

Cajaninae of Australia (Leguminosae: Papilionoideae)

L. J. G. van der Maesen

Biosystematics Group (Herbarium Vadense), Nationaal Herbarium Nederland, Wageningen University Branch,
Gen. Foulkesweg 37, 6703 BL, Wageningen, The Netherlands; email: jos.vandermaesen@wur.nl

Abstract. An overview is given of the tribe Cajaninae in Australia. The number of species of the papilionoid tribe Cajaninae for the Flora of Australia is 34. *Cajanus* is represented by 17 species, most of these are endemic to Australia. *Dunbaria* has two species, *Eriosema* one and *Flemingia* eight, most of which are endemic apart from two widely distributed species that were introduced into Australia. *Rhynchosia* contributes six species, with the pantropical *R. minima* represented with four varieties. Several varieties distinguished by Domin have been upheld, one is relegated to synonymy.

Four new species are described: *Cajanus hirtopilosus* Maesen, *C. geminatus* Pedley ex Maesen, *Rhynchosia bungarensis* Maesen and *R. filiformis* Maesen. Typification of *Dunbaria punctata* is discussed and a neotype is designated.

Introduction

Research in pulse crop improvement invariably involves the wild relatives of pulse species. In the Leguminosae, the subtribe Cajaninae of the bean tribe Phaseoleae contains only a single crop: the pigeonpea *Cajanus cajan* (L.) Millsp. Apart from the most closely related wild species, most Cajaninae can be considered to belong in the tertiary genepool (Harlan and de Wet 1971) and some are of interest as gene donors because of properties such as disease and/or pest resistance (ICRISAT). For Asia, most of the genera have been revised (van der Maesen 1986, 1998) and several treatments for the large genera *Rhynchosia* and *Eriosema* are available for America and Africa, respectively. *Flemingia* is still in need of further revision. The publication of four new species is appropriate, as I came across taxa new to science that had already been discerned by Australian botanists in herbarium collections, most of these are in need of names and all require formal publication. A treatment for Australia is due, after Bentham's (1852, 1864) publications and the more recent notes of Pedley (1981) and the *Atylosia* revision by Reynolds and Pedley (1981). This paper is based on a presentation given during the Fourth International Legume Conference in Canberra, 2–7 July 2001. More unknown species can be expected from the vast areas, particularly the northern areas of the continent.

Taxonomic overview of Australian Cajaninae

Characters

The subtribe Cajaninae is a natural group within the tribe Phaseoleae. The key characters to distinguish the species of this group are as follows:

Vesicular glands: leaflets, calyx and pods generally have yellowish gland dots, turning orange and black on drying. On leaflets these gland dots are usually present on the lower surface, sometimes above as well. In densely hairy leaves the glands are hard to discern. The function of the glands is unknown, although the secretion of anti-feeding substances seems logical. When boiling the leaflets for close inspection, the vesicles disappear.

Bulbous-based hairs: many Cajaninae have bulbous-based hairs (Lackey 1978, 1981), usually on the calyx and pods. The sticky species, such as *Rhynchosia bungarensis*, or *R. filiformis*, have abundant bulbous-based hairs among the normal ones on leaves and stems. Detailed verification of the occurrence of this character would be useful within this subtribe, to which it is restricted.

Bracteoles: absent (except *Adenodolichos*).

Inflorescences: not nodose, straight.

Style: slender at base, thickened distally and glabrous except in *Adenodolichos*.

Taxonomy and biogeography

The subtribe Cajaninae Benth. probably originated in Africa, with only *Eriosema* (DC.) G. Don and *Rhynchosia* Lour. extending to the Neotropics, while most species of *Cajanus* DC. are endemic either in southern and south-eastern Asia, or Australia (Fortunato 2000). *Dunbaria* Wight & Arn. has most of its species in Indo-China and Indonesia, but extends to India, Japan and northern Australia. *Rhynchosia* is represented in South-east Asia and Australia with much fewer species than in Africa and the Americas. *Eriosema* is represented in Australasia by only one or two species, whereas it is rich in species in Africa and the Americas. In South Africa, the endemic genus *Chrysoseias* E. Mey. (three or four spp.) (B. Schrire, pers. comm.) and the monotypic *Fagelia* DC. (= *Bolusafra* Kuntze) are found. The monotypic *Carissoa* Baker f. occurs in Angola, but this might be an *Eriosema* (Stirton in Lackey 1981). *Atylosia* Wight & Arn. (Lackey 1981; Reynolds and Pedley 1981) and *Endomallus* Gagnep. (Lackey 1981) have become synonyms of *Cajanus* (van der Maesen 1986). *Flemingia* Roxb. ex W. & W.T. Aiton, mainly of Asian distribution, has c. 40 species and is at present under revision.

Cajaninae in Australia

At present 34 species can be recognised. *Cajanus* has 17 species, two newly described here, 15 are endemic, while the cultigen *C. cajan*, the pigeonpea, has been introduced as a pulse crop. *C. reticulatus* also occurs in Papua New Guinea. The genus has 34 species, most other species are found in the Indian subcontinent.

Dunbaria is represented by two species; none is endemic. *D. debilis* has a peculiar disjunct distribution; it is also found in the eastern Himalayas. The genus has 20 Asian species.

Eriosema is a large pantropical genus of c. 130 species and is represented by only one species, *E. chinense*, which also occurs in south-eastern Asia. In the Australian flora, *Flemingia* has eight species, three of which are endemic, one species is in common with Papua New Guinea and four also occur in southern and south-eastern Asia. The genus comprises up to 40 species, one of which is endemic in Africa and one is common in Africa and India.

Rhynchosia has six species, including two endemics newly described here and the pantropical species *R. minima*, with four varieties in Australia. The genus includes >200 species in mostly (sub)tropical regions.

Nomismia and Rhynchosia

Pedley (1981) gave the section *Nomismia* of *Rhynchosia* generic status. In Australia, it only contains *R. rhomboidea*. No recent world-wide sectional treatment is available; hence, I prefer to keep *Nomismia* in *Rhynchosia*. In *Rhynchosia* several sections are easily distinguished.

Occurrence in Australia

Being basically tropical taxa, Cajaninae are found in the northern part of Australia (Fig. 1). Most species occur in Western Australia, Northern Territory and Queensland in rather dry, somewhat moister habitats, usually near the coast. *R. minima* is widely distributed, also inland and extends to New South Wales. Species with a very restricted distribution are found in all northern states.

New species of Cajanus

Cajanus hirtopilosus Maesen, sp. nov. (Fig. 2)

Planta perennis volubilis Rami, costati griseo-pubescentes. Stipulae anguste triangulares apicibus filiformi deciduis. Foliola membranacea ovata apicibus acutis mucronatisque basibus late cuneatis sparsim griseo-pilosa. Pseudoracemi axillares tenuior. Bracteae ovatae deciduae. Calycis dentes angustissime triangulares caudatique et dentes adaxiales connati. Petala lutea breviter unguiculata vexillo bruneo-striato rotundato alisque triangularibus. Ovarium triovulatum. Legumina bi- vel tri-seminalis.

Perennial rampant twiner, aromatic, branches probably at least 1 m long. Branches ribbed, softly grey-pubescent. Stipules narrowly triangular, c. 12 mm long, 2 mm wide at base, tip filiform, caducous. Leaflets flat, membranous, ovate, 4–8 cm long, 2.5–6.5 cm wide, tip acute, mucronate, base broad-cuneate, densely hairy when developing, later sparsely grey-hairy both sides, mainly on the veins, these slightly prominent below, green above, grey-green below, yellow vesicular glands only below, small and inconspicuous. Pseudo-racemes axillary, rather thin, c. 5 flowers distally, bracts ovate, c. 12 mm long, 3 mm wide, covered with long soft hairs, caducous. Calyx with long soft hairs, tube c. 3 mm, teeth triangular-lineate, 8–11 mm long, adaxial teeth connate. Corolla yellow, standard striped maroon, rounded, 10 × 9 mm, base short-clawed, auricle rims thickened, wings triangular, 9 × 3 mm, base with short claw and two auricles, keel 9 × 4 mm, tip blunt, claws short; stamens 9 fused, vexillary stamen free, c. 8 mm, ovary ellipsoid, 2 mm long, 3-ovuled, long-hairy, style 6 mm. Pods brown, short-pubescent and thinly clad with longer hairs, 2- or 3-seeded, depressed between the seeds when ripe. Seeds flattened-ovoid, c. 4 × 4 × 1.5–2 mm, blackish brown with or without brown-red variegation, strophiole conspicuous, 2.5 mm long, 2-rimmed.

Note

Labelled as *Cajanus* sp. A for the Flora of the Kimberley region, by J. R. Wheeler.

Specimens examined

Type: WA: Merry's Ck, upper Glenelg River, C.A. Gardner 9642a (holo: PERTH; iso: PERTH). Wrens Gorge, 83 km NNW of Beverley Springs Homestead on Munja Rd, 16°01'S, 125°18'E, R.L. Barrett RLB 340



Fig. 1. Distribution of new Cajaninae in Australia: (a) *Cajanus geminatus*, (b) *Cajanus hirtopilosus*, (c) *Rhynchosia bungarensis* and (d) *Rhynchosia filiformis*.

(PERTH); Artesian Range, *W.V.Fitzgerald 1371* (PERTH); Prince Regent River, *C.A.Gardner 1370* (PERTH); NW Kimberley, 19 km SE of the mouth of Prince Regent River, 15°35'S, 125°11'E, *K.F.Kenneally 8923* (PERTH); Gardner distr., 15 km E of King Cascade, 15°36'00"S, 125°26'30"E, *K.F.Kenneally & B.P.M.Hyland 10540* (BRI, PERTH); W Kimberley, 4 km W of King Cascade on Prince Regent River, 3 km from the coast, *K.F.Kenneally & B.P.M.Hyland s.n.* 28.vi.1987 (PERTH).

***Cajanus geminatus* Pedley ex Maesen, sp. nov. (Fig. 3)**

Herba perennis effusa. Folia pinnatim trifoliolata foliolis membranaceis ovato-rhomboides usque ad ellipticis, 3–7 cm longis, 2–3.5 cm latis, utrinque glandulis vesicularibus. Pseudoracemi axillaris laxissimi ramosi pedunculis gracilibus usque ad 20 cm longis, floribus circiter 8, paribus dispositis. Calyx pubescens partim glandulosus, tubo *c.* 3 mm longo, dentibus triangularibus 3–5 mm longis costatisque, dentibus adaxialibus connatis. Vexillum rotundatum sine callis *c.* 8 × 8 mm basi unguiculatum auriculis parvis duabis. Ala obovata 7.5 × 2.5 mm, basi

clavata auriculataque, carina circiter 7 × 2.5 mm abaxialiter rotundata. Ovarium ovulis quatuor; stylus *c.* 5 mm longus. Legumen maturum abest.

Perennial straggling herb, branches up to 4.5 m long. Branches ribbed, grey-pubescent. Stipules triangular, minute, caducous. Leaf petioles canaliculate above, 3–6 cm, rachis 1–1.5 cm, stipellae linear, minute, 1 mm. Leaflets flat, membranous, ovate-rhomboid to elliptic, 3–7 cm long, 2–3.5 cm wide, terminal one largest, green above, glaucous green below, veins of both sides yellowish, hairy, somewhat prominent below, vesicular glands both sides. Pseudo-racemes axillary, very lax, branched, thin-peduncled, up to 20 cm long, *c.* 8 flowers. Bracts ovate-acuminate, 1–2 mm. Flowers usually 2, sometimes 1, per node. Calyx appressed pubescent, with vesicular glands, tube *c.* 3 mm, teeth triangular, 3–5 mm long, with a midrib, adaxial teeth connate. Standard rounded, *c.* 8 × 8 mm, base clawed, with 2 small auricles, no callosities, wings obovate, 7.5 × 2.5 mm,

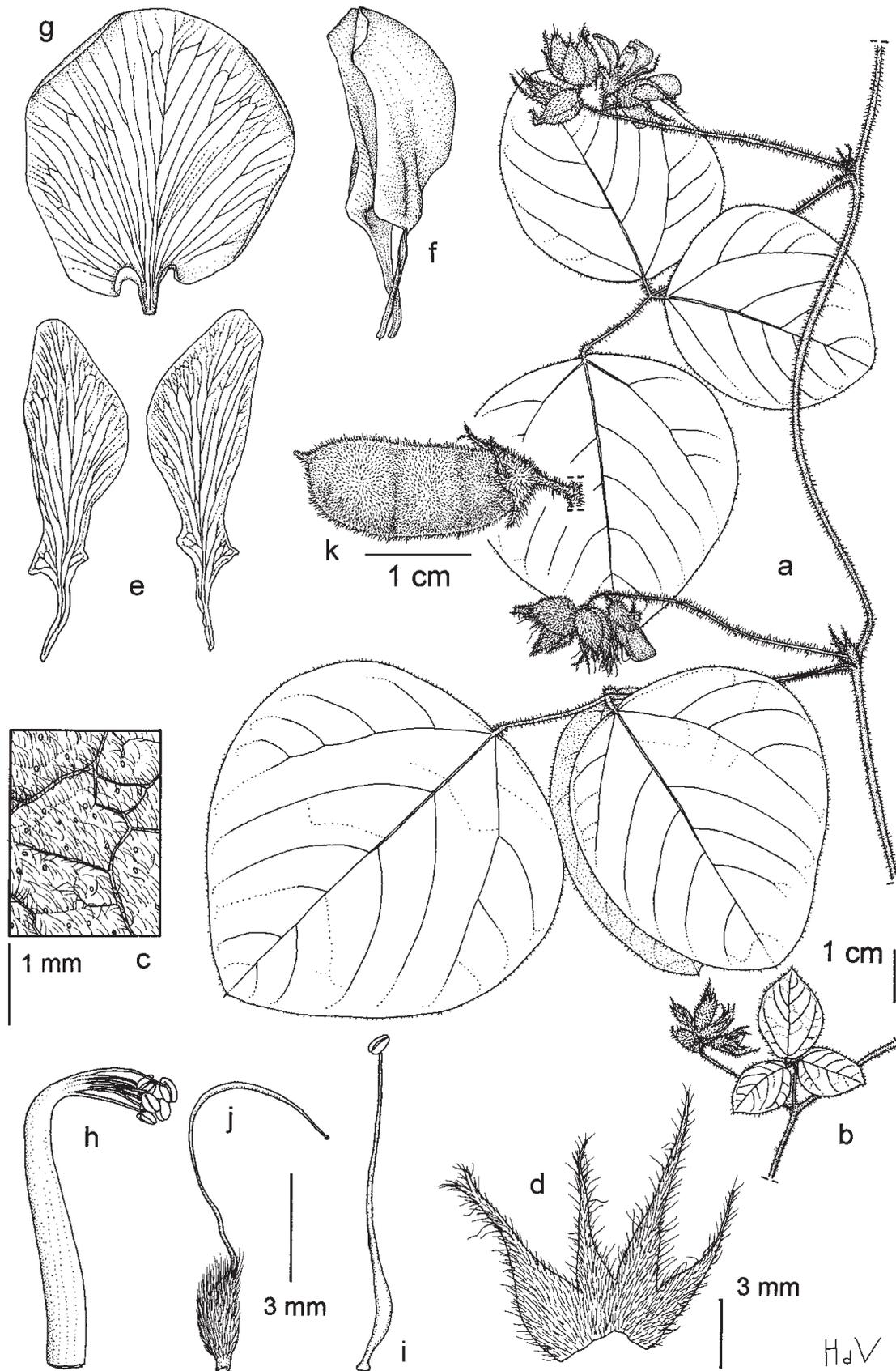


Fig. 2. *Cajanus hirtopilosus*. (a, b) Branches. (c) Detail of leaf indumentum. (d) Calyx exterior. (e) Wings. (f) Keel. (g) Flag. (h, i) Stamens. (j) Ovary. (k) Pod. a, K.F.Kenneally 8923; b, C.A.Gardner 9642a; c-k, R.L.Barrett RLB 340.

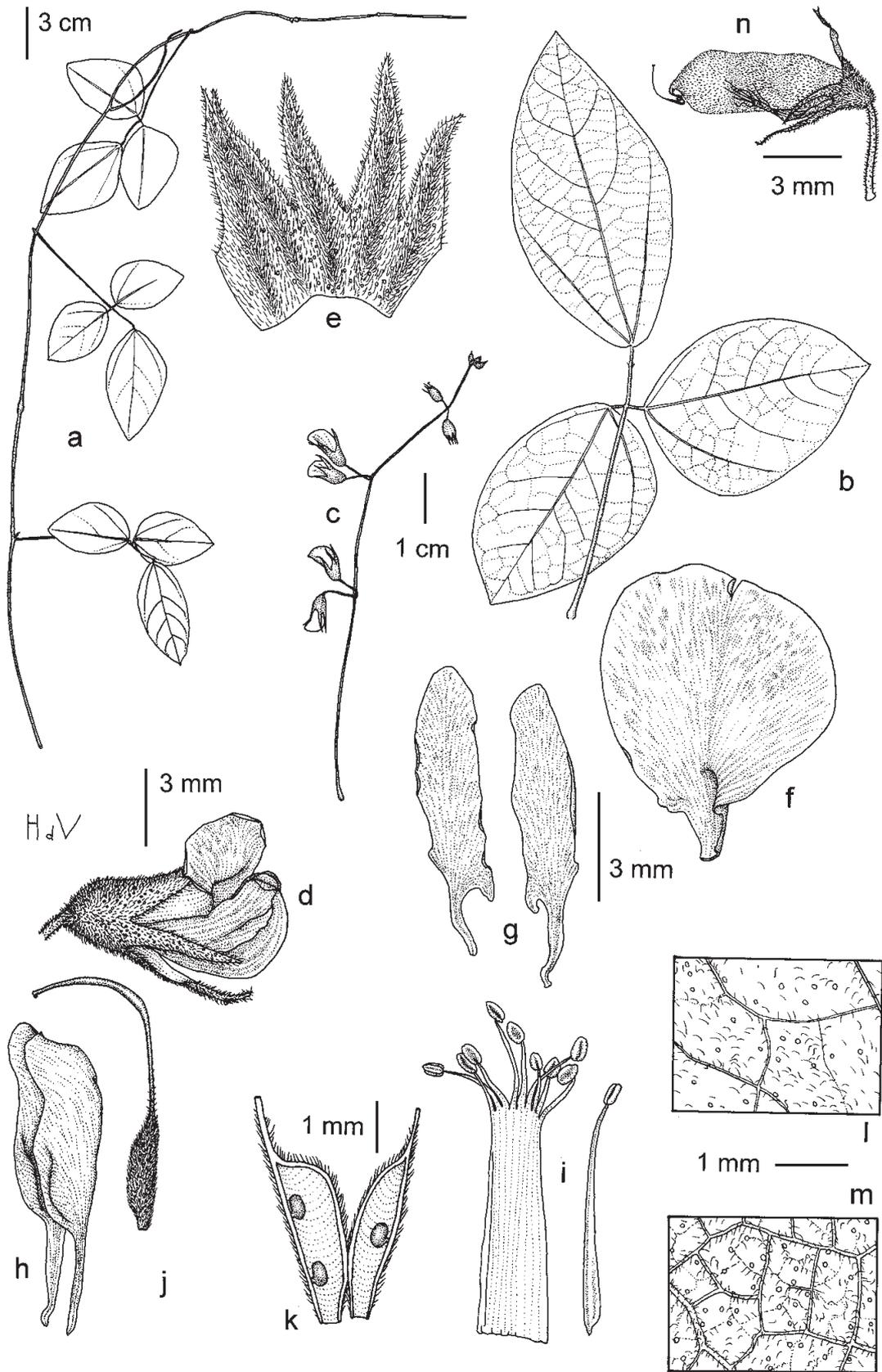


Fig. 3. *Cajanus geminatus*. (a) Habit. (b) Leaf. (c) Inflorescence with geminate flowers. (d) Flower. (e) Calyx. (f) Flag. (g) Wings. (h) Keel. (i) Stamens. (j, k) Ovary. (l) Detail of upper leaflet indumentum. (m) Detail of lower leaflet indumentum. (n) Pod. a, R.W.Johnson 4151; b, K.F.Kenneally 7999; c-n, C.R.Dunlop & J.A.Taylor 6131.

base clawed and auricled, keel *c.* 7 × 2.5 mm, abaxially rounded. Stamens 9 fused, vexillary stamen free, *c.* 7 mm, anthers dorsifix. Ovary with 4 ovules, style *c.* 5 mm. Ripe pods not available.

Notes

Designated by the Brisbane botanists, in particular L. Pedley, as *Rhynchosia* sp. Q1 (*geminata*), obviously because of the branched thin peduncles with twin flowers (geminate, paired) at the various nodes. The leaves have the aspect of those of *Cajanus reticulatus*. As depressions on the developing ovary are not clearly visible yet, the species might also be a *Dunbaria*. As there are four ovules, this species is not a *Rhynchosia*.

The habitat is red clay over laterite, in *Eucalyptus miniata*–*Livistonia* forest burnt the year previously, or open tall grassy forest on a well-drained slope, or open forest on sandy soil.

Specimens examined

Type: NT: Melville I., Snake Bay, 11°28'S, 130°42'E, open tall grassy forest of *Eucalyptus nesophila*, *E. miniata*, well-drained slopes. Fl. iv.1986. *R.W.Johnson 4151* (holo: BRI). WA: ± 4 km N of Airfield, Mitchell Plateau, 14°48'S, 125°47'E, 26.i.1982, *K.F.Kenneally 7999* (PERTH, sterile). NT: Munmarlary, 12°34'S, 132°42'E, *C.R.Dunlop 6131* & *J.A.Taylor* (S) (BRI, DNA n.v.).

New species of *Rhynchosia*

Rhynchosia bungarensis Maesen, sp. nov. (Fig. 4)

Suffrutex compactus prostratusque glutinosus pilis glandulosis substantiam oleosam secernentibus glandisque vesicularibus. Foliola late elliptica vel rhomboidea fere rotundata apicibus obtusa usualiterque mucronatis basibus late cuneatis super minute pubescentia usque ad glabrescentia venis impressis subtusque pubescentia venis prominentibus. Calyx glanduloso-pubescentis dentibus anguste triangularibus, dente abaxiali longissimo. Corolla lutea vexillo obovato, normaliter adaxialiter pubescenti et glanduloso-punctato in parte centrali supera basi unguiculato biauriculatoque rubro-venoso alisque longe unguiculatis adaxialiter magne auriculatis carinaque abaxialiter rotundata. Ovarium ellipticum; stylus curvatus in medio parum inflatus. Legumina falcata adaxialiter inter semina angustata pilis brevibus pilisque longioribus bulbosis glandulosisque etiamque glandulis vesicularibus.

Compact prostrate shrublet, 30–50 cm high, up to 90–120 cm wide, sticky with glandular hairs secreting an oily substance and orange-brown vesicular glands. Stipules long ovate-acuminate, striate, up to 5 mm long. Leaflets broad-elliptic or rhomboid, almost rounded, 12–35 mm long, 10–25 mm wide, apex obtuse usually mucronate, base broad-cuneate, thinly pubescent to glabrescent above, veins sunken, pubescent below on raised veins. Racemes axillary, short up to 5–8 cm long, *c.* 5–10 flowers. Bracts ovate, *c.* 1.5

mm long. Calyx with glandular hairs and vesicles, tube 2–3 mm, teeth long-triangular, 2–5 mm, abaxial one longest, imbricate at first. Corolla yellow, vexillum obovate, 9 × 6 mm, usually adaxially hairy and with glands at the central upper adaxial part, clawed and biauriculate at base, red-veined, wings *c.* 7.5 × 1.5 mm, long-clawed, a large adaxial auricle; keel 7.5 × 3 mm, abaxially rounded. Stamens 9 fused, adaxially one free, *c.* 8 mm. Ovary elliptic, *c.* 5 × 2 mm, style curved, *c.* 5 mm, a little swollen in the middle. Pods falcate, *c.* 15–20 × 5–6 mm, adaxially narrowed between the 2 seeds, with short hairs and longer bulbous-based glandular ones, as well as vesicular glands. Seeds reniform, *c.* 4 × 3 × 2 mm, brown-variegated with dark cream.

Notes

Similar to the sticky *R. rhomboidea*, but with pods as in *R. minima*. The oily secretion is not reported to have a fragrance. On the banks of a flow line in the mouth of a gully in the southern wall of a moderate-sized valley. Soil: pebbly and/or shingly coarse sand amongst boulders, some fine material. *Eucalyptus leucophloia*, *Acacia pruinocarpa* low open woodland over *Abutilon lepidum*, high open shrubland over *Tephrosia densa*, *Indigofera* aff. *monophylla* shrubland over *Triodia wiseana*, *Eriachne tenuiculmis* grassland. Distinguished by the Perth botanist M. E. Trudgen and in BRI, as a separate entity in *Rhynchosia* from Bungaroo Creek, hence its specific epithet.

Specimens examined

Type: WA: Hamersley Ranges, gully on S side of valley of Bungaroo Ck, 4.6 km almost due S of Yathala (Old Yalleen) Well, *M.E. Trudgen, M. Trudgen & S. Deluca MET 12402*, 4.v.1995 (holo: PERTH; iso: PERTH). WA: Yardie Ck, *K.M.Allen 446* (PERTH); *A.S.George 10297* (PERTH); *c.* 10 km E of Yarraloola Hsd in bed of Robe River, 21°38'54"S, 115°57'15"E, *A.A.Mitchell PRP 826* (BRI, PERTH); track up W side of Bee Gorge, *c.* 6 km W of Wittenoom, *A.A.Mitchell PRP 1095* (BRI, PERTH); Knox Gorge, Hamersley Range, *J.H.Willis 16.viii.1974* (MEL); Fortesque River. *J.Forrest, June 1878* (MEL); Deepdale, Robe River, *C.A.Gardner 6378* (PERTH); Yathala Well, near Mt Rice, *C.A.Gardner 6445* (PERTH).

Rhynchosia filiformis Maesen, sp. nov. (Fig. 5)

Herba perennis. Caules virides usque ad aureo-brunnei, pilis velutini griseis. Stipulae angustissime ellipticae deciduae. Rhachis griseo-velutina. Foliola ovata usque rhomboideo-ovata utrinque glandulis vesicularibus costaque super pubescente apicibus acuminatis mucronatisque, basi rotundatis usque ad cuneatis. Pseudoracemi axillares tenuissimis. Calyx pilosus dentibus adaxialibus semiconnatis denteque abaxiali longissimo. Corolla rubro-venata vexillo ovato apice emarginato. Legumina oblonga brunnea pubescentia grisea. Legumina biseminata.

Perennial herb, up to 1.5 m. Stems green to golden brown with velvet grey hairs. Stipules very narrowly elliptic,

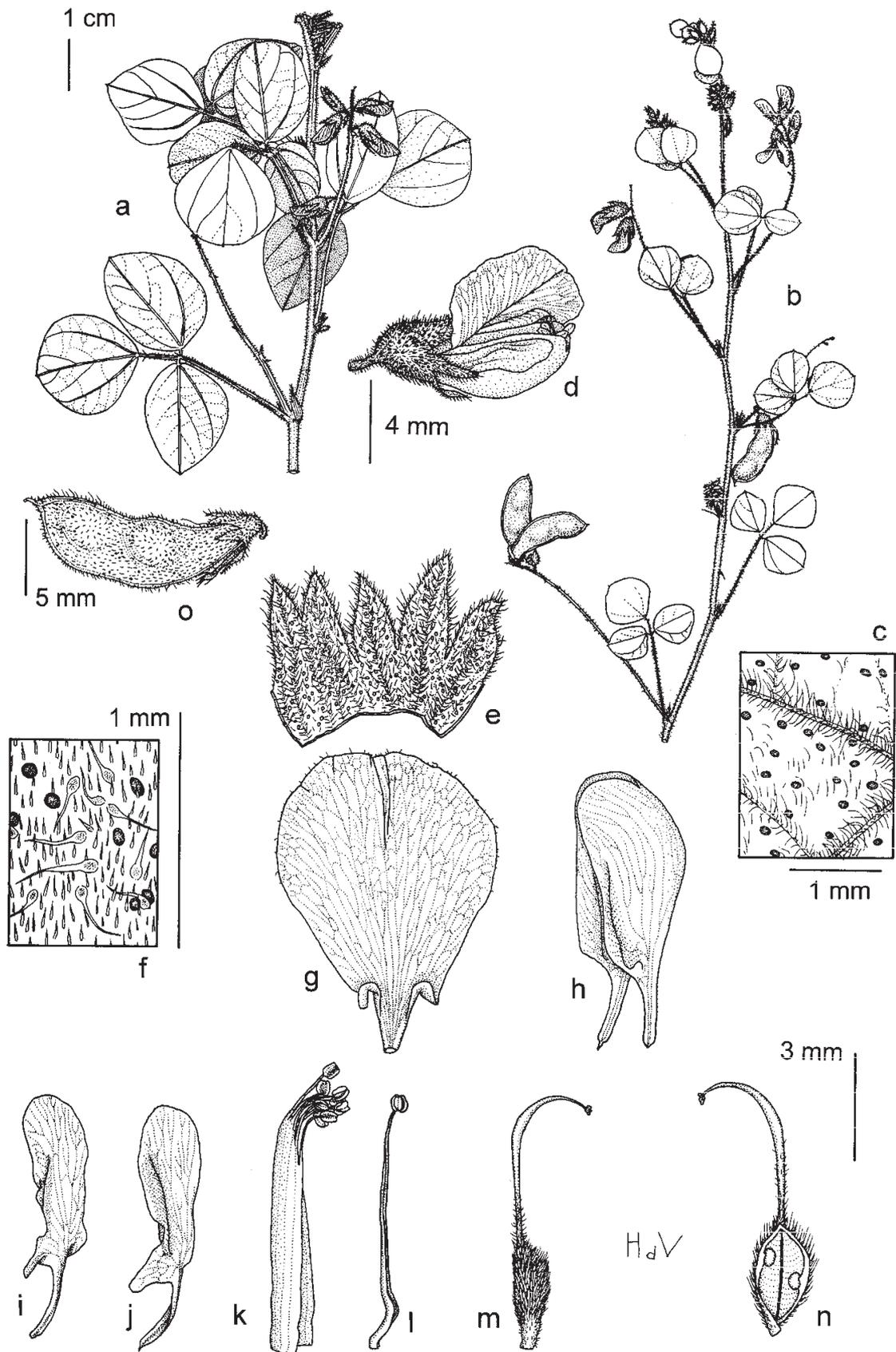


Fig. 4. *Rhynchosia bungarensis*. (a, b) Habit. (c) Detail of lower leaflet indumentum. (d) Flower. (e) Calyx. (f) Detail of calyx indumentum. (g) Flag. (h) Keel (i) Wing, exterior. (j) Wing, interior. (k, l) Stamens. (m, n) Ovary. (o) Pod. a–o, A.A.Mitchell et al. PRP 826.

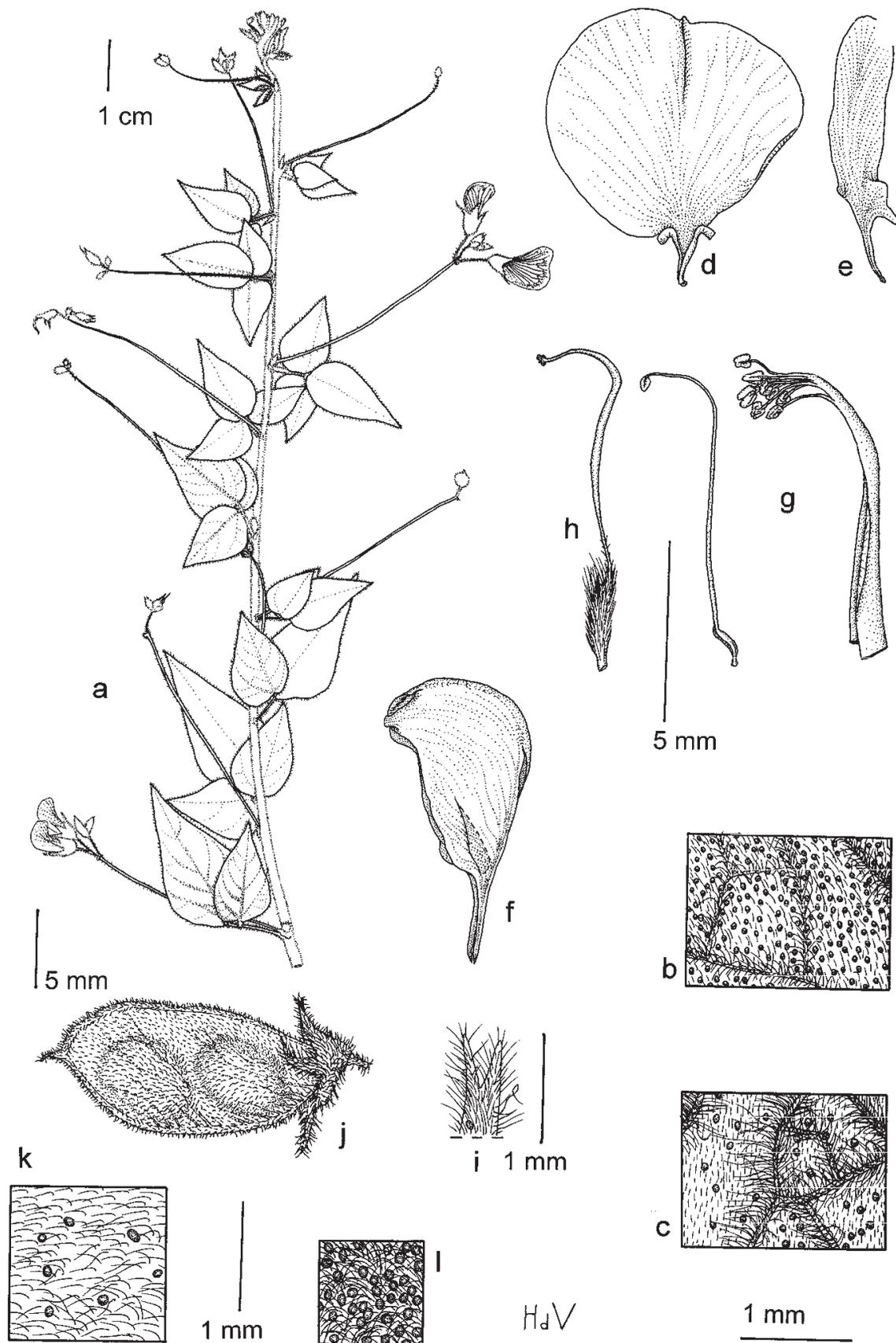


Fig. 5. *Rhynchosia filiformis*. (a) Habit. (b) Detail of upper leaflet indumentum. (c) Detail of lower leaflet indumentum. (d) Flag. (e) Wing. (f) Keel. (g) Stamens. (h) Pistil. (i) Upper sepals. (j) Pod. (k) Detail of pod indumentum. (l) Detail of calyx indumentum. a-m, B.G.Thomson 1414.

plumose hairy, *c.* 3 mm long, caducous. Leaf petioles 3–30(–40) mm long, rachis 3–12 mm, grey velvety. Leaflets ovate to rhomboid-ovate, 25–40 × 15–25 mm, side leaflets 15–30 × 7–20 mm, dotted with vesicular glands above as dense as below, sunken reticulate and midrib pubescent above, reticulate with raised veins below, tip acuminate and mucronate, base rounded to cuneate. Pseudoracemes axillary, peduncles very thin, 3–5 cm long, with *c.* 3–7 distal flowers, the first 2 paired, pedicels very thin, *c.* 5 mm. Calyx hairy, tube *c.* 3 mm, teeth 3–5 mm long, adaxial ones halfway connate, abaxial one longest. Corolla with red venation, standard ovate, emarginate at apex. Pods oblong, depressed in the middle when ripe, *c.* 15 × 7 mm, brown with grey pubescence, tipped by the remnant of the style. Seeds (1 or 2, immature in the specimens seen).

Notes

Belongs to section *Nomismia* (Wight & Arn.) Benth., *Fl. Austral.* 2: 266 (1864). Named *filiformis* from the Latin *filum*, thread, because of the thread-like peduncles. The species is found on sandstone scree or amongst boulders, e.g. at the edge of a vine thicket.

Specimens examined

Type: NT, 7 km W of Victoria River Inn, Gregory NP, 15°35'S, 131°06'E, common on lower slopes of sandstone hill amongst large boulders near roadside, *B.G. Thomson 1414* (holo: BRI; iso (not seen): CANB, DNA, NT). Two km E of Victoria River, 15°37'S, 131°09'E, sandstone talus, edge of vine thicket, *J. Russell-Smith 6519* (BRI; also in DNA, NT, not seen). Flowering and fruiting: December, March.

Synonymy in *Rhynchosia*

Rhynchosia minima var. *eurycarpa* Domin, *Biblioth. Bot.* 89:229 (1926): syn. nov. of *R. minima* var. *australis* (Benth.) C.Moore. T: WA, between Ashburton and Yule River, *E. Clement s.n.* (holo: PR; iso: K?, L).

The type is identical to the majority of *R. minima* var. *australis* (Benth.) C.Moore specimens. Domin determined *A. Dietrich 206* as *R. minima* (implying var. *minima*) but this sheet is var. *australis*.

Other varieties distinguished by Domin (1926) have been upheld.

Neotypification of *Dunbaria punctata*

The type of *Dunbaria punctata* (Wight & Arn.) Benth., Wight 996, most likely from Peninsular India, has not been traced (van der Maesen 1998). It is appropriate to assign a neotype for the time being. I have chosen Clarke 36579 B (BM) as neotype; it was collected in Balasun, in the Darjeeling Terai, West Bengal, India, on 12 or 15 October 1884. The herbaria G, K and US have sheets marked Clarke 36579 D, 36579 E and 36579 B, respectively. I consider these to be duplicates, hence isoneotypes. CAL also has a sheet (Satyanarayana 1993). Clarke 36579 is the Indian accession that I know to have the most duplicates, hence the choice.

Another Wight sheet, n. 765 from Quilon, S. India, has some *D. punctata* mixed among *Dolichos trilobus* (as *D. falcatus*). Material from southern India is very scarce or of dubious origin and Satyanarayana (1993) did not see it. *D. punctata* is widely spread from China to Australia. A single collection was found near Kika, east of Parakou, Benin, West-Africa; the first record from Africa.

Lectotypes of the well-known synonym *D. conspersa* Wight & Arn., Wallich 5542B (K and BM, G, K), could also have been assigned but this complicates matters.

Acknowledgments

This publication is part of a progressing taxonomic research in Cajaninae. For the funding of my participation in the Fourth International Legume Conference (July 2001) I am grateful to the Biosystematics Group Wageningen University. I appreciate the invitation by the organisers of the Legume Conference to present this overview in a plenary session. I acknowledge the provision of extensive herbarium loans by BRI, CANB, K, MEL, NT and PERTH by courtesy of their respective curators. The information supplied by individual Australian botanists was most stimulating. I am indebted to the herbarium staff at Wageningen for handling the various loans. Dr A. J. M. Leeuwenberg supplied the Latin diagnoses. Mr J. M. (Hans) de Vries prepared the illustrations.

References

- Bentham G (1852) In 'Plantae Junghuhnianae'. (Eds FAW Miquel, WH de Vriese) p. 242.
- Bentham G (1864) 'Flora australiensis, vol. 2.' pp. 261–269. (Reeve & Co.: London)
- Domin K (1926) Beiträge zur Flora und Pflanzengeographie Australiens. *Bibliotheca Botanica* 89, 228–229.
- Fortunato RH (2000) Systematic relationships in *Rhynchosia* (Cajaninae–Phaseoleae–Papilionoideae–Fabaceae) from the neotropics. In 'Advances in legume systematics, 9'. (Eds PS Herendeen, A Bruneau) pp. 339–354. (RBG Kew: London)
- Harlan J, de Wet JMJ (1971) Toward a rational classification of cultivated plants. *Taxon* 20, 509–517.
- Lackey JA (1978) Leaflet anatomy of Phaseoleae (Leguminosae: Papilionoideae) and its relation to taxonomy. *Botanical Gazette* 139, 436–446.
- Lackey JA (1981) Phaseoleae. In 'Advances in legume systematics, 1'. (Eds RM Polhill, PH Raven) pp. 301–327. (RBG Kew: London)
- van der Maesen LJG (1986) *Cajanus* DC., and *Atylosia* W. & A. (Leguminosae). *Agricultural University Wageningen Papers* 85-4, 1–225.
- van der Maesen LJG (1998) Revision of the genus *Dunbaria* Wight & Arn. (Leguminosae–Papilionoideae). *Wageningen Agricultural University Papers* 98-1, 1–109.
- Pedley L (1981) Notes on Leguminosae. II. *Austrobaileya* 1, 376–379.
- Reynolds ST, Pedley L (1981) A revision of *Atylosia* (Leguminosae) in Australia. *Austrobaileya* 1, 420–428.
- Satyanarayana P (1993) A taxonomic revision of the tribe Cajaneae (Fabaceae) in India. PhD Thesis, Calcutta University, India.

Manuscript received 6 December 2001, accepted 23 October 2002