicuous faveolate. *Spathe* 1, opening with 1 slit up to the base, usually with 1–3 shorter additional slits. *Flowers* white or creamy or on the Canary Is. pink. Filaments about as long as the tepals.

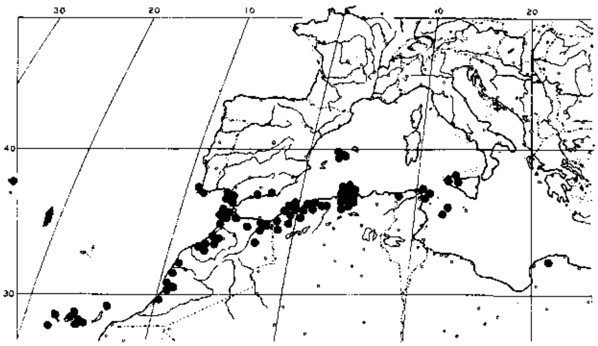
Vernacular name. Morocco: *El Bseyla* (Arabic).

Uses. In Algeria the inflorescences are eaten (fide BOVÉ in G, K, L, P).

Habitat. Apparently more or less bound to coastal regions, not found more than c. 150 km inland. It grows besides on places close to the sea, as on beaches and sand dunes etc., also in localities as ravines, escarpments, steep slopes, rocks, hills, moist places, waste fields, arable land, and roadsides. Furthermore in cedar- and pine forests, and in *Erica arborea*- and *Cistus* scrub. On the Canary Islands it is found also on volcanic soils up to 1600 m. There is a preference for sandy- and calcareous soils. Altitude 0–1600 m. Flowers: December–March (Madeira, Canary Is.); January–April (Morocco); March–June (Algeria, Tunisia, Libya); December–June (Europe).

Distribution. Some collections from the Azores and Madeira; common in the Canary Is., Morocco, and Algeria, rare in Tunisia and Libya; in Europe only known from the South coast of the Iberian Peninsula, the Balearic Is.; Sicily (numerous collections from the vicinity of Palermo, however, not collected after 1891), and the Isole Pelagie (3 collections).

AZORES: Sao Miguel I.: 1847, HUNT s.n. (BM, C, FI, K).
CANARY Islands: Hierro I.: near El Golfo, 19 Feb. 1858, LOWE s.n. (BM); Riscos de Jinama, 1250 m, grasses, March 1905, PITARD 1241 (P). La Palma I.: La Cumbrecita, 1600 m, cliffs in pine forest, 15 April 1971, BRAMWELL 3437 (BM). Tenerife I.: Mount Pino de Oro, Dec. 1851, BOLLE s.n. (MPU, P); Volcano near Orotava, 8 Jan. 1921, BØRGESEN 45 (C); San Diego del Monte, under *Erica arborea* scrub, BOURGEAU 31 (BM, FI, G, K, P); near Los Campitos, Jan. 1845, BOURGEAU 997 (FI); San Diego del Monte, in pine forest, BOURGEAU



MAP 15. Localities of *Allium subhirsutum* subsp. *subvillosum*.

1535 p.p. (C, FI, G, K, MPU, P, WAG); Orotava, Feb.–April 1925 BROOKS s.n. (BM); s.l., 1807, BROUSSONNET s.n. (G); Bunavista, rocks near the sea, Jan. 1904, BURCHARD 25 (M); N. of Puerto Cruz, 150 m, cinder heaps, 1 Feb. 1935, CLAYTON 3 & 4 & 5(K); N. of Carachico, 100 m, cliffs, CLAYTON 22 (K); s.l., Jan. 1895, DE DALMAS 25 a (G); s.l., 1837, DESPRÉAUX 509 (G); on rocks, Jan.–April 1903, DINN 12 (WAG); s.l., 18 Jan. 1838, ELLIOT 1 (G); s.l., 1796, LEDRU s.n. (P); Orotava, (erroneously located on Madeira), arable land, 4 Dec. 1857, LOWE 28bis (BM, G, K); Santa Cruz, 10 Feb. 1859, LOWE 57bis (BM, P); Orotava, Jan. 1930, MAUDE s.n. (BM); Jacaronte, Feb. 1932, MAUDE s.n. (BM); Orotava, Feb. 1862, PEREZ s.n. (K); Mount Marguesa, near Orotava, 23 Feb. 1900, PEREZ s.n. (BM, K); Tégueste, 25 Jan. 1905, PITARD 378 (G, L, P); Orotava, Jan. 1865, SAGOTZ s.n. (P); Santa Cruz, March 1933, TRETHEWY 9 (K); s.l., humid rocks and ravines, WEBB s.n. (FI); s.l., WEBB s.n. (FI, K, P). Gran Canaria I.: Las Palmas, near the coast, 2 March 1933, ASPLUND 5 (G); near Tentinignada, 600 m, 19 Jan. 1970, VAN HEEL s.n. (L); Bandama, 13 Jan. 1965, KAAE s.n. (C); Barranco Aguatona, 100 m, 2 Dec. 1965, KUNKEL 7735 (WAG); Atalaya, 19 Dec. 1965, KUNKEL 7806 (WAG); Barranco Ojeda, 1000 m, 13 Jan. 1966, KUNKEL 8073 (WAG); Pinar Ojeda, 1000 m, 13 Jan. 1966, KUNKEL 8078 (WAG); Tamadaba, in pine forest, 25 March 1966, KUNKEL 8951 (WAG); Tamadaba, between rocks, 1100 m, KUNKEL 8952 (WAG); Tamadaba, 1330 m, wet patch of turf in open forest, 4 March 1955, SCOTT s.n. (K); Arucas, 1929, TRETHEWY s.n. (BM); s.l., WEBB 509 (FI). Lanzarote I: along road to Haria, 17 June 1858, LOWE 95 (K); above Hano, 500 m, 17 Jan. 1966, MONTAGU POLLOCK 127 (BM).

MOROCCO: S. of Tanger, coast, 5 Feb. 1966, ARCHIBALD 780 (E, K); Saffy, Feb. 1875, BEAUMIER s.n. (FI, G, P); Casablanca, Feb. 1918, BENOIST 1 (P); near Tanger, BOUCHET s.n. (MPU); Tanger, BROUSSONNET s.n. (P); near Tanger, 21 Feb. 1901, BUCHET s.n. (P); near Tignimin, 200 m, limestone, 20 March 1929, FONT QUER 73 (BM, G); Marsa Seguira, 16 May 1927, FONT QUER 118, (BM, G); between Tetuan and Ceuta, April 1871, HOOKER s.n. (K); Tindighas, 1550 m, limestone, 16 May 1925, JAHANDIEZ 295 (BM, G); Sidi el Ghiat, 400 m, limestone, 12 April 1934, MAIRE c.s. s.n. (P, type of *A. album* SANTI var. *purpurascens* MAIRE et WEILLER); Hamara, 1875, MARDOCHÉE s.n. (FI); Haouara, 1875, MARDOCHÉE s.n. (P); Dar Ould Delimi, 1875, MARDOCHÉE s.n. (P); Province of Ksima, 1875, MARDOCHÉE s.n. (P); Agadir, Jan. 1875, MARDOCHÉE s.n. (P); Zeluan, fields, 1 April 1931, MAURICIO 8041 (BM, G); Casablanca, 2 Feb. 1887, MELLERIO 19 (P); Rabat, sands, Feb. 1912, MOURET 967 (P); Tanger sands, MUNBY s.n. (K); Tanger, SALZMANN s.n. (FI, K, M, P, type of *A. subvillosum* SALZMANN); Tanger, 1835, SALZMANN s.n. (G); El Zaio, between *Zizyphus lotus* hedges, 23 April 1931, SENNEN c.s. 8040 (BM, G); Beni-Sidel, 24 Feb. 1934, SENNEN c.s. s.n. (BM); Fedhala, Feb. 1930, TRETHEWY s.n. (BM); Mogador, Feb. 1934, TRETHEWY 47 (K); Fedhala, Feb. 1930, TRETHEWY 99 (K); Fedhala, Feb. 1930, TRETHEWY 111 (K); Safi, Feb. 1931, TRETHEWY 140 & 140 A (K); forest near El-Harhoura, near Rabat, Dec. 1955, VINDT s.n. (COI); near Debdou, 700–900 m, rocks, 10 April 1928, WILCZEK c.s. 465 (G); near Taourirt, 600–800 m, scrub, 13 April 1928, WILCZEK c.s. 698 (G); near Berkane, valley of Oued Feroudj, 500–600 m, scrub, WILCZEK c.s. 1073 (G).

ALGERIA: Sidi-Ferruch, roadside, March 1880, ALLARD 157 (FI, G); Oran, scrub, Feb. 1914, D'ALLEIZETTE s.n. (P); between Oran and Mostaganem, April 1917. D'ALLEIZETTE s.n. (P); Miliana, 360 m, slopes, 1 May 1937, ALSTON c.s. s.n. (BM); Oran, sands, 15 April 1852, BALANSA 228 (BM, C, FI, G, K, MPU, P, WAG); Oran, 1849, BOISSIER c.s. s.n. (BM, K); near Oran, 10 April 1856, BOURGEAU s.n. (P); Alger, hills, March 1837, BOVÉ s.n. (G, K, L, P); Oran, hills, April 1839, BOVÉ s.n. (FI, G, P); Arzew, 1836, BRAVAIS s.n. (P); Mostaganem, BROUDELS s.n. (P); Médéah, 20 May 1872, CHABERT s.n. (FI); River Chiffa, rift, 26 May 1872, CHABERT s.n. (FI); Guyotville, March 1881, CHABERT 2571 (FI); near Oran, scrub, 2 May 1896, CHABERT s.n. (FI); Dj. Curua, near Aumale, 14 July 1857, CHAROY 605 (P); E. of Droh Bridha, near Aumale, 14 June 1863, CHAROY 887 (P); between Guyotville and Staoueli, March 1881, CHEVALLIER s.n. (P); La Calle, sands, 25 April 1915, CLAVÉ 3837b (G); escarp of El Oudja, near Oran, 24 April 1842, COSSON s.n. (P); Oran, scrub, April 1847, COSSON s.n. (P); escarp of Batterie Espagnole, 8 May 1852, COSSON s.n. (P); E. of Boghar, plateau Dj. Guessa, 1427 m, June 1852, COSSON s.n. (P); near Blidah, rift of River Chiffa, 16 July 1854, COSSON s.n. (P); Teniet-el-Haad, ceder forest, 23 July 1854, COSSON s.n. (P); Ouarsenis, 27 April 1854, COSSON s.n. (P); Orléansville, 24 April 1875, COOSON s.n. (P); Dahra, Dj. Mediouna, COSSON s.n. (P); Cherchell, April 1890, COUTAN s.n. (P); Oran, escarps, 25 April 1882, DEBEAUX s.n., p.p. (G); 'in arvis Algeriae', DESFONTAINES s.n. (G); Oran, 4 March 1889, DOUMERGUE 5 (FI); s.l. 13 April 1950, DUBUIS 1167 (G, K); Oran, 1850, DURANDO 167 (FI, G, P); near Oran, rocks, 19 April 1842, DURIEU DE MAISONNEUVE s.n. p.p. (P); Alger, DUVAL 157 (COI); Oran, valley of the Noiseux R., 15 May 1904, FAURE 542 (G, P); La Macta, scrubs and sands, 2 May 1909, & 28 April 1912, & 20 April 1913, & 18 April 1915, & 9 April 1933, FAURE s.n. (BM, FI, G, M); Oran, sand dunes, 20 March 1887, GARRIGUES s.n. (P); Guyotville, Dec. 1873, GIROD s.n. (K); Oran, 1837, GOUGET 857 (P); Zeralda, near Alger, April 1926, HUMBERT s.n. (P, type of *A.* × *humbertii* MAIRE); near Chiragas, sands, JAMIN s.n. (P); Blidah, LEFEBVRE s.n. (P); Fouka, sands, 9–10 April 1862, LEFEBVRE 645 (P); Sidi-bel-Abbès, April–May, LEFRANC s.n. (P); Oran, April 1847, MARSILLY s.n. (P); Mascara, hills, 20 April 1906, Herb. MARTY s.n. (G, P); Mascara, Tell Mountains, 12 May 1844, MIALHES s.n. (P); Milianah, 1845, MIALHES 69 (P); Annaba, sand dunes, 9 April 1972, MULLER 09820 (WAG); Oran, sands, May 1848, MUNBY s.n. (P); Tlemcen, Lalla Maghnia, May 1855, MUNBY s.n. (K); Oran, MUNBY s.n. (G, K); Oran, in shrubbery, April 1849, REUTER s.n. (P); Tlemcen, road to plateau of Terni, 7 June 1908, SAINT-LAGER s.n. (G); Mitjidja, April–May 1881, SURINGAR 292 (L); Mustapha, March 1880, Herb. DE VÉSIAN s.n. (P); Nemours, coast, WARNIER 384 (P); Oran, 1839, WEBB s.n. (FI); E. of Oran, scrub, 1 May 1928, WILCZEK c.s. 1563 (G); Sidi-Ferruch, April 1856, Herb. WOLFE s.n. (K); Staoueli, April 1857, Herb. WOLFE s.n. (K, P).

TUNISIA: Kelibia, 15 May 1883, COSSON c.s. s.n. (P); Djebel Cheban, 20 May 1883, COSSON c.s. s.n. (P); Ile Plane, 31 May 1888, COSSON c.s. s.n. (P).

LIBYA: Miserghin, near El-Beida, 3 May 1886, DUVEYRIER 108 (P).

PORTUGAL: Algarve, Sagres, in arable land, 7 March 1947, BENTO BAINHA 1291 (L); Algarve, Cabo de S. Vicente, 6 April 1968, MERXMÜLLER c.s. 23232 (M).

SPAIN: Cadiz, Feb. 1881, AROZARENA 29 (P); Cadiz, BOISSIER s.n. (P); Puerto Santa Maria, sands, 1 May 1849, BOURGEAU 477 (FI, P, WAG); Cadiz, 1853, ELISALDE s.n. (P); Cadiz, May 1852, FÉE s.n. (FI); Almuñécar, sands, 16 March 1965, KAAE s.n. (C); Jeti, roadside, 25 March 1965, KAAE s.n. (C); Cadiz, 17 Feb. 1851–1852, LANGE 137 (C, P); Granada, rocky escarpment, 12 April 1968, MERXMÜLLER c.s. 23372 (M); Cadiz, sands, 1838, RAMBUR s.n. (K, P); near Cadiz, sands, 1826–1828, WEBB s.n. (FI): Cadiz, WILLKOMM 466 (P); Puerto Santa Maria, 12 Feb. 1845, WILLKOMM 859 (FI); near Cadiz, 29 Jan. 1845, WILLKOMM 860 (P); Almeria, 5 April 1876, WINKLER s.n. (M, P).

BALEARIC IS.: MALLORCA: between Esportas and Puigpugnent, wall, 17 June 1971, VAN BALGOOY 1240 (L); Mount Soller, May–June 1881, BOISSIER s.n. (G); Barranco de Soller, rocks, April–May 1869, BOURGEAU 2804 (FI, P); Arta, 16 April 1825, CAMBESSEDES s.n. (P);

Puig de Galatro, 1000–1300 m, limestone, 23 May 1885, PORTA c.s. s.n. (G, M, P); El Prat, pineforest, dry sand, 26 April 1873, WILLKOMM s.n. (C, FI, P); between Miramar and Degá, 10 May 1873, WILLKOMM 233 (P).

SICILY: s.l., GUSSONE s.n. (FI); s.l., 1859, GUSSONE (P); Mondello, near Palermo, sands, 26 March 1855, HUET DU PAVILLON c.s. s.n. (FI, P, WAG); Favignana I., sands, 5 May 1855, HUET DU PAVILLON c.s. s.n. (FI, WAG); Mondello, 1886, MARCHESETTI s.n. (FI); Palermo, March 1835, August 1842, PARLATORE s.n. (FI); Mondello, May 1891, ROSS s.n. (FI); Mondello, TINEO s.n. (FI, P, type of *A. vernale* TINEO); Palermo, TODARO s.n. (FI); Mondello, TODARO 705 (FI, P); Palermo, sands, Dec. 1856, TODARO s.n. (FI).

ISOLE PELAGIE: Linosa I., 24 April 1873, SOMMIER s.n. (FI); rocks, 1–6 March 1906, SOMMIER s.n. (FI).

LAMPEDUSA I.: Sanguedolce, April 1905, ZODDA s.n. (FI).

Notes.

Synonyms. *A. chamaemoly* auct. non L. was enumerated by VIVIANI, 1824, for Libya and based on a specimen collected by DELLA CELLA, preserved in G. According to COSSON (1875) it belongs to *A. subhirsutum* ssp. *subvillosum*. I have not examined the specimen in G myself.

The type specimen of *A. vernale* TINEO bears hirsute as well as glabrous leaves.

A. roseum auct. non L.: WEBB et BERTHELOT p.p., and *A. trifoliatum* auct. non CIRILLO: WEBB et BERTHELOT. Under *A. roseum* is explained that this species is not indigenous to the Canary Islands. *A. trifoliatum* CIRILLO is synonymous with the type-subspecies, ssp. *subhirsutum*, which is also not indigenous to the Canary Islands. Specimens of the present ssp. *subvillosum* from the Canary Islands have either pink or white flowers, which accounts for the acception by WEBB and BERTHELOT of the two misinterpretated species.

A. subvillosum var. *canariense* REGEL. According to REGEL 1875:249 this (sub)glabrous variety is few-flowered, small of habit, with glabrous and narrow leaves. The abundant and variable material from the Canary Islands includes the specimens described by REGEL.

A. × humbertii Maire. This was supposed to be a hybrid of *A. roseum* L. and *A. album* SANTI. MAIRE described the capsule as containing abortive ovules, but the type specimen examined by me has normal seeds, and belongs to ssp. *subvillosum*.

A. album SANTI is a synonym of *A. neapolitanum* CIRILLO (see there).

Bulbcoats. In some specimens more than the usually two protective bulbcoats are found, e.g. in JAHANDIEZ 295 from Morocco with 18 bulbcoats, and in MIALHES 69 from Algeria with 12 bulbcoats. The presence of more than two bulbcoats by accumulation is explained under *A. roseum*.

Colour. Flower colour varies from white or creamy, to pink. Apparently only pink and pure white flowers occur on the Canary Isiands, whereas the flowers in the remaining areas seem to be creamy only. The pink-flowered specimens from the Canary Islands have led repeatedly to misidentifications in *A. roseum* L. and *Nothoscordum inodorum* (AIT.) NICHOLSON.

Tepals. MULLER 09820 in WAG, collected in Algeria, has sparingly laciniate tepal-edges, apparently as an aberration; fig. 23:2–4.

Fieldnotes. Crushed parts have only a faint *Allium* smell.

c. ssp. spathaceum (STEUDEL ex A. RICHARD) DUYFJES, *stat. nov.*

Fig. 24, 25, Map 14.

A. spathaceum STEUDEL ex A. RICHARD 1850:330; SCHIMPER 1838: no. 1266 (*A. spathaceum* STEUDEL in sched.); BAKER in THISELTON-DYER 1898:516; TÄCKHOLM et DRAR 1954:80; TÄCKHOLM 1974:654.

A. subhirsutum var. *spathaceum* REGEL 1875:221; ENGLER 1892:164.

Type: Ethiopia, near Démerki, SCHIMPER 1266 (holotype: P; isotypes: FI, G, M).

Protective leaves of bulb after decay of outer epidermis with conspicuous sinuate structure. *Spathe* 1, opening with 1 slit up to the base, rarely with 1–3 shorter additional slits. *Flowers* white. Filaments c. $^2/_3$ the length of the tepals.

Vernacular name. Egypt: *Oatoom.*

Habitat. The subspecies grows only in mountainous localities of over c. 1000 m; it can be found on hills, mountain meadows, cliffs, in cracks, on steep slopes, etc. In the Semian Mountains it grows gregariously in arable land at 3000 m altitude. On the Gara Mulatta Mountain and in the Erkowit region it was collected on limestone. Altitude c. 1000–3100 m. Flowers: throughout the year.

Distribution. Sudan (Erkowit region); Eritrea and Ethiopia; Somalia (formerly British).

SUDAN: Erkowit, 1300–1700 m, February 1932, AYLMER 129 (K); Sinkat, Feb. 1938, cultivated at botanical garden at Dokki, DRAR s.n. (CAIM); Erkowit, abundant, March 1938, DRAR s.n. (CAIM); Diris Pass, Red Sea Hills, 1700 m, April 1953, JACKSON 2882 (K); Red Sea Hills, May 1938, KENNEDY-COOK s.n. (K).

ERITREA AND ETHIOPIA: Ghinda, Feb. 1916, BALDRATI 2481 (FI); Summit of Kondudo Mt, near Harrar, 3100 m, Nov. 1961, BURGER 1256 (ETH, K, WAG); above R. Mojjo, and S. of Gara Mulatta Mt, 2300 m, August 1963, BURGER 3142 (BR, ETH, FI, K, WAG); Embatcalla in Mt. Hamasen, 1300 m, Feb. 1909, FIORI 881 (FI); Sorgenti, 1200 m, March 1893, PAPPI 3177 (FI); Mt. Dijot, 1200–1800 m, PAPPI 5748 (FI); Agau, South Tigre region, 1854, SCHIMPER 839 (G, K); Mt. Bachit, Semien Mts, near Demerki, August 1938, SCHIMPER 1266 (BM, FI, G, K, M, P, type of *A. spathaceum* STEUDEL ex A. RICHARD); Mt. Alam Kalé, NW. of Aidereso, April 1892, SCHWEINFURTH c.s. 1475 (FI, G, K); Semien Mts, 3000 m, between Debarak and Geech, in cultivated field, Nov. 1969, DE WILDE c.s. 1 (WAG).

SOMALIA (formerly British): Gan Liban, near Adadle, 2000 m, March 1899, DONALDSON SMITH s.n. (BM).

Notes.

Taxonomy. A. RICHARD in Tentamen Florae Abyssinicae erroneously considered *A. spathaceum* an anomalous taxon belonging to the section *Macrospatha* G. DON, noting that this species could not be confused with any other species of that section.

Bulbils. The specimens from Somaliland collected by DONALDSON SMITH (BM), bear as an exception a few bulbils in the inflorescences.

Colour. The flower colour is mostly white, but as an exception the flowers of PAPPI 5748 are pink.

Fieldnotes. DRAR noted on the field label that the species occurs abundantly in hilly places in the Erkowit Region; this abundant growth was also observed by J. J. F. E. DE WILDE c.s. in the Semien Mts. in Ethiopia. The gregarious growing appears also from herbarium specimens, and from living specimens in the botanical garden at Wageningen, where in both cases the bulbs produce striking clusters of numerous smaller bulbs, a character not obvious in ssp. *subhirsutum* and ssp. *subvillosum*.

Crushed parts have a faint *Allium* smell.

19. A. longanum PAMPANINI — Fig. 26, Map 16.

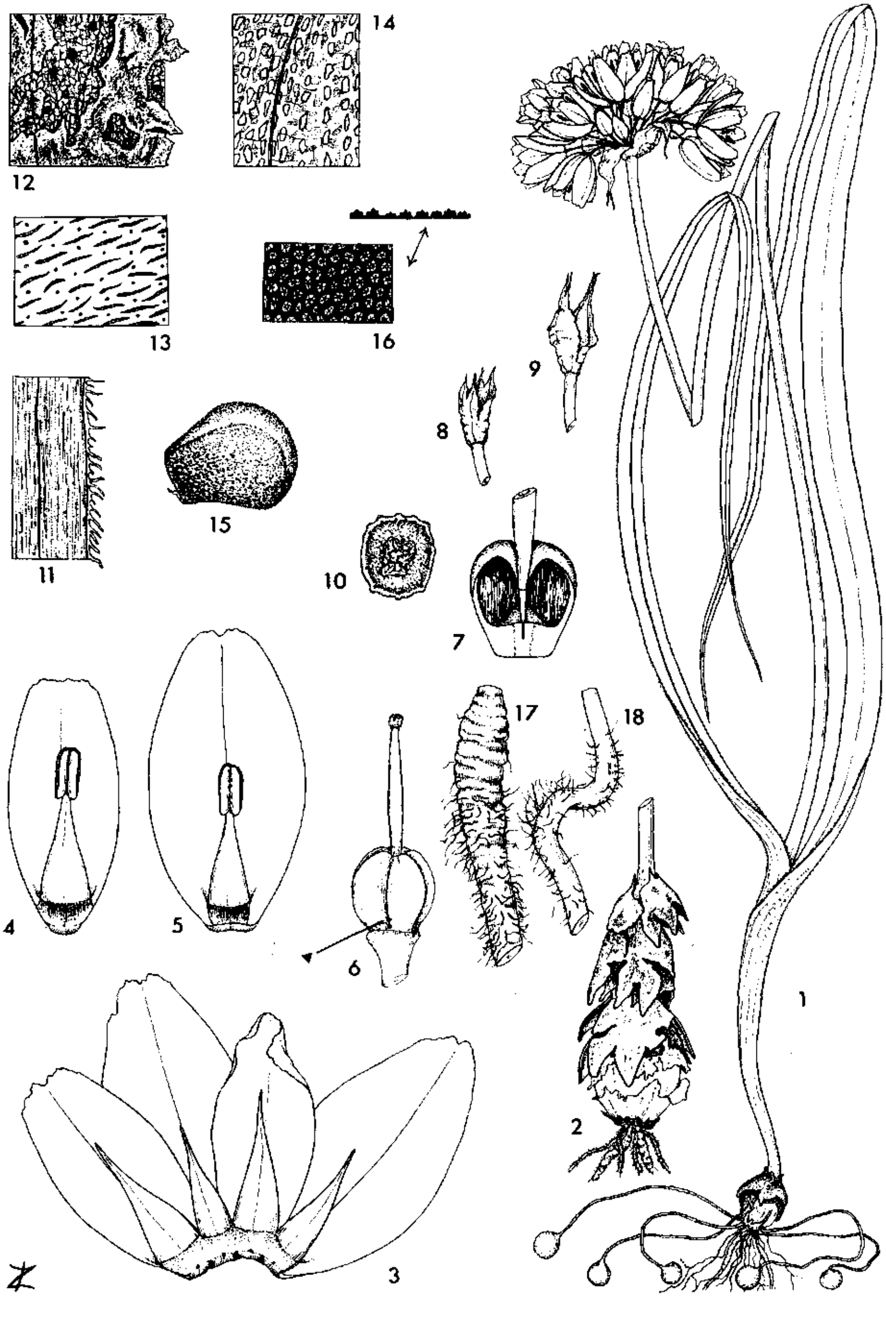
A. longanum PAMPANINI 1912:116; ibid. 1931:155, in syn. *A. roseum* TÄCKHOLM et DRAR 1954:78, in syn. *A. roseum*.

Type: Libya, border of Wadi Derna, Feb.-March 1912. LONGA s.n. (holotype: FI).

A. subhirsutum L. var. *barcense* MAIRE et WEILLER in MAIRE 1939:304; MAIRE 1958:288.

Syntypes: Libya, near Bengasi, MAIRE et WEILLER 1438 (not seen); & near Tocra, MAIRE et WEILER 1441 (lectotype: P); & near Barce. MAIRE et WEILLER 1437 (not seen); & between El Abrag and Lamlouda, MAIRE et WEILLER 1440 (P); & near Magroun, MAIRE et WEILLER 1439 (not seen).

Bulb globose to ovoid, 7–17 × 6–18 mm. Contractile roots and smooth roots finely hirsute, not branched. Increase bulbs 1–5, globose, 4–6 mm diam., not beaked, 35–50 mm stiped, wrapped in a rather firm whitish prophyll. Outer bulbcoat-leaves 2–4(–6), outer surface light to dark brown, inner surface dull, light to dark brown, after decay of outer epidermis the inner layer without conspicuous structure. Sproutleaf not observed. *Foliage leaves* 2–3, soon wilting, glabrous or near the base sparingly hirsute, or occasionally entirely hirsute; blades linear, approximate, 15–30 cm × 2–20 mm, flat, top acute, margin entire or crenulate or especially near the base hirsute; sheaths subequal, largely subterranean, 2–10 cm long, whitish, sometimes tinged purplish, glabrous or towards the top sparingly hirsute. Scape 1–3, longer than the leaves, erect, terete, solid, glabrous, 25–55 cm long, 2–5 mm diam. *Inflorescence* umbellate to hemispherical, few- to many-flowered, 2–5 cm diam., without bulbils.



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Spathe 1, hyaline, persistent, 9–18 mm, inconspicuously 4-veined; spathe opening in few-flowered inflorescences with one single slit reaching (nearly) to the base, not recurved, c. 2–3 mm acuminate, in many-flowered inflorescences with 2 (or 3) slits, varying in depth from halfway up to the base, forming 2 (or 3) spathe-bracts, often recurved, c. 3–5 mm acuminate, the acumen often split again. Bracteoles absent. Pedicels subequal, 10–20 mm, slender, in anthesis straight, or in hemiglobose inflorescences the outer pedicels recurved, in fruit straight, rigid. *Flowers* subcampanulate. Tepals c. 0.5 mm adnate to bases of filaments, persistent, white to pink, with a brownish, or pink, or purplish midvein; outer tepals oblong, 8–10 × 3.5–5 mm, top broadly obtuse or subtruncate, often with more or less undulated edge; inner tepals shorter and narrower, 5.6–8.5 × 3–4.5 mm, top and edge as outer tepals. Stamens shorter than the tepals; filaments simple; outer filaments 3.6–5 mm long, at base 1–1.2 mm wide, connate with inner filaments for c. 1 mm; inner filaments longer and wider than outer filaments, 4–6 mm long, at base 1.2–1.5 mm wide. Anthers 1–1.5 × 0.8 mm, yellow. Pistil shorter than the tepals; ovary globose to obovoid, 1.8–3 × 1.8–3 mm; style 2.5–4.5 mm, slender, inserted towards the base of the ovary; stigma inconspicuous, with three very minute lobes. *Fruits* subglobose, c. 3.5 mm diam. Seeds c. 2.2–2.5 × 1.2–1.5 mm, black.

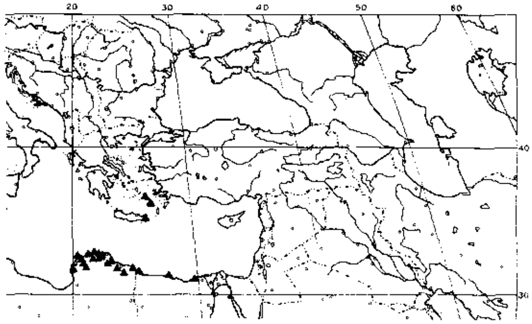
Vernacular names. Libya: *Utema*, *Sohsa*.

Habitat. The species is largely confined to the northern Cyrenaica and occurs not further than c. 60 km inland. It was found on ruins, in cave-entrances, shaded places, in thickets along wadis, in gullies and gorges, also in scrub and on bare ground. The species has a preference for limestone. Altitude 0–650 m. Flowers (February-)May.

Distribution. Libya, northern Cyrenaica; NW. Egypt; Crete and Cyclades.

Libya: Wadi Schada, 100 m, shaded places, 14 March 1954, BOLWICK 29 (BM); Wadi Kouf, W. of Shahat, limestone gorge, 25 March 1970, DAVIS 49992 (K); below Cyrene, ruins, rocky limestone gully, 26 March 1970, DAVIS 50039 (E, K); ruins of Cyrene, 600–650 m, 26 March 1970, DAVIS 50079 (E, K); Um el Adiab, Shabat, 13 April 1961, KHALIFA c.s. 932 (K); Kommel's Pool, near Benghazi, 20 m, 19 March 1959, KEITH 312 (K); along Wadi Derna, thickets, and Ben Rus, Feb.–March, LONGA s.n. (FI, type of *A. longanum* PAMPANINI);

FIG. 26. *Allium longanum*. – 1. Habit, ×2/3; 2. bulb with outer bulbcoat-leaves, ×1; 3. perianth and filaments, partly, ×4; 4–5. inner and outer tepal with corresponding filaments, ×4; 6. pistil, arrow indicates excretion opening of nectary, ×4; 7. longitudinal section of ovary, nectary visible at centre of basal part, ×9; 8–9. young and old spathe, ×2/3; 10. transverse section of scape, ×6; 11. detail of margin of leaf blade, ×6; 12. detail of outer bulbcoat-leaf, ×20; 13. ditto, outer epidermis removed, ×40; 14. detail of membranous bulbcoat-leaf, ×20; 15. seed, lateral view, ×8; 16. detail of testa, seen from above and in profile, ×40; 17–18. pieces of contractile and smooth roots resp., ×6. (1. DAVIS 49992 and DAVIS 50039; 2, 12–16. KHALIFA c.s. 932; 3–7, 17–18. DAVIS 50039; 8–9. SANDWITH 2364; 10–11. DAVIS 49992).



MAP 16. Localities of *Allium longanum*.

Lethes, calcareous rocks, April 1938, MAIRE c.s. 1428 (P); between El Abrag and Limmiades, April 1938, MAIRE c.s. 1440 (P); between Tauchiram and Barce, calcareous hills, 20 April 1938, MAIRE c.s. 1441 (P, type of *A. subhirsutum* var. *barcense* MAIRE et WEILLER); between El-Agheila and Maaten Giofer, 15 March 1933, PAMPANINI 1287 (FI); Wadi es-Sahal, between Tobruk and Bardia, 23 March 1933, PAMPANINI 1288 (FI); Wadi el-Kuf, between Gasr Beni Gdam and Sidi Abd el-Uahed, 6 April 1933, PAMPANINI 1289 (FI); Martuba, S. of Barce, 8 April 1933, PAMPANINI 1290 (FI); Apollonia, 2 April 1933, PAMPANINI 1291 (FI); Barce, Gebel el-Abid, 17 April 1933, PAMPANINI 1293 (FI); Safsaf, 18 April 1933, PAMPANINI 1294 (FI); Wadi Buten, 18 April 1933, PAMPANINI 1295 (FI); Tolmeta, 23 April 1933, PAMPANINI 1296 (FI); between Tolmeta and Sidi Dachil, 23 April 1933, PAMPANINI 1297 (FI); Derna, 16 April 1934, PAMPANINI c.s. 1302 (FI); El-Gefar, near Bomba, 17 April 1934, PAMPANINI c.s. 1303 (FI); Umm er-Rzem, 18 April 1934, PAMPANINI c.s. 1304 (FI); Chaulan, 20 April 1934, PAMPANINI c.s. 1307 (FI); El-Beda, Wadi Messaf, Saf Ain Legmeilia, 22 April 1934, PAMPANINI c.s. 1305 (FI); El-Beda, 27 April 1934, PAMPANINI c.s. 1306 (FI, K); Messa, 29 April 1934, PAMPANINI c.s. 1308 (FI); Apollonia, 1 May 1934, PAMPANINI c.s. 1309 (FI); El-Beda, 2 May 1934, PAMPANINI c.s. 1310; El-Abrach, 4 May 1934, PAMPANINI c.s. 1311 (FI); Wadi Hofra, Cirene, 5 May 1934, PAMPANINI c.s. 1312 (FI); Wadi Scisu, El-Beda, 7 May 1934, PAMPANINI c.s. 1313 (FI); Messa-Umm er-Rcham, 8 May 1934, PAMPANINI c.s. 1314 (FI); El-Beda, 10 May 1934, PAMPANINI c.s. 1315 (FI); El-Gubba, May 1934, PAMPANINI c.s. 1316 (FI); Wadi El-Arun, 14 May 1934, PAMPANINI c.s. 1317 (FI); Bengasi, Giocchi el Chebir, 9 March 1933, PAMPANINI 1318 (FI); Gerdes El-Abid, 29 March 1933, PAMPANINI 1319 (FI); Barce, 6 April 1933, PAMPANINI 1320 (FI); El-Gubba, Bir Salem, 7 April 1933, PAMPANINI 1321 (FI); Melchifaf, 7 April 1933, PAMPANINI 1322 (FI); El-Gubba, 7 April 1933, PAMPANINI 1323 (FI); between Lamluda and Macchia, 9 April 1933, PAMPANINI 1324 (FI); Lamluda, 9 April 1933, PAMPANINI 1325 (FI); between Apollonia and Bgua, 11 April 1933, PAMPANINI 1326 (FI); Slonta, 17 April 1933, PAMPANINI 1327 (FI); El-Beda, 2 May 1934, PAMPANINI c.s. 1328 (FI); Tecnis, E. of Barce, 15 April 1934, PAMPANINI c.s. 1329 (FI); above Barce, 3 April 1939, SANDWITH 2327 (K); between Cyrene and Apollonia, 4 April 1939, SANDWITH 2364 (K); Mirsa Badia, March 1890, SCHWEINFURTH 117 (G); Cyrenaica, 14 April 1887, TAUBERT 425 (BM); Tokra, March 1945, WARREN s.n. (K); Bengasi, Groh Kebir, 16 March 1916, ZANON 416 (FI); Bengazi, Andizire, 9 March 1916, ZANON 524 (FI); Bengasi, Groh Kebir, cave-entrance, 16 March 1916, ZANON 546 (FI).

Egypt: s.l., DELILE s.n. (MPU); Mersa Matruh, April 1940, DRAR 233 (CAIM); Alexandria, May 1878, EHRENBERG s.n. p.p. (FI); Mariut, April 1924, SHABETAI s.n. (CAIM); Messaad, April 1934, SHABETAI Z 3292 (CAIM); Alexandria, Herb. RICHARD s.n. (P); Mex, April 1894, SIKKENBERGER s.n. (G).

GREECE: E. Crete, March 1961, GREUTER S3419 (BM); Sirina I., April 1966, RUNEMARK c.s. 22374 (BM); & May 1967, RUNEMARK c.s. 28499 (BM); Koutzomiti I., April 1966, RUNEMARK c.s. 22653 (BM).

Notes.

Synonymy. The present species has long been neglected as it was described by PAMPANINI in 1912, but placed in 1931 in the synonymy of *A. roseum* by its own author. The taxon was accepted by MAIRE and WEILLER as a variety of *A. subhirsutum*. Possibly its local endemic distribution in the still ill-known and under-collected Cyrenaica accounts for the rarity of specimens in most herbaria. Only the Florence herbarium contains a fine collection of several dozens of good specimens, by which the identity of this distinct species is quite clear.

Resembling species. *A. longanum* recalls *A. subhirsutum*, as well as *A. roseum* and *A. neapolitanum*, but *A. roseum* and *A. neapolitanum* differ by their structure of the outer bulbcoats, and the entirely glabrous leaves. *A. subhirsutum* has subsessile increase bulbs, smaller flowers, the tepals subacute, the inner ones about as long as, or longer than the outer tepals; in *A. longanum* the increase bulbs are longly stiped, the tepals broadly obtuse, and the inner tepals distinctly shorter than the outer tepals.

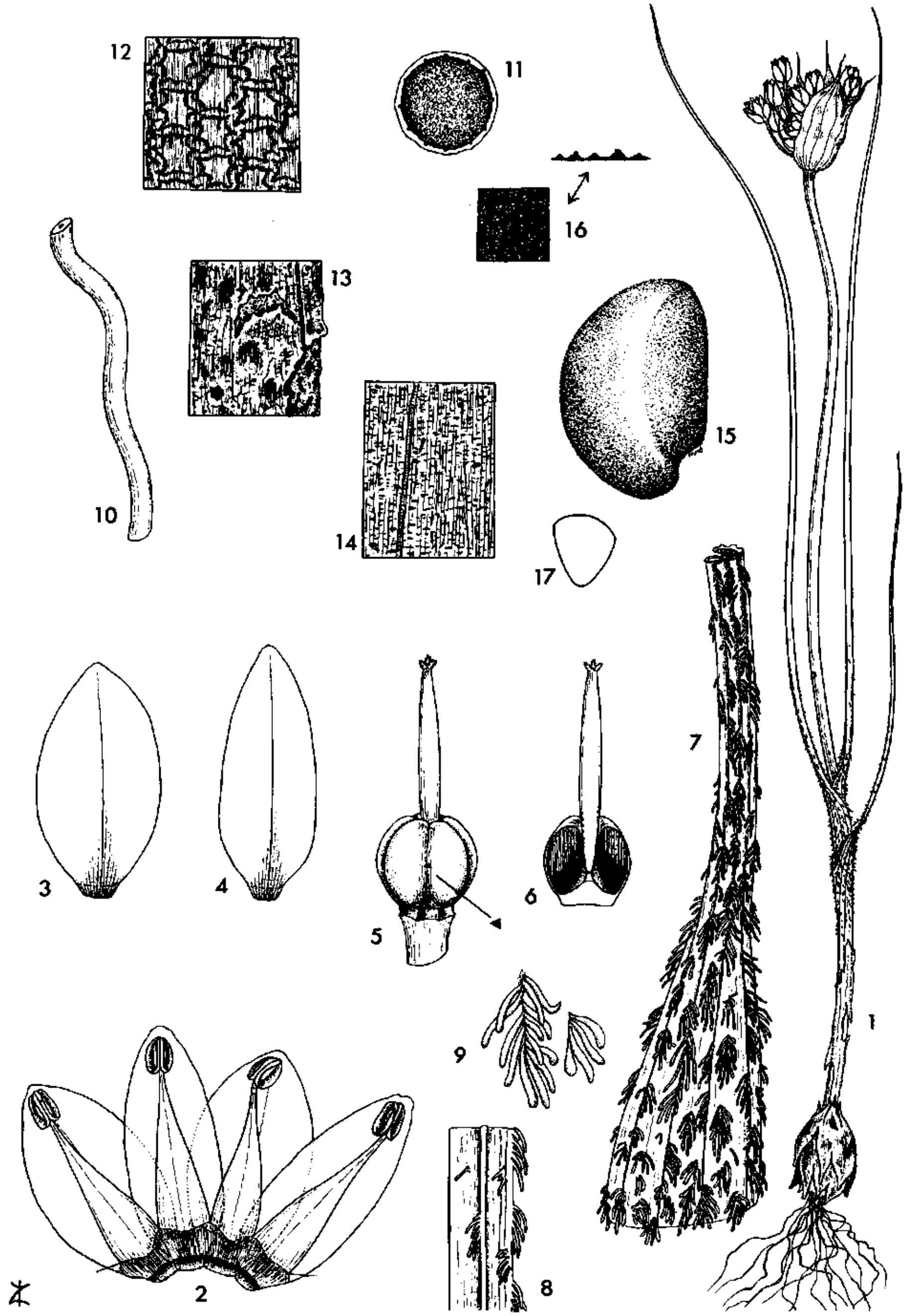
Distribution. The occurrence also in Crete and the Cyclades is noteworthy (see SANDWITH and SIMPSON 1941:34).

20. A. papillare BOISSIER **Fig. 27, Map 17.**

A. papillare BOISSIER, Diagnoses Plantarum Orientalum Novarum, sér. I, vol. 2, part 13, 1854:27; REGEL 1875:205; BARBEY C. et W. 1882:162; BOISSIER 1882:271; MUSCHLER 1912:217; DINSMORE in POST 1933:643; TÄCKHOLM et DRAR 1954:77; KOLLMANN 1970:245, Pl. I, 3; TÄCKHOLM 1974:652.

Type: Palestine, nr. Nochl and Gaza, Apr., BOISSIER s.n. (holotype: G).

Bulb ovoid, 12–20 × 9–12 mm. Roots glabrous, unbranched. Increase bulbs 0–2(–3), ovate, 5–9 × 3–5 mm, up to 1 mm acuminate, 5–10 mm stiped. Outer bulbcoat-leaves 2–4, outer surface yellowish to greyish-brown, inner surface glossy, orange-yellowish to brown, without conspicuous structure, but after removal of outer epidermis faveolate or pitted. Sproutleaf 1, soon wilting, 3–10 cm long, hyaline, not or hardly emerging above ground. *Foliage leaves* 2–6, the lower part set with bundles of thickish, club-shaped retrorse hairs 0.5–1 mm long, the remaining part glabrous: blades subapproximate or more or less scattered along the basal part of the scape, linear, tapering or attenuate from the base, 10–30 cm × 1–5(–6) mm, folded, the margins usually inwards rolled, top acute, the apical part soon withering but usually persistent, margin entire, at the base with bundles of club-shaped retrorse hairs; sheaths unequal in length, those of upper leaves longest and extending for up to 5 cm above ground, 6–12 cm long, purplish or brownish, the exposed part set with club-shaped retrorse hairs. Scape 1(–2), shorter than or equal to the leaves, apically (sub)erect, but faintly curved in the basal part, terete, solid, glabrous, 10–30 cm long, 1–3 mm diam. *Inflorescence* narrowly fascicled to hemispherical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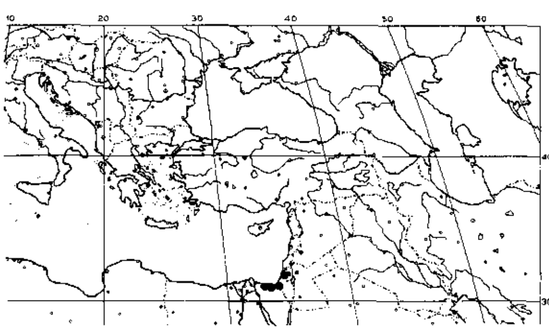
or subspherical, few- to many-flowered, 2–5 cm diam., without bulbils. *Spathe* 1, sometimes exceeding the inflorescence, hyaline, persistent, 15–25 mm, many-veined, opening with 3–4 slits, one of which reaching to or nearly to the base, the others to about half-way to one-third, forming 3–4 spathe-lobes, straight or the tops slightly curved, acute, up to 7 mm acuminate. Bracteoles absent. Pedicels (sub)equal or rarely unequal, 10–20 mm, slender, pale brownish, in anthesis straight or the outer pedicels curved, in fruit more or less straight, somewhat stouter and darker of colour. *Flowers* subcampanulate to stellate. Tepals adnate to bases of filaments for 0.5–1 mm, minutely saccate at base, persistent, white, creamy, or pale pinkish, with a greenish or purplish midvein; outer tepals ovate, 5–6 × 3–4 mm, top subobtuse to acute; inner tepals narrower than outer tepals, ovate-oblong. Stamens equal to or shorter than the tepals; filaments simple; outer filaments 4–5 mm long, at base 1–1.4 mm wide, connate with inner filaments for 0.8–1 mm; inner filaments slightly longer and wider than outer filaments. Anthers 0.7–1 × 0.6–0.8 mm, yellow. Pistil shorter to longer than the tepals; ovary globose, c. 2 × 2 mm; style 3–5 mm, slender, or slightly inflated, inserted at about half-way from the base of ovary; stigma minutely but distinctly 3-lobed. *Fruits* globose or depressed globose, c. 5 × 5.5 mm. Seeds 3.5–4 × 2–2.5 mm, black.

Habitat. Known from a restricted area in the north-eastern part of the Sinai, where it is presumably bound to desert-like conditions. It was collected in sandy localities, and in fields. Altitude 0–100 m. Flowers: March–April.

Distribution. Endemic in Egypt in the north-eastern Sinai, and in the area known as the Gaza Strip; known from one collection in coastal SW. Israel.



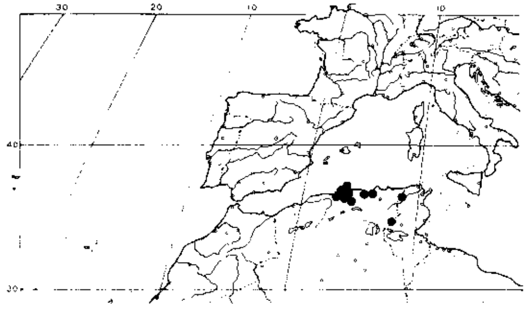
MAP 17. Localities of *Allium papillare*.

FIG. 27. *Allium papillare*. – 1. Habit, $\times {}^2/_3$; 2. perianth with stamens, partly, ×6; 3–4. outer and inner tepal, outer view, ×6; 5. pistil, arrow indicates excretion opening of nectary, ×6; 6. ditto, longitudinal section, ×6; 7. portion of leaf at transition of sheath to blade, ×4; 8. detail of leaf margin, ×4; 9. bundles of club-shaped hairs, ×8; 10. piece of smooth root, ×6; 11. transverse section of scape, ×8; 12–13. detail of outer bulbcoat-leaf, inner and outer view resp., ×20; 14. detail of white membranous inner bulbcoat-leaf, ×20; 15. seed, lateral view, ×8; 16. detail of testa, seen from above and in profile, ×40; 17. seed, transverse section, ×3. (1, 10, 12–14. POST 54; 2–9. DEFLERS 83; 11, 15–17. SHABETAI 17/259).

leaves 2–3, hirsute to various degree, if 3, then the third leaf much smaller; blades subapproximate, (lanceolate to) linear, suberect, 5–30 cm × 2–8 mm, flat, top acute, margin entire or shortly ciliate; sheaths 1.5–7 cm long, subequal, subterranean, glabrous. Scape 1, much shorter than the leaves, about as long as inner sproutleaf, 3–11 cm long, 1–2 mm diam. *Inflorescence* subumbellate, 2–5-flowered, without bulbils. *Spathe* 1, hyaline, persistent, 15–25 mm, opening with 2 or 3 equal slits reaching up to halfway, each spathe-lobe with a purplish midvein. Bracteoles absent. Pedicels subequal, 20–40 mm, slender, in anthesis straight, in fruit recurved, with age conspicuously spiralling. *Flowers* subcampanulate. Tepals adnate to bases of filaments for 1–2 mm, persistent, white with pink or purplish midvein; outer tepals oblanceolate, 7.5–10 × 2.5–3 mm, top obtuse to subacute; inner tepals somewhat shorter and narrower than outer tepals, top subacute. Stamens c. half as long as tepals; filaments simple; outer filaments 4–5 mm long, at base 0.5–0.9 mm wide, connate with inner filaments for c. 1 mm; inner filaments slightly longer and narrower than outer filaments. Anthers c. 1.2 × 0.8 mm, yellow. Pistil shorter than the tepals; ovary globose, c. 2.5 mm diam; style 4–4.5 mm, slender, inserted at about one-third to halfway from the base of ovary; stigma inconspicuous, composed of three minute lobes c. 0.1 mm. *Fruits* subglobose, c. 4 mm diam. Seeds not seen.

Habitat. *A. tourneuxii* has a limited distributional area and seems restricted to mountainous localities in northern Algeria and western Tunisia; most collections originate from the Atlas Mountains near Blidah (6 collections). It can be found in shaded localities, in forests with *Quercus mirbeckii*, *Quercus suber*, *Cedrus atlantica*, *Pinus pinaster*, and *Ilex aquifolium*. The species is recorded from limestone and schistaceous soils. Altitude 100–1600 m. Flowers: December–May.

Distribution. Algeria; Tunisia.



MAP 18. Localities of *Allium tourneuxii*.

ALGERIA: Mt. Mouzaïa, near Blidah, 2 April 1878, CHABERT s.n. (FI, type of *A. tourneuxii* CHABERT); Atlas Mts near Blidah, April 1924, HUMBERT s.n. (P); Blidah, 28 Dec. 1861, LEFEBVRE 649 (P); Guerrouch forest, near Djidjelli, 30 Dec. 1911, MAIRE s.n. (P, MPU, type of *A. chamaemoly* var. *coloratum* BATTANDIER); Cap Cavallo, 100 m, 22 Jan. 1913, MAIRE s.n.

(MPU); Atlas Mts near Blidah, 1500 m, 5 April 1914, MAIRE s.n. (MPU); near Blidah, 1500 m, 13 May 1934, MAIRE s.n. (MPU); Atlas Mts near Blidah, 1600 m, WEILLER 548.34 (MPU).

TUNISIA: Forest of Feidja, 20 km NW. of Ghardimaou, 26 March 1965, JANSEN 34 (WAG); Kedir Bou Chebka, Jan. 1893, PATOUILLARD s.n. (P).

Notes.

Nomenclature. As explained in the notes under *A. roseum* the earlier name *A. tourneuxii* BOISSIER is invalid, and hence the name *A. tourneuxii* CHABERT is not a later homonym.

Resembling species. *A. tourneuxii*, which certainly should be regarded as a good species, has been overlooked for a long time by most authors, which accounts for its few literature references. Only MAIRE recognized this taxon but only as a variety in *A. chamaemoly*. Most specimens were discovered among the material of *A. chamaemoly* to which it resembles superficially, but specimens have also been found among the material of *A. roseum* and *A. subhirsutum*.

22. A. chamaemoly L. **Fig. 29, Map 19.**

A. chamaemoly L., Sp. Pl. 1, 1753:301; ibid. 1762:433; DESFONTAINES 1798: 288; LOISELEUR-DESLONGCHAMPS 1806:197, 724; TENORE 1811:169; REDOUTÉ 6, 1811:325; VIVIANI 1824:19; GUSSONE 1842:391; KUNTH 1843:442; MUNBY 1847:35; GRENIER et GODRON 3, 1855–1856:203; MUNBY 1859:29; WILLKOMM et LANGE 1862:212; MUNBY 1866:32; SALISBURY 1866:92; REGEL 1875: 214; BALL 1878:692; BOISSIER 1882:268; BATTANDIER et TRABUT 1884:152; LORET et BARRANDON 1888:471; WILLKOMM 1890:208; BATTANDIER et TRABUT 1895:59; BONNET et BARRATTE 1896:414; HALÁCSY 1904:257; ASCHERSON et GRAEBNER 1905:155; BRIQUET 1910:298; JAHANDIEZ et MAIRE 1931:123; MARKGRAF in HAYEK 1932:49; RECHINGER FIL. 1943:717; FOURNIER 1946:169; VINDT 1953:112; CUÉNOD 1954:213; MAIRE 1958:284, fig. 911; QUÉZEL et SANTA 1962:210; MOSSA et SCRUGLI 1970:62; DE WILDE-DUYFJES 1973:65; GARBARI 1975:541.

Type: Italy, Rome, Mt. La Vinea della Madonna, 25 Feb. 1610, BURSER s.n. (lectotype: BAS, in Herb. BAUHIN; isotype: UPS, in Herb. BURSER).

Saturnia cernua MARATTI 1822:258.
Type: Italy, Mt. Ianiculum, PANCRATIUS s.n. (not seen).

Saturnia etrusca JORDAN et FOURREAU 1866:59.
Type: Italy, near Pisa, SAVI s.n. (not seen).

Saturnia viridula JORDAN et FOURREAU 1866:60; ibid. 1870: fig. 354.
A. chamaemoly var. *viridulum* MAIRE et WEILLER in MAIRE 1958:286.
Type: France, Corsica, Porto-Vecchio, REVELIÈRE s.n. (not seen).

April 1876, FREYN s.n. (L); Split, PETTER s.n. (L); Lošinj I., 1859, ROEMER s.n. (L); & March 1843, TOMMASINI 2320 (L, WAG).

GREECE: near Korinthos, coast, Nov. 1854, DE HELDREICH s.n. (P); Pharios I., 1845, KELLNER s.n. (FI); Korinthos, grasses along the coast, 18–30 Nov. 1854, ORPHANIDES 426 (COI, FI, P, WAG).

Notes.

Synonyms. *Saturnia* MARATTI. Of three of the five names described under *Saturnia*, *S. cernua*, *S. etrusca*, and *S. viridula*, I have not seen the types, but from the protologues it is clear that all three belong to *A. chamaemoly*.

A. chamaemoly var. *battandieri* MAIRE et WEILLER. MAIRE (1958) refers for this variety to Bull. Soc. Bot. Fr. 1912:424, where it is recognized, but not named. I could not trace the type specimen.

Habitat and distribution. It is of interest to note that most collections date from before 1900. This is striking because other mediterranean *Allium* species, e.g. *A. roseum* and *A. subhirsutum*, are represented by numerous more recent collections apparently as a result of modern human activities and tourism. One of the reasons of the relatively limited amount of herbarium material of *A. chamaemoly* may be its early flowering time, but it seems very likely that the recent destruction of its habitat accounts for its present rarity. In this respect I may cite the comment on a herbariumlabel of 1845 of ROUX s.n. (P): 'Marseille, il ne se trouve plus sur la plage à cause du grand nombre de constructions'. According to LORET et BARRANDON (1888), and FOURNIER (1946) the species is rare in France.

Noteworthy is that the species is absent or nearly so on the East coasts of the Iberian- and Italian Peninsula, and on Sardinia. The three collections from Greece date from around 1850.

Caryology. MOSSA et SCRUGLI (1970) found $2n=22$.

23. A. neapolitanum CIRILLO — Fig. 30, Map 20.

A. neapolitanum CIR., Plant. Rar. Neap., 1, 1788:13, fig. 4; GUSSONE 1827: 400; TENORE 1831:166; GUSSONE 1842:389; KUNTH 1843:439; WILLKOMM et LANGE 1862:211; REGEL 1875:224; BARBY, C. et W. 1882:162; BOISSIER 1882: 274; BARBY, W. 1884:187; RICHTER 1890:209; BATTANDIER et TRABUT 1895: 57; HALÁCSY 1904:259; ASCHERSON et GRAEBNER 1905:159; BRIQUET 1910: 302; MUSCHLER 1912:218; HOLMBOE 1914:47; NÁBĚLEK 1929:36; MARKGRAF in HAYEK 1932:52; DINSMORE in POST 1933:644; OPPENHEIMER et EVENARI 1940:189; RECHINGER F. 1943:718; TÄCKHOLM et DRAR 1954:79; MAIRE 1958: 293; MANN 1959:730–739; ibid. 1960:765–771; KOLLMANN 1973a:93, 107.

Type: Italy, Naples, in gardens and spontaneously outside the town, CIRILLO's description and figure.

A. album SANTI 1795:352, fig. 7; LOISELEUR-DESLONGCHAMPS 1828:253.
Type: Italy, Montamiata, SANTI s.n. (not seen).

A. candidissimum CAVANILLES 1802:446.
Type: Spain, spontaneously in Botanic Garden Barcelona, CAVANILLES s.n. (isotype: FI).

A. lacteum SMITH 1809:226; ibid. 1823:21, fig. 325.
Type: Italy, BAUER s.n. (not seen).

A. sulcatum DELILE in REDOUTÉ 8, 1815:482.
Type: France, Botanic Garden Montpellier (not seen).

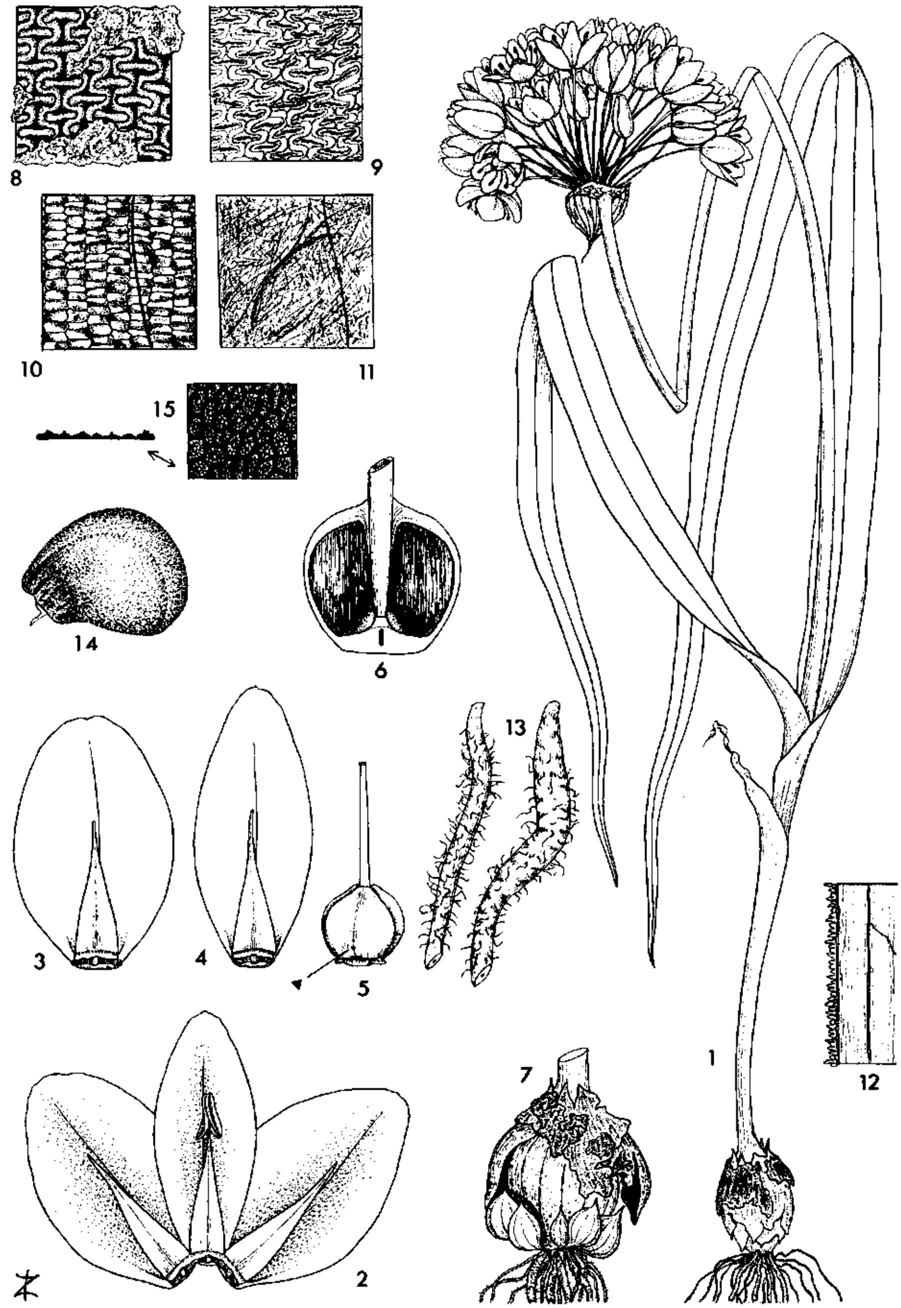
? *A. cowanii* LINDLEY 1823:t.758 ('*Cowani*'); SPRENGEL 1825:36; G. DON 1827:85 ('*Gouanii*').
Type: cultivated in the botanical garden of Chiswick from specimens sent by COWAN from Peru (not seen).

A. sieberianum SCHULTES et SCHULTES F. 1830:1099.
Type: Greece, Creta, Cap Maleca, SIEBER s.n. (not seen).

A. subhirsutum L. var. *glabrum* REGEL 1875:221; BRIQUET 1910:303.
Type: not indicated.

A. neapolitanum var. *angustifolium* TÄCKHOLM et DRAR 1954:80.
Type: Egypt, W. of El Ramle, SHABETAI s.n. (holotype: CAIM).

Bulb globose to ovoid, 15–20 × 13–17 mm. Roots hirsute, not or sparingly branched. Increase bulbs several, 1–3 collaterally in the axils of foliage leaves, globose to ovoid, 4–10 × 3–5 mm, c. 1 mm beaked, c. 0.5 mm stiped, wrapped in a non-translucent prophyll. Protective leaves 2, outer surface brownish, or greyish, or dull creamy, inner surface dull or glossy, pale brown to yellowish-orange, after decay of outer epidermis with conspicuous sinuate structure by the sclerified inner layer. Sproutleaf 1, wilting, sheath 4–10 cm long, and with a 1–5 cm long blade-like apical part emerging above ground. *Foliage leaves* (2 or) 3, glabrous; blades subapproximate, linear, 15–35 cm × 5–30 mm, flat, top acutish, soon wilting, margin entire or distinctly, sometimes irregularly, crenulate; sheaths subequal, largely subterranean, 4–13 cm long, whitish. Scape 1(or 2), shorter to longer than the leaves, erect, terete to subtriquetrous, solid, glabrous, 20–45 cm long, 2–7 mm diam. *Inflorescence* umbellate to (sub)-spherical, usually many-flowered, 5–11 cm diam., without bulbils. *Spathe* 1, hyaline, persistent, 12–25 mm, 6–12-veined, opening with one single slit up to or nearly up to the base, forming one spathe-lobe, sometimes recurved, 4–8 mm acuminate, without midvein. Bracteoles absent. Pedicels subequal, 20–30 mm, slender or thickish up to 0.8 mm diam., in anthesis straight, or in globose in-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florescences the outer ones recurved, in fruit straight, rigid. *Flowers* campanulate. Tepals c. 0.5 mm adnate to bases of filaments, persistent, white, with or without a yellowish or light brown midvein; outer tepals ovate to obovate, 8.5–11 × 5–7 mm, top retuse or broadly obtuse; inner tepals longer and narrower than outer tepals, 9–11 × 4–5.5 mm, top obtuse or broadly obtuse. Stamens shorter than the tepals, filaments simple; outer filaments 4–5.5 mm long, at base 1.2–1.5 mm wide, connate with inner filaments for c. 0.5 mm; inner filaments slightly longer than outer filaments, 5.5–6 mm long, at base 1.2–1.5 mm wide. Anthers 1.5–2 × 0.6–1.2 mm, yellow. Pistil shorter than the tepals; ovary globose to obovoid, 2.5–3.5 × 3–5.2 mm; style 3–4 mm, slender, inserted at about one-fifth to one-fourth from the base of ovary; stigma inconspicuous. *Fruits* subglobose, 4–5 mm diam. Seeds c. 2.5–2.7 × 2 mm, black.

Vernacular name. France: *Ail de Naples.*

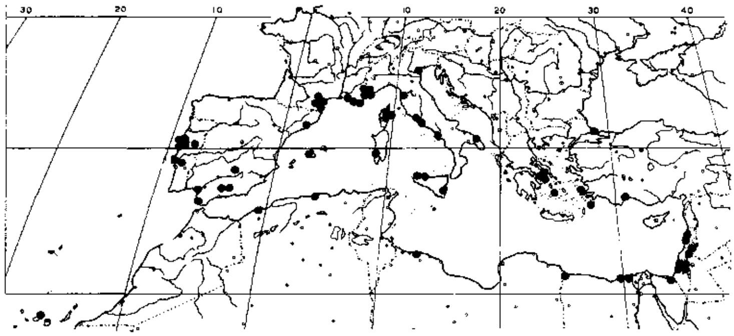
Uses. Often grown as an ornamental.

Habitat. Most collections are from the Mediterranean region. The species is frequently grown as an ornamental, and was often recorded from parks, monasteries and from botanical- and private gardens. It easily runs wild on ruins, old walls, in vine- and oliveyards, arable land, hedges and in roadsides. Furthermore it was collected in humid and shady places, along streams, in pine forests, in meadows, on hills, and sand dunes, quite often also in the littoral zone. There seems to be a preference for sandy- and calcareous soils. Altitude 0–1000 m. Flowers: January–May.

KOLLMANN (1973a) collected many specimens for caryological studies in Israel. She found the polyploid plants having a greater adaptability to the poorer soil types. She records the species from sandstone, fissure rocks, terra rossa, and the so-called batha-areas.

Distribution. Canary Is. (3 collections); Algeria (2 collections); Libya (1 collection); Egypt; Portugal; Spain; Balearic Is. (1 collection); France; Corsica; Sardinia; Sicily; Italy; Greece; Cyprus; Turkey (2 collections); Lebanon; Israel; Jordan.

FIG. 30. *Allium neapolitanum*. – 1. Habit, $\times^2/_3$; 2. perianth and stamens, partly, ×4; 3–4. outer and inner tepal with corresponding filaments, ×4; 5. pistil, arrow indicates excretion opening of nectary, ×4; 6. transverse section of ovary showing nectary at centre of basal part, ×8; 7. bulb with increase bulbs, bulbcoat-leaves partly removed, $\times 1^1/_3$; 8. detail of outer bulbcoat-leaf, outer view, ×20; 9. detail of firm bulbcoat-leaf, inner view, ×20; 10–11. details of two different membranous bulbcoat-leaves, ×20 and ×10 resp.; 12. fragment of leaf blade with finely crenulate margin, ×8; 13. pieces of contractile and smooth roots, ×6; 14. seed, lateral view, ×8; 15. detail of testa, seen from above and in profile, ×40. (1–13. LETOURNEUX 305; 14–15. MICHON s.n., Nazareth, Feb. 1851).



MAP 20. Localities of *Allium neapolitanum*.

Canary Is.: Tenerife I, San Diego del Monte, 24 Jan. 1855, Bourgeau 1535 p.p. (K); & 4 March 1855, Bourgeau s.n. (FI, P); & 4 May 1855, Bourgeau s.n. (P);

Algeria: Oran, culta, April 1914, d'Alleizette s.n. (P); Alger, garden, 4 April 1882, Jordan 15793 (MPU).

Libya: Tripoli, roadside, sands, 22 March 1845, Blanche s.n. (P).

Egypt: Rafah, 7 March 1927, Drar 17/259 (CAIM); near Mariut, stony soil, Feb. 1880, Letourneux 305 (FI, G, MPU, P); Mariut, Feb. 1880, Letourneux s.n. (FI); El Burg, near Mariut, 19 Jan. 1922, Shabetai s.n. (CAIM); Sellum, Wady el Ramla, sands, Shabetai F 4906 (K).

Portugal, many collections: Coimbra, Santa Cruz, March 1886, Craveiro s.n. (COI); Lisboa, March 1887, da Cunha 1094 (COI); Figueira da Foz, near railway-station, limestone, 16 March 1957, Fernandes c.s. 6153 (COI, FI); Coimbra, Sta. Clara, cultivated, Feb. 1877, Moller s.n. (COI); Cantanhede, cultivated, limestone, 4 Feb. 1966, Moura 243 (COI); s.l., not spontaneously, as ornamental, 1840, Welwitsch 208 (FI, P).

Spain, many collections: San Lucar de Barameda, along Gualdalquivir, 2 April 1849, Bourgeau 478 (FI, P, WAG); Barcelona, spontaneously in botanical garden, 1844, Cavanilles s.n. (FI. type of *A. candidissimum* Cavanilles); Chiclana, April 1883, Korb s.n. (M); Alhambra, between grasses, June 1969, van Prehn Wiese 395 (WAG); Llero, oliveyards, April 1908, Sennen 592 (MPU); Cadiz, 1826–1828, Webb s.n. (FI).

Balearic Islands: Mallorca, s.l., naturalized, 4 April 1954, Ferrer 678 (COI).

France, many collections: Banyuls sur Mer, olive- and vineyards, 26 Feb. 1883, Boutigny 3888 bis (MPU, P); Marseille, along stream, 17 April 1857, Duval-Jouve s.n. (MPU); Grasse, waist field, 1 May 1964, Gavelle s.n. (COI); near Hyères, disturbed places, 29 May 1863, Huet 341 (COI, FI, P); Cannes, 1851, Loret s.n. (P); Narbonne, monastery garden, May, Pourret s.n. (P); Perpignan, ruins, April–May 1895, Sevitien c.s. 3868 (P).

Corsica: Bastia, 1845, Bernard s.n. (P); & fields, 12 April 1867, Debeaux 321 (P); & vineyards, 20 April–8 May 1866, Mabille 184 (FI, P); & 12 April 1884, Petit s.n. (C); & roadside, 15 April 1912, Roux 3838 (P).

Sardinia: Mandriate, 15 April 1881, Chabert s.n. (FI); Ajaccio, citadel, April 1848, Requin (FI); & August, Requien s.n. (FI).

Sicily: Palermo, March 1842, Parlatore s.n. (FI); Saracena, s.d., Requin s.n. (FI); near Siracusa, March 1830, Schouw s.n. (C); near Palermo, s.d., Tineo s.n. (P); & cultivated, April, Todaro 802 (COI, FI, P).

Italy, in FI many collections of the provinces of Liguria, Lombardia, Venezia, Istria, Emilia, Toscane, Marche, Lazio, Abruzzo, Campania, and Puglie: Pisa, walls, s.d., Cesati c.s. 580 (P); Triest, grassy slopes, April 1886, Engelhardt s.n. (B); Rome, botanical garden, 2 April 1864, Heiberg s.n. (C); & 1833, de Jussieu s.n. (P); Brindisi, s.d., Rabenhorst 57 (WAG); Venetia, culture, 12 April 1912, Rigo s.n. (MPU); near Naples, s.d., Tenore s.n. (FI, P).

Greece, many collections: Rhodos and Constantinople, s.d., AUCHER-ELOY 2195 (FI, P); Island of Telendhos, 10 April 1887, BARBEY 9 (FI); Rhodos, April 1926, FEIRINI s.n. (FI); near Athens, 10–22 March 1850, ORPHANDES 239 (C, FI, P, WAG); Island of Syros, 1845, RAULIN s.n. (P); Pompejopolis, 1896, SIEHE 125 (B, P).

Cyprus, in K many collections; Zarnaco, sands, 28 Feb. 1884, DEFLERS 1278 (MPU).

Turkey: Rhodos and Constantinople, s.d., AUCHER-ELOY 2195 (FI, P); Lara, 10 km SE. of Antalya, shaded places, 8 April 1959, DE WILDE c.s. 211 (L, WAG).

Lebanon, Israel, Jordan: Jerusalem, April 1846, BOISSIER s.n. (L, WAG); Ain Tabigha, fields, 4 April 1911, MEYERS c.s. B 2419 (L); Nazareth, Feb. 1851, MICHON s.n. (MPU); valley of River Jordan, Feb. 1851, MICHON s.n. (MPU); Beiruth, littoral, May 1875, POST 277 (FI); near Rayfoun, 950–1000 m, fields, 28 April 1965, ROESSLER 5151 (M); near Hebron, 1839, ROTH s.n. (M); Sta. Saba, near Jerusalem, April 1857–1858, ROTH s.n. (FI, M); Beit Meir, limestone, 29 March 1965, STEVELS 92 (WAG).

Notes.

Typification and synonyms. The type-specimen of *A. neapolitanum* CIRILLO possibly was destroyed during the Burbundian revolt at Naples in 1799. No type-material could be traced in the herbaria at Naples and Florence, but the species is well-typified by CIRILLO's description and accompanying figure. The plate shows, among other characters, the characteristic shape of the inflorescence with the single spathe.

A. magicum L. The Linnean Herbarium contains one incomplete specimen, LINN 419.6, with on the sheet written in the hand of LINNAEUS '*magicum*'; this specimen is *A. neapolitanum*. The protologue belonging to *A. magicum* (1759: 978) describes an *Allium* with flat leaves, and with an umbellate, bulbil-bearing inflorescence, and may pertain to several *A.*-spp. The name '*magicum*' was possibly later on erroneously written on the sheet. The name '*magicum*' is validated by its printed description; the specimen does not match this description (and '*magicum*' is not an earlier epithet for '*neapolitanum*').

A. album SANTI. The type-specimen could not be traced; I could not find it in Florence nor in Naples. The protologue by SANTI with a figure, which is obviously drawn after the type, illustrates an *Allium* with one single spathe, the filaments much shorter than the tepals and with the leaves rather broad, and all this clearly points to *A. neapolitanum*. Various authors, e.g. JAHANDIEZ et MAIRE 1931, VINDT 1953, and MAIRE 1958, erroneously used the name for specimens belonging to *A. subhirsutum* L.

A. lacteum SMITH. The description and figure doubtlessly point to *A. neapolitanum*, as appears by the single spathe, the large white flowers, and the glabrous and broad leaves. *A. neapolitanum* is common in Italy, which is in accordance with the distribution 'Italy' as given by SMITH.

A. sulcatum DELILE in REDOUTÉ. Contrary to the types of two names in REDOUTÉ now in the synonymy of *A. subhirsutum*, I have not found a type-specimen in Herb. WEBB (FI), nor in MPU. The protologue, however, contains a very clear figure. DELILE mentions about the origin of the species 'L'ail cannelé a été observé au Jardin de Montpellier sans qu'on y ait observé de traces de son origine.'

A. cowanii LINDLEY was described from material sent from Peru by COWAN cultivated in the garden of the Horticultural Society at Chiswick, England. The description is accompanied by a beautiful drawing which doubtlessly represents *A. neapolitanum*. Apparently it concerns an early introduction of this European species into the New World.

A. sieberianum SCHULTES et SCHULTES F. is placed in the synonymy on account of various characters mentioned in the description, for instance the triquetrous scape in connection with the single spathe, the obtuse tepals, and the scabrous leaf-margins.

A. subhirsutum L. var. *glabrum* REGEL. The identity of this taxon is not clear as unfortunately the type is not indicated and could not be traced in any herbarium. REGEL described a white-flowered, glabrous *Allium*, with the filaments about half as long as the tepals. The distribution given by REGEL is 'Teneriffa, Italia inferior, Corsica'. It remains possible that REGEL's variety is a white-flowered form of *A. roseum* or that it belongs to the type-subspecies of *A. subhirsutum*. This can be questioned, however, because of its distribution, although *A. neapolitanum* is known from Tenerife I. from but three collections, all made by BOURGEAU in 1855.

Resembling species. *A. neapolitanum* may be confused with *A. triquetrum*, as was done for instance by ASCHERSON and GRAEBNER 1905:159, who considered both species very closely related. *A. triquetrum*, however, differs clearly by e.g. the two spathes and the carunculate seeds. *A. neapolitanum* furthermore resembles white-flowered *A. roseum*, but this latter species has, among other characters, faveolate, not sinuate, outer bulbcoats. Finally *A. neapolitanum* can be confused with *A. massaessylum* which is distinct by having two spathes and the outer bulbcoats with a much coarser and more irregular sinuate structure.

Spathe. According to MANN (1959) the spathe in sect. *Molium*, which is always (3–)4-veined, should be regarded as composed of four spathe-bracts, except in *A. neapolitanum* in which the spathe is many-veined, and possibly corresponds with but one single so-called spathe-bract.

Colour. The flowers are white. One exception is a collection of ENGELHARDT s.n. in B, from Triest, with pale pink flowers.

Distribution. *A. neapolitanum* was described under several names, most of which based on specimens collected apparently in or near gardens, e.g. *A. neapolitanum*, *A. candidissimum*, and *A. sulcatum*. Also later collections appear often to originate from not quite natural habitats. The species is grown widely as an ornamental, and can often be found as a garden escape, apparently spontaneously growing. Localities in the eastern Mediterranean seem on the whole more natural. As the species is showy, and distinct, it is strange that it was described not before 1788, and thereafter, under different names, from gardens in the western Mediterranean. Not unlikely the species originally occurred only in a limited region possibly somewhere in the central or eastern Mediterranean, and was an early introduction elsewhere in its present distributional area.

Concerning the distribution in North Africa its presence on the Canary

Islands is doubtful as I have seen but three collections, all made by BOURGEAU in 1855 from San Diego del Monte, Tenerife I. From Morocco and Tunisia the species is unknown; from Algeria I saw two collections from culture. In this respect I quote MAIRE (l.c.) who writes 'Originaire de l'Europe méridionale; cultivé comme plante d'ornament sur le littoral et parfois naturalisé dans les cultures. Indiqué en Barbarie par divers auteurs n'y a jamais trouvé spontané.' From Libya no present-day collections are known, but I saw an old specimen, from 1845, collected by BLANCHE in the vicinity of Tripoli. According to MUSCHLER (l.c.) the species is not common in Egypt and occurs only in the Marmarica. TÄCKHOLM et DRAR (l.c.) mention not only the Marmarica as locality but also the eastern Mediterranean coast region, the Isthmic desert, and the Sinai region. In the Egyptian material I found among the material identified as *A. neapolitanum* 5 collections of the species, the remainder of the material identified as such concern in reality specimens of *A. subhirsutum*, *A. roseum*, and *A. erdelii.*

Caryology. KOLLMANN (1973a) reports intraspecific polyploidy and found for many populations from all over Israel 2n=14, 2n=21, and 2n=28. The triploids and tetraploids are found more frequent on the poorer soil types, and it is suggested that these possibly have a greater adaptability in the more extreme habitats. The triploids have a very low seed set, and reproduce mainly vegetatively.

24. A. massaessylum BATTANDIER et TRABUT **Fig. 31, Map 21.**

A. massaessylum BATTANDIER et TRABUT, Bull. Soc. Bot. Fr. 39, 1892:74, fig. 3; ibid. 1895:57; BATTANDIER 1904:353; COUTINHO 1913:131; JAHANDIEZ et MAIRE 1931:122; MAIRE 1937:381; EMBERGER et MAIRE 1941:955; MAIRE 1958:293, fig. 916.

A. moly L. ssp. *massaessylum* VINDT 1953:124; QUÉZEL et SANTA 1962:211.

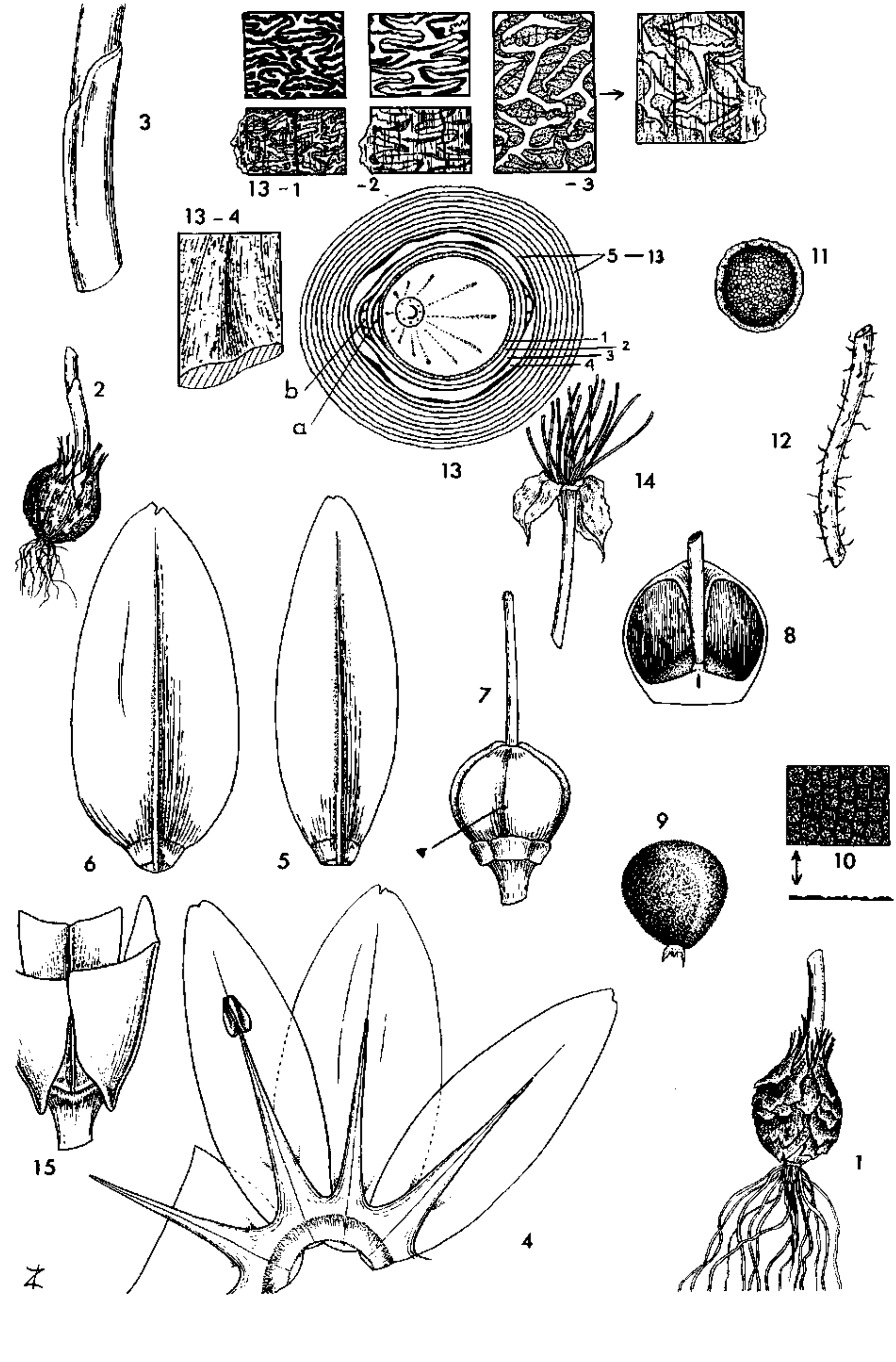
Type: Algeria, Forêt d'Hafir, near Tlemcen, June 1891, BATTANDIER s.n. (holotype: P; isotype: MPU).

? *A. transtaganum* WELWITSCH ex ROUY 1891:133, nomen nudum; COUTINHO 1913:715 (in syn. *A. massaessylum*); JAHANDIEZ et MAIRE 1931:122 (in syn. *A. massaessylum*).

Bulb ovoid, 15–25 × 12–18 mm. Roots glabrous or hairy, unbranched. Increase bulbs several, 1–3 collaterally in the axils of foliage leaves, ovoid, 8–10 × 6–8 mm, subacute, sessile, wrapped in a prophyll. Protective leaves 2, outer surface light to dark brown, inner surface dull, whitish or greyish brown, after decay of outer epidermis with conspicuous wrinkled-sinuate structure caused by the sclerified inner layer. Sproutleaf 1, soon wilting, 2–7 cm long, emerging up to c. 5 mm above ground. *Foliage leaves* (1–)2, glabrous; blades approximate, linear, 15–40 cm × 2–9 mm, flat or in section v-shaped, top acute, soon wilting, margin entire; sheaths subequal, largely subterranean, 2–7 cm long, whitish. Scape 1, equal to longer than the leaves, erect, terete, solid, glabrous, 20–50 cm long, 1.5–4 mm diam. *Inflorescence* umbellate, mostly many-flowered, 4–7 cm diam., without bulbils. *Spathe* 1, hyaline, persistent or not, 10–25 mm long, 2-veined, opening with 2 equal slits reaching to the base, forming 2 spathe-lobes, recurved, c. 1–3 mm acuminate, with one greenish or pink midvein. Bracteoles absent. Pedicels (sub)equal, 15–25 mm, slender, in anthesis straight, in fruit straight, rigid. *Flowers* subcampanulate or cup-shaped, becoming rigid with age. Tepals 2–3 mm adnate to bases of filaments, persistent, white to creamy, sometimes with a pink midvein. Tepals 2–3 mm adnate to bases of filaments, persistent, white to creamy; outer tepals ovate to elliptic, saccate at base, 8.5–10.5 × 4.5–7 mm, top retuse to acute, often shallowly lacerate or undulate; inner tepals resembling outer tepals, but much narrower. Stamens much shorter than the tepals; filaments simple; outer filaments 5.5–8 mm long, at base 0.5–1 mm wide, connate with inner filaments for 0.5–1 mm; inner filaments slightly longer and wider than outer filaments. Anthers 0.8–1.5 × 0.5–1 mm, yellow. Pistil shorter than the tepals; ovary globose to ovoid, 2.5–3.5 × 1.8–4 mm; style 3.5–5 mm, slender, inserted at about one-third from the base of ovary; stigma inconspicuous, almost undivided. *Fruits* subglobose, 4.5 mm diam. Seeds c. 2.5 × 2.5 mm, black.

Habitat. *A. massaessylum* has a limited mountainous distributional area in the Western Mediterranean. From Morocco and Algeria it is known from but a few collections; it occurs more frequently in Portugal, but it is rare in Spain. It grows in shaded places in open forests of e.g. *Quercus ilex* and *Cedrus atlantica*. Soils are recorded as rich in humus, or rocky, also limestone, sand, granitic, and silicious soil. According to BATTANDIER et TRABUT (1892) and MAIRE (1937) *A. massaessylum* is a gregarious-growing species, due to vegetative reproduction. MAIRE found this gregariously growing linked with a low percentage of flowering specimens, and with a limestone substratum. He found normal-flowering populations apparently bound to silicious soil-types. Altitude 1550–2200 m. Flowers: May–June (Morocco, Algeria), April–June (Portugal, Spain).

FIG. 31. *Allium massaessylum*. – 1. Bulb with old outer bulbcoat-leaves, $\times^2/_3$; 2. sprouting bulb showing sproutleaf, $\times^2/_3$; 3. upper part of sproutleaf, lateral view, ×2; 4. perianth and stamens, partly, ×4; 5–6. inner and outer tepal, outer view, ×4; 7. pistil, arrow indicates opening of nectary, ×4; 8. longitudinal section of ovary, ×6; 9. seed, lateral view, ×6; 10. detail of testa, seen from above and in profile, ×40; 11. transverse section of scape, ×6; 12. piece of smooth root, ×6; 13. bulb in transverse section with corresponding details showing structure of bulbcoat-leaves (1–4), a. scape, b. young increase bulbs, (5–13. bulbcoat-leaves); 14. inflorescence with 2-lobed spathe, flowers removed, $\times^2/_3$; 15. lower portion of perianth, the tepals having saccate bases, ×4. (1, 11, 13, 15. DE WILDE & DORGELO 2882; 2–3. MAIRE s.n., Iter Maroccanum 27, 16 June 1936; 4–8, 12, 14. BATTANDIER s.n., Algeria, June 1891, type; 9–10. BATTANDIER s.n., Algeria, 16 May 1904).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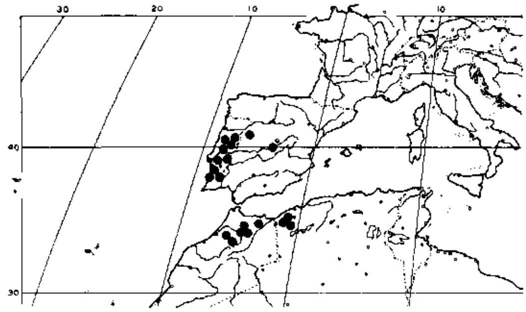
Distribution. Morocco; Algeria; Portugal; Spain.



MAP 21. Localities of *Allium massaessylum.*

Morocco: Mt. Tazzeka, near Taza, 1600–1800 m, 18 June 1925, MAIRE s.n. (P); near Bab-Amegas, 1600 m, in *Cedrus* forest on sands, 17 April 1928, MAIRE s.n. (P); Tizi-n-Treten, S. of Ifrane, 2000–2200 m, June 1936, MAIRE s.n. (MPU); & on soil rich in humus over limestone, 2100 m, 16 June 1936, MAIRE s.n. (P); Bab-Bou-Idir, Tazzeka Mts, 1550–1600 m, in *Quercus ilex* forest, 16 June 1954, VAN STEENIS 19175 (L); Mt. Tazzeka, 1989 m, steep slope between rocks in open *Cedrus* forest, 9 June 1961, DE WILDE c.s. 2882 (L, WAG).

Algeria: Forêt d'Afir, near Tlemcen, June 1891, BATTANDIER s.n. (P, type of *A. massaessylum* BATTANDIER et TRABUT); & May 1895, BATTANDIER s.n. (G); & 16 May 1904, BATTANDIER s.n. (G, MPU, P).

Portugal, many collections: between Valhelhas and Guarda, granite, May 1933, CARISSO c.s. 3256 (COI); between Cercal and Odemira, April 1886, DAVEAU 1268 (COI, P); Arredores de Serta, 22 April 1954, FERNANDES c.s. 4709 (COI); Arredores de Castelo Vide, 22 June 1959, FERNANDES 6957 (COI); between Coimbra and Porto, 20 June 1965, FERNANDES c.s. 9227 (COI); S. Martinho da Cortica, May 1892, FERREIRA s.n. (COI); Ponte da Murcella, Moura Morta, May 1892, FERREIRA 1421 (COI, G, MPU, P); between Sameiro and Manteigas, 15 June 1949, FERREIRA c.s. 3336 (COI); Serra da Estrela, Soutos Velhos, June 1883, FONSECA s.n. (COI); Vendas Novas, 15 April 1946, GARCIA c.s. 1225 (COI); Marvaõ, June 1891, MOLLER s.n. (COI); Mirando do Corvo, Coimbra, May 1969, DE WIT 12341 (WAG).

Spain: San Pablo de los Montes, near Toledo, 18 June 1854, BOURGEAU s.n. (P); Bejar, c. 150 km W. of Madrid, 4 June 1892, ROUY s.n. (P).

Notes.

Synonyms. The name *A. transtaganum* WELWITSCH, a herbarium name, most possibly belongs to a Portugese collection by WELWITSCH of *A. massaessylum.* ROUY (1891) published it without a description in a list supplementing RICHTER's Plantae Europaea. In the Paris Herbarium is one sheet of *A. massaessylum* collected in 1892 by ROUY in Spain and identified, apparently by him, as *A. transtaganum* WELWITSCH. Both COUTINHO (1913), and JAHANDIEZ et MAIRE (1931) placed it in the synonymy of *A. massaessylum.* I have not seen WELWITSCH's plant.

Resembling species. *A. massaessylum* has its alliance with both *A. moly* L., from Spain and Southern France, and well-known from cultivation, and with *A. stramineum* BOISSIER et REUTER from Spain. *A. moly* is distinct by its bright yellow flowers and lanceolate, not linear, leaves; *A. stramineum* differs in its straw-yellow flowers, and its spathe soon falling off. Although these three specimens are perfectly distinct they are obviously related by the uniform wrinkled-sinuate structure of the outer bulbcoats.

A. massaessylum resembles furthermore a third species, *A. neapolitanum* CIRILLO, which differs by a single undivided spathe, the outer bulbcoats with regularly sinuate structure, and the sproutleaf emerging leaf-like 1–5 cm above ground.

25. A. roseum L. **Fig. 32, 33, Map 22.**

A. roseum L., Sp. Pl. 1, 1753:296; ibid. 1759:978; ibid. 1762:432; DESFONTAINES 1798:287; DC. in REDOUTÉ 4, 1808:213; TENORE 1811:158; GUSSONE 1827:399; G. DON 1827:77; VISIANI 1842:135; KUNTH 1843:438; MUNBY 1847:35; WEBB et BERTHELOT 1848:346, p.p. (see note); MUNBY 1859:29; WILLKOMM et LANGE 1862:210; MUNBY 1866:32; REGEL 1875:228; BALL 1878: 691; BARBEY, C. et W. 1882:162; BOISSIER 1882:273; BARBEY, W. 1884:187; BATTANDIER et TRABUT 1884:151; ibid. 1895:58; BONNET et BARRATTE 1896: 413; HALÁCSY 1904:261; ASCHERSON et GRAEBNER 1905:157; BRIQUET 1910: 299; DURAND et BARRATTE 1910:234; PAMPANINI 1917:126; JAHANDIEZ et MAIRE 1931:122; PAMPANINI 1931:155 (excl. *A. longanum* PAMPANINI); LINDBERG 1932:33; MARKGRAF in HAYEK 1932:53; DINSMORE in Post 1933:644; RECHINGER F. 1943:718; VINDT 1953:113, 125; CUÉNOD 1954:215; TÄCKHOLM et DRAR 1954: 78 (excl. *A. longanum* PAMPANINI); MAIRE 1958:295; MANN 1959:730–739; ibid. 1960:765–771; QUÉZEL et SANTA 1962:211; PALHINHA 1966:136; KOLLMANN 1973:92–112; DE WILDE-DUYFJES 1973:78; SJÖGREN 1973:105; OSORIO-TAFALL et SERAPHIM 1973:22.

A. roseum var. *typicum* REGEL 1875:228; *A. roseum* subvar. *typicum* BRIQUET 1910:300; *A. roseum* var. *grandiflorum* BRIQUET 1910:229; CUÉNOD 1954:215 (quod subvar. *typicum*); *A. roseum* ssp. *eu-roseum* VINDT 1953:125; *A. roseum* subvar. *typicum* forma *coloratum* VINDT 1953:126; *A. roseum* var. *grandiflorum* subvar. *typicum* forma *verum* MAIRE et WEILLER in MAIRE 1958:296.

Type: LINN 419.10, '9 *roseum*'.

A. illyricum JACQUIN 1789:273; ibid. 1790:14, fig. 365.

Type: Yugoslavia, Fiume, HOST s.n. (not seen).

A. odoratissimum DESFONTAINES 1798:289; KUNTH 1843:440; MUNBY 1847: 35; REGEL 1875:109 (in section *Schoenoprasum*); BATTANDIER et TRABUT 1884: 125; ibid. 1895:58.

A. africanum DIETRICH 1815:160; *A. roseum* var. *odoratissimum* COSSON 1875:50; BONNET et BARRATTE 1896:413; DURAND et BARRATTE 1910:234; PAMPANINI 1931:155; CUÉNOD 1954:215; MAIRE 1958:297, fig. 918; *A. roseum* ssp. *odoratissimum* MURBECK 1899:23; VINDT 1953:125; QUÉZEL et SANTA 1962:211; *A. roseum* forma *odoratissimum* PAMPANINI 1936:176.

Type: Tunisia, near Cafsam et Tozzer, in sandy, desertlike places, DESFONTAINES s.n. (holotype P, in Herb. DESFONTAINES; isotypes: P, FI).

A. carneum TARGIONI TOZZETTI 1802 (2):242, 1802 (1), Tab. 6, fig. 304; BERTOLONI 1803:7; ibid. 1806:11; LOISELEUR-DESLONGCHAMPS 1810:54; TENORE 1811:159; TARGIONI TOZZETTI 1813:271.

A. roseum var. *carneum* REICHENBACH 1848:28; HALÁCSY 1904:261; ASCHERSON et GRAEBNER 1905:158; HOLMBOE 1914:47; *A. roseum* subvar. *bulbiferum* (DESF.) BRIQUET forma *carneum* VINDT 1953:126; MAIRE 1958:296.

Type: Italy, near Firenze, SANTI s.n. (no holotype found in MICHELI'S Herb. at FI, in which Herb. TARGIONI TOZZETTI; no isotypes seen).

Cepa flexuosa MOENCH 1802:80; G. DON 1832:78.

Type: not seen (acc. to STAFLEU 1967 herbarium and types of MOENCH no longer extant).

A. roseum var. *bulbiferum* DESF. in KER-GAWLER 1807:978; DC. in REDOUTÉ 4, 1808:213; DESFONTAINES 1815:32; GUSSONE 1827:400; ibid. 1842:388; TENORE 1831:167; KUNTH 1843:439; REGEL 1875:229; BOISSIER 1882:274; BATTANDIER et TRABUT 1895:58; EMBERGER et MAIRE 1941:955; CUÉNOD 1954: 215 (var. *grandiflorum* subvar. *bulbiferum*); TÄCKHOLM et DRAR 1954:79.

Type: not seen.

A. ambiguum SMITH in SIBTHORP et SMITH 1809:227; ibid. 1823:23, fig. 327; G. DON 1827:75.

Type: Italy, SIBTHORP s.n. (not seen).

A. majale TENORE 1811 (1):LX, 160, t. 29; G. DON 1827:83.

A. roseum var. *majale* REGEL 1875:229; *A. roseum* ssp. *majale* RICHTER 1890: 210; *A. roseum* forma *majale* ASCHERSON et GRAEBNER 1905:158; VINDT 1953: 126; MAIRE 1958:296.

Type: Italy, Puglia (Apulia), in arable land, TENORE s.n. (holotype: FI).

A. pulchrum CLARKE 1814:337.

Type: Greece, Isle of Kos (Cos), CLARKE s.n. (holotype: BM).

A. permixtum GUSSONE 1827:8; GUSSONE 1842:388; KUNTH 1843:442; REICHENBACH 1848:27.

A. subhirsutum ssp. *permixtum* RICHTER 1890:209.

Type: Italy, Sicily, Le Madonie, GUSSONE s.n. (holotype destroyed in NAP; no isotypes seen).

A. roseum var. *bulbilliferum* VISIANI 1842:135; MARKGRAF in HAYEK 1932: 53; RECHINGER F. 1943:718.

A. rubicundum WILLD. ex KUNTH 1843:439, nom. inval., in syn. of *A. roseum*.

Type: WILLD. 6466 fol. 1.3 (holotype: B).

A. obtusiflorum REQUIEN ex GRENIER et GODRON 1855:205, non REDOUTÉ.
Type: France, Corse, s.l., REQUIEN s.n. (not seen).

A. confertum JORDAN et FOURREAU 1868:127.
Type: France, Corse, near Bonifacio, REVELIÈRE s.n. (not seen).

A. subalbidum JORDAN et FOURREAU 1868:126.
Type: France, Saint-Tropez, LANNES s.n. (not seen).

A. tourneuxii BOISS. in LETOURNEUX exs. 1878, nom. inval.
A. roseum var. *tourneuxii* BOISS. 1882:274; BARBEY, C. et W. 1882:162; DURAND et BARRATTE 1910:234; MUSCHLER 1912:217; BÉGUINOT et VACCARI 1914:96; PAMPANINI 1931:155; TÄCKHOLM et DRAR 1954:78; MAIRE 1958:296.
Type: Egypt, near Mandara and Mariut, in arable land, LETOURNEUX 205 (holotype: G; isotypes: FI, P).

A. roseum var. *insulare* W. BARBEY 1884:187; BRIQUET 1910:300.
Type: not seen.

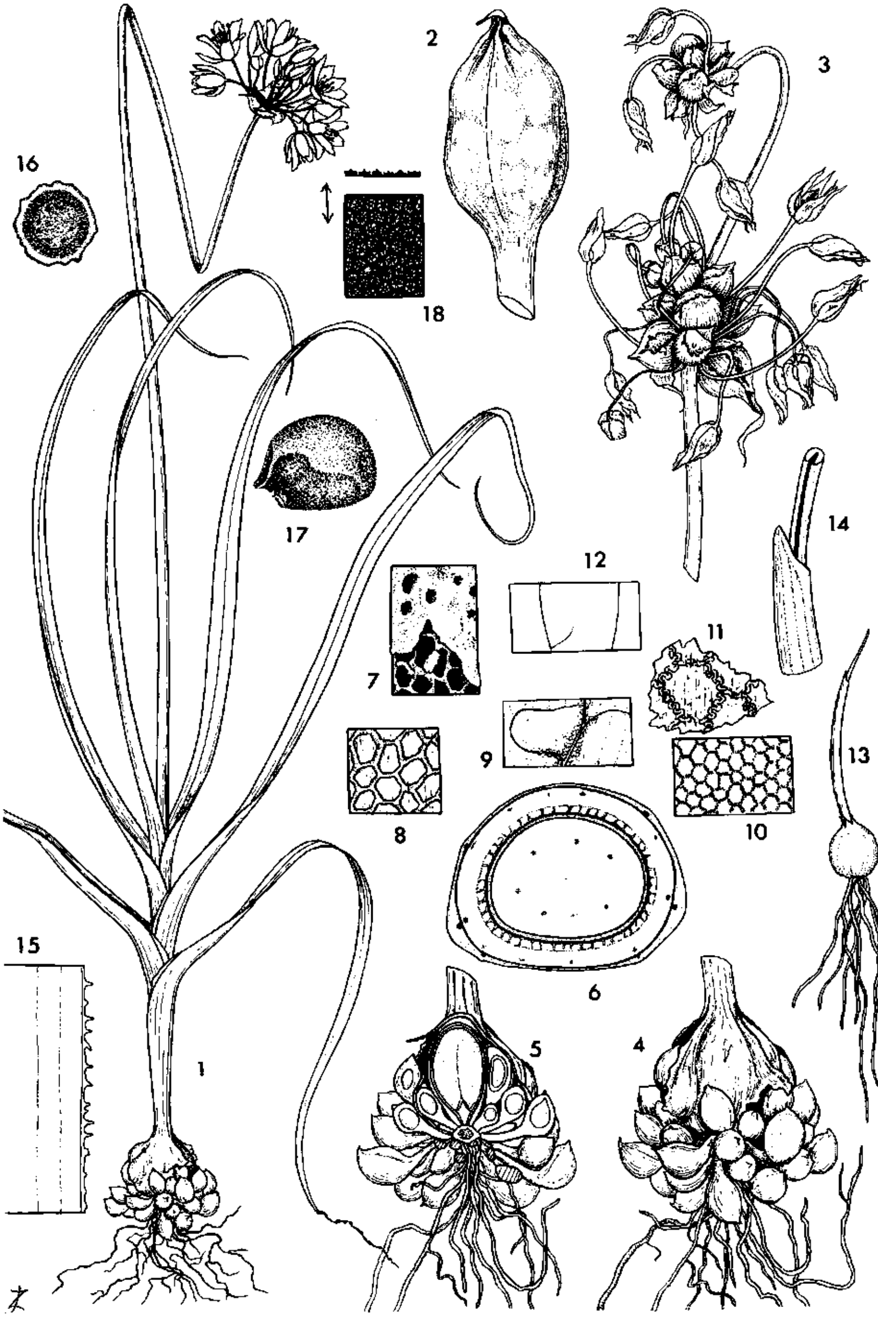
A. roseum var. *pandatarium* TERRACCIANO 1884:6.
A. roseum ssp. *pandatarium* RICHTER 1890:210.
Type: Italy, I. Ventotene, TERRACCIANO s.n. (not seen).

A. roseum var. *humile* SOMMIER 1894:248.
Syntypes: Italy, Isle of Giglio, 22 May 1888, BIONDI s.n. (lectotype: FI); & ditto, 1843, PARLATORE s.n. (not seen).

A. roseum var. *carneum* forma *albiflorum* MAIRE 1939:366; VINDT 1953:126; MAIRE 1958:296.
Type: Algeria, Djebel Aourès ('Montis Pharaonis Aurasiorum'), MAIRE s.n., 24 April 1938 (holotype: P).

A. roseum var. *perrotii* MAIRE 1939:366; VINDT 1953:126; CUÉNOD 1954:215; TÄCKHOLM et DRAR 1954:79; MAIRE 1958:296.
A. roseum var. *perrotii* subvar. *floriferum* MAIRE et WEILLER in MAIRE 1958:296.
Type: Algeria, Guelma nr. Villars, MAIRE s.n., May 1938 (holotype: P).

A. roseum var. *perrotii* forma *bulbillosum* MAIRE 1940:42.
A. roseum var. *perrotii* subvar. *bulbillosum* CUÉNOD 1954:215; MAIRE 1958:297.
Type: Tunisia, Djebel Zaghouan, SERRES s.n., 1 May 1939 (holotype: P).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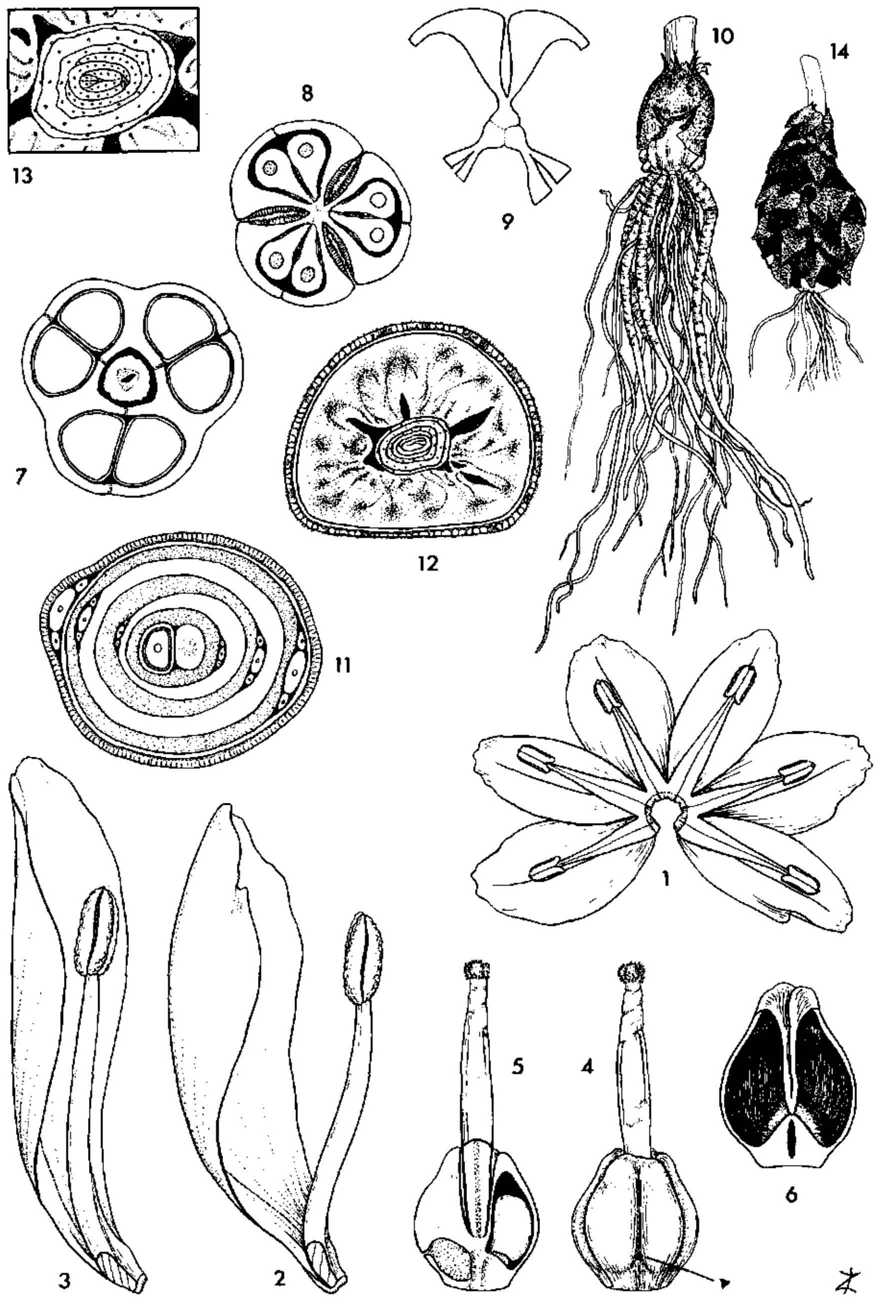
Bulb globose to ovoid, 13–25 × 12–20 mm. Contractile roots scattered over whole surface of bulb disk, glabrous, unbranched, smooth roots inserted laterally on the bulb disk, glabrous, not or sparingly branched. Increase bulbs numerous, 1–3 collaterally in the axils of protective-, sprout-, and foliage leaves, globose to ovoid, 2–15 × 2–10 mm, 0.5–1 mm beaked, 1–5(–55) mm stiped, wrapped in a hyaline prophyll. Protective leaves 2–4(–12), outer surface light yellowish or greyish, or medium brown, inner surface glossy, pearly white or whitish brown, after decay of outer epidermis conspicuously faveolate or pitted by the sclerified inner layer, the cell walls finely sinuate. Sproutleaf 1, soon wilting, 2–10 cm long, emerging to up to 5 mm above ground. *Foliage leaves* 3–7, glabrous; blades approximate, linear, 8–60 cm × 0.5–15(–25) mm, flat or folded, top acute, soon wilting, margin entire or distinctly crenulate; sheaths subequal, largely subterranean, 2–10 cm long, whitish, often tinged purplish. Scape 1 (or 2), longer than the leaves, erect, terete, solid, glabrous, 8–70 cm long, 2–5 mm diam. *Inflorescence* umbellate to spherical, usually many-flowered, 2–8 cm diam., usually without or sometimes with bulbils. *Spathe* 1, hyaline, persistent, 12–25 mm, 4-veined, opening with (2 or 3, or) 4 equal slits reaching to halfway to three-fourth, or with one single slit up to the base and with three shorter slits, forming (2 or 3, or) 4 spathe-lobes, often recurved, c. 2 mm acuminate, with purplish midvein. Bracteoles absent. Pedicels (sub)equal, seldom central pedicels longer, 10–40 mm, in bulbiferous inflorescences up to 60 mm, slender, in anthesis straight, or in globose inflorescences the outer pedicels recurved, in fruit straight, rigid. *Flowers* subcampanulate, fragrant. Tepals 1–1.5 mm adnate to bases of filaments, persistent, light to dark pink or purplish, with a darker midvein, or pure white; outer tepals ovate to obovate, 7.5–14 × 3.5–7 mm, top retuse, subtruncate or broadly obtuse, rarely acute, often with shallowly lacerated or undulated edge; inner tepals shorter and narrower, rarely longer than outer tepals, 7–12 × 3–5 mm, top obtuse to retuse, rarely acute. Stamens shorter than the tepals; filaments simple; outer filaments 3.8–8 mm long, at base 0.8–1.5 mm wide, connate with inner filaments for 0.7–1.5 mm; inner filaments slightly longer and wider than outer filaments, 4–8.5 mm long, at base 1.1–2 mm wide. Anthers 1–2.8 × 0.8–1.3 mm, yellow. Pistil shorter than the tepals; ovary globose to obovoid, 2–4 × 1.5–4 mm; style 2–5 mm, slender, sometimes in the upper part contorted, inserted at about one-third to halfway from the base of ovary; stigma inconspicuous, with three minute lobes c. 0.4 mm. *Fruits* subglobose, 4–5 mm diam. Seeds c. 3 × 1.5 mm, black.

FIG. 32. *Allium roseum*. – 1. Habit, ×$^1/_3$; 2. closed spathe, ×2; 3. blown over, bulbil-bearing inflorescence, ×$^2/_3$; 4. bulb with increase bulbs, ×$^2/_3$; 5. ditto, longitudinal section, ×$^2/_3$; 6. transverse section of increase bulb, ×4; 7–8. pitted structure of outer bulbcoat-leaf in autumn, outer view, ×10; 9. structure of outer bulbcoat-leaf, inner view, ×4; 10–11. pitted structure of second bulbcoat-leaf, inner view, ×4 and ×16 resp.; 12. detail of innermost bulbcoat-leaf, without structure, inner view, ×4; 13. sprouting increase bulb, ×$^2/_3$; 14. upper part of sproutleaf, ×4; 15. fragment of leaf blade with minutely crenulate margin, ×8; 16. transverse section of scape, ×6; 17. seed, lateral view, ×6; 18. detail of testa, seen from above and in profile, ×40. (1–16. DE WIT 12664; 17–18. COSSON s.n., Philippeville, 1853).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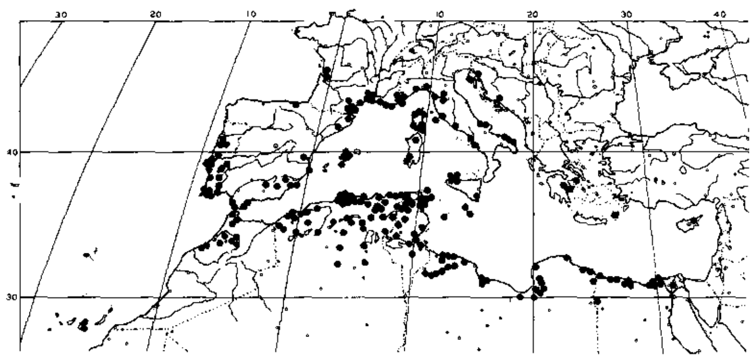
Vernacular names: Libya: *Gazul*, *Rhazul*; Egypt: *Toam*, *Zozah*, *Busseyl*.

Uses. Raw bulbs eaten by the Jazoul (Algeria) (COSSON 68).

Habitat. Largely bound to the Mediterranean region. Occurs mostly along and near the coast, but sometimes also more inland, as e.g. in N. Africa, the Iberian Peninsula, and in France. It is found frequently in dry riverbeds, on sand dunes, on arid rocks, in desertlike habitats, and in more or less secondary localities like vine- and oliveyards, roadsides, cultivated-, irrigated-, and abandoned fields. The species has a preference for limestone and sandy soils, but it is found on clayish soil types as well. Altitude 0–2000 m. Flowers: February–June (Morocco, Algeria, Tunisia); February–May (Libya, Egypt); (February–) April–June(–September) (Europe).

Distribution. Canary Is. (only two collections seen, see notes); NW. and N. Morocco; Algeria, as far south as Laghouat; Tunisia, as far south as Douirat; N. Libya; N. Egypt; Portugal; Spain, rare in the far interior, and but one collection from the Atlantic north coast; Balearic Is.; France, south coast, also some collections north of Bordeaux; Corsica; Sardinia; Sicily; Lampedusa I.; Maltese Is.; Italy; Yugoslavia; Greece, as far east as the Isles of Kos and Karpathos; Cyprus; Turkey, one collection seen. In the Near East the species seems to be replaced by the related *A. erdelii* ZUCC.



MAP 22. Localities of *Allium roseum*.

FIG. 33. *Allium roseum*. – 1. Perianth and stamens, ×2; 2–3. outer and inner tepal, lateral view, ×6; 4. pistil, arrow indicates opening of nectary, ×6; 5. ditto, longitudinal section, nectary at left, ×6; 6. longitudinal section of ovary, nectary at bottom centre, ×6; 7. transverse section of ovary, nearly at the base, ×12; 8. transverse section of nearly mature fruit, showing nectaries, ×6; 9. transverse section of mature fruit towards the base, showing empty nectaries, ×12; 10. bulb in spring with contractile roots, $\times^2/_3$; 11. transverse section of bulb in spring, note young increase bulbs, ×4; 12. the same in autumn, full grown increase bulbs omitted, ×2; 13. ditto, inner part, ×4; 14. bulb with several old outer bulbcoat-leaves, $\times^2/_3$. (1–13 DE WIT 12664; 14. CARVALHO 780).

MEDITERRANEAN AREA: s.l., LINNAEUS 419.10 (LINN, type of *A. roseum* L.).

Canary Is.: Gran Canaria, in fields near Tafira, March 1846, BOURGEAU 998 (FI); Gran Canaria, WEBB 508 (FI).

MOROCCO: Along the road Meknez-Fez, 12 April 1931, DAME ALICE c.s. 45 (BM), & 7 April 1931, 46 (K); along the road Khemissat–Meknes, 27 March 1939, ALLINSON s.n. (BM); near Tetuan, on limestone rock, 13 April 1871, BALL s.n. (BM, FI, P); Beni Hosmar, 13 April 1939, DAVIS 437 (E, K); Petitjean, April 1935, GARNETT 37/6 (BM); Jebel Sadik, 1500 m, near Aïn Sefrou, 1888, GRANT s.n. (K), & 28 May 1888 (P); Casablance, April 1871, HOOKER s.n. (K); Tetuan, April 1871, HOOKER (K); Casablanca, 18 april 1887, MELLERIO 140 (P); Tetuan, near Beni–Hosmar, 7 April 1911, PITARD 181 (P); Tetuan, near Jebel Dersa, on stony places, 30 March 1911, PITARD 206 (G, P), & 15 April 1911, 207 (G, P); Hidum, May 1932, SENNEN c.s. s.n. (BM); Fez, March 1930, TRETHEWY 274 (K); Fédala, March 1935, TRETHEWY 290 (K); Fez, March 1935, TRETHEWY 362 (K); Tanger, March 1935, TRETHEWY 388 (K);

ALGERIA: Chabet-el-Akra, between Bougie and Sétif, on rocky slope, 25 April 1937, ALSTON c.s. 341 (BM); road Bougie-El Kseur, 25 April 1937. ALSTON c.s. 37543 (BM); near Tizi Ouzou, 28 April 1937, ALSTON c.s. 37642 (BM); oasis of Biskra, 5 April 1853, BALANSA 744 (BM, C, FI, G, K, MPU, P, WAG); Mustapha, April 1840, BARAU s.n. (P); Bou Saada, April 1890, BATTANDIER c.s. 577 (L, G); Negrin, 180 m, 1882, BIMLER s.n. (P); Khreïder, 950 m, 26 April 1888, BONNET c.s. s.n. (P); Blidah, roadside, 29 April 1938, BOOM 12703 (L); Alger, hills, May 1837, BOVÉ s.n. (FI, G, K, P), & April 1838, 87 (G, WU); Oran, April 1839, BOVÉ s.n. (P); near Fort National, 18 June 1877, Herb. CAMUS 3837 (P); Médéah, hedges, 9 May 1872, CHABERT s.n. (FI); Aumale, 850 m, in scrub, 10 May 1857, CHAROY 579 (P); Mustapha, in forest, 9 April 1893, CHEVALLIER s.n. (P); Laghouat, 790 m, 9 April 1897, CHEVALLIER 243 (P), & on dry rocky and sandy places, 22 April 1899, CHEVALLIER 371 (FI, G, P); Lambèse, in arable land, 3 June 1909, CLAVÉ s.n. (G); between Biskra and Touggourt, on gritty and sandy soil, 19 March, COSSON 68 (P); Mostaganem, waste fields, 31 March 1848, Herb. COSSON s.n. (P); Philippeville, 11 May 1853, Herb. COSSON s.n. (MPU, P); Biskra, 4 April 1858, Herb. COSSON s.n. (P); Bougie, 1870, Herb. COSSON s.n. (P); Alger, fields, April 1888, Herb. COSSON 84 (P); Orléansville, 24 April 1875, COSSON s.n. (P); Oran, 26 April 1933, CUÉNOD s.n. (G); Jebel Santo, near Oran, grassy places, 17 April 1882, DEBEAUX s.n. (G); Oran, slopes of the great ravine, 25 April 1882, DEBEAUX p.p. s.n. (G); forest of Jebel Santo, 4 May 1884, DEBEAUX s.n. (COI); Oran, 1892, DEBEAUX s.n. (FI); near Mostaganem, DELESTRE s.n. (P); near Tiaret, 1845, DELESTRE s.n. (P); 'Barbarie', DESFONTAINES s.n. (G); near Batna, 1000 m, 1854, DU COLOMBIER s.n. (P); Mustapha, 20 March 1840, DUFOUR s.n. (P); valley of the Bou-Merzoug, near Constantine, 10 May 1840, DURIEU DE MAISONNEUVE s.n. (P); La Calle, sands, 4 April 1841, DURIEU DE MAISONNEUVE s.n. (P); Oran, 10 April 1904, FAURE 24 (G); Tlemcen, along the road to Sidi-Bou-Medin, 23 May 1904, FAURE 543 (P); near El Ancor, grassy places and scrub, 11 April 1922, FAURE s.n. (M); Biskra, 1869–1870, FÉE s.n. (P); Rouïba, arable land, 15 March 1886, GAGNAIRE s.n. (MPU); Kouba, March 1879, GANDOGER 206 (BM, FI); Mustapha, 2 April 1879, GANDOGER 862 (BM); Jebel Santo, near Oran, on grassy places, GARRIGUES s.n. (P); Constantine, June 1888, GIROD 24 (G); Birmandreïs, near Alger, 10 March 1935, GOMBAULT s.n. (P); Oran, in the ravine Noiseux, 2 April 1906, HIBON s.n. (P); Jebel Lammah, April 1849, JAMIN 57 (P); Birkadem, near Alger, scrub, April 1850, JAMIN 103 (FI, G, K, MPU, P, WAG); near Blidah, scrub, 13 Aug. 1862, LEFEBVRE 646 (P), & 5 May 1861 (BM); Jebel Batna, LEFRANC s.n. (P); Edough, 710 m, 12 June 1855, LETOURNEUX s.n. (P); La Calle, 6 May 1861, LETOURNEUX s.n. (P); Tebessa, 1080 m, 10 April 1862, LETOURNEUX s.n. (P); Ouled Sahari, May 1882, LETOURNEUX s.n. (P); Zahrez, 840 m, sandy places, April 1883, LETOURNEUX s.n. (C); Hippone, near Bône, waste fields, 21 April 1890, LUILFROY 83 (P); Bône, sandy places in the mouth of the river Seybouse, 21 April 1892, LUILFROY s.n. (P); La Calle, in *Quercus suber* forest, 28 April 1930, MAIRE s.n. (P); Guelma, on limestone ridges, 28 May 1938, MAIRE s.n. (P, type of *A. roseum* var. *perrottii* MAIRE); Jebel Aourès, 1300 m, in *Quercus laxis* forest, 24 June 1938, MAIRE s.n. (P, type of *A. roseum* f. *albiflorum* MAIRE); Blidah, 8 April 1877, MEYER s.n. (FI); Alger, March–April 1877, MEYER s.n. (FI), & 30 April 1884, MEYER s.n. (FI); Bou Ghezoul, 630 m, sand dunes, 20 April 1852, NENOU s.n. (P); near Alger, 17 April 1892, NEYRAUT 117 (MPU); near Djelfa, June 1854, REBOUD s.n. (P); banks of the Bou Saada River, 1865, REBOUD s.n. (P); escarpments of Jebel Kerkera, near Constantine, June 1878, REBOUD s.n. (P); Aïn Beïda, 12 May 1883, REBOUD s.n. (P); Kabylie, 1000 m, forest on calcareous soil, June 1898, REVERCHON s.n. (P); Laghouat, Feb. 1869, SAMARY s.n. (P); near Alger, Feb. 1832, SCHIMPER s.n. (BM, FI, K, M, P); near Tlemcen, 28 Feb. 1862, SIGNON s.n. (P); Mostaganum, SPACH s.n. (FI); Bône, 1834, STEINHEIL s.n. (P); Mustapha, Feb. 1881, DE VÉSIAN s.n. (P); Staoueli, April 1857, Herb. WOLFE s.n. (K, P); Oued Rir, March 1864, ZICKEL 105 (P).

TUNISIA: near Béja, 10 April 1888, BARRATTE s.n. (P); Bordj-Toum, 12 April 1888, BARRATTE s.n. (P); Sidi Chuega, 13 April 1888, BARRATTE s.n. (P); La Mactra, sandy soil, 18 April 1888, BARRATTE s.n. (P); Mghaïssa, 26 April 1888, BARRATTE s.n. (P); Jebel Ahmar, 2 May 1888, BARRATTE s.n. (P); Ras Zebib, near Tunis, 10 May 1888, BARRATTE s.n. (P); near Tunis, fields, 26 April 1894, CHEVALLIER s.n. (P); Laghouat, April 1897, CHEVALLIER 243 (WU); Hamman-El-Lif, 8 May 1883, COSSON c.s. s.n. (P); Cap Bon, between Kurba and Menzel-Temim, 14 May 1883, COSSON c.s. s.n. (P); Kelibia, 15 May 1883, COSSON c.s. s.n. (P); El-Haouiria, 16 May 1883, COSSON c.s. s.n. (P); Cap Bon, 17 May 1883, COSSON c.s. s.n. (P); El-Haouiria, rocks near the sea, 17 May 1883, COSSON c.s. s.n. (P); Jebel Cheban, 20 May 1883, COSSON c.s. s.n. (P); valley of the Oued Bou-Noukhal, Cap Bon, 21 May 1883, COSSON c.s. s.n. (P); Zaghouan, 31 May 1883, COSSON c.s. s.n. (P); Fedj El-Saha, between Aïn Drahan and Souk-El-Arba, 30 June 1883, COSSON c.s. s.n. (P); E. Kroumirie, Kaf El-Madhi (Ouled Ali), 22 May 1888, COSSON c.s. s.n. (P); Tunis 10 April 1909, CUÉNOD s.n. (G); Zaghouan, 15 April 1913, CUÉNOD s.n. (G); desert of Cafsa and Tozzer, DESFONTAINES s.n. (FI, G; P, type of *A. odoratissimum* DESF.); Tebourba, near Tunis, 1 April 1884, DOÛMET-ADANSON c.s. s.n. (P); & 1 Aug. 1884, DOÛMET-ADANSON c.s. s.n. (P); near Sfax, DUCOURET s.n. (P); near Sfax, 1854, ESPINA s.n. (P); Oued Zerkine, near Gabes, 22 April 1909, HIBON s.n. (P); near Soliman, pasture, sandy soil, 25 April 1965, JANSEN 235 (WAG); forest of Feidja, W. of Ghardimaou, 900 m, loamy-sandy soil, 14 May 1965, JANSEN 315 (WAG); forest of Oued Zeen, SE. of Tabarka, 500 m, sandy soil, 17 June 1965, JANSEN 570 (WAG); Sfax, 27 Feb. 1854, KRALIK s.n. (FI); Gabes, waste fields, 10 March 1854, KRALIK s.n. (FI), & 19 March 1854, KRALIK s.n. (FI); well of Beni-Zid, at base of Jebel Dziza, near Gabes, 14 May 1854, KRALIK s.n. (FI, P); Ghardimaou, 31 March 1884, LETOURNEUX s.n. (P); Porto Farina, 5–6 April 1884, LETOURNEUX s.n. (P); hills near Haouaïa, 1 May 1884, LETOURNEUX s.n. (P); Gabes, in palm grove, 17 Feb. 1886, LETOURNEUX s.n. (P); Metrech, near Gabes, fields, 6 March 1886, LETOURNEUX s.n. (P); Oued Magroum, near Kebili, 12 and 14 March 1886, LETOURNEUX s.n. (P); hills near Birch Ahmar, 25 March 1886, LETOURNEUX s.n. (P); Oudref, in palm groves and fields, 26 March 1886, LETOURNEUX s.n. (P); between the mountains Guelaat-es-Senam and Guelaat-Rebiba, 14 May 1886, LETOURNEUX s.n. (P); near El Kef, 19 May 1886, LETOURNEUX s.n. (P); Douirat, 1887, LETOURNEUX s.n. (P); between rocks near Ksar El-Kabbar, 1 April 1887, LETOURNEUX s.n. (P); on stony and sandy plain between Douirat and Oued ber Ruheb, 11 April 1887, LETOURNEUX s.n. (P); Jebel Chambi, pine forest and sand dunes, 13 May 1887, LETOURNEUX s.n. (P); Jebel Semata, near Shiba, 21 May 1887, LETOURNEUX s.n. (P); valley near Jebel Bargou, 2 June 1887, LETOURNEUX s.n. (P); top region of Jebel Bargou, 1280 m, in crevices, 3 June 1887, LETOURNEUX s.n. (P); Isle of Djamour (Zembretta), in stony soil, 19 June 1887, LETOURNEUX s.n. (P); Maktar, June 1896, MURBECK s.n. (WU); Oudref, in cultivated land, March 1907, PITARD 268 (G, L, P); Aïn Draham, 900 m, in cultivated land, JUNE 1910, PITARD 2475 (G); Aïn Drahan, in forest on the foot of Jebel Bir, 25 May 1885, ROBERT s.n. (P), & 10 June 1885, ROBERT 235 (P); Sidi Drif, near Carthagena, sands, 7 April 1904, ROMIEUX 168 (G); Zaghouan, among *Juncus* on sand, 1 May 1939, SERRES s.n. (P, type of *A. roseum* f. *bulbillosum* MAIRE); Jebel Bou Hedma, near Gabes, April 1968, YOUNG 57 (BM).

LIBYA: W. of Tripoli, in sparce scrub land, 19 Feb. 1966, ARCHIBALD 897 (K); Tigrinna, 8 April 1939, BENL 33 (M); Jebel Nefusa, 170 km SW. of Tripoli, 6 April 1971, BOULOS c.s. 4705 (L); 58 km W. of Tripoli, 23 March 1961, BRONGERSMA 14 (L); El Azizia, 24 March 1961, BRONGERSMA 47 (L); between Jefren and El Azizia, 27 March 1961, BRONGERSMA 104 (L); Jebel Nefusa, 700 m, sub-desert, 15 March 1970, DAVIS 4955 1b (K); Jebel Nefusa, 600 m, 75 km from Giado to Garian, 18 March 1970, DAVIS 49736 (E, K); Jebel Nefusa, 650 m, 27 km SE. of Giado, barley field, March 1970, DAVIS 49647 (E, K); near Tripoli, 1827, DICKSON s.n. (FI); between Buerat and Sirte, in barley fields, 16 Feb. 1958, GUICHARD 58 (BM); 18 km S. of Bu Ngem, coastal plain, 8 March 1952, GUICHARD 208 (BM); Sidi Mersi, Feb. 1954, GUICHARD 590 (BM); Tarhuna, sands, 14 Feb. 1949, JOHNSON 78 (BM); Azizia plain, sub-desert, 23 Jan. 1949, JOHNSON 113 (BM); Sirte, 6 Feb' 1961, KHALIFA EL KARAMANLI 847 (K); Hescian, W. of Tripoli, 6 Feb. 1963, KIJLSTRA 1168 (K); Ghiran, 7 April 1886, LETOURNEUX s.n. (P); Tripoli, Tagiura, 21 Feb. 1913, PAMPANINI 131 (FI); Tripoli, oasis of Zanzur, 23 Feb. 1913, PAMPANINI 171 (FI); Tripoli, Suani Beni Aden, 25 Feb. 1913, PAMPANINI 242 (FI); Tripoli, Fonduc Ben Cascir, 25 Feb. 1913, PAMPANINI 244 (FI); hills E. of Kasr Tarhuna, 27 Feb. 1913, PAMPANINI 351 (FI); Tarhuna, Abiar Milgah, 28 Feb. 1913, PAMPANINI 525 (FI), & 2 March 1913, PAMPANINI 608 (FI); Tarhuna, Aïn Scersciara, 14 March 1913, PAMPANINI 654 (FI); Tarhuna, Uadi Msaaba, near Kasr Doga, 18 March 1913, PAMPANINI 942 (FI), Tarhuna, Ras Bu Tauil, 21 March 1913, PAMPANINI 1322 (FI); Tarhuna, Ras Ghenai, 25 March 1913, PAMPANINI 1334 (FI); Tarhuna, Kasr Daun, 7 April 1913, PAMPANINI 1528 (FI); S. of El Agheila, Giofen, bank of Uadi Faregh, 15 March 1933, PAMPANINI 1285 (FI); Bu Nogra, bank of Uadi Faregh, 15 March 1933, PAMPANINI 1286 (FI); Saniet El Hamar, SE. of Agedabia, 12 March 1933, PAMPANINI 1283 (FI); Bir El Gelulia, S. of Agedabia, 13 March 1933, PAMPANINI 1284 (FI); Ridotta Tilger, near Agedabia, 7 April 1934, PAMPANINI c.s. 1298 (FI); Sidi Hmuda, E. of Agedabia, 8 April 1934, PAMPANINI c.s. 1299 (FI); Shabi, SE. of Agedabia, 9 April 1934, PAMPANINI c.s. 1300 (FI); between Agedabia and Antelat, 10 April 1934, PAMPANINI c.s. 1301 (FI); Uadi es Sahal, between Tobruk and Bardia, 23 March 1933, PAMPANINI 1330 (FI); Amseat, S. of Bardia, 24 March 1933, PAMPANINI 1331 (FI); Uadi Beni Ulid, clay & loam, 13 Jan. 1958, PARK 124 (K); Sirte, sands, 13 Feb. 1958, PARK 282 (K); Benghazi, 2 March 1883, RUHMER 334(P); Benghasi, 1884, PETROVICH 18 (WU); Derna, on sand and among boulders, 10 April 1939, SANDWITH 2516 (K); Marsa Bardia, 9–10 March 1891. SCHWEINFURTH 117 (K); Jebel Nefusa, between Garian and Jeffren, fields along road, 26 March 1971, SLEUMER s.n. (L); Leptis Magna, coast, 30 March 1971, SLEUMER s.n. (L); 'Iter Cyrenaicum', 14 April 1887, TAUBERT 45 (G, P), & 7 April and 2 May 1887, TAUBERT 367 (G, P); Tobruk, sands, 20 Feb. 1912, VACCARI 30 (FI); Zuaga, desert, S. of Sabratha, 18 March 1931, ZODDA s.n. (FI).

EGYPT: Aboukir, 23 March 1887, ASCHERSON 1189 (BR, P); Ramleh, near Alexandria, 23 March 1877, Ball s.n. (K); Mariut, 4 March 1880, BARBEY 879, p.p. (G, MPU, P); Ramleh, April 1878, BOISSIER s.n. (FI); El Amriya, 6 March 1912, BOLLAND s.n. (CAIM); Egypt, 1831, COQUEBERT DE MONTBRET s.n. (FI); Egypt, 1803, DELILE s.n. (BM); Mariut, 6 March 1950, DOORENBOS s.n. (L); El Amriya, in sandy irrigated fields, DRAR s.n. (CAIM); El Dikheila, May 1935, DRAR s.n. (CAIM); Marsa Matruh, 8 March 1939, DRAR s.n. (CAIM); El Daba, March 1945, DRAR s.n. (CAIM); between Barrani and Matruh, 14 March 1945, DRAR s.n. (CAIM); Alexandria, fields, March 1823, EHRENBERG 1875 (C, G, K, P), & May 1878, EHRENBERG s.n. (FI, L); Dikheila, Alexandria, sandy desert, 3 April 1946, GILBERT s.n. (BM); near Mamourah, in sandy desert, 22 March 1911, HARTMANN s.n. (CAIM, MPU); El Derna, 26 Jan. 1948, HASHIM s.n. (BM); Marsa Matruh, 21 Sept. 1906, HUGHES s.n. (K); Ramleh, April 1871, HURST s.n. (K), & May 1877, HURST s.n. (BM); Alexandria, sands, 24 March 1911, KAISER p.p. s.n. (G); Bahag, 20 March 1934, KHATTAB c.s. 5854 (CAIM); Abusir, 1 April 1952, KHATTAB c.s. 257 (CAIM); Aboukir, sands, 28 March 1848, KRALIK s.n. (G, K); Ramleh, March 1877, LETOURNEUX s.n. (P); between Mandara and Mariut, fields, LETOURNEUX 205 (FI, G, K, P, type of *A. roseum* var. *tourneuxii* BOISS.); Alexandria, March 1879, LETOURNEUX s.n. (FI, K, P); Mariut, March 1880, LETOURNEUX s.n. (P), & April 1880, LETOURNEUX s.n. (FI, *A. palastinum* in sched.), & May 1880, LETOURNEUX s.n. (P); Ramleh, April 1880, LETOURNEUX s.n. (FI); near Alexandria, ex Herb. MARTIN s.n. (FI); Marsa Matruh, in dry Uadi bed, 1928, MEINERTZHAGEN s.n. (BM); Mariut, April 1904, MUSCHLER s.n. (K); Tell-el-Kebir, March 1906, MUSCHLER s.n. (K); Ras el-Hikma, E. of Matruh, sands, 17 March 1964, NIAZI c.s. s.n. (CAIM); Burg el Arab, western desert, PALMER 164 A (K); near Bab-en, 14 April 1871, DU PARQUET 378 (BM); Mustapha Pascha, near Alexandria, 20 Feb. 1832, SCHIMPER s.n. (M); Mariut, 2–5 March 1891, SCHWEINFURTH 236 (G);

Mariut, 27 Feb. 1929, SHABETAI 1151 (CAIM); Garet Riteima, sands, 16 April 1934, SHABETAI 3290 (CAIM); Burg el Arab, sands, 13 March 1940, SHABETAI 6151 (CAIM); El Amriya, sands, 9 March 1949, SHABETAI s.n. (G); N. of Lake Mariut, sands, SHABETAI c.s. 27350 (CAIM); El Amriya, 16 March 1923, SIMPSON 1899 (CAIM); Marsa Matruh, 29 March 1927, SIMPSON 4594 (CAIM); 108 km W. of Marsa Matruh on the road to Sidi Barrani, 30 m, in low grass, roadside, 10 March 1969, WANTORP c.s. 2289 (K).

PORTUGAL, many collections: Setubal, April 1862, CARVALHO 780 (COI); hills near Lisboa, clayish limesoil, March–April 1877, DAVEAU s.n. (P); Vila Viçosa, 5 May 1947, FERNANDES c.s. 1540 (COI); roadside near Portimão, clayish soil, 4 May 1951, FERNANDES c.s. 3617 (COI); Coimbra, Santa Clara, 27 April 1949, MATOS c.s. s.n. (C); Mértola, April 1888, MOLLER s.n. (COI); Faro, April 1889, MOLLER s.n. (COI); Lagos, May 1969, DE WIT 12315 (WAG).

SPAIN, many collections: near Bilbao, sanddunes, May 1850, ANON. s.n. (WAG); Denia, S. of Valencia, scrub, 15 April 1936, BOOM 11494 (L); roadside near Cartagena, 28 April 1850, BOURGEAU s.n. (P); Puerto Santa Maria, 12 April 1849, BOURGEAU s.n. (P); Esparraguera, near Barcelona, 7 May 1847, BOURGEAU 161 (P); Algeciras, fields, 14 April 1876, HACKEL s.n. (C); Jaen, fields and roadsides, 2 May 1852, LANGE s.n. (C); Prov. of Granada, banks of Rio Segura, 1500 m, limestone, July 1906, REVERCHON 1437 (P); Sierra de Chiva, near Valencia, 1650 m, 6 June 1845, WILLKOMM 855 (P); between Figueras and Rosas, 4 May 1968, DE WIT 12064 (WAG).

BALEARIC IS., many collections: near Soller, waste fields, 20 May 1869, BOURGEAU s.n. (P); Island of Cabrera, 2 May 1948, FERRER 74 (COI); near Pastilla, E. of Palma, sanddunes, 7 May 1955, VAN STEENIS 18689 (L).

FRANCE, many collections: Hyères, hills, 19 April 1873, ALLARD 231 (P); near Toulon, hills near Clairet, 4 May 1848, BOURGEAU 395 (FI, P); near Nice, arable land, 28 May 1861, BOURGEAU s.n. (P); Grasse, waste fields, 25 April 1964, GAVELLE s.n. (COI); Dépt. Deux Sèvres, La Charrière, 3 June 1911, HIBON 3837 (P); near Marseille, May 1847, KRALIK s.n. (P, WAG); near Rochefort, bank of the River Charente, May 1846, LETOURNEUX s.n. (C); Chaillé les Marais (Vendée), 1 June 1853, LETOURNEUX s.n. (P, with the following annotation: 'il at à présumer que cette plante plus c dans la Charente, ne départe point cette limite'); Vendée, hills, 17 May 1868, LETOURNEUX s.n. (C); Narbonne, shaded places, 1846, DE LOST s.n. (P); Bédarieux, 196 m, 7 May 1914, RENAUD 3837 (MPU); near Banyuls-sur-mer, hedges, 3 May 1847, ROUSSILLON s.n. (P); Mount Gardiole, W. of Montpellier, roadside, in scrub, 9 April 1959, TOUW 121 (WAG); bank of Gironde, vineyard, clayish soil, May, URGEL s.n. (WAG).

CORSICA, many collections: Bastia, 26 May 1908, HIBON s.n. (P); beach near Bonifacio, 10 June 1880, REVERCHON 293 (G, P); 'maquis' of Santa Manza, 11 June 1880, REVERCHON s.n. (P); limestone plateau near Bonifacio, 13 April 1926, RUPPERT s.n. (M); Saint Florent, SOLEIROL 4348 (FI, P); delta of the River Ficarella, 12 May 1956, VAN WIJK s.n. (L).

SARDINIA, many collections in FI: Pixinamanna, 13 June 1962, ARRIGONI s.n. (FI); Island of Sant Antioco, W. of Calasetta, 9 May 1967, ARRIGONI c.s. s.n. (FI); Iglesias, 16 May 1967, ARRIGONI c.s. s.n. (FI); Sulcis, 18 May 1963, BAVAZZANO c.s. s.n. (FI); Sarcidano, 550m, 21 May 1963, BAVAZZANO c.s. s.n. (FI); Santa Teresa Gallura, near Tempio, sandy beach, 8 June 1882, REVERCHON s.n. (COI).

SICILY, many collections: Mondello, near Palermo, in arable land, 26 March 1855, HUET DU PAVILLON s.n. (P, WAG); in arable land and on hills near Palermo, May 1902, ROSS 388 (L, P, WAG); between Siracusa and Noto, March 1830, SCHOUW s.n. (C); near Palermo, TINEO s.n. (P). In FI many specimens.

LAMPEDUSA I., many collections in FI.

Maltese Is.: Isle of Malta, San Paolo, hills, 3 May 1907, SOMMIER s.n. (FI); Isle of Gozo, 29 April 1907, SOMMIER s.n. (FI).

ITALY, many collections: Brindisi, 5 May 1880, BARBEY 878 (P); Capo Rosso, Isle of Giglio, 22 May 1888, BIONDI s.n. (FI, type of *A. roseum* var. *humile* SOMMIER); Varazze, 9 May 1908, GREISNO s.n. (C); Rapallo, April 1932, LABOHM 1574b (WAG); Firenze, near Settignano, 13 May 1886, LEVIER s.n. (P); Rome, roadside, 1833, MAURI s.n. (P); Monte Pisa, April 1844, SAVI s.n. (P); Capalbio, 27 March 1894, SOMMIER s.n. (FI, *A. roseum* var. *stellatum* in sched.); Apulia, in arable land, TENORE s.n. (FI, type of *A. majale* TENORE); Gargani, in arable land, TENORE s.n. (P); Vigan, vineyards, 15 May 1860, TUEZKIEWICZ 3224 et bis (WAG); San Pietro, S. of Brindisi, 4 May 1971, DE WIT 12501 (WAG); In FI many collections: Province of Liguria, many coll.; Emilia, some coll.; Toscana, many coll.; Marche, some coll.; Lazio, some coll.; Abruzzo, 3 coll.; Campania, some coll.; Lucania, 1 coll.; Puglie, many coll.; Calabria, some coll.

YUGOSLAVIA, some collections: Istria, many collections in FI; Rijeka (Fiume), in vineyards, May 1839, NOË 720 (FI, L, P); Split, figyard, 13 May 1956, VAN OOSTSTROOM 18849 & 18850 (L); Split, vineyard, April–May, PETTER 14 (WAG).

GREECE: Isle of Kos, CLARKE s.n. (BM, type of *A. pulchrum* CLARKE); Karpathos, 11 May 1886, FORSYTH MAJOR 68 (G); Phaliron, in arable land, 9 April 1877, DE HELDREICH s.n. (P); Piraeus, coastal hills, May 1854 & March 1878, DE HELDREICH s.n. (P); Mt. Phaliron, April 1850, DE HELDREICH s.n. (WAG); Isle of Karpathos, 16 May 1963, PHITOS 799 (M); 'Iter Thessalicum' 24 June 1890, SINTENIS 846 (P); Navplion, 1841, SPRUNER s.n. (C); Zerna, June 1842, SPRUNER s.n. (C).

CYPRUS: According to OSORIA-TAFALL and SERAPHIM (1973); Kantara, 3 May 1880, SINTENIS c.s. 989 p.p. (MPU).

TURKEY: 50 km NE. of Tunçeli, 2000 m, barren stony slope, 29 May 1959, DE WILDE c.s. 1606 (L, WAG).

Notes.

Variability and synonyms. After examination of abundant material from all over the area it appeared that *A. roseum* is a particular polymorphous entity, possibly containing several ecotypes. Its variability accounts for the many species, subspecies, varieties and formas described.

The following names need further comment:

A. odoratissimum DESF. This name belongs to specimens with narrow, folded leaves, and with small, white, fragrant flowers. Such specimens, however, easily merge into specimens with (1.) leaves narrow and flowers small, pink, or with (2.) leaves narrow and flowers large, white, or with (3.) leaves narrow and flowers large, pink, or with specimens with (4.) leaves broad and flowers large, white. All these combinations can be connected by intermediates mutually, and with the typical '*roseum*' with broad leaves and large pink flowers. In all specimens the flower structure is essentially identical. It is true that the form with small white flowers and narrow leaves occurs more inland in desert-like habitats as found in Algeria, Tunisia and Libya, but similar forms have also been recorded from near the coast in these countries. The type, DESFONTAINES s.n. (P), was collected in a desert-like region near Cafsam and Tozzer in south Tunisia. BONNET et BARRATTE (1896) discussed the status of *A. odoratissimum* DESF. and decided upon a variety, *A. roseum* var. *odoratissimum*.

A. carneum TARGIONI TOZZETTI, *A. roseum* var. *bulbiferum* DESF., *A. roseum* var. *bulbilliferum* VISIANI. These names concern variations with bulbils in the inflorescences. Bulbifery is common in *Allium*, and appeared to be of little or no taxonomic value within many species, especially in *A. roseum*. Bulbiferous and non-bulbiferous specimens have often been found growing side by side.

A. majale TENORE. The epitheton *majale* has been wrongly carried to CIRILLO's credit by all authors concerned. However, in the literature cited by these authors: CIRILLO, Plantarum rariorum neapolitanum 1788:13, fig. 4, only *A.*

neapolitanum is described; he never described *A. majale.*

A. permixtum GUSSONE. Some authors interpreted this name as belonging to a glabrous subspecific taxon in *A. subhirsutum* L. I have not found the type in the herbaria of Naples nor Florence, but the ample protologue (leaves flat and glabrous, increase bulbs numerous) clearly points to *A. roseum.*

A. obtusiflorum REQUIEN ex GRENIER et GODRON, *A. roseum* var. *insulare* W. BARBEY, *A. roseum* var. *humile* SOMMIER. These names pertain to a form of *A. roseum* with a short scape, and with small, almost white flowers, occurring on Sardinia, Corsica, Sicily, and Giglio I. The abundant material of *A. roseum* at hand from these islands shows all possible scape- and flower sizes, as well as various flower colour-shades between pink and white, and there is no reason to distinguish it separate.

A. tourneuxii BOISS. The outer tepals in the Egyptian specimens of *A. roseum* are often considerably longer than the inner ones, while the colour of the flowers can be of an intensive purple. There are also collections from the same localities which do not show these characters conspicuously, whereas transitional specimens are at hand as well. The name *A. tourneuxii* BOISS. originally appeared in 1878 on LETOURNEUX's exsiccates without a description or diagnoses, and therefore was not validly published. Subsequently the name *A. roseum* L. var. *tourneuxii* BOISS. was validly published in BOISSIER 1882:274; *A. tourneuxii* was placed here in the synonymy, and according to art 34 (4) of the Code again *A. tourneuxii* was not validly published.

A. roseum var. *perrotii* MAIRE. This variety described as having lanceolate, narrow, and acute tepals (13 × 3 mm), cannot be maintained. The material concerned shows a considerable variation in tepal sizes and shape, also in the type material. Flowers with acute and obtuse tepals can be found in one single inflorescence.

Outer bulbcoats. Every year two protective bulbcoats are produced. It is of interest to mention the presence in some specimens of much more than the usually two protective bulbcoats. This can be explained by assuming that the bulbcoats of preceding years have not decayed, possibly due to edaphic- and climatic conditions, as this feature has only been found in specimens from dry areas. In these cases the outer two bulbcoats, which are naturally the oldest and the smallest, are pushed up every year along the scape, by which a series of bulbcoats, decreasing in size, is formed (fig. 33:14). A specimen with at least 12 bulbcoats is CARVALHO 780 from Portugal; hence the age of this plant was at least 6 years. Similar specimens were collected in Algeria (NENOU s.n., with 10 bulbcoats), and in Libya (D'ESCAYRAC 83, with 12 bulbcoats).

Increase bulbs. In *A. roseum* these are usually numerous and doubtless contribute considerably to the propagation of the species. Normally they are 1–5 mm stiped; in rare cases, e.g. in two specimens of LETOURNEUX collected near Kebilie (Tunisia), the increase bulbs are up to 55 mm stiped. Normally the increase bulbs are situated axillary close to the bulb disk, but the long-stiped ones, as mentioned above, are located higher up, between the leafsheaths, in the same manner as e.g. in *A. sphaerocephalum* L.

Bulbiferous specimens and seed production. Bulbils are produced at the base of the umbelliferous inflorescence, but sometimes also at the end of the pedicels, replacing normal flowers. Mostly, bulbiferous specimens do not produce seeds. In the Wageningen botanical garden, however, as an exception some bulbiferous specimens produced viable seeds.

Colour. The flower colour is variable. It ranges from pure white (found in e.g. Algeria, Tunisia, Libya, and Spain) to dark pink or purplish. True pink flowers are the most commonly encountered; purplish flowered specimens are found in Egypt and in bulbiferous forms. Sometimes white- and pink flowered specimens grow side by side. It can be difficult to decide upon the original colour in herbarium material, as the pink colour in dried specimens has often faded.

Specimens from the Canary Islands. All pink-flowered material from the Canary Islands, except for BOURGEAU 998 and WEBB 508 (both FI), appeared to be misidentified and to belong in *A. subhirsutum* L. All these specimens have pitted bulbcoats, but hirsute leaves and filaments as long as or longer than the tepals. The misidentifications may have been caused by the occurrence of the pitted bulbcoats and the pink flowers, typical for *A. roseum*. It can be doubted whether the collections of BOURGEAU and WEBB concern truly indigenous specimens.

A second case of misinterpretation concerns *Nothoscordum inodorum* (AIT.) NICHOLSON, which is an introduced species from subtropical America, and a common weed all over the Canaries, the Azores, Madeira, and incidentally in N. Africa. *N. inodorum* can easily be recognized by its spathe valves overlapping at the base, in *Allium* these never overlap. Specimens of *N. inodorum* are misidentified as *A. roseum* by e.g. LID 1967:43.

Caryology. KOLLMANN (1973a) reports on the frequent occurrence of intraspecific polyploidy, and lists for several varieties 2n = 16, 24 (var. *tourneuxii* BOISSIER); 2n = 16, 32 (var. *roseum*); 2n = 40, 48 (var. *bulbiferum* DESFONTAINES).

Fieldnotes. The flowers are fragrant. All parts of the plant have a (strong) garlic-like smell when crushed.

26. A. ruhmerianum ASCHERSON ex DURAND et BARRATTE Fig. 34, Map 23.

A. ruhmerianum ASCHERSON ex DURAND et BARRATTE, Fl. Lib. Prodr. 1910: 234, fig. 18; BÉGUINOT et VACCARI 1915:17; PAMPANINI 1916:271; ibid. 1919: 209; ibid. 1931:155; MAIRE 1958:297.

Type: Libya, Benghasi, 15 Dec. 1882, RUHMER 332 (holotype: G; isotypes: FI, P).

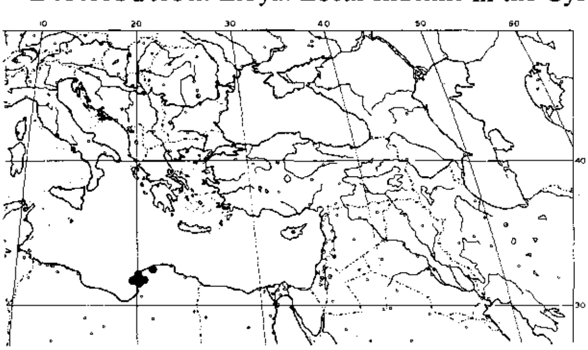
Bulb ovoid, 10–20 × 7–15 mm. Roots sparsely hairy, unbranched. Increase bulbs not seen. Protective leaves 2–8, outer surface grey-brown, inner surface glossy orange brown, after decay of outer epidermis conspicuously faveolate by the sclerified inner layer. Sproutleaf 1, soon wilting, 1–3.5 cm long, top oblique, subacute, c. 3 mm. *Foliage leaves* 5–7, glabrous; blades approximate, linear, 7–25 cm × 0.5–1 mm, flat or folded, top acute, margin minutely crenulate; sheaths subequal, largely subterranean, 1–3.5 cm long, whitish. Scapes 1–3, shorter to longer than the leaves, erect, terete, faintly angled at one side, solid, glabrous, 4–13 cm long, 0.5–1 mm diam. *Inflorescence* umbellate to spherical, many-flowered, 1.5–3 cm diam., without bulbils. *Spathe* 1, hyaline, persistent, 5–10 mm, pinkish 2–4-veined, opening with one slit to the base and often with a second one nearly to the base, forming (1 or) 2 spathe-lobes, usually recurved, acute-acuminate. Bracteoles absent. Pedicels subequal, 5–15 mm, slender, in anthesis the outer ones sometimes recurved, in fruit straight, somewhat rigid. *Flowers* subcampanulate. Tepals c. 0.3 mm adnate to bases of filaments, persistent, white, with a narrow green to pink midvein; outer tepals ovate to obovate, 4–5.5(–7) × 2.4–3 mm, top obtuse to broadly obtuse, entire; inner tepals resembling outer tepals but somewhat narrower. Stamens much shorter than the tepals; filaments simple; outer filaments 2.2–3.3 mm long, at base 0.8–1 mm wide, connate with inner filaments for 0.2–0.3 mm; inner filaments resembling outer filaments but slightly longer and wider. Anthers 0.6–1 × 0.5–0.8 mm, yellow. Pistil shorter than the tepals; ovary globose to ellipsoid-obovoid, 1.2–1.5 × 1–1.2 mm; style 1.5–2.2 mm, slender, inserted at about one-third to halfway from the base of ovary; stigma inconspicuous, almost undivided. *Fruits* subglobose, c. 2 mm diam. Seeds 0.8–1.2 × 0.7–1 mm, black.

Vernacular names. *Grsud el grab*, *Garshud* (Arabic).

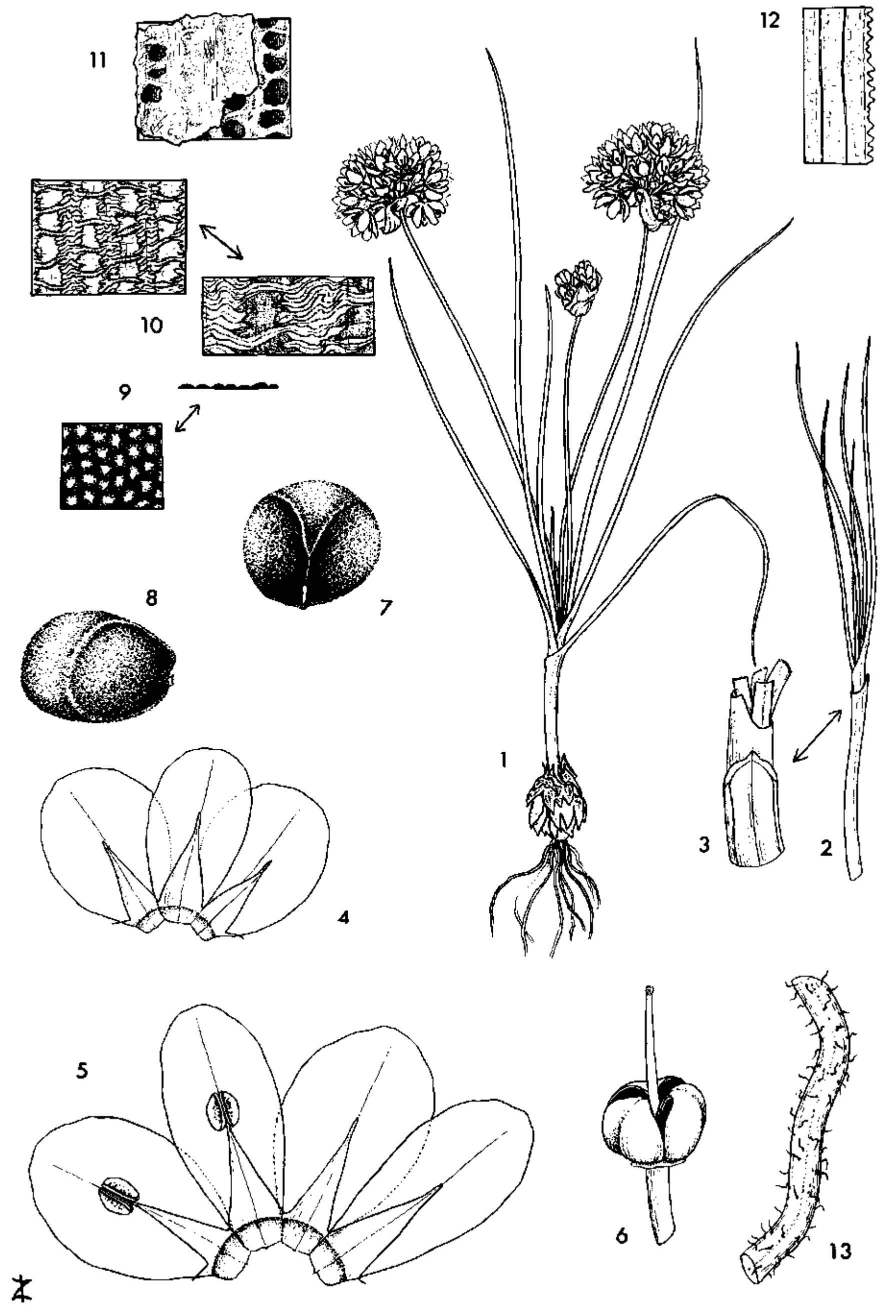
Uses. Bulbs edible, eaten raw by Arabs.

Habitat. *A. ruhmerianum* is a very rare local endemic species from the northern Cyrenaica in Libya. It is known from but 7 collections all originating from the coastal plain at low altitude. It was recorded from herbaceous vegetations on sand soil, and as growing in rocky red clay in a forest area. Altitude c. 0–100 m. Flowers: October–December.

Distribution. Libya. Local endemic in the Cyrenaica.



MAP 23. Localities of *Allium ruhmerianum*.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Libya: Attag, terra rossa, Nov. 1958, KEITH 474 (K); Tolmetta, Dec. 1958, KEITH 475 (K); Benghasi, 70 m, forest area on rocky red clay, Nov. 1957, PARK 56 (K); Benghasi, 1884, PETROVICH 16 (WU); Benghasi, 15 Dec. 1882, RUHMER 332 (FI, G, P, type of *A. ruhmerianum* ASCHERON ex DURAND et BARRATTE); Tolmetta, between herbs on sand, 1 Oct. 1913, VACCARI 29 (FI); Benghasi, Fuehat, Due Palme, Dec. 1914, ZANON 15 (FI); Benghasi, Casa Auari, Dec. 1917, ZANON 52 (FI).

Notes.

Resembling species. *A. ruhmerianum* resembles certain small specimes of *A. roseum* L., and possibly its alliance is with this species. *A. roseum* differs essentially, even in small specimens, by a much stouter habit and consequently by, for instance, larger flowers and broader leaves. The spathe in *A. ruhmerianum* is 1- or 2-lobed, as against usually 3- or 4-lobed in *A. roseum*.

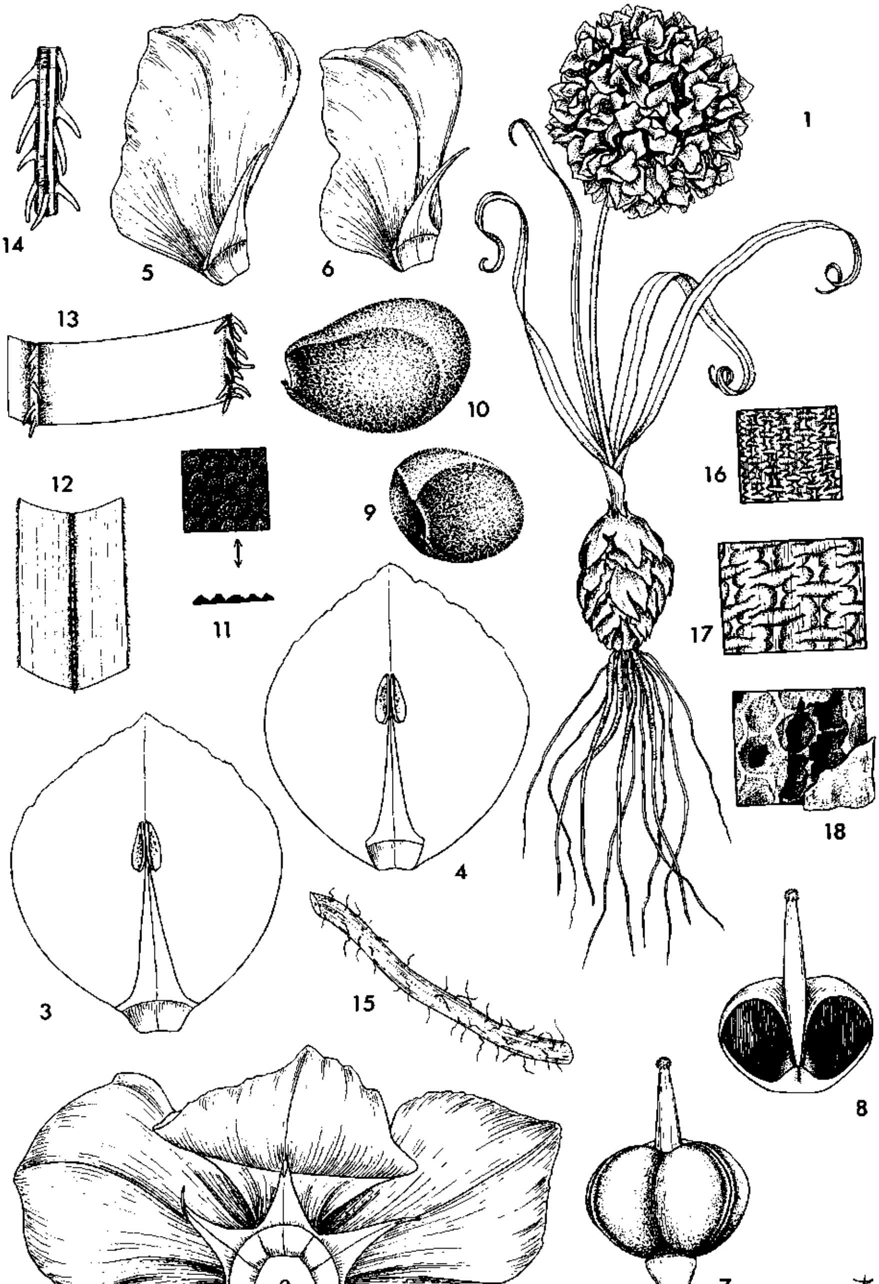
27. A. blomfieldianum ASCHERSON et SCHWEINFURTH **Fig. 35, Map 24.**

A. blomfieldianum ASCHERSON et SCHWEINFURTH in Bull. Herb. Boiss. 1, 1893:671; MUSCHLER 1912:217; CAVARA 1928:44; PAMPANINI 1931:153; TÄCKHOLM et DRAR 1954:75; MAIRE 1958:287 (as *A. bloomfieldianum*).

Type: Egypt, Matruh, 8 March 1890, SCHWEINFURTH 238 (holotype: B; isotypes: G, K, P).

Bulb ovoid, 15–20 × 10–15 mm. Roots unbranched, hairy. Increase bulbs 0–3, ovoid, 4–7 × 3–4 mm, sessile. Protective bulbcoat-leaves 2–8, outer surface dull light brown or grey-brown, inner surface somewhat darker, after decay of outer epidermis with more or less sinuate structure or inconspicuously faveolate or pitted by the underlying sclerified layer. Sproutleaf 1, soon withering, 1–4 cm long, with oblique-truncate top. *Foliage leaves* 3–5; blades approximate, linear, 5–15 cm × 3–9 mm, flat or spirally twisted near the top, the margins and middle nerf beneath crenulate or shortly ciliate, top acute; sheaths subequal, 1–4 cm long, subterranean, closed, whitish-yellowish. Scapes 1–2, shorter than the leaves, suberect, subterete, faintly 2-angled, solid, glabrous, 3–9 cm long, 1–2 mm diam. *Inflorescence* spherical, many-flowered, 2–4 cm diam., without bulbils. *Spathe* 1, ± hyaline, persistent, 8–12 mm long, 9–12-veined, opening with 3–4 equal slits reaching halfway to three-fourth of the spathe, forming 3–4 spathelobes, recurved, acute or usually shortly

FIG. 34. *Allium ruhmerianum*. – 1. Habit, $\times^2/_3$; 2. sprout of sterile plant with sproutleaf, ×2; 3. top of sproutleaf, ×6; 4. perianth and filaments of young flower, partly, ×6; 5. perianth and stamens of mature flower, partly, ×6; 6. fruit, ×6; 7–8. seed, frontal and lateral view, resp., ×20; 9. detail of testa, seen from above and in profile, ×40; 10. details of bulbcoat-leaf, inner view, ×20 and ×40 resp.; 11. ditto, outer view, showing pitted structure, ×20; 12. fragment of leaf blade with crenulate margin, ×20; 13. piece of smooth root, ×6. (1–13. RUHMER 332, type).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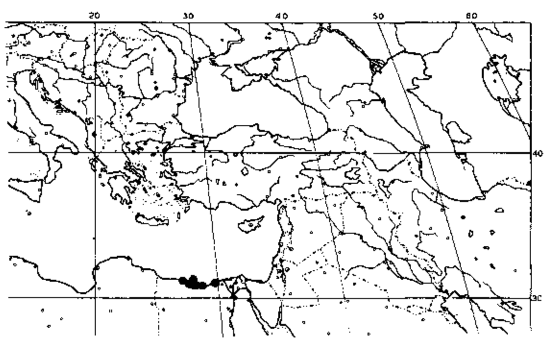
acuminate. Bracteoles absent. Pedicels subequal, 8–15 mm long, rather slender. *Flowers* peculiar of shape by the horizontally spreading outer tepals and the connivent suberect inner tepals. Tepals c. 0.5 mm adnate to base of filaments, persistent, scarious, silvery-creamy; outer tepals suborbicular, 6–8 $\times$ 5–8 mm, top acute to broadly obtuse, the margin faintly undulate; inner tepals as the outer tepals, but slightly longer and narrower to wider; filaments simple, usually $\pm$ inward curved; outer filaments 3.5–4 mm long, at base c. 1 mm wide, connate with inner filaments for 0.1–0.5 mm; inner filaments as long as or slightly longer and wider than outer filaments. Anthers c. 1 $\times$ 0.6 mm, yellow. Pistil shorter than the tepals; ovary subglobose to broadly obovoid, 2.5 $\times$ 3.5 mm; style 2–2.5 mm, slender, inserted at about one-fourth from the base of ovary; stigma undivided, minutely capitate. *Fruits* subglobose, c. 4 mm diam. Seeds 1.5–3 $\times$ 1–2 mm, black.

Habitat. *A. blomfieldianum* is a species with a very restricted distributional area in the coastal region W. of Alexandria in Egypt. It was only collected on localities close to the sea, mostly on sandy soil, but on clayish and stony ground, and low rocky hills as well. It growed together with e.g. *Androcymbium* sp. and *Gagea* sp. Although but a few collections of the species exist, it was recently recorded as common near Mersa Matruh by WANNTORP c.s. (K). Altitude 0–100 m. Flowers: January–March.

Distribution: Western Egyptian coast, in the region known as 'Marmarica'.



MAP 24. Localities of *Allium blomfieldianum*.

FIG. 35. *Allium blomfieldianum*. – 1. Habit, $\times^2/_3$; 2. perianth and filaments, seen from above, partly, $\times$6; 3, 5. inner tepal, inner and lateral views, $\times$6; 4,6. outer tepal, inner and lateral views, $\times$6; 7. fruit, $\times$6; 8. longitudinal section of fruit, showing nectary at centre of basal part, $\times$6; 9–10. seed, frontal and lateral views, $\times$16; 11. detail of testa, seen from above and in profile, $\times$40; 12–13. pieces of leaf blade, lower side, $\times$6 and $\times$24 resp.; 14. detail of leaf margin, $\times$42; 15. piece of smooth root, $\times$6; 16–17. details of structure of second bulbcoat-leaf, inner side, $\times$20 and $\times$40 resp.; 18. detail of structure of outer bulbcoat-leaf, outer side, showing pitted structure, $\times$20. (1–18. SCHWEINFURTH 238, type).

Egypt: Mersa Matruh, 250 km W. of Alexandria, HUGHES s.n. (K); Wadi Matruh, near the sea, sands, Jan. 1928, MEINERTZHAGEN s.n. (BM); Mariut Bringhi, April 1904, MUSCHLER s.n. (K); Mirsa Matruh, 8 March 1890, SCHWEINFURTH 238 (B, G, K, P, type of *A. blomfieldianum* ASCHERSON et SCHWEINFURTH); between Alexandria and Mersa Matruh, low rocky hill, 9 March 1969, WANNTORP c.s. 2194 (K); between Mersa Matruh and Sidi Barrani, clay stony ground near the sea, 10 March 1969, WANNTORP c.s. 2283 (K).

Notes.

Resembling species. *A. blomfieldianum* resembles in habit somewhat *A. circinnatum* SIEBER, an endemic species from Crete. This species differs by its densely hairy leaves and scape, and by its flowers with oblong, acute tepals.

Flowers. When in full anthesis, the flowers give one the impression as if they are already overblown, because of the scarious silvery tepals.

Caryology. EID 1963:134 reports 2n = 14.

Sect. Melanocrommyum WEBB et BERTHELOT

Sect. *Melanocrommyum* WEBB et BERTHELOT 1848:347; BOISSIER 1882:229; STEARN 1944:20; TÄCKHOLM et DRAR 1954:61; MAIRE 1958:299; WENDELBO 1969:27; ibid. 1971:67; EKBERG 1972:94–101 (as subgen.); KOLLMANN 1973: 92.

Sect. *Melamprason* F. HERMANN 1939:58.

Type-species: *A. nigrum* L.

Moly MOENCH 1794:286.

Sect. *Moly* (MOENCH) ENDLICHER 1836:147.

Type-species: *A. magicum* L.; for a discussion on the identity of *A. magicum* L. see under *A. nigrum* L., and *A. neapolitanum* CIRILLO.

Plants glabrous. Outer bulbcoat-leaves membranous to coriaceous, not with a particular sculpture. Leaf blades subapproximate at ground level, flat. Leaf sheaths open. Scape terete. Spathe 1, acute-acuminate, persistent. Bracts and bracteoles absent. Flowers not nodding. All filaments simple. Ovules (4–)6–14 per locule; seeds without a caruncle, (1–)2–4 per locule.

In Africa 4 species, nrs. 28–31.

Note. I have decided not to accept the older name Sect. *Moly*, because of the ambiguity of its type-species, *A. magicum* L.

28. A. schubertii ZUCCARINI — Fig. 36, Map 25.

A. schubertii ZUCCARINI in Abh. Math. Phys. Cl. Ak. Wiss. III, 1843:234, tab. 3; REGEL 1875:239; BARBEY C. et W. 1882:163; BOISSIER 1882:278; ASCHERSON et GRAEBNER 1905:164; BOULOUMOY 1930:330; DINSMORE in POST

1933:644; OPPENHEIMER et EVENARI 1940:189; FEINBRUN 1948:146; MAIRE 1958:303, fig. 922; EKBERG 1970:115.

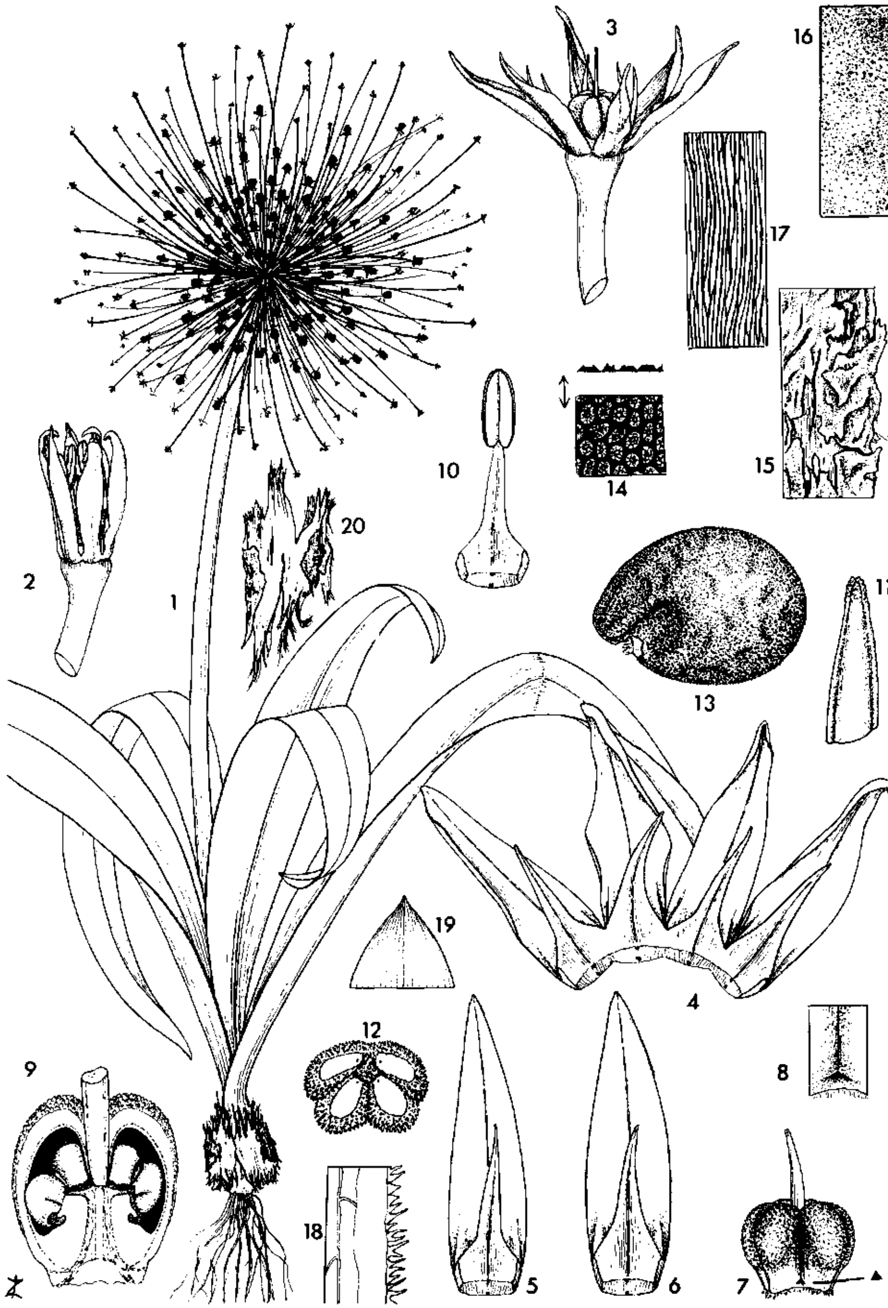
Type: Israel, Iter Schubert, near Nazareth, April 1839, ROTH s.n. (holotype: M; isotype: FI).

Bulb depressed-globose to ovoid, 30–40 × 30–40 mm. Roots glabrous, unbranched. Increase bulbs absent. Protective bulbcoat-leaves 2–8, chartaceous, more or less breaking up into fibres, without conspicuous structure, outer surface greyish-brown, inner surface dull, pale yellowish-brown. Sproutleaf 1–2, thin, not hyaline, incompletely known. *Foliage leaves* 4–8, usually more or less curved and with faintly coarsely wavy margin or not, glabrous; blades approximate, lanceolate to linear, 20–45 cm × (10–)15–60 mm, flat, top subobtuse to acute, the basal part for a short distance inconspicuously sheathing the scape, margin sometimes subentire to usually conspicuously but shortly serrulate-ciliate; sheaths open. Gemmiferous leaf absent. Scape 1, erect, stout, terete, hollow, glabrous, 30–60(–100) cm long, 8–15 mm diam. *Inflorescence* subspherical, 20–40 cm diam., many-flowered, the pedicels of strongly varying lengths, bulbils absent. *Spathe* 1, hardly hyaline, papery, persistent, 20–30 mm long, many-veined, opening with 2–3 subequal slits reaching nearly to the base, forming 2–3 spathe-lobes, broadly ovate, acute, up to 3 mm acuminate, recurved or reflexed. Bracteoles absent. Pedicels strongly unequal, 2–20 cm long, slender to stout, 0.5–2 mm diam., straight, or sometimes upward curved, in fruit stouter. *Flowers* stellate, the shorter pedicelled ones presumedly largely hermaphrodite; the longest pedicelled flowers hermaphrodite, or male, or sterile (see notes). Tepals c. 0.5 mm adnate to bases of filaments, persistent, white to pink with purplish midvein, the upper part often twisted when dry, in fruit recurved or not, and slightly more rigid; outer tepals lanceolate, 8–10 × 2–2.5 mm, top acute; inner tepals similar to outer tepals or slightly shorter. Stamens shorter than tepals; filaments simple; outer filaments 4–5.5 mm long, at base c. 1.5 mm wide, connate with inner filaments for c. 1 mm; inner filaments as outer filaments or slightly shorter. Anthers 1.5–2 × 0.8–1 mm, yellow, early falling. Pistil shorter than tepals; ovary depressed globose, 3.5 × 4–4.5 mm, finely but conspicuously pustulose, especially when young; locules each with 4 ovules; style c. 2 mm, slender, inserted at one-third to half-way from the base of ovary; stigma minute, very inconspicuously 3-lobed. *Fruits* depressed globose-obovoid, 6–8 × 7–8 mm, straw-coloured to brown. Seeds (0–)1–2 per locule, 3–4.5 × 2–2.8 mm, black.

Uses. Cultivated as an ornamental in Europe.

Habitat. Usually in waste fields, and as a weed in cornfields. According to FEINBRUN (1948) in heavy deep soil in Palestine. Altitude 100–800 m. Flowers: April to May.

Distribution. Libya (Cyrenaica); Syria; Israel (Palestine); Jordan.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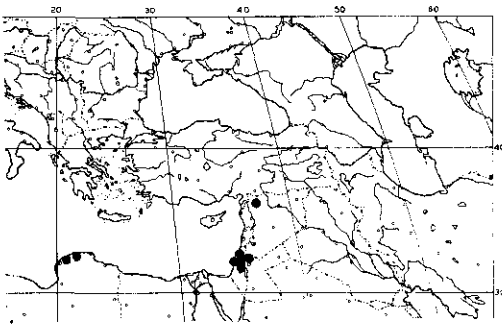


MAP 25. Localities of *Allium schubertii.*

LIBYA: Barce, near El Merj. cornfield weed, 300–350 m, 2 April 1970, DAVIS 50389 (E, K); Barce, cornfield, spring 1954, GUICHARD s.n. (BM); between Messa and Negret Said, 8 May 1934, PAMPANINI c.s. 1377 (FI, G, K, L); El-Gubba, 13 May 1934, PAMPANINI c.s. 1378 (FI, K); near Barce, 20 May 1934, PAMPANINI c.s. 1379 (FI).

SYRIA: Aleppo, AUCHER-ELOY 2199 (MPU); Aleppo, 1834, COQUEBERT DE MONTBRET 2621 (FI); Aleppo, 26 April 1918, GOERBING s.n. (B).

ISRAEL and JORDAN: plain of Esdraëlon, between Samaria and Lake of Galilee, fields, 16 April 1880, BARBEY 874 (MPU); Jerusalem, BUYSMAN s.n. (L); near Jaffa?, 3 April 1900, JOFFÉ 74 or 79 (MPU); Irbid, fields, 530 m, 7 May 1911, MEYERS c.s. G 766 (L); Jerusalem, fields, 800 m, 29 April 1914, MEYERS c.s. 4766 (L); near Nazareth, April 1839, 'Iter SCHUBERT', ROTH s.n. (FI, M, type of *A. schubertii* ZUCCARINI); Ramleh, 1857–58, ROTH s.n. (L, M); Jerusalem (Hierosolyma), 1857–58, ROTH s.n. (M).

Notes.

Habit, bulbs, leaves, and scape. From the fairly abundant herbarium material the habit of the present species becomes not quit clear. All collections are rather fragmentary, in that usually only the characteristic inflorescence, without complete scape, is present. In but one case there was a fragmentary bulb (AUCHER-ELOY 2199), and in a few cases there were detached leaves only. Fortunately the species is nowadays locally in cultivation in Europe, incl. the Netherlands, so that I could get a complete picture of the plant. One of the reasons of the incompleteness of the herbarium specimens may be the early dying off of the leaves as compared to the inflorescence, or the possible early

FIG. 36. *Allium schubertii.* – 1. Habit, $\times 1/4$; 2. young flower, $\times 2$; 3. open flower, anthers fallen off, $\times 2$; 4. perianth and filaments, partly, $\times 4$; 5–6. outer and inner tepal resp., with corresponding filaments, $\times 4$; 7. pistil, arrow indicates excretion opening of nectary, $\times 4$; 8. excretion opening of nectary, enlarged; 9. longitudinal section of ovary, $\times 6$; 10. outer stamen of young flower, $\times 4$; 11. upper part of style with stigma, $\times 20$; 12. placenta showing papillose rings around attachment of ovules, $\times 12$; 13. seed, lateral view, $\times 6$; 14. detail of testa, seen from above and in profile, $\times 40$; 15–16. details of resp. old and young outer bulbcoat-leaf, $\times 6$; 17. detail of inner, coriaceous bulbcoat-leaf, outer view, $\times 18$; 18. fragment of leaf blade with crenulate-fimbriate margin, $\times 8$; 19. top of leaf, $\times 2/3$; 20. fragment of outer bulbcoat-leaf, $\times 2/3$. (1. AUCHER-ELOY 2199 and after colour slide WAG 38–044; 2–12. TUBERGEN s.n., collected in Israel and cultivated at WAG, spirit mat.; 13–14. PAMPANINI c.s. 1311; 15–17, 20. AUCHER-ELOY 2199; 18–19. ROTH s.n., Ramleh, 1857–1858).

detachment of the ripening inflorescence, or both. Moreover, it was reported (FEINBRUN 1948) that the species grows in Palestine in heavy deep soil, so that the bulbs are possibly particularly difficult to obtain.

In the original description of the species also only the inflorescence is described; the type specimen contains only two halved inflorescences.

In the original description the scape is mentioned by ZUCCARINI as measuring 3–4 feet (90–120 cm), and on the label of a collection of MEYERS c.s. (in L) the length of the scape is recorded as c. 1 meter. In cultivation in the Netherlands the scape reaches usually 30–50 cm.

From cultivation it appeared that the bulbs produce no increase bulbs, and propagation can be performed only by seeds. It lasts c. 5 years before good-flowering bulbs are grown.

In cultivated specimens the newly dug bulbs are whitish, becoming brownish with age.

Smell. The smell of crushed bulbs is not particularly onion-like, but reminiscent of a mixture of turnip, fish and onion.

Inflorescence and flowers. The inflorescence is very characteristic by its pedicels of very varying lengths. The shorter stiped flowers usually set fruit, whereas the later developing flowers, which become much longer and stouter stiped, mostly remain possibly only male or sterile, but with an ovary present. However, also these later formed, and long-pedicelled outer flowers may develop fruits as well in certain specimens; in most specimens the outermost sterile flowers soon fall off. (See also under Ecology, below).

Placenta. The four anatropous ovules are embedded by a low, butterfly-shaped papillose rim formed by the placenta (see Fig. 36:12).

Distribution. The species was formerly known from the Near East only; in and after 1934 several different collections, from different localities, were made in a restricted area in the Cyrenaica. The species is not known from elsewhere in North Africa.

Ecology. It is supposed that the inflorescences with ripe fruits easily break off, and that the large spherical inflorescences, with their rigid and long pedicels may roll, pushed by the wind, over the fields and other bare habitats, and thus effect the seed dispersal. In this respect it is noted again that in cultivation propagation is by seeds only.

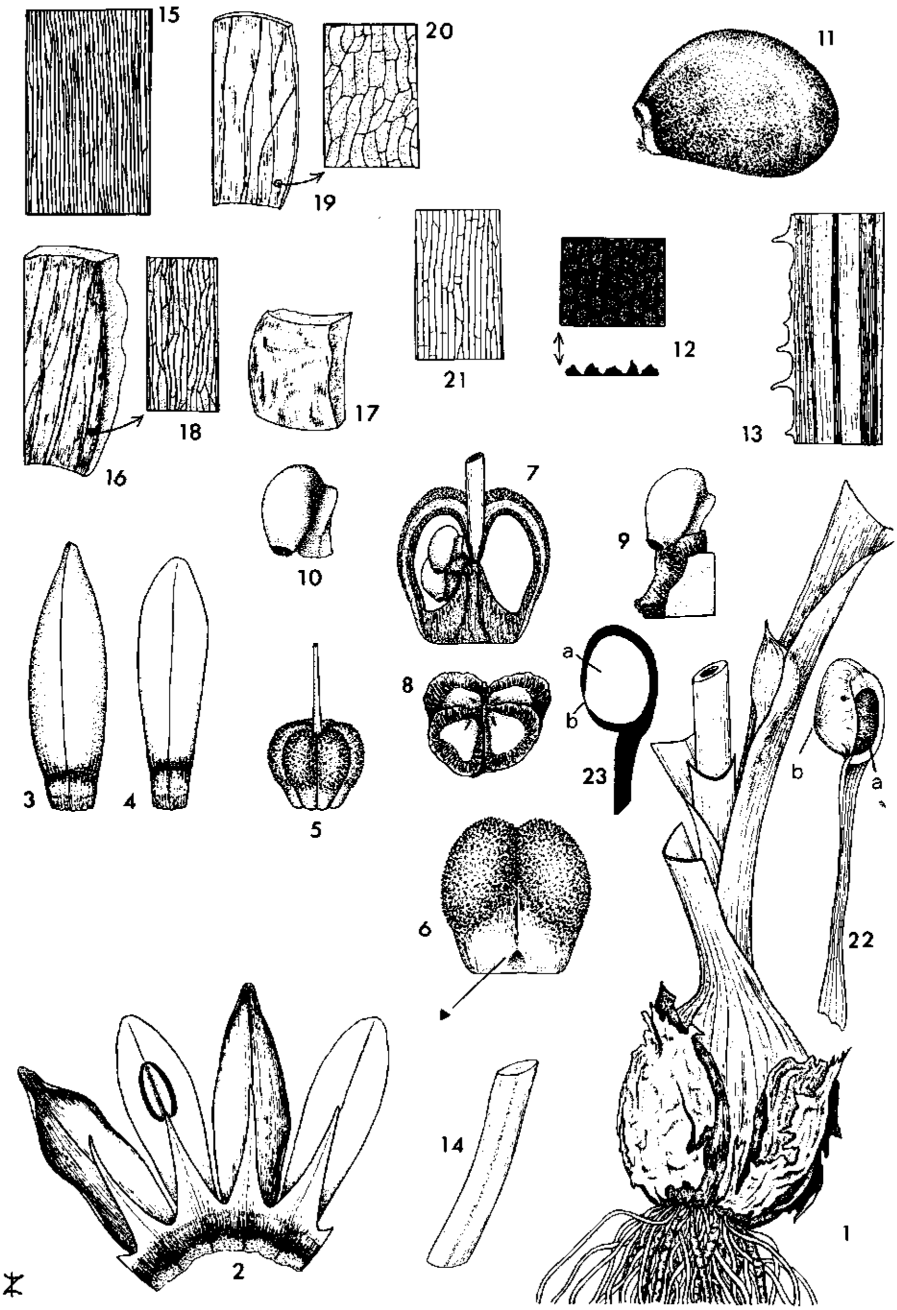
In Wageningen botanical garden it was observed that *A. schubertii* shows in its life-cycle the same peculiar phenomenon as can be seen in some other plants of the mediterranean area (e.g. *Reseda suffruticosa*). The flowering plant (stem and subterraneous parts) dries and dies while the top parts of the stem (and branches, or inflorescence) retain water (or moisture). Although the central part of the plant is entirely dry and dead (and the inflorescence of *A. schubertii* has no living tissue to connect it with the root or bulb, finally), flowering continues and seeds develop and ripen and prove to be viable.

29. A. nigrum L. **Fig. 37.**

A. nigrum L., Sp. Pl. 1, ed. 2, 1762:430; for other references and synonyms see under the subspecies.

Bulb globose or depressed globose, sometimes ovoid, 25–50 × 20–50 mm. Roots glabrous, unbranched. Increase bulbs absent or numerous, 1–3 collaterally in the axils of the foliage leaves, globose to ovoid, 5–10 × 5–10 mm, c. 1 mm beaked, 5–30 mm stiped, wrapped in a firm prophyll. Corm on foliage leaf present or not, see below. Protective bulbcoat-leaves 1–2, chartaceous, without conspicuous structure, outer surface whitish yellow to light brown, inner surface similar, slightly glossy. Sproutleaf not seen, apparently 1–2. *Foliage leaves* 2–5, straight, glabrous; blades approximate, linear, 10–60 cm × 10–50 mm, flat, top subacute, soon wilting, basal part inconspicuously sheathing the scape, margin entire or distinctly finely crenulate or serrate; sheaths short, subterranean part of sheathing blades 1–10 cm. Gemmiferous leaf absent or one, 2–20 cm × 3–15 mm, folded or not, the top hooded, enclosing a single corm (gemma), 10–25 × 10–18 mm, developed from its margin or a vein. Scape 1, longer than the leaves, erect, terete, solid, later on hollow, glabrous, 40–85 cm long, 5–10 mm diam. *Inflorescence* either umbellate to subspherical, many-flowered, 3–11 cm diam., without bulbils, or rarely flowers completely absent and replaced by up to 10 sessile bulbils, 10–20 mm long. *Spathe* 1, not hyaline, persistent, 15–30 mm long, many-veined, opening with 2 or 3 (or 4) equal slits reaching nearly to the base, forming 2 or 3 (or 4) spathe-lobes, broadly ovate to ovate-elliptic, acute, recurved or not. Bracteoles absent. Pedicels subequal, 20–50 mm, 0.5–0.7 mm in diam., slightly longer after anthesis, straight, the outer pedicels recurved, in fruit rigid, stouter. *Flowers* subcampanulate to stellate. Tepals c. 0.5 mm adnate to bases of filaments, persistent, in fruit sometimes reflexed, white to purple with greenish to purplish midvein; outer tepals obovate-oblong to lanceolate, 7.5–10 × 2–3.5 mm, top obtuse to subacute; inner tepals resembling outer tepals, but usually somewhat shorter and narrower. Stamens shorter than the tepals; filaments simple; outer filaments 5–7 mm long, at base 1–1.5 mm wide, connate with inner filaments for 1–1.5 mm; inner filaments 0.5–1 mm longer, and slightly wider than outer filaments. Anthers 2–3 × 1 mm, yellow or purple. Pistil shorter than the tepals, ovary globose-obovoid, 2.5–4 × 3–4.5 mm, usually finely but conspicuously pustulose, especially when young; locules each with 4–8 ovules; style 2–3.5 mm, slender, inserted at about one-third to halfway from the base of ovary; stigma minutely 3-lobed, rarely distinctly branched. *Fruits* broadly ovoid, 7–10 × 7–10 mm, straw-coloured to blackish. Seeds (0–)2–4 per locule, 3–4.5 × 2–3 mm, black.

Notes. *A. nigrum* can be divided into two subspecies mainly by differences in vegetative propagation. In the type-ssp. this vegetative propagation occurs by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a single gemma situated at or near the top of one of the leaves transformed into a gemmiferous leaf, whereas increase bulbs are absent. In ssp. *multibulbosum* there are only increase bulbs situated axillary to the normal foliage leaves, attached to the main bulb, and a foliar gemma is absent. Both sspp. largely have a distributional area of their own, but in the regions where the areas overlap complete material is indispensable for determination. The type-ssp. occurs in western N. Africa including Libya, Portugal, S. Spain, S. France, Italy, and, according to MARKGRAF l.c., in Yugoslavia and Greece. The ssp. *multibulbosum* occurs in Central Europe, and adjoining Italy, Yugoslavia, Greece, and Cyprus.

Variability and synonyms. Although both sspp. are rather uniform, there is a considerably synonymy. Further notes are given under ssp. *nigrum*.

The taxonomy of the ssp. *multibulbosum* is not worked out here, as I have examined only a limited amount of material, and as it falls beyond the scope of the present study. For facilitating comparison I give the following synonymy:

a. ssp. multibulbosum (JACQUIN) HOLMBOE 1914:47.

A. multibulbosum JACQUIN 1773:9, tab. 10; REGEL 1875:226; ASCHERSON et GRAEBNER 1905:163.

A. nigrum var. *multibulbosum* ROUY 1910:379; FIORI et PAOLETTI 1923–1925: 275.

Type: Austria, not further indicated (not seen).

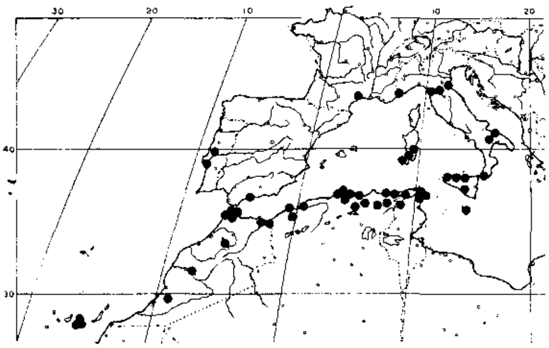
A. atropurpureum WALDSTEIN et KITAIBEL 1802:16, tab. 17; RICHTER 1890: 210; MARKGRAF in HAYEK 1932:54.

Type: Hungary, near Kovácsi, WOLNY in Herb. KITAIBEL s.n. (isotype: BM).

A. cyrilli TENORE 1824–1829:364; KUNTH 1843:448; BOISSIER 1882:280; HALÁCSY 1904:261; MARKGRAF in HAYEK 1932:54; RECHINGER F. 1943:718.

FIG. 37. *Allium nigrum* ssp. *nigrum*. – 1. Lower part of plant with gemmiferous leaf hidden in the sheath of a normal leaf, $\times^2/_3$; 2. perianth and stamens, partly, $\times 4$; 3–4. outer and inner tepal resp., outer view, $\times 4$; 5. pistil, $\times 4$; 6. ovary, arrow indicates excretion opening of nectary, $\times 8$; 7. longitudinal section of ovary, $\times 8$; 8. placenta, the four ovules removed, showing the thickened rims around the ovules, $\times 16$; 9. thickened rim of placenta around base of ovule, $\times 16$; 10. ovule detached from placenta, $\times 16$; 11. seed, lateral view, $\times 6$; 12. detail of testa, seen from above and in profile, $\times 40$; 13. detail of leaf margin, $\times 20$; 14. piece of smooth root, $\times 6$; 15. detail of outermost bulbcoat-leaf, $\times 20$; 16–17. details of second bulbcoat-leaf, inner and outer view, $\times 6$; 18. detail of membrane (epidermis) attached to innerside of second bulbcoat-leaf, $\times 20$; 19. detail of third, thin but cariaceous bulbcoat-leaf, $\times 6$; 20. detail of membrane (epidermis) attached to innerside of third bulbcoat-leaf, $\times 20$; 21. detail of fourth, membranous, bulbcoat-leaf, $\times 20$; 22. gemmiferous leaf, as in 1, $\times^2/_3$; 23. longitudinal section of gemmiferous leaf, showing the attachment of the gemma to the gemmiferous leaf, a. gemma, b. attachment of gemma to the leaf (black), schematic. (1. LEFEBVRE 186 and LAVERAU 143; 2–10. LAVERAU 143; 11–12. FOURNIER s.n., Jan. 1885; 13–21. LEFEBVRE 186; 22–23. ANON. s.n., Algeria).

Algeria; Tunisia; Libya, only one collection; Portugal; S. Spain; S. France; Corse (fide BRIQUET l.c.); Sardinia; Sicily; Maltese Is.; Italy; apparently rare in Yugoslavia and Greece. In eastern N. Africa the ssp. seems to be replaced by the related *A. aschersonianum* BARBEY.



MAP 26. Localities of *Allium nigrum*.

CANARY IS.: Gran Canaria, San Mateo, fields, 27 April 1855, BOURGEAU s.n. (P); s.l., DESPRÉAUX s.n. (FI); s.l., Herb. HOOKERIANUM s.n. (K); Gran Canaria, San Mateo, 6 April 1858, LOWE s.n. (K); Gran Canaria, 28 May 1875, LOWE s.n. (BM).

MOROCCO: Between Rabat and Tanger, 21 April 1931, DAME ALICE c.s. 267 (BM); EL Hajeb, 30 April 1914, BIAU s.n. (P); near Berkane, massive of Benisnassene, 700–800 m, 22 April 1928, BRIQUET 1265 (G); Tanger, 7 April 1898, CROSSFIELD s.n. (K); Tanger, April, DURAND s.n. (MPU); near Ksar-el Kebir, sands, FONT QUER 131 (B, BM, G); Tanger, June 1888, FOSTER s.n. (K); Krinfla, June 1887, GRANT s.n. (K); between Tanger and Tetuan, April 1871, HOOKER s.n. (K); Bekrit Maissons, 1850 m, 1 June 1924, JAHANDIEZ 511 (B, BM, G); Djebel Tizelmi, 1876, MARDOCHÉE s.n. (P); Tétuan, fields, 2 April 1911, PITARD 204 (P); Tanger, 27 April 1916, Herb. ROFFEY s.n. (BM); Tanger, 1825, SALZMANN s.n. (FI, G, K, P); Kaddur, fields, 13 May 1934, SENNEN c.s. 9587 (BM, G); Tanger, March 1936, TRETHEWY 341 (K); Tanger, WEBB s.n. (FI); High Atlas, near Demnate, 1200 m, 7 April 1958, WHITING c.s. 288 (K).

ALGERIA: Mostaganem, cultivated fields, 1848, BALANSA s.n. (P); Alger, fields, May 1840, BARAU s.n. (P); Alger, fields, May 1838, BOVÉ 88 (G, WU); near Alger, BOVÉ 294 (FI); Bougie, April 1870, CAUVET s.n. (P); Constantine, 14 May 1853, COSSON s.n. (P); Cherchell, fields, 25 April 1890, COUTAN s.n. (P); near Mostaganem, DELESTRE s.n. (P); Alger, DESFONTAINES s.n. (FI); Alger, April 1840, DURIEU DE MAISONNEUVE s.n. (P); Constantine, valley of R. Rummel, 11 May 1840, DURIEU DE MAISONNEUVE s.n. (P); Djouh, May 1888, GIROD s.n. (G); near Bordj-bou-Arréridj, 4 June 1914, HIBON s.n. (P); Alger, Oran, 1840, Herb. HOOKERIANUM 294 (K); near Hussein-Dey, May 1850, JAMIN s.n. (P); Blidah, 1867, LAVERAU 143(P); Blidah, May 1862, LEFEBVRE 650 (P); Sidi-bel-Abbès, near Oran, LEFRANC s.n. (P); near Bône, fields, LETOURNEUX s.n. (P); Toudja, 1 June 1889, LETOURNEUX s.n. (P); Oran, fields, April 1847, MARSILLY s.n. (P); Kouba, fields, 25 April 1882, MEYER s.n. (FI); El-Biar, fields, 7 May 1884, MEYER s.n. (FI); ruins of Khanissa, 940 m, May 1883, REBOUD s.n. (P); Alger, 1832, SHUTTLEWORTH 12 (BM); Bône, 1834, STEINHEIL s.n. (P).

TUNISIA: near Tunis, cultivated fields, 17 April 1888, BARRATTE s.n. (P); Tunis, April 1894, CHEVALLIER s.n. (P); near Tunis, fields, June 1911, CUÉNOD s.n. (G); near Tunis, cultivated fields, DESFONTAINES s.n. (MPU); Aïn Drahan, fields, 12 May 1885, ROBERT 108 (P); Aïn Drahan, forest, 20 May 1885, ROBERT s.n. (P).

LIBYA: Cirenaica, Cirene-Borgû, 30 April 1934, PAMPANINI c.s. 1375 (FI, K, L).

PORTUGAL: near Lisboa, April–May 1879, DAVEAU s.n. (MPU); Serra de Monsanto, May 1883, DAVEAU s.n. (FI, G, MPU); Serra de Monsanto, April 1880, MOLLER 684 (G).

SPAIN: near Malaga, fields, April, SALZMANN s.n. (MPU).

FRANCE: Monaco, Monte Carlo, cultivated fields, 9 April 1874, NEYRAUT s.n. (MPU); Montran, 19 April 1862, DE POMMARET s.n. (MPU); Montpellier, SALZMANN s.n. (MPU); near Agon, cultivated fields, 5 May 1860, SOMMY s.n. (MPU).

SARDINIA: Decimoputzu, fields, 9 May 1879, BIONDI s.n. (FI); Isili, 16 May 1894, MARTELLI s.n. (FI); Iglesia, fields, 8 May 1872, SOMMIER s.n. (FI).

SICILY: Caccamo, May 1890, GUZZINO s.n. (FI); Sommatino, 20 May 1901, MARTELLI 154 (FI); Palermo, cultivated fields, 20 May 1836, PARLATORE s.n. (FI); near Palermo, cultivated fields, April–May 1907, ROSS 680 (FI, L, WAG); Palermo, fields, TODARO s.n. (FI).

MALTESE IS.: Malta, Girgenti, fields, SOMMIER s.n. (FI).

ITALY: San Marino, M. Cocco, 3 May 1912, PAMPANINI 944 (FI); San Marino, La Dogana, 2 May 1912, PAMPANINI 945 (FI, type of *A. nigrum* forma *denticulatum* PAMPANINI); Pisa, April 1917, SAVELLI s.n. (FI, *A. nigrum* forma *latifolium* in sched.).

Notes.

Synonyms. ? *A. magicum* L. As pointed out under *A. neapolitanum* the protologue belonging to *A. magicum*, and the accompanying sheet LINN 419.6 are at variance (p. 163), as this sheet represents *A. neapolitanum*. The description of *A. magicum* L. cannot be placed with any certainty (in spite of RICHTER's view, l.c.). LINNAEUS himself was uncertain of '*magicum*' as appears from LINN 419.6 and in 1762 he added a number of lit. references to *A. magicum* which pertain to different spp.; *A. magicum* is a nomen rejiciendum (Code, Art. 70).

A. monspessulanum GOUAN. I have not seen the type-specimen, but the protologue, including the illustration, points to ssp. *nigrum*.

A. speciosum CIRILLO. The Herbarium of CIRILLO has been destroyed (see also under *A. subhirsutum*), but CIRILLO's illustration very clearly depicts a gemmiferous leaf.

Ornithogalum afrum ZUCCAGNI in ROEMER. From a note in the protologue appears that ZUCCAGNI cultivated this plant in the Botanical Garden at Florence, but herbarium material of it is no longer extant. In the protologue the plant is described as bulb-bearing, scape c. 60 cm high, with at the base numerous leaves, shorter than the scape; and with a single spathe, 2-lobed, the lobes connate at base, with a 5-flowered inflorescence. This description pertains to *A. nigrum*. ZUCCAGNI noted that it was brought from Egypt by DESFONTAINES, and that seeds from it, under the name *Ornithogalum afrum*, were obtained through mediation by THOUIN. However, *A. nigrum* does not occur in Egypt. Both DESFONTAINES and THOUIN never visited Egypt; DESFONTAINES stayed from 1783 to 1786 in Tunisia and Algeria, and THOUIN visited Italy from 1796 to 1797 (according to DAVY DE VIRVILLE, 1954). Probably DESFONTAINES collected the plant in Tunisia or Algeria, where *A. nigrum* does occur, and later on possibly seeds of it were handed by THOUIN to ZUCCAGNI in Italy. The locality as mentioned by ZUCCAGNI, Egypt, most likely was erroneous.

A. nigrum var. *bulbiferum* GRENIER et GODRON represents a form of ssp. *nigrum* with bulbils in the inflorescence.

A. nigrum L. forma *album* MAIRE, and forma *roseum* MAIRE. Both fall within the flower colour range of the subspecies.

Gemmiferous leaf. Normally the gemma is situated at or near the hooded top of the gemmiferous leaf. As an exception in the specimen JAMIN s.n. (P) from Alger the gemma is situated on the margin of a foliage leaf, slightly smaller than the other foliage leaves. An ample study of the gemmiferous leaf is given by GERMAIN DE SAINT-PIERRE l.c., and LAGRÈZE-FOSSAT l.c.

Ovules. In ssp. *nigrum* there are 4–6 ovules per locule; this seems to be 6–8 in ssp. *multibulbosum*, but further study is needed to ascertain this.

Distribution. The occurrence of the species on the Canary Is. is most probably due to an early introduction. From other areas it is well-known that it easily runs wild.

The ssp. *nigrum* is apparently rare in Europe. According to WILLKOMM et LANGE l.c. it occurs in Spain only in the southern part. FOURNIER l.c. mentions it as very rare for France, and LORET et BARRANDON (1888) wrote for the occurrence in the region of Montpellier: 'this beautiful species is extinct already for a long time there'. From Corsica I saw no specimens, but according to BRIQUET l.c. it occurs there. From Sardinia, Sicily, the Maltese Is., and Italy I examined a few specimens. I have seen no recent European collections; all the European material seen by me dated from around or before 1900. For convenience's sake I have not enumerated specimens from East of Italy.

Caryology. 2n = 16, fide CELA RENZONI & GARBARI 1971.

30. A. orientale BOISSIER — Fig. 38, 39, Map 27.

A. orientale BOISSIER, Diagnoses plantarum orientalium novarum, ser. 1, vol. 2, part 13, 1854:25; ibid. 1882:282; HOLMBOE 1914:47; DINSMORE in POST 1933:645; FEINBRUN 1948:149; KOLLMANN 1970:248.

Syntypes: Turkey, Caria, PINARD s.n. (not seen); & Caria, Mt. Sipylo, AUCHER 2200 (FI, G, K); & Cilicia, AUCHER 2188 (lectotype: G; isotypes: FI, K); & Lycia, Mt. Solyma, DE HELDREICH s.n. (not seen); Syria, near Aleppo, KOTSCHY 71 (= 171) (BAS, FI, *A. subciliatum* STEUDEL in sched., K); Palestine, Arabian Desert, BOISSIER s.n. (not seen); Mesopotamia, AUCHER 2215 (FI).

A. aschersonianum BARBEY, C. et W. 1882:163, pl. 4; BOISSIER 1882:283; DURAND et BARRATTE 1910:235; MUSCHLER 1912:218; HAYEK 1914:185; PAMPANINI 1916:270; OPPENHEIMER 1930:278; PAMPANINI 1931:155; DINSMORE in POST 1933:646; FEINBRUN 1948:148; TÄCKHOLM et DRAR 1954:81; MAIRE 1958:301, fig. 921; TÄCKHOLM 1974:654.

A. aschersonianum var. *typicum* BÉGUINOT et VACCARI 1915:17; *A. aschersonianum* var. *barbeyanum* MAIRE et WEILLER in MAIRE 1958:302.

Syntypes: Egypt, Mariut, 4 March 1882, BARBEY 887 bis (lectotype: G, not seen); Israel, 'apud Philistinos', near Beersheba, 27 March 1882, BARBEY 888 bis (not seen); Paratypes cited: Egypt, Mariout, near Alexandria, LETOURNEUX 137 (FI, K, MPU, P); Israel, valley of Achor between Jerusalem and Jericho, 8

April 1880, BARBEY 873 (MPU); Syria, near Aleppo, KOTSCHY 71 (=171) (BAS, K).

A. gayi BOISSIER 1882:271.
Type: Turkey, Mersina, BALANSA 814 (isotypes: C, MPU, WAG); as *A. graecum* auct. non URVILLE: J. GAY in BALANSA, Pl. d'Orient 1855.

A. aschersonianum subsp. *ambiguum* BÉGUINOT et VACCARI 1912:1.
A. aschersonianum var. *ambiguum* PAMPANINI 1931:156; TÄCKHOLM et DRAR 1954:82; MAIRE 1958:302.
Type: Libya, Tobruk near Semaphore, 18 March 1912, BÉGUINOT et VACCARI s.n. (not seen, see note).

A. nigrum L. var. *papillosum* PAMPANINI 1914:13; ibid. 1914:46.
Syntypes: Libya, Tarhuna, Ras Ghenai, 25 March 1913, PAMPANINI 1564 (lectotype: FI); & E. of Kasr Tarhuna, 4 April 1913, PAMPANINI 2111 (FI).

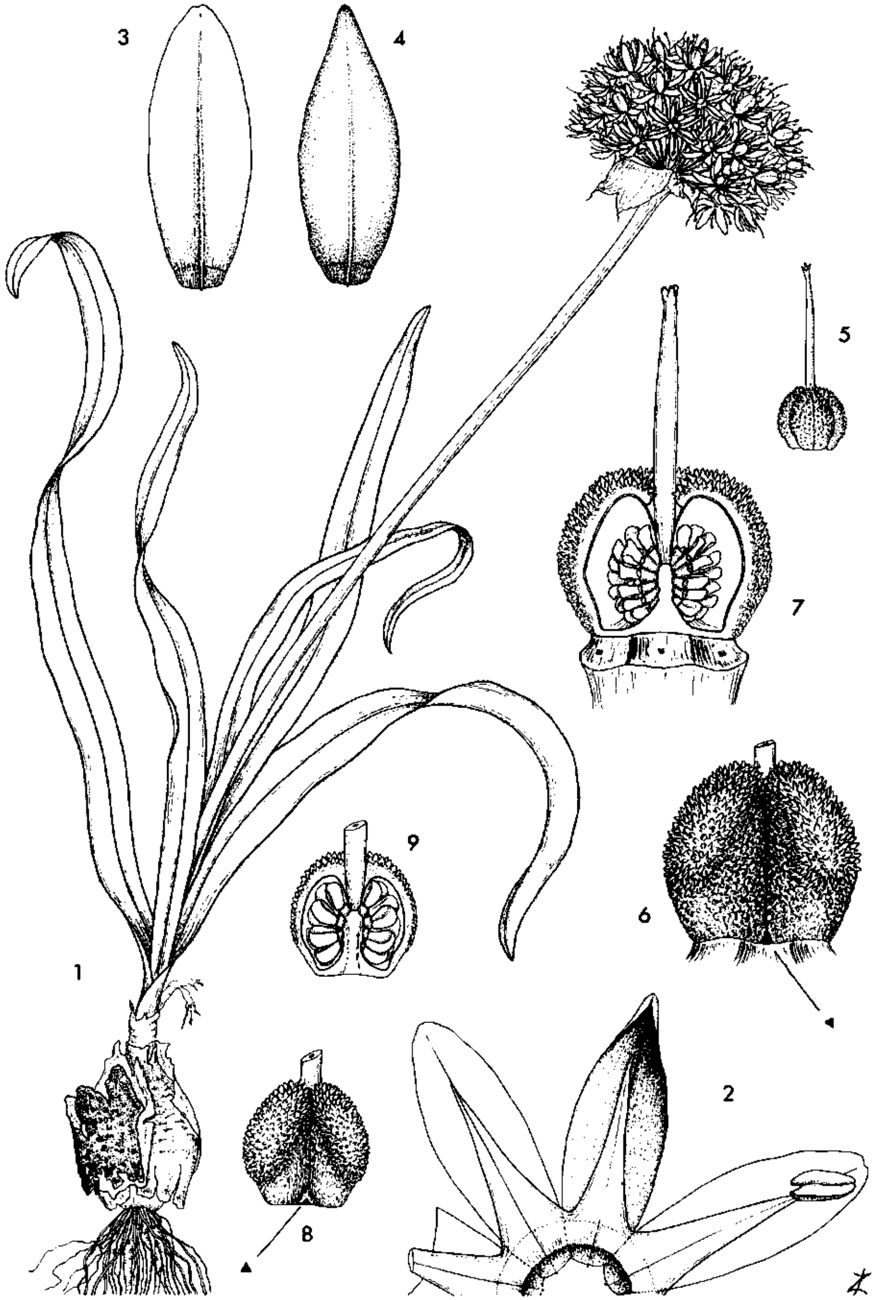
A. aschersonianum forma *ciliatum* PAMPANINI 1917:125; ibid. 1924:205; ibid. 1931:156; MAIRE 1958:302.
Type: Libya, Fuehat, 3 March 1916, ZANON 483 (holotype: FI).

A. aschersonianum forma *genuina* PAMPANINI 1917:125; ibid. 1924:204; ibid. 1931:156; MAIRE 1958:302.
Syntypes: Libya, Suani Osman, 9 March 1916. ZANON 492 (lectotype: FI); & Fuchat, 3 March 1916, ZANON 190 (not seen).

A. tel-avivense EIG 1931:75; FEINBRUN 1948:148; TÄCKHOLM et DRAR 1954: 83.
A. aschersonianum subsp. *tel-avivense* OPPENHEIMER in OPPENHEIMER et EVENARI 1940:189, fig. 7.
Type: Israel, vicinity of Jaffa, April 1901, JOFFÉ 165 (isotype: MPU).

A. aschersonianum forma *leve* PAMPANINI 1936:21.
Type: Libya, Tobruk, 23 March 1933, PAMPANINI 1349 (holotype: FI; isotype: K).

Bulb globose to ovoid, 20–45 × 20–40 mm. Roots glabrous, unbranched. Increase bulbs absent. Protective bulbcoat-leaves 1–4, chartaceous, without conspicuous structure, outer surface grey-brown to blackish, inner surface whitish or yellowish or greyish-brown, slightly glossy. Sproutleaf 1–2, membranous and hyaline, soon wilting, 1–4 cm long, not or hardly emerging above ground. *Foliage leaves* 2–7, usually more or less contorted or curved and with wavy margin or not, sometimes leaves straight or almost so, glabrous; blades approximate, linear to strap-shaped, 10–45 cm × 4–20 mm, flat, top acute, the apical part of the blade soon wilting and breaking off, basal part unconspicuous-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ly sheathing the scape, margin entire or distinctly denticulate or irregularly denticulate-serrulate; sheaths short, open, subterranean part of sheating blades 1–4 cm. Gemmiferous leaf absent. Scape 1, shorter to longer than the leaves, erect, terete, hollow, glabrous, 15–70 cm long, 3–10 mm diam. *Inflorescence* umbellate to subspherical, many-flowered, 4–10 cm diam., without bulbils. *Spathe* 1, not or but slightly hyaline, persistent, 15–25 mm long, many-veined, opening with 2–4 subequal slits reaching three-fourth to nearly to the base, forming 2–4 spathe-lobes, broadly ovate, acute or 2–5 mm acuminate, recurved or not. Bracteoles absent. Pedicels subequal to unequal, 15–35 mm long, rather slender, straight, the outer pedicels recurved, in fruit rigid, stouter. *Flowers* subcampanulate to stellate. Tepals 0.5(–1) mm adnate to bases of filaments, persistent, in fruit sometimes reflexed, white, pink, or purple, with greenish to purple midvein; outer tepals obovate-oblong to lanceolate, slightly saccate at base, 6.5–9 × 2–3 mm, top broadly obtuse to subacute; inner tepals equal to outer tepals, or somewhat longer and narrower. Stamens shorter than or sometimes equal to the tepals; filaments simple, whitish to yellowish-brown; outer filaments 4–6.5 mm long, at base 0.5–1.5 mm wide, connate with inner filaments for c. 1 mm; inner filaments as outer filaments or slightly longer and wider. Anthers 2–2.5 × 0.8–1 mm, yellow. Pistil shorter than or equal to the tepals, ovary globose-obovoid, 2–3 × 2–3.5 mm, conspicuously finely pustulose, especially when young; locules each with (4–)6–14 ovules; style 2–4 mm, slender, inserted at about one-third to halfway from the base of ovary; stigma minutely 3-lobed. *Fruits* broadly ovoid, 6–9 × 6–8 mm, straw-coloured to purplish or brownish-black. Seeds (0–)1–3 per locule, 3–4.5 × 2–3.5 mm, rather flattened, black.

Vernacular names. Egypt: *Körrart*, *Ka'ber*, *Ka'abal.*

Habitat. Mostly in coastal areas, but also up to c. 150 km inland, and occasionally found in the mountains. It is found in dry riverbeds, on dry hills, and in fields in hard soil. The species seems to have a preference for sandy, calcareous, and loamy soiltypes. Sometimes recorded as gregarious growing. Altitude 0–2000 m. Flowers: February–May (Libya), March–May (Egypt, Israel).

Distribution. Libya, mainly Cyrenaica, but also two collections from near Tripoli; N. Egypt; Cyprus; Turkey; Syria; Israel; Jordan. The species is apparently distributed still farther to the north and the east, but its exact distributional limits there are unknown (see also notes).

FIG. 38. *Allium orientale*. – 1. Habit, $\times^2/_3$; 2. perianth and stamens, partly, ×4; 3–4. inner and outer tepal, outer views, ×4; 5. pistil, ×4; 6, 8. papillose ovaries of different specimens, arrows indicate excretion openings of nectaries, ×8; 7,9. longitudinal section of these ovaries, note the many ovules, ×8. (1, 5, 8–9. SICKENBERGER s.n., 6 April 1894; 2–4, 6–7. KHATTAB s.n., April 1948).

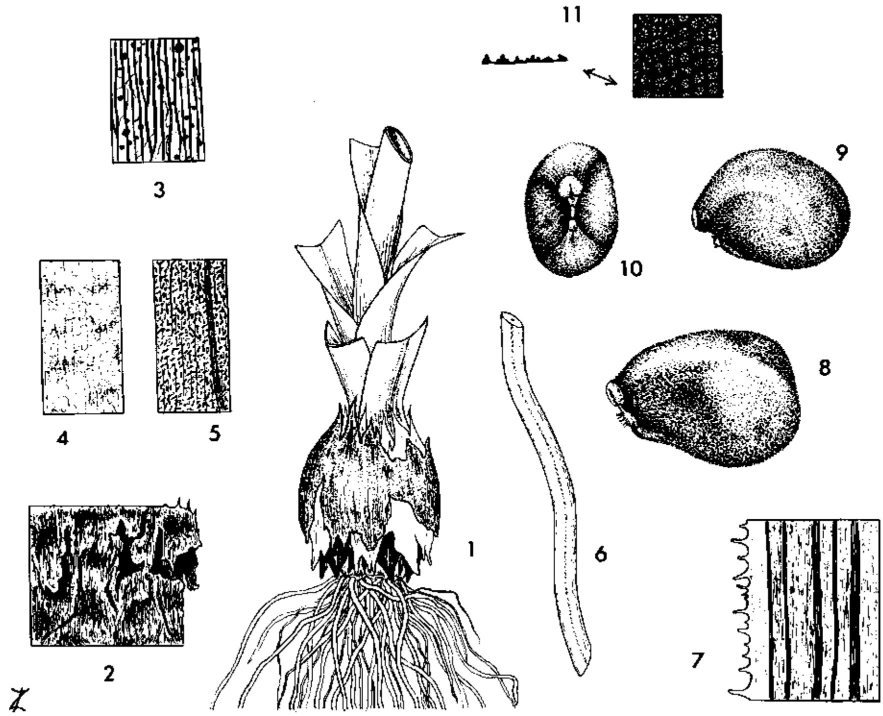
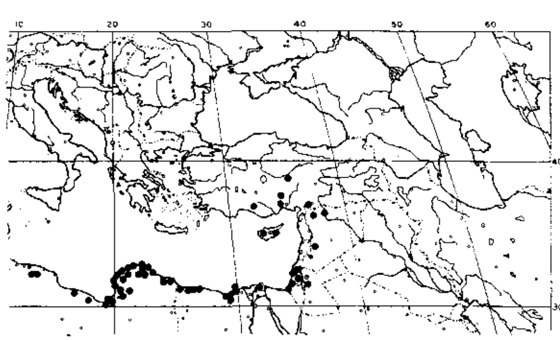


FIG. 39. *Allium orientale*. – 1. Habit of lower part of plant, $\times^{2}/_{3}$; 2–3. details of outer bulbcoat-leaf, outer view, ×6 and ×20 resp.; 4. detail of firm inner bulbcoat-leaf, outer view, ×20; 5. detail of translucent thin bulbcoat-leaf, outer view, ×20; 6. piece of smooth root, ×6; 7. fragment of leaf margin with crenulate fimbriate edge, ×16; 8–10. seeds, two lateral views and one basal view (hylum), ×8; 11. detail of testa, seen from above and in profile, ×40. (1. LETOURNEUX 137; 2–7. SICKENBERGER s.n., 6 April 1894; 8–11. KHATTAB s.n., April 1948).



MAP 27. Localities of *Allium orientale*.

LIBYA: Tobruk, dry hill, March 1914, BÉGUINOT c.s. 31 (FI); near Bescer, sandhills, March 1958, GUICHARD CYR/67/58 (BM); between Benghazi and Agedabia, cornfield, March 1958, GUICHARD CYR/85/58 (BM); Ras el Hilal, April 1954, GUICHARD KG/CYR/143 (BM); Tocra Pass, 300 m, maquis, March 1958, GUICHARD CYR/59/58 (BM); Shabat, April 1961, KARAMANLI 895 (K); Benghazi, Rommel's Pool, March 1959, KEITH 368 (K); 42 km SW. of Agedabia, April 1938, MAIRE c.s. 1433 (P); 32 km W. of En Nofilia, sands, April 1938, MAIRE c.s. 1436 (P); near Benghazi, March 1922, MAUGINI s.n. (FI, 6 collections from different localities); Benghazi area, Giocchi el Ghebir, 9 March 1933, PAMPANINI 1269 (FI); & Sceilabi el Baabas, 11 March 1933, PAMPANINI 1270 (FI); Msus, 20 March 1933, PAMPANINI 1271 (FI); Chaulan, 20 April 1934, PAMPANINI c.s. 1272 (FI); Umm el Fachar, 27 April 1934, PAMPANINI c.s. 1273 (FI); Messa, E. of Cyrene, dry riverbed, 29 April 1934, PAMPANINI c.s. 1274 (FI); Marsa Susa, PAMPANINI c.s. 1275 (FI); El Beda, dry riverbed, 2 May 1934, PAMPANINI c.s. 1276 (FI); between Messa and Negret Said, 8 May 1934, PAMPANINI c.s. 1278 (FI); El Beda, dry riverbed, 10 May 1934, PAMPANINI c.s. 1280 (FI); Uadi el-Atrun, 14 May 1934, PAMPANINI c.s. 1281 (FI); between Agedabia and Saumnu, 10 April 1934, PAMPANINI c.s. 1282 (FI); S.E. of Benghazi, 20 March 1933, PAMPANINI 1933 (FI); Msus, 20 March 1933, PAMPANINI 1334 (FI); S.E. of Barce, 8 April 1933, PAMPANINI 1336 (FI); Derna, dry riverbed, 9 April 1933, PAMPANINI 1337 (FI); between Derna and Mechili, 10 April 1933, PAMPANINI 1338 (FI); near Marsa Susa, 11 April 1933, PAMPANINI 1339 (FI); between Benghazi and Agedabia, 7 April 1934, PAMPANINI c.s. 1340 (FI); near Marsa el-Brega, 8 April 1934, PAMPANINI c.s. 1341 (FI); between Agedabia and Antelat, 10 April 1934, PAMPANINI c.s. 1343 (FI); near Bomba, 17 April 1934, PAMPANINI c.s. 1344 (FI); near Chaulan, 20 April 1934, PAMPANINI c.s. 1345 (FI); between El-Hania and Messa Gabr Scegmin, 9 May 1934, PAMPANINI c.s. 1346 (FI); Has esc Sceilabi el Baabas, 11 March 1933, PAMPANINI 1347 (FI); S.E. of Benghazi, 20 March 1933, PAMPANINI 1348 (FI); Tobruk, 23 March 1933, PAMPANINI 1349 (FI, K, type of *A. aschersonianum* var. *leve* PAMPANINI); between Tobruk and Bardia, 23 March 1933, PAMPANINI 1350 (FI); S.E. of Barce, 8 April 1933, PAMPANINI 1351 (FI); Ras Ghenai, 25 March 1913, PAMPANINI 1564 (FI, type of *A. nigrum* var. *papillosum* PAMPANINI); E. of Kasr Tarhuna, hill, 4 April 1913, PAMPANINI 2111 (FI); Sirte, sands, Feb. 1958, PARK 281 (K); Benghazi, 1884, PETROVICH 19 (WU); Benghazi, March 1883, RUHMER 335 (G, K, MPU, P); 60 km N. of Agedabia, desert, SANDWITH 2233 (K); between Cyrene and Apollonia, maquis, April 1939, SANDWITH 2359 (K); Raaba, April 1915, ZANON 64 (FI); Fuehat, 3 March 1916, ZANON 483 (FI, type of *A. aschersonianum* forma *ciliatum* PAMPANINI); Fuehat, 9 March 1916, ZANON 492 (FI, type of *A. aschersonianum* forma *genuina* PAMPANINI).

EGYPT: Ramle, near Alexandria, sands, March 1877, BALL 165 (K); Mariut, March 1938, BOETJE-VAN RUYVEN 123 (L); near Rafah, March 1927, DRAR s.n. (CAIM); Gaza, sands, March 1927, DRAR 17 (CAIM); & DRAR 88 (CAIM); between Amreya and Burg el Arab, April 1948, KHATTAB s.n. (CAIM); & April 1952, KHATTAB s.n. (CAIM); & KHATTAB 1 (CAIM); Mariut, May 1877, LETOURNEUX s.n. (K); near Mariut, fields, 4 March 1877, LETOURNEUX 137 (FI, K, MPU, P, paratype of *A. aschersonianum* BARBEY); near Maxum, fields, LETOURNEUX s.n. (FI, P); Alexandria, April 1903, MUSCHLER s.n. (K); Damietta, Dec. 1905, MUSCHLER s.n. (K); Barrani, March 1933, PALMS 164 (K); Mariut, April 1903, SCHWEINFURTH s.n. (CAIM); N. of Hamman, April 1911, SCHWEINFURTH s.n. (BR); Behig, April 1911, SCHWEINFURTH s.n. (BR); Mariut, sands, Feb. 1924, SHABETAI 17 (CAIM); between Barrani and Sallum, April 1932, SHABETAI Z1677 (CAIM, K); Burg el Arab, near the sea, April 1934, SHABETAI 3294 (CAIM); & sands, May 1936, SHABETAI 6623 (CAIM); Mex, April 1894, SICKENBERGER s.n. (G); Mariut, cornfields, SIMPSON 537 (CAIM); Abusir, April 1925, SIMPSON 3396 (CAIM); 100 km W. of Mersa Matruh, barley fields on hard loamy soil, March 1969, WANNTORP c.s. 2279 (K); 50 km W. of Mersa Matruh, common in barley fields, March 1969, WANNTORP c.s. 2244 (K).

CYPRUS: Larnaka, fields, calcareous soil, March 1893, DESCHAMPS 476a (G, bulb lacking, identification somewhat doubtful, is possibly *A. nigrum* L.); between Potami and Evriku, June 1880, SINTENIS c.s. 860 (M).

TURKEY: Caria, Mt. Sipylo, AUCHER 2200 (FI, G, K); Cilicia, AUCHER 2188 (FI, G, K, type of *A. orientale* BOISSIER); Bouloukli, near Mersina, April 1855, BALANSA 814 (C, MPU, WAG; type of *A. gayi* BOISSIER); N. of Alanya, c. 1000 m, May 1975, DUYFJES-RONSDORF s.n. (L); 25 km. WNW. of Mersin, open places in *Quercus* scrub, April 1959, DE WILDE c.s. 1154 (WAG); Cilician Gates, 1800 m, loamy soil, May 1959, DE WILDE c.s. 1276 (WAG); between Elâzig and Erzurum, 2000 m, clayish soil, May 1959, DE WILDE c.s. (WAG).

SYRIA: near Aleppo, KOTSCHY 71(= 171) (BAS, FI, K, syntype of *A. orientale* BOISSIER; paratype of *A. aschersonianum* BARBEY C. et W.); near Biredjik, April 1889, SINTENIS 314 (M).

MESAPOTAMIA: AUCHER 2215 (FI, syntype of *A. orientale* BOISSIER).

ISRAEL and JORDAN: near Jaffa, March 1897, BORNMÜLLER 1536 (B); between Ramleh and Yebueh, 30 March 1911, DINSMORE 4546 (L); Moab, EGGER s.n. (B); Sharon, near Tel-Aviv, sandy loam, 1954, FEINBRUN C.S. 599 (B, FI, G, L, WAG, WU); near Jaffa, April 1901, JOFFÉ 165 (MPU, type of *A. tel-avivense* EIG); Galilée, May 1901, JOFFÉ 88 (MPU); near Ramleh, March 1905, KRONENBURG 564 (B); Jaffa, coast, 1–20 m, 10 March 1911, MEYERS c.s. 1553 (B); Moab, fields, April 1911, MEYERS c.s. M 1725 (B); Nazareth, fields, 13 Feb. 1914, MEYERS c.s. 1725 (L); Tiberias, fields, 0–200 m, 27 Feb. 1912, MEYERS c.s. 6849 (L).

Notes

Variability and synonyms. *A. aschersonianum* BARBEY. The species *A. orientale* as conceived here, is a morphologically variable and complex species with a large distributional area. Variability abounds not only in its habit, but also in flower size, flower colour (white, or pink, to purple), size and shape of fruit, and especially also in the degree of division of the leaf margin. In particular as regards the material from North Africa I am convinced that there is no sufficient reason to keep this apart from what goes under the name *A. orientale* in the Near East and Turkey.

The original two syntype-specimens of *A. aschersonianum* come from N. Egypt and from Beir-Sheba in Israel, and there is additional material cited also from Egypt, and from Syria and Jordan. *A. orientale* was described from specimens from Turkey, Syria, and from material from other areas in the Near East. I have examined original specimens belonging to both names, and in addition more recent collections, though, unfortunately, the rich modern collections from Israel in HUJ could not be studied.

The specimen KOTSCHY 71 (171) from near Aleppo in Syria was cited with the specimens enumerated with the original description of *A. orientale* in 1854. In 1882 it was moved into *A. aschersonianum*, described by BARBEY, and already also treated by BOISSIER in Flora Orientalis 1882. This same specimen was earlier in the herbarium at FI labelled by BOISSIER as *A. subciliatum* BOISS. in sched., and is discussed by BARBEY, C. et W. 1882:163 and BOISSIER 1882:283 under *A. aschersonianum*.

A. aschersonianum BARBEY subsp. *ambiguum* BÉGUINOT et VACCARI. I could not find the type specimen belonging to this name, a plant which was collected in 1912, in FI, but I examined a specimen of a later date, 12 March 1914, collected by the same collectors and in the same locality, Libya, Tobruk, near the semaphore.

A. nigrum L. var. *papillosum* PAMPANINI. The syntypes of this variety, two collections of PAMPANINI, from Libya, E. of Tripolis, are in the herbarium of FI identified by PAMPANINI as *A. aschersonianum* BARBEY, and were not renamed on the sheets when publishing the variety.

A. tel-avivense EIG. The type, a collection by JOFFÉ from near Jaffa in Israel, is in habit practically identical with the type of *A. orientale*. Specimens from the same area, collected by FEINBRUN and AMDURSKY, belong, in my opinion, to *A. orientale*. OPPENHEIMER, 1940, gives a description in latin, incorrectly stating that EIG's description in Hebrew of 1931 would have remained a *nomen nudum*. A list of differentiating characters with *A. aschersonianum* is given by FEINBRUN 1948:149, from which appears the very close similarity of both species.

Allied and resembling species. Most of the species belonging to the section *Melanocrommyum* are closely allied and rather difficult to distinguish altogether. *A. nigrum* resembles much in habit to many of the specimens of *A. orientale* from the Cyrenaica, formerly referred to as *A. aschersonianum*; *A. nigrum* is distinct by its gemmiferous leaf, and less ovules, 2–6(–8) per locule. As regards *A. orientale* there is described, for the Near East, a number of obviously good-, as well as rather ill-defined species, mainly by BOISSIER (1854, 1882), and BORNMÜLLER (1917), and more recently FEINBRUN (1948). Several of these species belong to the close alliancy of *A. orientalis*, of which I may enumerate and briefly comment the following for reference and comparison:

A. rothii ZUCCARINI 1843:235, tab 4; BOISS. 1882:283; FEINBRUN 1948:150; TÄCKHOLM et DRAR 1954:82; KOLLMANN 1970:248. This species is described from the Israel-Jordan area (Hebron) and is characterized by its small size (short scape), the tufted inflorescence, and smaller flowers of 4–5 mm long only. According to TÄCKHOLM et DRAR 1954:83 the species occurs also in the El Tih desert E. of the Gulf of Suez, and hence close to the area of the present study; I have not seen, however, TÄCKHOLM's authentic specimens. It should be kept in mind that, in case a future student decides to accept but one single specific epithet for the whole group, *A. rothii* is the oldest name.

A. libani BOISSIER 1854:26. It seems not unlikely that this is simply only a mountainous form of *A. orientale*; more material for study and comparison is needed.

A. asclepiadeum BORNMÜLLER 1917:42; FEINBRUN 1948:149. This species is fairly distinct by a number of good characters, for instance its reflexed tepals already in anthesis, contrasting to the rigidly erect stamens.

A. aschersonianum var. *latifolium* BOULOUMOY 1930:330 in clav. This is a broad-leaved variety, leaves 5–6 cm broad, with smooth, not crenulate, edges. It originates from Bikfaya, Lebanon, and is according to FEINBRUN 1948:147 likely synonymous with *A. dumetorum* (see below).

A. lachnophyllum PAINE ex DINSMORE in POST 1933:647. Possibly only a narrow-leaved form; from Palestine.

A. dumetorum FEINBRUN et SZELUBSKY in FEINBRUN 1948:146, pl. IIIA, and fig. 1–3. With the description of this species the authors discuss its differentiating characters with *A. nigrum* as known from the literature. Furthermore its affinities to the resembling and related species *A. aschersonianum* and *A. tel-avivense* appear from the key, the description, and the figs. 1–3. From this it appears to me that these three species are feebly defined, and possibly only represent certain ecotypes from different habitats, belonging to one single, large species, *A. orientale.*

Protective bulbcoat-leaves. The presence of protective bulbcoat-leaves is sometimes obvious, e.g. in the specimen PAMPANINI 1345 (FI). The accumulation or not of these dead wrappings is likely related with the local climatic or edaphic conditions.

Increase bulbs. These have not been observed and are, as in *A. nigrum* ssp. *nigrum*, as well as in the above mentioned related species to *A. orientale*, apparently absent or rare.

Leaf blades quite often start dying off from the top during or even before anthesis, which may give a wrong impression of the lengths of the leaves, and which obscures the true shape of the leaf top.

Leaf margin. The division of the leaf margin is variable; several taxa have been distinguished mainly because of differences in the shape of the leaf margin. The examination of the rather abundant old and recent collections, however, showed that the degree of incision of the leaf margin may vary from entire to distinctly serrulate-denticulate even in one single specimen.

Flowers. In the original description of *A. aschersonianum* the number of stamens is erroneously mentioned as four.

Caryology. FEINBRUN 1948:149 mentions as one of the differences between *A. tel-avivense* and *A. aschersonianum* that the former has one satellited chromosome pair, as against two in *A. aschersonianum*. KOLLMANN (1970) found for several species of sect. *Melanocrommyum* 2n = 16. She states (p. 248); 'The idiograms of *A. asclepiadeum*, *A. orientale*, *A. rothii*, and *A. libani* of section *Melanocrommyum* are very similar. They consist of eight metacentric and submetacentric chromosomes forming eight bivalents at MI (Plate I, 4). One of the submetacentric chromosomes usually bears a satellite on its distinctly shorter arm (Plate I, 1 and 2). This is the karyogram generally found within section *Melanocrommyum* (FEINBRUN, 1954)'.

31. A. crameri ASCHERSON et BOISSIER — Fig. 40, Map 28.

A crameri ASCHERSON et BOISSIER in BOISSIER, Flora Orientalis 5, 1882:279; BARBEY, C. et W. 1882:163; MUSCHLER 1912:219; DINSMORE in POST 1933: 645; TÄCKHOLM et DRAR 1954:81; TÄCKHOLM 1974:654, pl. 239.

Syntypes: Egypt, near Cairo, Great Petrified Forest, 2 May 1880, CRAMER s.n. (G); & Bir el Fahm (Bir el Fahma, or Fachmi), 6 March 1881, CRAMER s.n. (lectotype: G); & ditto, SICKENBERGER s.n. (MPU).

Bulb ovoid, 40–45 × 30–35 cm. Roots glabrous, unbranched. Increase bulbs absent. Protective bulbcoat-leaves 4–20, chartaceous, becoming somewhat fibrous with age, without conspicuous structure, outer surface yellowish-brown to blackish, inner surface yellowish to greyish-white, slightly glossy.

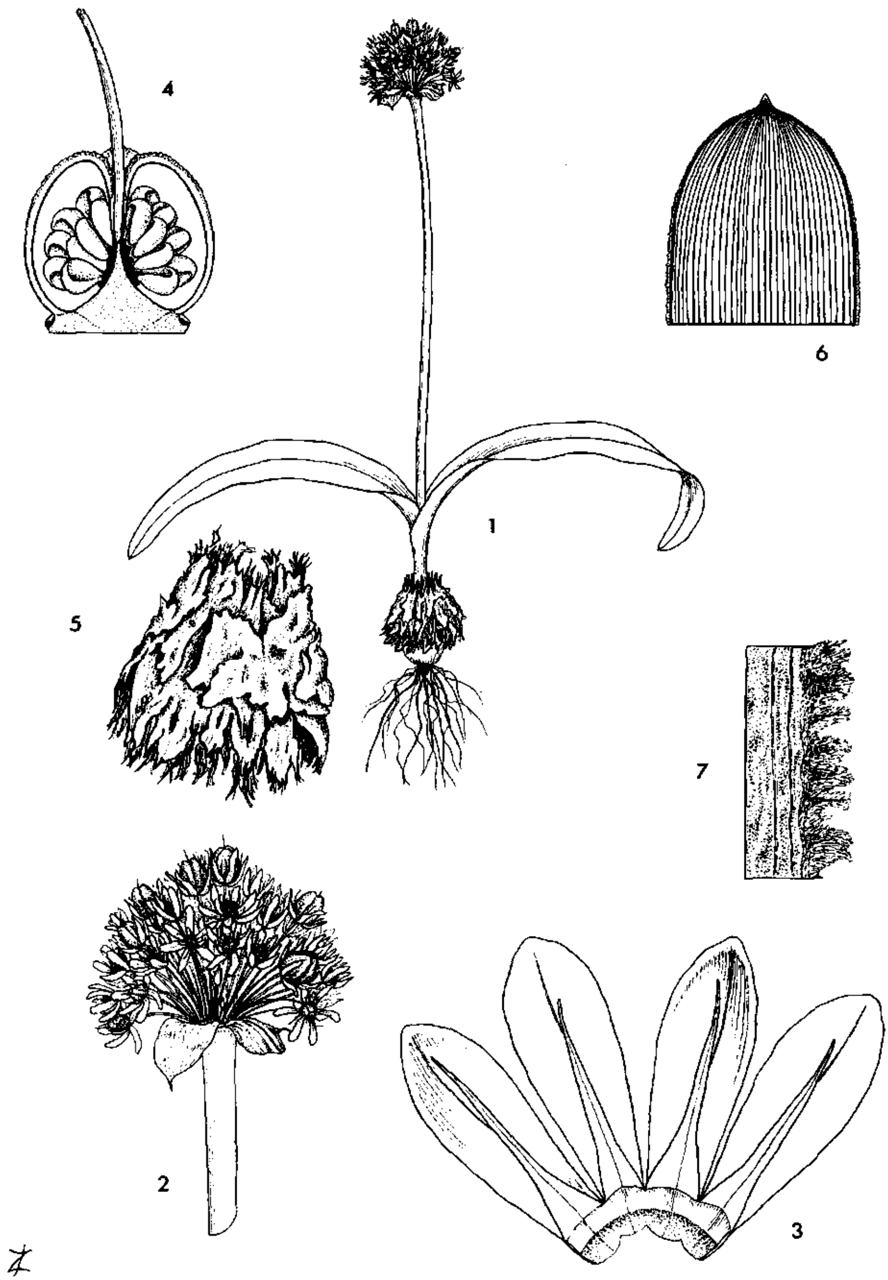


FIG. 40. *Allium crameri*. – 1. Habit, $\times{}^{1}/_{4}$; 2. inflorescence composed of fruits and flowers, $\times{}^{2}/_{3}$; 3. perianth and filaments, partly, $\times 6$; 4. longitudinal section of pistil, $\times 6$; 5. outer bulbcoat-leaves, $\times{}^{2}/_{3}$; 6. leaf top, upper view, $\times 2$; 7. detail of leaf margin, showing structure of the crenulation, $\times 6$. 1–4. CRAMER s.n., 6 March 1881, lectotype; 5–6. BURDET 290; 7. SHABETAI Z 4130).

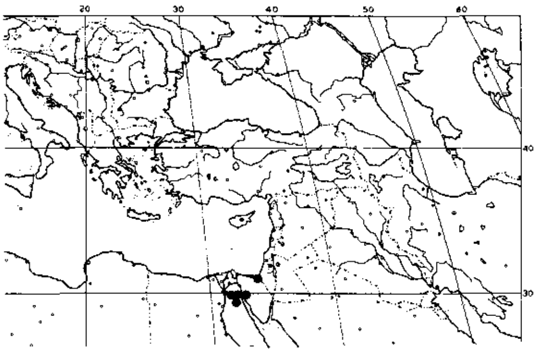
Sproutleaf 1–2, membranous and hyaline, soon wilting, 1–6(–15) cm, not or hardly emerging above ground. *Foliage leaves* 2(–3), curved or twisted, sometimes with coarsely wavy edges, glabrous; blades approximate, broadly strap-shaped, 10–25(–50) cm × 20–50 mm, flat, top broadly rounded and shortly acuminate c. 2 mm, the apical part of the blade often soon withering and truncately breaking off, basal part usually inconspicuously sheathing the scape, blade-margin usually conspicuously crenulate to fimbriate or subcrispate, and often horny; sheaths open, subterranean part of sheathing blades 1–6(–15) cm. Gemmiferous leaf absent. Scape 1, erect, terete, hollow, glabrous, 15–60 cm long, 4–10 mm diam. *Inflorescence* umbellate to subspherical, many-flowered, 4–8 cm diam., without bulbils. *Spathe* 1, not or but slightly hyaline, persistent, 15–25(–45) mm long, many-viened, opening with 2–5 equal slits reaching halfway to nearly to the base, forming 2–5 spathe-lobes, broadly ovate, 1–5(–25) mm acuminate, recurved or not. Bracteoles absent. Pedicels subequal to unequal (see note), 10–45 mm long, rather slender, straight, the outermost pedicels sometimes recurved, in fruit rigid, stouter. *Flowers* subcampanulate-stellate. Tepals c. 0.5 mm adnate to bases of filaments, persistent, in fruit not conspicuously recurved, whitish to pink with purplish or greenish midvein; outer tepals oblong to lanceolate, 5.5–8 × 2–2.8 mm, top subacute to obtuse; inner tepals obovate to elliptic or oblong, 5.5–7 × 2.5–3 mm, top obtuse to broadly obtuse, sometimes with slightly irregular edge. Stamens shorter than or as long as the tepals; filaments simple, whitish; outer filaments 4.5–6 mm long, at base 1–2 mm wide, connate with inner filaments for c. 1 mm; inner filaments as outer filaments or slightly wider. Anthers 1.5–2 × 0.8–1 mm, yellow. Pistil shorter than the tepals; ovary globose to obovoid, c. 2 × 2 mm, finely but conspicuously pustulose, especially when young; locules each with 8–10 ovules; style 2–4 mm, slender, inserted at about one-third to halfway from the base of ovary; stigma inconspicuous. *Fruits* rather conspicuous, broadly ovoid, 8–11 × 8–10 mm, dark brown to blackish. Seeds 1(–2 ?) per locule, 3–3.5 × 2.5 mm, black.

Vernacular name. *Busseyl* (Arabic).

Habitat. A local endemic in Egypt from the desert region E. and SE. of Cairo, and from a restricted area in the Sinai. It was mainly collected in the desert area known as the Great Petrified Forest E. of Cairo. It grows on sand and gravel, and is also recorded from flint-hills. Altitude 50–200 m. Flowers: (January–)February–April(–May).

Distribution. NE. Egypt.

EGYPT: E. of Cairo, Great Petrified Forest, desert, April 1882, BURDET 290 (G); Bir el Fahm (Fachmi), desert, April 1881, BURDET 291 (G); Great Petrified Forest, 2 May 1880, CRAMER s.n. (G); near Cairo, Bir el Fahm (Fachma), 6 March 1881, CRAMER s.n. (G, type of *A. crameri* ASCHERSON et BOISSIER); & ditto, 26 March 1882, CRAMER s.n. (G); Gebel el Asmat, flint hills, 14 Jan. 1945, DAVIS 8218 (K); Petrified forest, 18 Feb. 1945, DAVIS 8247 & 8320 (K); Gebel Abraq, 8 April 1945, DAVIS 10337 (K); Rafah, sandy fields, 23 Feb. 1937 DRAR 448/37 (CAIM); desert from the Galala, 17 March 1931, SHABETAI 60 (K); El Shatt,



MAP 28. Localities of *Allium crameri.*

12 April 1937, SHABETAI Z4130 (CAIM); Bir el Fahm (Fahma), 3 April 1884, SICKENBERGER s.n. (MPU).

Notes.

Allied species. *A. crameri* is closely allied to *A. orientale.* It belongs to the alliance of species around *A. orientale* as partly discussed under that species. From *A. orientale* it is quite distinct in habit, and differs by e.g. the conspicuously more numerous bulbcoat-remnants, and the much broader leaves.

Protective bulbcoat-leaves are conspicuous, and may number to up to 20 or even more. Presumably the accumulation of these bulbcoat-remnants is caused by the local extremely dry climatic-, and possibly also the edaphic conditions, i.e. desert, under which the species grows. Each year two new protective bulbcoat-leaves are produced, so that the age of certain plants could be determined as 10 years or older.

Renewal bulb. When the bulb is dissected only one renewal bulb can be found, already well-developed during anthesis. No traces of increase bulbs were observed.

Inflorescences. As also in many other *Allium* species, the inflorescence in *A. crameri* is, beside the flowers with (sub)equal pedicels forming the umbellate or subglobose inflorescence, provided also with a considerable number of smaller, and possibly wholly or partly, sterile flowers with the pedicels of variable, but much shorter, lengths.

Spathe. The specimen DRAR 448/37, from Rafah in the Gaza area, deviates in its spathe, i.e. before opening it is provided with an exceptionally long acumen of c. 25 mm long.

Smell. In a note to the description of *A. crameri* ASCHERSON et BOISSIER (l.c.) the authors mention the absence of a distinct *Allium* smell, and point to the alliance with *Allium (Ornithogalum) afrum.*

Allium afrum. On the label of the type collection is written: 'Genre nouveau entre *Allium* et *Ornithogalum* (ASCHERSON). *Allium afrum. Ornithogalum afrum.*' As I have explained under *A. nigrum* the name *Ornithogalum afrum* most likely belongs there, not under *A. crameri.*

NAMES EXCLUDED FOR AFRICA

A. moly L.

A. moly L., Sp. Pl. 1, 1753:301; ibid. 1762:432; KUNTH 1843:445; REICHENBACH 1848:27; PARLATORE 1852:579; GRENIER et GODRON 1855–1856:226; WILLKOMM et LANGE 1862:212; REGEL 1875:214; ARCANGELI 1882:689; BATTANDIER et TRABUT 1884:152; RICHTER 1890:208; ASCHERSON et GRAEBNER 1905:156; COUTINHO 1913:131; JAHANDIEZ et MAIRE 1931:121; HEGI 1939:293; MAIRE 1958:283, fig. 910; DE WILDE-DUYFJES 1973:69.
Type: LINN 419.36.

A. aureum LAMARCK 1778:260.
Type: France, near Paris (no type in Herb. LAMARCK).

This species is accepted by BATTANDIER et TRABUT (1884) for Algeria, and by JAHANDIEZ et MAIRE (1931) and MAIRE (1958) for Morocco. Two collections from Morocco are mentioned, one collection by PAU from Tetuan and one by FONT-QUER from between Larache et Chaouen. I have examined abundant African material in all relevant major herbaria including Paris, and have never come across any specimen of *A. moly* collected in Africa. Possibly the African records pertain to cultivated or escaped specimens. *A. moly* is widely cultivated in gardens, and seems to be indigenous only in a restricted area in Spain and Southern France.

A. victorialis L.

A. victorialis L., Sp. Pl. 1, 1753:295; ibid. 1762:424; TÄCKHOLM et DRAR 1954:106–108.
Type: LINN 419.2, '4 *victorialis*'.

There is only one single specimen of this species, annotated as collected by DEBEAUX s.n. in Algeria on Mt. Ouarensenis in 1892, in FI. As a wild species *A. victorialis* is not mentioned in any literature for Africa. Since I have seen no authentic specimens other than the one mentioned above, I assume that the species is not indigenous in our region.

TÄCKHOLM et DRAR l.c., mention the species in connection with the Egyptian drug market.

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SUMMARY

The present revision deals with the morphology, taxonomy, and geography of *Allium*, indigenous or cultivated, on the continent of Africa. Many data on ecology, anatomy, and other botanical disciplines, either compiled from the herbarium labels, from observations in the field or in the garden, or from literature, are added.

All species are amply illustrated, often in much and varied detail.

For Africa the full synonymy is given, as well as type-specimens, a full description, distribution, and notes on various other aspects of the taxa.

The arrangement of the species is not alphabetically, but according to the recognized sections, and hence to a certain degree systematically. Thus, besides the key to the species and the descriptions, the illustrations will strongly facilitate the identification of a specimen.

The *Alliums* of Africa are largely confined to the northern, mainly Mediterranean region; one species, *A. dregeanum*, presumably indigenous there, is recognized for southern Africa.

In total 27 wild species are accepted for Africa; in addition four of the more commonly cultivated species are treated, together 31 species. Several species are subdivided into subspecies. Contrary to previous authors the African species have been amply compared with, or studied in conjunction with related or identical species from the nearby Mediterranean areas in southern Europe and the Near East, which forced me ultimately to accept a rather wide species-concept, often leading to extensive synonymy, including many names formerly proposed for Europe.

In this revision no new names are proposed; only *A. subhirsutum* L. ssp. *subvillosum* (SCHULTES) DUYFJES, *A. subhirsutum* L. ssp. *spathaceum* (A. RICHARD) DUYFJES, *A. sphaerocephalum* L. ssp. *durandoi* (BATTANDIER et TRABUT) DUYFJES, and *A. sphaerocephalum* L. ssp. *curtum* (BOISSIER et GAILLARDOT) DUYFJES are proposed under a new status or combination.

The 31 African species are subdivided into 6 sections. These are defined as far as the African species are concerned, but the accepted sections are used in the sense of previous authors working on *Allium* outside Africa, e.g. STEARN, WENDELBO, and others. It appeared that a final subdivision into sections should await an overall treatment of this large genus of 500–600 species, which is mainly and almost exclusively distributed on the whole northern hemisphere.

Short introductory essays deal with various general aspects, such as morphology, seedlings, anatomy, palynology, caryology.

All citations to authors refer to an extensive separate bibliography.

The work concludes with an index accounting for supposedly all names, specific and infraspecific, for Africa, with in addition many names of related species or synonyms from adjacent areas, mainly Europe.

A separate article on the typification of Linnean *Allium* species likely to occur in Africa, is added to the thesis.

SAMENVATTING

Het genus *Allium* (*Liliaceae*) komt met 500–600 soorten voornamelijk en bijna uitsluitend voor op het noordelijk halfrond in de Oude en de Nieuwe Wereld. Belangrijke centra van ontwikkeling vormen het Nabije- en Midden Oosten, en ook het Middellandse Zeegebied.

Geïnspireerd door de ruime sortering van destijds in cultuur aanwezige wilde *Allium*-soorten in de botanische tuin van het Laboratorium voor Plantensystematiek en -geografie te Wageningen, besloot ik, op instigatie van Prof. Dr. H. C. D. de Wit, in 1968 een promotie-onderzoek te wijden aan de revisie van de voor Afrika wilde en gekweekte uie-soorten.

De recente en oudere verhandelingen over *Allium* in Afrika betroffen voornamelijk studies voor lokale flora's. Vooral MAIRE publiceerde vele notities over *Allium* in Noord Afrika, hetgeen resulteerde in een overzicht van het genus voor heel Noord Afrika in zijn bewerking voor de 'Flore de l'Afrique du Nord' (1958). Deze en andere auteurs hadden echter bij hun bewerkingen geen of slechts weinig rekening gehouden met eerdere literatuur over uien uit andere delen van het aangrenzende Mediterrane floragebied en het Nabije Oosten, in verband waarmee de Noord-Afrikaanse flora zeer duidelijk gezien moet worden.

In de thans voor U liggende studie is bij de soortsomgrenzing in hoge mate gebruik gemaakt van materiaal uit de aangrenzende gebieden in (voornamelijk Zuidelijk) Europa en het Nabije Oosten, hetgeen resulteerde in de noodzaak tot het aanvaarden van een nogal ruim soortsbegrip. Hierdoor is, b.v. in vergelijking met MAIRE's bewerking, het aantal soorten voor Afrika aanzienlijk ingekrompen, terwijl in enkele gevallen een oudere naam, die eerder voorgesteld was voor een plant afkomstig uit een gebied buiten Afrika, aangenomen moest worden.

Naast het omvangrijke herbarium-materiaal uit de belangrijkste herbaria in Europa en Noord Afrika, was het vele levende materiaal in de botanische tuin – sinds het begin van mijn studie aanzienlijk uitgebreid dank zij de medewerking van vele geïnteresseerden – van groot belang voor het omgrenzen van de taxa. Het observeren van het levende materiaal leverde voorts verscheidene biologische gegevens op.

In totaal werden voor Afrika 27 wilde soorten onderscheiden; hiernaast worden vier gecultiveerde en commercieel belangrijke soorten behandeld.

Veel aandacht is besteed aan de sleutel tot de soorten.

Alle soorten worden uitvoerig behandeld. Voor Afrika is een volledige synonymie gegeven, en vele synoniemen van buiten Europa zijn toegevoegd wanneer de type-exemplaren, die dikwijls lastig te achterhalen waren, bestudeerd konden worden, of wanneer door de diagnose of bijgevoegde figuur geen twijfel mogelijk was. Voorts is er van elke soort een beschrijving, gevolgd door uitvoerige opmerkingen over verwantschappen, over er op gelijkende soorten, verspreiding, habitat, biologische gegevens, veldkenmerken, en andere gegevens.

Elke soort is afgebeeld, vaak met vele details.

De rangschikking van de soorten is systematisch, volgens een indeling in secties, waarbij zoveel mogelijk aansluiting gezocht is bij de sectie-indeling door andere auteurs in dit grote en wijd verbreide genus.

Aan het systematisch gedeelte gaan een aantal hoofdstukken vooraf van algemene aard, o.a. betreffende de algemene morfologie, kieming, kiemplanten, enz.

De literatuur-referenties verwijzen naar een uitgebreide bibliografie, speciaal voor Afrika.

De index vermeldt alle voor Afrika bestaande namen, op soortsniveau en lager, naast vele namen voor de aangrenzende gebieden in Europa en het Nabije Oosten voor zover die met de Afrikaanse uien in verband gebracht zijn.

Bij het proefschrift is een eerdere publikatie van mij gevoegd; deze behandelt de vaak ingewikkelde typificatie – nodig voor het vaststellen van de uiteindelijke naam – van de *Allium*-soorten die reeds door LINNAEUS beschreven werden, en die wellicht ook in Afrika voor zouden komen.

ACKNOWLEDGEMENTS

Financial support was given by the Agricultural University at Wageningen covering a period of two years. This was discontinued, and the work would never be finished were it not that the Laboratory for Plant Taxonomy and Plant Geography maintained its support. The series of drawings was completed – all species are fully illustrated – and working facilities were supplied, which enabled me to examine the herbarium specimens received on loan, to study the *Alliums* grown in the botanical garden; and there was a many-sided and efficient support of the library and secretarial help.

Besides, much of the actual writing and arranging was done at my home, and also particularly in the close-by National Herbarium at Leyden, where Prof. Dr. C. KALKMAN was generous enough to provide me of space and access to the library and the collections, together with all facilities. In this respect I am grateful especially to Messrs L. VOGELENZANG and C. W. J. LUT of the Library, and to Mr. A. K. GROENEWEGEN, the curator of the collections.

Further financial support I received from Z.W.O. (Netherlands Organization for the Advancement of Pure Research) and C.N.R. (Consiglio Nazionale delle Ricerche), and also from the Agricultural University, which enabled me in 1971 and 1973 to visit personally the herbaria and libraries in Basle, Geneva, Florence, Naples, Paris, Kew, and London.

The present revision is based on material on loan from the following herbaria, of which the directors or curators are gratefully acknowledged:
B (Berlin), BAS (Basle), BM (London), BR (Brussels), C (Copenhagen), CAIM (Cairo), COI (Coimbra), E (Edinburgh), ETH (Addis Ababa), FI (Florence, incl. Herb. WEBB), G (Geneva), HUJ (Jerusalem), K (Kew), L (Leyden), LINN (London), M (Munich), MPU (Montpellier), NAP (Naples), O (Oslo), P (Paris), S (Stockholm), TL & TLJ (Toulouse), VER (Verona), WU (Vienna), WAG (Wageningen).

Of course, the accomplishment of this revision was only possible with the help of many persons, of whom I should mention Dr. W. T. STEARN (London), Prof. dr. H. O. SLEUMER (Leyden) and Dr. R. C. BAKHUIZEN VAN DEN BRINK (Leyden), mainly for their interest and advice on taxonomy and nomenclature.

Mr. G. BOELEMA untiringly assisted with editorial and other matters.

Mr. W. H. GROTENBREG skillfully grew the *Alliums* in the Wageningen botanical garden.

Miss IKE ZEWALD made the drawings with utmost care, illustrating all species with much and varied details, which not rarely revealed new evidence. These illustrations form a complete companion to the text.

Finally I wish to express my sincere thanks to Prof. dr. H. C. D. DE WIT and his staff for their continuous interest in the work and numerous cases of assistance.

INDEX OF NAMES

Accepted names have been printed in plain type, synonyms in *italics*, new combinations in **bold type.**

'Excl.' refers to the list of excluded names.

CURRICULUM VITAE

BRIGITTA EMMA ELISABETH DUYFJES was born 29 June, 1936, in Bandung, Indonesia. In 1946 she came to The Netherlands. She is married to Dr. W. J. J. O. DE WILDE, presently senior botanist at Rijksherbarium, Leyden.

After highschool examination (Dalton HBS-B, the Hague), she started in October 1955 the study in Biology at the Leyden University. The Bachelor's Degree was obtained in September 1960. During her study she was from 1960 to 1963 assistant in the institutes for Histology (with Prof. Dr. W. VERVOORT), Systematic Botany (with Prof. Dr. H. J. LAM), and Systematic Zoology (with Prof. Dr. H. BOSCHMA).

In the years 1963–1966 she accompanied her husband, then in service of the Agricultural University at Wageningen, in tropical Africa (Ivory Coast, Cameroons, Ethiopia) and assisted there in botanical collecting and research.

In September 1966 she obtained her MSc. at Leyden University with the predicate 'cum laude'. For this examination she studied under supervision of respectively Prof. Dr. H. BOSCHMA and Dr. C. O. VAN REGTEREN ALTENA (on a collection of molluscs from Norway, and the study of the squid-genus *Todarodus*), Prof. Dr. C. G. G. J. VAN STEENIS and Dr. S. J. VAN OOSTSTROOM (a taxonomic revision of the *Festuca ovina*- and *Festuca rubra*-group, *Gramineae*, in The Netherlands), and under Prof. Dr. A. QUISPEL (on the growth rate of the fungus component of the tropical foliiculous lichen *Strigula elegans*, and on the growth rate of the lichen).

In August 1968 she was appointed as part-time botanical assistent at the Laboratory for Plant Taxonomy and -Geography of the Agricultural University, Wageningen, where she started the revision of *Allium* for Africa under supervision of Prof. Dr. H. C. D. DE WIT.

From May to September 1972, and from January to June 1975 she worked with grants from WOTRO (Netherlands Foundation for the Advancement of Tropical Research), together with her husband in the Gunung Leuser Nature Reserves in Aceh, Indonesia, for botanical exploration and collecting.

Since 1972 she is member of the Netherlands Gunung Leuser Committee (W.N.F., Zeist, The Netherlands).

LIST OF PUBLICATIONS BY B. E. E. DE WILDE-DUYFJES

- The squid genus *Todarodus* in The Netherlands. Basteria 26: 73–82 (1962).

- *Festuca ovina* L., s.l. en *Festuca rubra* L., s.l. in Nederland. Gorteria 2,4: 40–48 (1964).

- On the growth rate of the foliiculous lichen *Strigula elegans*. Persoonia 4,4: 429–432 (1967).

- Over de twee ondersoorten van *Festuca rubra* L. in Nederland. Gorteria 6,8: 128–131 (1973).

- Typification of 23 *Allium* species described by Linnaeus and possibly occurring in Africa. Taxon 22(1): 57–91 (1973).