BLUMEA 51: 309–332
Published on 27 July 2006 http://dx.doi.org/10.3767/000651906X622265

NOTES ON MALESIAN FABACEAE (LEGUMINOSAE–PAPILIONOIDEAE) 12. The genus Crotalaria

FRITS ADEMA

Nationaal Herbarium Nederland, Universiteit Leiden branch,
P.O. Box 9514, 2300 RA Leiden, The Netherlands

SUMMARY

Several species of *Crotalaria* are discussed. Two new species: *C. aiantha* Adema and *C. luzoniensis* Adema and one new variety: *C. assamica* Benth. var. *philippinensis* Adema are described. A key to the species in the Flora Malesiana area is presented. Notes on species not included in the Flora Malesiana treatment are given. Some aberrant specimens are discussed.

Key words: *Crotalaria*, Flora Malesiana, new species, new variety, key.

INTRODUCTION

Crotalaria L. is a large genus of Leguminosae (Papilionoideae–Crotalarieae) with c. 600 species in the tropics of Africa, America, Asia and Australia. Most species-rich is Africa with c. 500 species. For several parts of the distributional area local or continent wide revisions have been published: Thailand (Niyomdham, 1978), Africa and Madagascar (Polhill, 1982) and Australia (Holland, 2002). For the Flora Malesiana area a preliminary account (key, nomenclature, distribution) is available (De Munk, 1962). De Munk (1962) recognised for Malesia 38 species of which 7 were known from literature only and not recorded by herbarium specimens from the region. Only one of these species is given as a doubtfully indigenous species. In the treatment of *Crotalaria* for Flora Malesiana I have accepted 33 species, including two new ones, that are either indigenous or have escaped from cultivation and have become naturalized. Another 13 species have been recorded in literature or are present as herbarium specimens.

Crotalaria is most easily recognized by its often yellow flowers (but whitish to purplish or bluish flowers also occur) and its inflated pods. The ripe seeds are often loose and move around if the pods are shaken giving a rattling sound, hence several species have been called 'rattle pod'. If the leaves are compound they are digitately 3–7-foliolate.

Several species of *Crotalaria* have some economic importance as fibre plants, green manure, fodder plants or ornamentals. Especially *C. juncea* L. is cultivated as fibre plant, as Sunn hemp or Indian hennip (Chee & Chen, 1992). By PROSEA *Crotalaria* species have been included in Volume 4 (Forages) and 11 (Auxiliary Plants) ('t Mannetje & Jones, 1992; Faridah Hanum & Van der Maesen, 1997).

In the following sections several species will be discussed, two new species and one new variety will be described, a key to the species in the Flora Malesiana area will be

presented, notes on species not included in the Flora Malesiana treatment are given and some aberrant specimens are discussed.

CROTALARIA ASSAMICA

Crotalaria assamica Benth. (sect. *Crotalaria* subsect. *Crotalaria*) occurs from India to South China and Thailand. In the Flora Malesiana area the species is found only in the Philippines (Luzon, Bohol). However, the Philippine specimens differ from the continental Asian ones in the size of the stipules, bracteoles, flower parts, pods and seeds. Most remarkable is the difference in the size of the pods: in continental Asian specimens 40–60 by 15–20 mm, in Philippine specimens 34–40 by 10–18 mm. Table 1 gives an overview of the differences between the continental and the Philippine specimens. I think that the differences between the two groups of specimens are too small to justify a separate status as species. The Philippine specimens are described below as a new variety.

Table 1. *Crotalaria assamica* Benth.: differences between the continental var. *assamica* and the Philippine var. *philippinensis* Adema.

	var. *assamica*	var. *philippinensis*
Stipules	persistent, c. 4 mm long	caducous, 2–3 mm long
Bracteoles	c. 3 mm long	1–1.6 mm long
Standard, claw	c. 4 mm long	2 mm long
Standard, blade	c. 20 by 20 mm	13–18 by 11–18 mm
Wings, blade	c. 22 by 10 mm	12–14 by 6–7 mm
Keel petals, blade	c. 20 by 10 mm	13–15 by 6–7 mm
Pods	40–60 by 15–20 mm	34–40 by 10–18 mm
Seeds	c. 4 by 4 mm	4.5–5 by 4.5–5 mm

Crotalaria assamica Benth. var. **philippinensis** Adema, *var. nov.* — Fig. 1

> Var. *philippinensis* var. *assamicae* similis aspectis multis, longitudinem stipulorum (2–3 mm versus ca. 4 mm), bracteolarum (1–1.6 mm versus ca. 3 mm), floris partium seminumque differt. Discrepantia leguminis longitudine insignissima: var. *assamica* 40–60 mm longi 15–20 mm lati, var. *philippinensis* 34–40 mm longi 10–18 mm lati. — Typus: *BS 7255* (*M. Ramos*) (holo L), Philippines, Luzon, Prov. Abra, Jan.–Feb. 1909.

Dwarf shrub, c. 0.5 m high. *Twigs* terete, hollow, 4 mm diam., strigose. *Leaves* simple. *Stipules* acicular to triangular, 2–3 by 0.5–1 mm, outside sericeous, inside glabrous. *Petiole* mostly a pulvinus, 2–4 mm long, sericeous. *Leaf blades* (narrowly) elliptic, 6–16 by 1.5–5 cm, index 2.9–5, base cuneate to attenuate, apex acute or obtuse to rounded, apiculate, above glabrous, below sericeous, midrib flat to slightly sunken above, nerves flat or slightly raised above, 8–13 per side, 8–19 mm apart, venation ± reticulate. *Inflorescences* terminal, racemes 7.5–21 cm long, peduncle 0.5–4.5 cm long, sericeous. *Bracts* to the flowers (narrowly) triangular, 3–6 by 1–2 mm, outside sericeous, inside glabrous or sericeous at the base. *Pedicels* 5–7 mm long, sericeous. *Bracteoles* on the pedicels about halfway or higher, narrowly ovate to acicular, 1–1.6

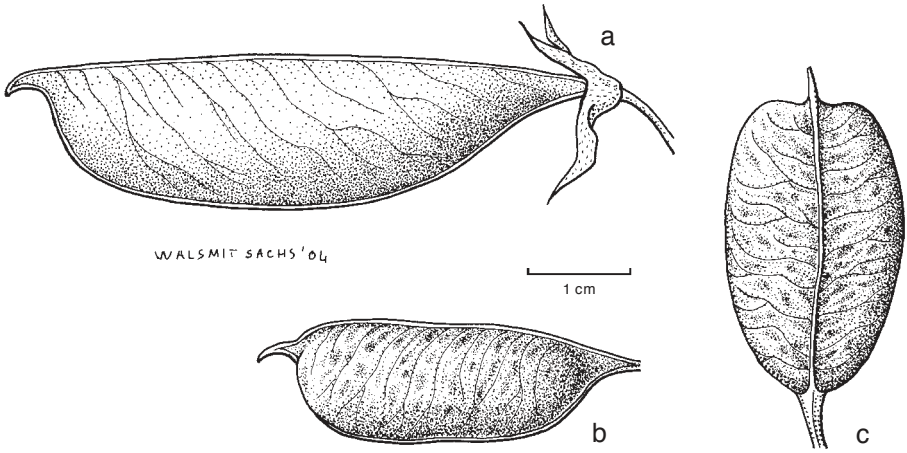

Fig. 1. *Crotalaria assamica* Benth. Fruits. a. Var. *assamica*; b. var. *philippinensis* Adema; c. var. *philippinensis* Adema, from above (a: *Garrett 475*; b, c: *BS 7255* (*M. Ramos*)).

by 0.2–0.6 mm, outside sericeous, inside glabrous at the base. *Calyx* 13–15 mm long, tube 3–5 mm long; teeth of upper lip triangular, 9 by 3–4 mm; lateral teeth triangular, 9 by 2.5–3 mm, median tooth triangular, 9 by 4 mm; outside sericeous, inside glabrous. *Standard*: claw 2 mm long, inside woolly up to base of callosities; blade obovate to orbicular, 13–18 by 11–18 mm, rounded, with two basal callosities, glabrous. *Wings*: claw 3–4 mm long, glabrous or ciliate along lower margins in lower half, some hairs inside at top; blade elliptic to ovate, 12–14 by 6–7 mm, rounded, glabrous, lateral pocket inconspicuous. *Keel petals*: claw 3.5–4 mm long; blade 'boat-shaped', rounded a little below the middle, 13–15 by 6–7 mm, beak well-developed, twisted, ciliate along upper margin from base of claw to base of blade, along lower margin to halfway the blade, lateral pocket 3–5 mm long. *Stamens*: tube oblique, 7–9 mm long, free parts of filaments 4–5 resp. 7–9 mm long, glabrous; anthers 2.5–3 by 0.6–0.7 resp. 0.7–0.8 by 0.5 mm, glabrous. *Disc* inconspicuous or annular, c. 0.4 mm high. *Ovary* 5–9 mm long, glabrous, stipe 2 mm long, glabrous; ovules many; style: thick part 3–4 mm long, glabrous, thin part 9–11 mm long, ciliate along both sutures at least in upper half. *Pods* ellipsoid, inflated, 34–40 by 10–18 mm, stipe 4–7 mm long, glabrous or with some appressed hairs at apex. *Seeds* obliquely heart-shaped, 4.5–5 by 4.5–5 × 1–1.5 mm; hilum eccentric, 0.5–1 mm long.

Distribution — Philippines (Luzon, Bohol).

Habitat & Ecology — Forest. Soil: rocky, ultrabasic. Altitude up to 300 m. Flowering: August, September; fruiting: January, February.

Specimens studied:

BS 7255 (*M. Ramos*), Philippines, Luzon, Prov. Abra, Jan., Febr. 1909; *BS 42736* (*M. Ramos*), Philippines, Bohol, Aug.–Oct. 1923; *FB 2021* (*T.E. Borden*), Philippines, Luzon, Prov. Bataan, Lamao River, Mt Mariveles, Sept.–Dec. 1904; *Hallier 4322*, Philippines, Luzon, Prov. Zambales, Subig, Jan. 1904.

CROTALARIA BRACTEATA

Crotalaria bracteata Roxb. ex DC. (sect. *Hedriocarpae* subsect. *Hedriocarpae*) is a species from Continental Asia, recorded from India, Burma, China and Thailand. Since long it was also reported from Luzon, the Philippines (Merrill, 1910, 1912, 1923). The Philippine material, however, differs in several aspects from the continental specimens. The Philippine plants are in general smaller in measurements of leaves, inflorescences and flower parts than the continental ones. The most striking difference is found in the bracteoles: In the Philippine plants inserted at the top of the pedicel or the base of the calyx, ± falcate, 0.6–1.2 by 0.3–1.1 mm; in the continental specimens inserted on the calyx tube and adnate for some length with this tube, obliquely ovate, 3–5 by 2–3 mm. Table 2 gives an overview of the other differences.

In other groups of related species in *Crotalaria* the differences between the member species are similarly small. In this case, especially seen the differences in the bracteoles, I think that the differences between the Philippine 'bracteata' specimens and those from continental Asia are sufficient to describe the material from Luzon as a separate species, closely related to *C. bracteata*.

Table 2. Differences between *Crotalaria bracteata* Benth. ex DC. and *C. luzoniensis* Adema.

	luzoniensis	*bracteata*
Leaves		
length petioles, mm	6–33	28–50
size blades, mm	10–82 by 3–35	40–100 by 15–55
Inflorescences, mm	7–65	100–110
Bracteoles	at top of pedicels or base of calyx	on and adnate for some length with the calyx tube
Blade of wing petals, mm	7–8 by 3–4	9 by 4
Blade of keel petals, mm	8–10 by 5–6	10 by 6
Stamens		
tube, mm	5–8	6–7
free part of filaments, mm	5.5–7 resp. 4–5	10 resp. 5
Anthers		
small, mm	0.4–0.5 by 0.3–0.4	0.6 by 0.6
large, mm	1.1–1.5 by 0.3–0.4	1.5 by 0.6

Crotalaria luzoniensis Adema, *spec. nov.* — Fig. 2

> *Crotalaria bracteata* similis, mensiones foliorum inflorescentiarum partium florique minores differt. Insignissime bracteolis dissimilis: in *C. luzoniensis* pedicelli apice vel calycis basi insertis plus minusve falcatis 0.5–1.2 mm longis 0.3–1.1 mm latis, in *C. bracteata* calycis tubo insertis et per aliquam longitudinem adnatis oblique ovatis 3–5 mm longis 2–3 mm latis. — Typus: *BS 29236* (*E. Fénix*) (holo L; iso BO, K, SING), Philippines, Luzon, Prov. Union, Bauang, 31 Dec. 1916.

Crotalaria bracteata auct. non Roxb. ex DC.: Merr. (1910) 63; (1912) 225; (1923) 271.

Shrub or treelet, up to 1 m high, dbh 2 cm. *Twigs* terete, 2–4 mm diam., strigose. *Leaves* digitately trifoliolate. *Stipules* ovate or triangular, 0.6–1 by 0.4–0.5 mm, caducous,

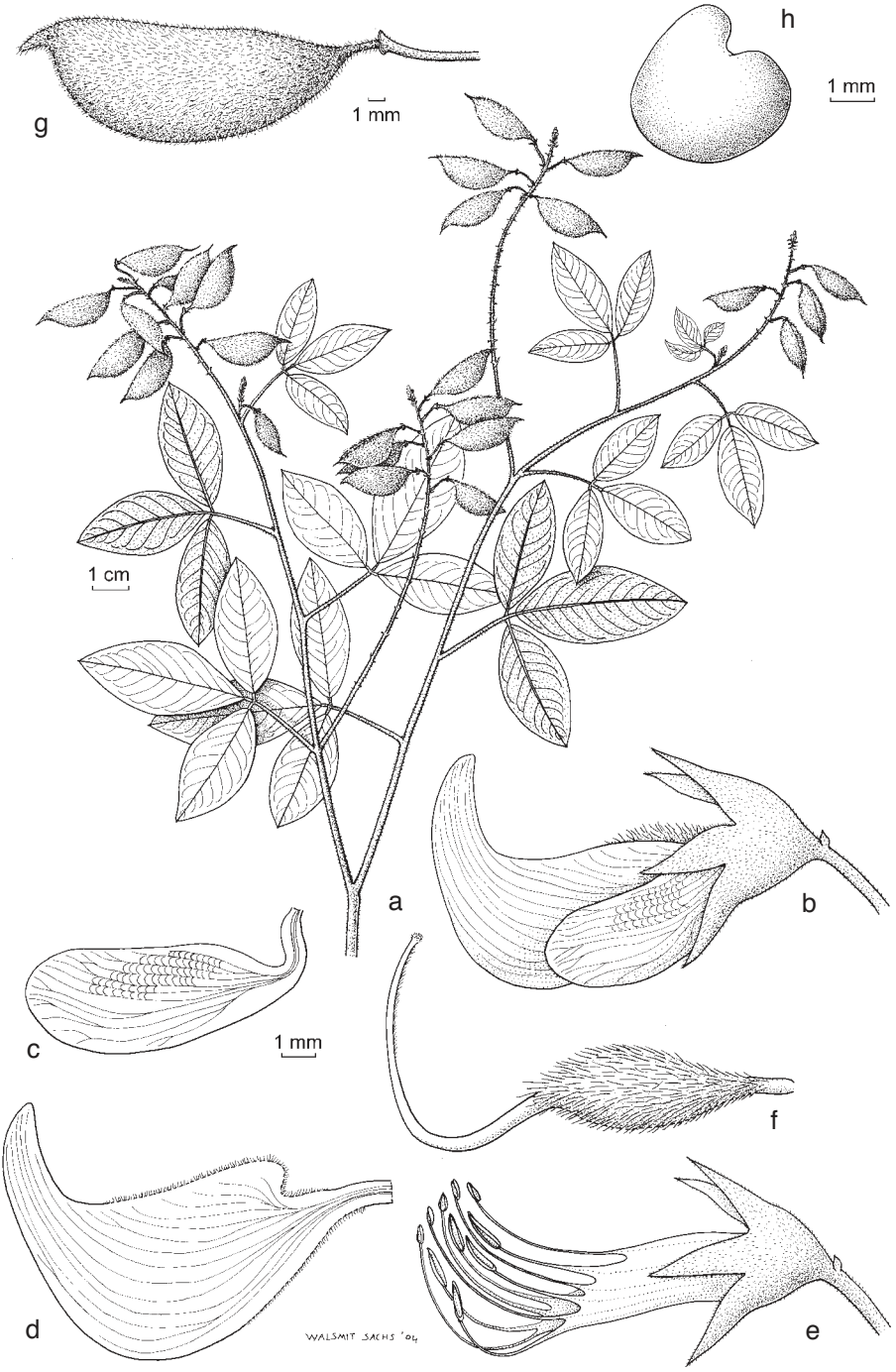

Fig. 2. *Crotalaria luzoniensis* Adema. a. Habit; b. flower; c. wing; d. keel petal; f. pistil; g. pod; h. seed (all: *PNH 18033*).

outside sericeous. *Petiole* 6–33 mm long, above flat or slightly grooved, sericeous; pulvinus 0.5–2 mm long. *Leaflets*: terminal ± elliptic, 1.5–8.2 by 0.3–3.5 cm, index 1.9–3, base cuneate to rounded, apex acute, rarely rounded, apiculate, above glabrous, or with some hairs along the midrib below (thinly) sericeous, midrib flat or slightly sunken above, nerves slightly raised above, 7–14 per side, 3–10 mm apart, venation reticulate; lateral moistly as the terminal, 1–6.5 by 0.5–2.9 mm, index 1.5–2.8; pulvinus 1–4 mm long. *Inflorescences* axillary or terminal or leaf-opposed, racemes 0.7–6.5 cm long, peduncle 0.2–2.5 cm long, sericeous. *Bracts* to the flowers ovate to triangular, 0.5–1.4 by 0.5–0.7 mm, ± persistent, outside sericeous, inside glabrous or with some hairs at the base. *Pedicels* 2.5–5 mm long, sericeous. *Bracteoles* at top of pedicels or base of calyx, ovate to triangular or ± falcate, 0.5–1.2 by 0.3–1.1 mm, outside sericeous, inside glabrous or with some hairs at the base. *Calyx* 5.5–9 mm long, tube 2–4 mm long; upper lip split to the tube, teeth narrowly triangular, 3–4 by 1–2.5 mm; lateral teeth triangular, 3.5–4 by 2–3 mm, median tooth triangular, 3–5 by 2–2.5 mm; outside sericeous, inside glabrous. *Standard*: claw 2–3 mm long, inside woolly up to the base of the callosities; blade broadly obovate to orbicular, 9 by 8–10 mm, rounded or emarginate, glabrous or outside with some hairs at midrib in upper part. *Wings*: claw 2 mm long; blade obliquely elliptic, 7–8 by 3–4 mm, rounded, glabrous. *Keel petals*: claw 2.5–3 mm long; blade broadly boat-shaped, 8–10 by 5–6 mm, acute, with a rounded, basal auricle, upper margin ciliate from top of claw to almost top of blade, along lower margin to 1/5–1/4 of blade. *Stamens*: tube 5–8 mm long, oblique, free part of filaments 4–5 resp. 5.5–7 mm long, glabrous; anthers 1.1–1.5 by 0.3–0.4 resp. 0.4–0.5 by 0.3–0.4 mm, glabrous. *Disc* inconspicuous to obliquely tubular, 0.3–0.5 mm high. *Ovary* 3.5–4 mm long, sericeous, stipe 2–2.5 mm long, with few hairs at apex to sericeous; ovules 8–12; style: thick part 3.5 mm long, sericeous at base, thin part 4.5–6.5 mm long, ciliate along the upper suture or both sutures in upper 1/3. *Pods* obovoid or ellipsoid, 15–19 by 8–10 mm, stipe 3–4 mm long, valves densely hirsute. *Seeds* obliquely heart-shaped, 3.5–5 by 3.5–5 by 1 mm; hilum 0.4–1 mm long.

Distribution — Philippines, Luzon.

Habitat & Ecology — Along forested ridges. Altitude up to 400 m. Flowering: October; fruiting: March, November, December.

Specimens studied:

BS 29236 (*E. Fénix*), Luzon, Prov. Union, Bauang, 31 Dec. 1916; *BS 43624*, Luzon, Ilocos Norte, Piddy; *Merrill 4316*, Luzon, Prov. Benguet, Bired River, Oct.–Nov. 1905; *PNH 18033* (*G.E. Edaño*), Luzon, Prov. Ilocos Norte, Mt Pico de Loro.

CROTALARIA FERRUGINEA AND CROTALARIA LEJOLOBA

Crotalaria ferruginea was described by Bentham in 1843. From 1852 onwards *C. lejoloba* Bartl. (1837) has been given as a synonym (e.g., Bentham, 1852; Miquel, 1855). Although the majority of the authors used *C. ferruginea* as the name for this species, the rules in the code for nomenclature necessitate the use of *C. lejoloba* because of priority. Only Hochreutiner (1925) and Alston (1931: 68, '*C. leioloba*') have used the latter name. For Flora Malesiana I have chosen to use the name *C. lejoloba* in its original spelling.

De Munk (1962) has discussed the same problem and also concluded that *C. lejoloba* has priority over *C. ferruginea*. However, he refrained from using *C. lejoloba* because of lack of a type specimen. On his request a search was made in the Göttingen Herbarium but no authentic specimen of *C. lejoloba* was found. Therefore the selection of a neotype is needed. As such I have selected *Hochreutiner 2747* (holo L), Java, Tengger, Bromo, Mer de Sable au Pied du Col de l'Idjen, 23 Jan. 1905. The full synonymy is given below.

Crotalaria lejoloba Bartl.

Crotalaria lejoloba Bartl. (1837) 2; (1838) 80; Hochr. (1925) 389; Alston (1931) 68 ('*leioloba*'). — Neotype (here designated): *Hochreutiner 2747* (holo L), Java, Tengger, Bromo, Mer de Sable au Pied du Col de l'Idjen, 23 Jan. 1905.

Crotalaria ferruginea Graham ex Benth. (1843) 476; Benth. (1852) 205; Miq. (1855) 327; Gagnep. (1916) 329; K. Heyne (1916) 266; Ridl. (1922) 560; Merr. (1923) 277; Craib (1928) 370; Burkill (1935) 694; De Munk (1962) 203; Backer & Bakh. f. (1964) 581; Niyomdham (1978) 131; Verdc. (1979) 578. — Type: *Wall. Cat. 5398* (n.v.).

Crotalaria pilosissima Miq. (1855) 327. — Type: not indicated.

Crotalari ferruginea Graham ex Benth. var. *major* Benth. (1843) 477. — Type: *Cuming 1628* (n.v.), Philippines.

Crotalaria ferruginea Graham ex Benth. var. *pilosissima* Benth. ex Baker (1879) 68. — Type: *Hook.f. & Thomson s.n.* (n.v.), India, Khasia.

Crotalaria lejoloba is in several aspects very similar to *C. mysorensis* Roth. According to De Munk (1962) the differences between these species are found in the bracteoles and in the length of the hairs on the calyx: *C. lejoloba*: bracteoles 5–8 mm long, hairs on the calyx less than 1.5 mm long; *C. mysorensis*: bracteoles 10–16 mm long, hairs on the calyx 3–4 mm long. Two specimens are more or less in between these two species: *Schiffner 2075* (Java, wild in Hortus Botanicus Bogor) has the longest hairs on the calyx, c. 2 mm long and bracteoles 11–12 mm long; *Brooke 10366* (Sarawak) has leaves similar in shape to those of *C. mysorensis*, longest hairs on the calyx 2–3 mm long and bracteoles c. 7 mm long.

CROTALARIA LINIFOLIA AND CROTALARIA MONTANA

The identity of *Crotalaria linifolia* L. is a long-standing and still unsolved problem. Several authors, including Gagnepain (1916), Merrill (1923), Craib (1928), De Munk (1962) and Backer & Bakhuizen van den Brink Jr. (1964), identify *C. linifolia* with *C. montana* Roth, while others, including Niyomdham (1978), Verdcourt (1979), Rudd (1991) and Holland (2002), identify *C. linifolia* with *C. tecta* K. Heyne ex Roth. The only one who gives clear differences between *C. linifolia* (incl. *C. tecta*) and *C. montana* is Rudd (1991: 187) in the key for *Crotalaria*. However, the flower size is probably the only truly distinguishing character there: *C. linifolia* should have flowers c. 10 mm long, *C. montana* c. 7 mm long. Niyomdham (1978: 144, 145) has 'seen' the types of *C. montana* and *C. linifolia* and concluded that they differ in flower characters. He distinguishes in his *C. montana* two varieties: var. *montana* with flowers 8–9 mm long and var. *angustifolia* (Gagnep.) Niyomdham with flowers 5–6 mm long.

Together, these varieties cover the gap given by Rudd (1991) and do away with this distinction between *C. linifolia* and *C. montana*. Holland (2002: 313–315) discusses the occurrence in Australia. She 'measured' the flowers of the type of *C. linifolia* on a photograph of the type concluding that they seem to be c. 10 mm long, and as the Australian material of this taxon has flowers c. 7 mm long she chose for *C. montana* as the name for the Australian plants.

In my opinion, comparing type specimens seen at different times or measuring flower sizes on photographs provide insufficient evidence for identification. A thorough analysis of all types is urgently needed to solve this problem.

Crotalaria linifolia, C. montana and *C. tecta* together with *C. albida* and probably other species form a complex of species. Study of much more material of these species from all over the geographical range may produce better differences between the species or at least a better understanding of the pattern of variability.

For the Flora Malesiana treatment I have chosen for the name *C. linifolia* with *C. montana* as a synonym.

CROTALARIA SEMPERFLORENS AND CROTALARIA VERRUCOSA

Among a group of *Crotalaria* species with large falcate stipules *C. semperflorens* Vent. and *C. verrucosa* L. often cause some problems. Although the characters that separate them are clear: *C. semperflorens*: leaflets glabrous above, rarely with some hairs, flowers yellow; *C. verrucosa*: leaflets sericeous above, flowers whitish to purplish (called 'blue' in literature), there are several specimens, collected in Java at high altitudes, that seem to fill the gap between the two species. These specimens have leaflets that are sericeous above and flowers that are yellow. Hochreutiner (1925) saw these specimens as intermediates between *C. semperflorens* and *C. verrucosa* and reduced *C. semperflorens* to a variety of *C. verrucosa*. De Munk (1962) correctly noted that there are no transitional specimens connecting *C. semperflorens* and *C. verrucosa*. However, both Hochreutiner and De Munk did not thoroughly analyse the material ± transitional between *C. semperflorens* and *C. verrucosa* and so missed the fact that these specimens do have several characters of their own. Although most of these characters concern sizes of leaflets, bracteoles, flower parts and fruits, they seem sufficient to give this small stack of specimens an independent status as a new species that is described below.

Crotalaria aiantha Adema, *spec. nov.* — Fig. 3

> *Crotalaria semperflorenti C. verrucosaque* similis. Cum *C. semperflorenti* characterem unum: corolla lutea, cum *C. verrucosa*: folia supra pubescentia. Praeter hanc combinationem *C. aiantha* ambabus speciebus mensionibus foliolorum bracteolarum floris partium et fructibus differt. — Typus: *Hochreutiner 2611* (holo L), Java, Tengger, au-dessous du col de Moengal, c. 2000 m, 12 Jan. 1905.

Crotalaria arnottiana auct. non Benth.: Benth. (1852) 205; Miq. (1855) 332; Koord. (1900) 267.

Subshrubs up to 2 m high (Koorders, 1900). *Stems* ± terete, upwards angular, 4–6 mm diam., sericeous. *Leaves* unifoliolate or simple. *Stipules* falcate, 7–17 by 3.5–9 mm,

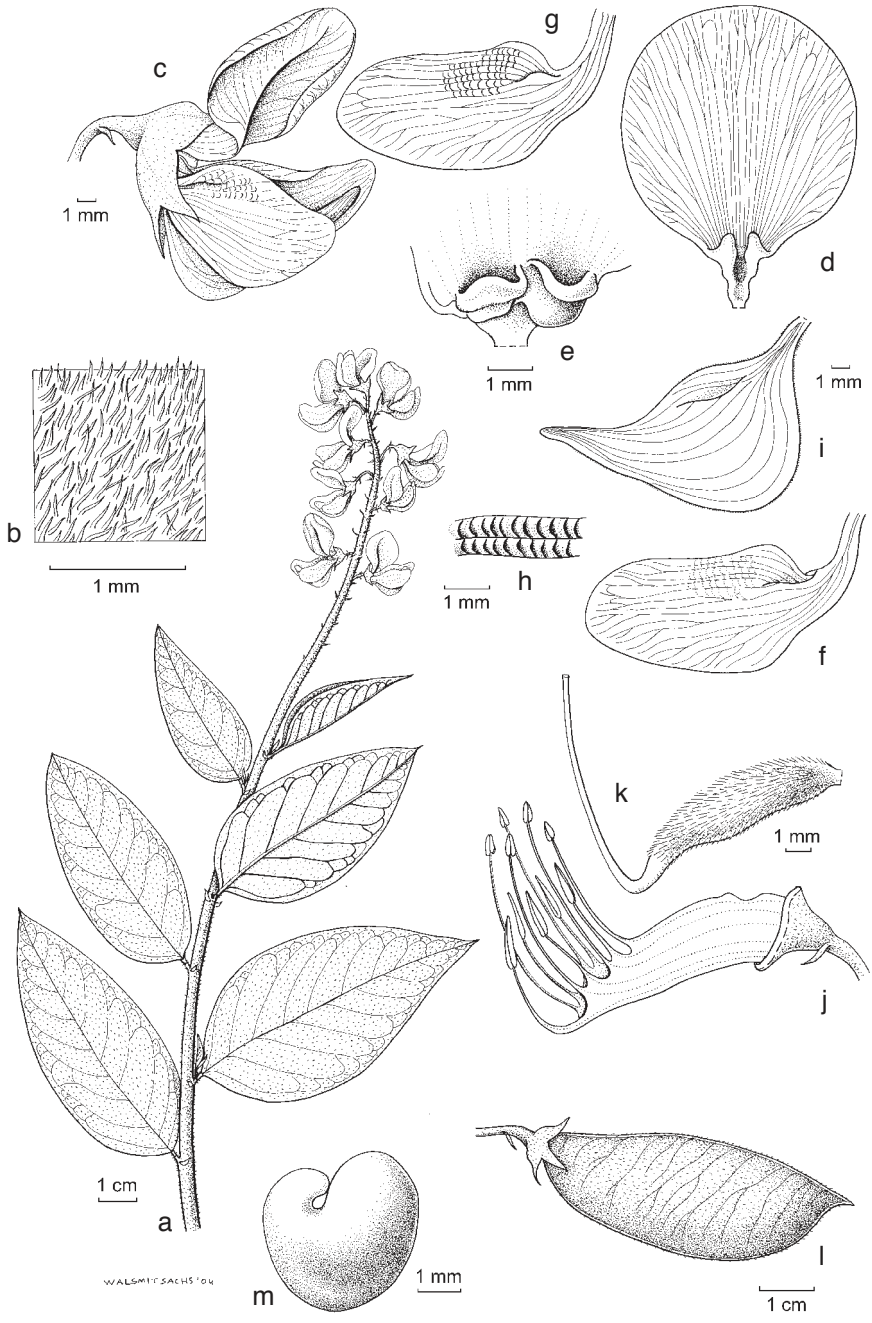

Fig. 3. *Crotalaria aiantha* Adema. a. Habit; b. detail upper surface of leaf; c. flower; d. standard from inside; e. detail showing the callosities; f. wing petal from inside; g. wing petal from outside; h. detail of the sculpting; i. keel petal from inside; j. stamens; k. pistil; l. pod; m. seed (a–k: *Dorgelo S299*; l, m: *Went s.n.*).

both sides sericeous. *Petiole* 3–7 mm long, sericeous. *Leaf blades* ovate, 6–12.5 by 3.5–8.5 cm, index 1.4–1.7, base truncate to broadly cuneate, apex rounded, apiculate, above (thinly) sericeous, below sericeous, midrib above flat or slightly sunken, nerves above flat, 7 or 8 per side, 5–16 mm apart. *Inflorescences* terminal, racemes 9–17.5 cm long, peduncle 4–7.5 cm long, sericeous. *Bracts* to the flowers ovate or triangular, 3–7 by 1–1.5 mm, outside sericeous, inside glabrous. *Pedicels* 6–9 mm long, sericeous. *Bracteoles* on the pedicels at 1–1.5 mm below the calyx to top of pedicel, (ovate to) triangular, 0.9–4 by 0.3–0.7 mm, outside sericeous, inside glabrous. *Calyx* 12–16 mm long, tube 6–7 mm long; teeth of the upper lip triangular, 7–8 by 4–7 mm; lateral teeth triangular, 6–8 by 4–5 mm, median tooth 6.5–9 by 3–5 mm; outside sericeous, inside glabrous. Corolla yellow. *Standard*: claw 2.5–3.5 mm long, inside woolly up to base of callosities; blade obovate to orbicular, 16–22 by 13–20 mm, rounded or slightly emarginate, outside glabrous to sericeous in upper part, inside glabrous. *Wings*: claw 4–5 mm long; blade (broadly) elliptic to (broadly) obovate, 11–19 by 7–13 mm, rounded, inside some hairs at top of claw and base of blade, sometimes some hairs at upper margin at top of claw or base of blade, lateral pocket inconspicuous, up to 3 mm long. *Keel petals*: claw 3.5–4 mm long; blade boat-shaped, 15 by 10–11 mm, with a twisted beak, lateral pocket 3–5 mm long, ciliate along lower margin from base of claw up to almost top of blade, along upper margin to halfway the blade. *Stamens*: tube oblique, 10–13 mm long, free part of filaments 4.5–7 resp. 9–10 mm long, glabrous; anthers 2.7–3.5 by 0.5–0.7 resp. 0.9–1.1 by 0.5–0.8 mm, glabrous. *Ovary* 7–10 mm long, sericeous, stipe 1–1.5 mm long, sericeous; ovules many; style: thick part 4–5 mm long, sericeous, thin part 9–12 mm long, ciliate along both sutures in upper part, rarely also along upper suture at base. *Pods* ellipsoid, inflated, 5.5–7 by 1.5–2 cm, stipe 4–5 mm long, sericeous. *Seeds* obliquely heart-shaped or kidney-shaped, 5–6 by 5–7 by 1.5–2 mm; hilum 0.7–1 mm long.

Distribution — Java.

Habitat & Ecology — Forests (Koorders, 1900), waste places. Altitude 1200–2300 m. Flowering: January, February, April, June, July, October, November; fruiting: January, February, October, November.

Note — Some specimens from India (*Anonymous s.n.* (herb. Hooker & Thomson), *B. Schmid 114, Wight 613*), which have been identified as *C. semperflorens*, have leaves with a hairy upper surface. However, without any indication of the flower colour it is impossible to decide to which species they really belong.

Specimens studied:

Backer 847, Java, Tosari, 1700 m, June 1913; *Backer 37299*, Java, Pasoeroean, G. Tengger, boven Tosari, 1800 m, Apr. 1927; *Danser 6608*, Java, Pasoeroean, Poedjan, 1200 m, Nov. 1926; *De Voogd 1806*, Java, G. Lawoe, 2000 m, Nov. 1925; *Docters van Leeuwen-Reijnvaan 4496*, Java, G. Tengger, Kletak, 1800 m, Apr. 1920; *Dorgelo 1498*, Java, Pasoeroean, Kletakpas boven Nonghodjadja, Nov. 1922; *Dorgelo S299*, Java, Madioen, G. Lawoe, boven Sarangan, 1500 m; *Hochreutiner 2611*, Java, Tengger, au-dessous de col de Moengal, 2000 m, Jan. 1905; *Junghuhn 103*, Java, Juni, Lawoe, 4000 ft/July, Wonosari; *Junghuhn 167*, Java, 'Ajang'; *Kobus s.n.*, Java, Tosari, 2000 m, Feb. 1899; *Koorders 37638*, Java, Ngadisari, 2200 m, Oct. 1899; *Koorders 37639*, Java, Ngadisari, 2300 m, Oct. 1899; *Mousset 53*, Java, Kletak, 1400 m; *Went s.n.*, Java Tengergebergte tussen Ngadisari, zandzee en Tosari, *Zollinger 2561b*, Java, Mt Tengger, 1500–2300 m, July 1858.

CROTALARIA TRICHOTOMA

Crotalaria trichotoma Bojer was in Asia formerly called *C. zanzibarica* Benth. or *C. usaramoensis* Baker f. For the last synonym Polhill (1982: 191) cites two collections as syntypes: *Stuhlmann s.n.* and *Stuhlmann 8216*. The duplicates of these specimens in Berlin have been lost. However, there are some fragments of *Stuhlmann s.n.* in BM (Polhill, 1982). I have chosen this specimen as the lectotype of *C. usaramoensis*.

Crotalaria trichotoma Bojer (1837) 88; Polhill (1990) 200. — Neotype (Polhill, 1990): *Bojer s.n.* (holo K, n.v.), 'Cult. in Hort. Maurit e Madagascaria'.

Crotalaria zanzibarica Benth. (1843) 584; Verdc. (1979) 548; Polhill (1982) 191. — Type: *Bojer s.n.* (holo K), Zanzibar Isl.

Crotalaria usaramoensis Baker f. (1914) 346; Burkill (1935) 892; De Munk (1962) 216; Backer & Bakh.f. (1964) 584. — Lectotype (here designated): *Stuhlmann s.n.* (holo B†, BM, fragm.), Tanzania, Uzaramo.

CROTALARIA VALETONII AND ITS ALLIES

Crotalaria valetonii Backer from Java (Kediri, Madura) is a member of a group of *Crotalaria* species that can be characterized as follows:

Erect widely branched plants with simple leaves. Stipules relatively large with black lower surfaces. Racemes mostly terminal on lateral branches giving the specimens a paniculate outlook. Bracts and bracteoles large, reflexed, black at the lower surface. Calyx black inside, teeth with revolute margins. Standard densely sericeous outside.

Crotalaria valetonii is according to Backer (1920) closely related to *C. ramosissima* Roxb. from India. According to De Munk (1962) *C. valetonii* is 'extremely' close to *C. madurensis* Wight from India. And according to Rudd (1991) *C. valetonii* is synonymous to *C. lunulata* K. Heyne ex Wight & Arn. (see also Kumar & Sane, 2003: 150). Other species that belong to this group are: *C. longipes* Wight & Arn., *C. paniculata* Willd., *C. pulchra* Andrews (*C. pulcherrima* Roxb. ex Sims), *C. shevazoyensis* Gamble and *C. subperfoliata* Wight. The members of the whole group seem to differ in characters like size of leaves, size of flowers and size of fruits. A more close study of this group and its relations with *C. berteroana* DC. (*C. fulva* Roxb.) and other unifoliolate members of section *Crotalaria* is needed to ascertain true identities of all species mentioned above. For Flora Malesiana I prefer to keep *C. valetonii* as a separate species.

When Backer described *C. valetonii* he did not give a type specimen. As far as I know a lectotype has never been chosen. Therefore, I select *Backer 21187* (holo BO; iso L) as the lectotype.

Crotalaria valetonii Backer

Crotalaria valetonii Backer (1920) 324; K. Heyne (1927) 768; De Munk (1962) 217; Backer & Bakh.f. (1964) 583. — Lectotype (here designated): *Backer 21187* (holo BO; iso L), Java, Madura, Amboetan, 3 July 1916.

KEY TO THE SPECIES OF CROTALARIA IN MALESIA

1a. Leaves digitately 3–7-foliolate 2
b. Leaves simple or unifoliolate. 12

2a. Leaves mostly with 5 leaflets, rarely mixed with leaves with 3, 4 or 7 leaflets 3
b. Leaves mostly with 3 leaflets. 4
3a. Stems filled with pith. Bracteoles inserted on the calyx tube. Calyx 7 mm long, hairy. Pods cylindric, thinly sericeous . . . . . **10. C. cleomifolia**
b. Stems hollow. Bracteoles inserted on the pedicels, 1–2 mm above the base. Calyx 13–15 mm long, mostly glabrous, sometimes with some hairs at the apical part of the teeth. Pods ellipsoid, glabrous . . . . . **25. C. quinquefolia**
4a. Stipules absent or present, 0.5–18 mm long, often caducous. Ovary and pods hairy. Stipe of ovary 0.2–5 mm long. Stipe of fruit up to 5 mm long. 5
b. Stipules absent. Ovary and pods glabrous. Stipe of ovary 6–12 mm long. Stipe of pods 20–30 mm long . . . . . **15. C. laburnifolia**
5a. Stipules absent or acicular to ovate or triangular, 0.5–9 mm long. Leaflets above glabrous, rarely with some scattered hairs 6
b. Stipules falcate, 7–18 mm long. Leaflets above with some hairs to sericeous along midrib. – Blade of standard c. 9 mm long. Pods 15–20 mm long. . . . . **11. C. goreensis**
6a. Stipules present, often caducous. Calyx outside sericeous 7
b. Stipules absent. Calyx outside mostly glabrous, sometimes some hairs at apex of teeth. – Bracts persistent till fruitset. . . . . **29. C. trichotoma**
7a. Bracteoles 0.4–1 mm long. Blade of standard 4–5.5 mm long. Pods 3–6 mm long 8
b. Bracteoles 0.5–9 mm long. Blade of standard 9–14 mm long. Pods 15–45 mm long 9
8a. Terminal leaflets (narrowly) obovate, 6–20 by 3–10 mm, apex rounded or truncate, emarginate. Pods obliquely globular, gibbous at base, 3–5 by 3–5.5 mm . . . . . **19. C. medicaginea**
b. Terminal leaflets (broadly) elliptic or elliptic-obovate, 10–31 by 5.5–7 mm, apex rounded, emarginate. Pods ± globular, not gibbous at base, 6 by 4–5 mm. . . . . **31. C. uncinella** subsp. **elliptica**
9a. Stipules (if present) acicular, (1–)3–9 mm long. Bracteoles 3.5–9 mm long . 10
b. Stipules (if present) ovate or triangular, 0.6–2 mm long. Bracteoles 0.6–1.5 mm long 11
10a. Bracteoles inserted at the top of the pedicels, 3.5–5.5 mm long, persistent. Stipe of pod 0.5–2 mm long . . . . . **13. C. incana**
b. Bracteoles inserted between middle and top of the pedicels, 6–9 mm long, caducous. Stipe of pod c. 5 mm long. . . . . **20. C. micans**
11a. Apex of leaflets acute, rarely rounded. Stipules 0.6–0.8 mm long. Bracts persistent till fruitset. Bracteoles inserted at 0.6–1.2 mm long. Pods 15–19 mm long . . . . . **18. C. luzoniensis**
b. Apex of leaflets obtuse to rounded, usually emarginate. Stipules 0.75–2 mm long. Bracts early caducous, often fallen before anthesis. Bracteoles inserted at the calyx tube, 1–1.5 mm long. Pods 40–45 mm long . . . . . **23. C. pallida**
12a. Stems not winged. 13
b. Stems winged by decurrent stipules. . . . . **3. C. alata**
13a. Ovary and pods hairy. 14
b. Ovary and pods glabrous, rarely with few scattered hairs (*C. beddomeana*) . 20

14a. Stipules absent or present, acicular or linear to narrowly elliptic, or (broadly) obovate, 1–7(–20) mm long. Bracts 4–11 mm long. Calyx 10–24 mm long. Pods 10–32 mm long 15
b. Stipules obliquely ovate to falcate, 1.5–22 mm long. Bracts 2.5–7 mm long. Calyx 10–14 mm long. Pods 30–70 mm long 17
15a. Stipules absent, or, if present, acicular or linear to narrowly elliptic, 1–7 mm long, not black inside when dry. Bracts and bracteoles not black inside when dry. Calyx not black inside when dry, teeth with flat margins. 16
b. Stipules (broadly) obovate, c. 20 mm long, black inside when dry. Bracts and bracteoles black inside when dry. Calyx black inside when dry, teeth with revolute margins. – Bracts and bracteoles cordate. . . . . **32. C. valetonii**
16a. Bracts 8–11 mm long. Calyx 13–15 mm long. Pods 10–16 mm long . . . . . **7. C. berteroana**
b. Bracts 4 mm long. Calyx 22–24 mm long. Pods 25–32 mm long **14. C. juncea**
17a. Leaves glabrous above, rarely with some hairs 18
b. Leaves (thinly) sericeous above. 19
18a. Stems terete, upwards ± angular. Leaves 30–110 mm long. Bracteoles inserted at the pedicels at 3–7 mm above the base, sometimes up to the top of the pedicels or the base of the calyx. Pods 30–60 mm long . . . . . **27. C. semperflorens**
b. Stems angular. Leaves 7.5–53 mm long. Bracteoles inserted at the top of the pedicels. Pods c. 21 mm long. . . . . **30. C. triquetra**
19a. Leaf bases truncate or rounded to broadly cuneate. Bracteoles at the pedicels just or at most 1.5 mm below the calyx. Corolla yellow. Pods 5.5–7 by 1.5–2 cm. . . . . **2. C. aiantha**
b. Leaf bases cuneate. Bracteoles at the pedicels at about halfway. Corolla whitish or purplish. Pods 3.5–4.5 by 1–1.5 cm . . . . . **33. C. verrucosa**
20a. Stipules usually absent, or, if present not falcate. Pods 4–45 mm long 21
b. Stipules falcate. Pods c. 50 mm long. . . . . **6. C. beddomeana**
21a. Bracteoles inserted at the pedicels or at the base of the calyx. 22
b. Bracteoles inserted at the calyx tube 29
22a. Leaves above (thinly) sericeous. 23
b. Leaves above glabrous or with scattered appressed hairs, mostly along the midrib 25
23a. Calyx 4–13 mm long. Pods 4–15 mm long. 24
b. Calyx 13–18 mm long. Pods 20–45 mm long . . . . . **16. C. lejoloba**
24a. Stipules absent, rarely present, up to 0.5 mm long. Bracts 5.5–8 mm long. Calyx 8–13 mm long. Pods 11–15 mm long . . . . . **9. C. chinensis**
b. Stipules 2–3.5 mm long. Bracts 0.8–1.3 mm long. Calyx 4–5 mm long. Pods 4–7 mm long . . . . . **12. C. humifusa**
25a. Bracts 2.8–6 mm long. Pods 34–50 mm long 26
b. Bracts 5.5–20 mm long. Pods 11–22 mm long. 27
26a. Stipules c. 3 mm long. Leaves 75–135 mm long, apex acute or obtuse to rounded. Bracts 4–6 mm long. Pods 34–35 mm long **5. C. assamica** var. **philippinensis**
b. Stipules 1–2 mm long. Leaves 25–95 mm long, apex rounded, emarginate. Bracts 2.8–4 mm long. Pods 35–50 mm long . . . . . **26. C. retusa**

27a. Stipules (0.3–)1–8 mm long. Apex of leaves acute, rarely obtuse or rounded. Calyx 12–21 mm long. Pods 14–22 mm long 28
b. Stipules absent, rarely present, up to 0.5 mm long. Apex of leaves rounded. Calyx 8–13 mm long. Pods 11–15 mm long . . . . . **9. C. chinensis**
28a. Bracts 12–20 mm long. Calyx 20–21 mm long. Pods 20–22 mm long . . . . . **8. C. calycina**
b. Bracts 6.5–10 mm long. Calyx 12–17 mm long. Pods 14–15 mm long . . . . . **28. C. sessiliflora**
29a. Stipules usually absent, if present patent or not, up to 5 mm long. Bracts 1–6 mm long. Calyx 5–14 mm long. Pods 6–16 mm long 30
b. Stipules patent, 6–19 mm long. Bracts 14–21 mm long. Calyx 15–19 mm long. Pods 35–40 mm long. . . . . **21. C. mysorensis**
30a. Stipules absent, or, if present, not patent up to 2 mm long. Bracts 1–2.8 mm long 31
b. Stipules patent, 1–5 mm long. Bracts 4.5–6 mm long . . . . . **1. C. acicularis**
31a. Blade of standard 4–10 by 2.5–4 mm. Pods 6–10 mm long 32
b. Blade of standard 3–3.5 by 1.7–3 mm. Pods 13–16 mm long . **24. C. prostrata**
32a. Leaves linear to narrowly ovate or narrowly obovate, sometimes elliptic. Calyx 7–14 mm long. Pods 6–10 mm long 33
b. Leaves elliptic or obovate. Calyx 6 mm long. Pods 6 mm long . . . **22. C. nana**
33a. Apex of leaves rounded. Pods 8–10 mm long. . . . . **4. C. albida**
b. Apex of leaves obtuse to rounded or truncate. Pods 6–8 mm long. . . . . **17. C. linifolia**

NOTES ON OTHER SPECIES

Earlier treatments of *Crotalaria* for the Flora Malesiana area mentioned, apart from the taxa treated in the previous sections or given in the key, a number of species that have been cultivated in the area or were thought to occur there. My own study of *Crotalaria* in Malesia added several more. For these species there is no evidence that they ever escaped cultivation and became naturalized. Some of the specimens on which the records are based may not have been collected in the Flora Malesiana region at all. The species are discussed below.

1. *Crotalaria barbata* Graham ex Wight & Arn. (1834) 181; Miq. (1855) 338; De Munk (1962) 201. — Type: *Wall. Cat. 5394* (n.v.), India, Neelgherries.

Miquel mentions a Horsfield specimen from Java (*Horsfield s.n.*, Java bij Soerakarta). No specimen was found in A, BO, K, L, PNH, SING.

2. *Crotalaria biflora* (L.) L. (1771) 570; Miq. (1855) 326; Baker (1879) 66; De Munk (1962) 201; Backer & Bakh.f. (1964) 582. — *Astragalus biflorus* L. (1771) 273. — Type: not indicated. The correct name for this species is *C. angulata* Mill.

Hasskarl (1844: 270), Miquel (1855) and Baker (1879) mentioned this species for Java. No specimens are known from this island. See also Backer & Bakhuizen Jr. (1964: 582).

3. *Crotalaria guatamalensis* Benth. ex Oerst. (1854) 2. — Type: not indicated.

According to M.D. Sulit, who collected a specimen of this species in the Philippines (*PNH 7013*, Luzon, Laguna Prov., Mt Makiling, 7 March 1947), this species was planted as soil improver. No later collections are known. The species was probably not successful.

4. *Crotalaria lanceolata* E. Mey. (1836) 24; Polhill (1982) 193. — Type: *Drege s.n.* (K, MO, P, n.v.), South Africa, KwaZulu-Natal, between the rivers Umzimkulu (Omsamculo) and Omkomaas (Omcomas).

Burkill collected this species in a garden in Sumatra, Brastagi, grassland, Dec. 1921 (*Burkill 68*, SING). Clearly only locally cultivated and never collected again.

5. *Crotalaria mesoponticum* Taub. (1895) 207; De Munk (1962) 209; Backer & Bakh. f. (1964) 584. — Lectotype (Polhill, 1982): *Stuhlmann 4047* (K, BM, fragm., n.v.), Tanzania, Bukoba.

According to Backer & Bakhuizen Jr. (1964) sometimes used as green manure in Java. No Javanese specimens are present in A, BO, K, L, PNH, SING. The species is a native of Africa.

6. *Crotalaria ochroleuca* G. Don (1932) 138; Verdc. (1979) 285; Polhill (1982) 188. — Type: *G. Don s.n.* (BM, n.v.), Sao Tomé.

According to Verdcourt (1979) in plantations in Papua New Guinea. Cultivated? Specimen seen: *NGF 11585* (*Henty*) (K), Papua New Guinea, Morobe Prov., Markham Valley, Bubia plantation.

7. *Crotalaria orixensis* Willd. (1803) 217; Miq. (1855) 347; Merr. (1923) 273; De Munk (1962) 211. — Type: not indicated.

According to Merrill (1923) once collected in Luzon: *BS 19245* (*Guerro*), Luzon, Manila. 'Apparently as a casual introduction which will perhaps not persist.' In K a specimen is present as *L. Guerro s.n.* (ex BS). Probably this is the same specimen as *BS 19245* cited by Merrill. No other specimen of *C. orixensis* has been collected in the Flora Malesiana region.

8. *Crotalaria paniculata* Willd. (1802) 780; Miq. (1855) 337; De Munk (1962) 211; Backer & Bakh. f. (1964) 383. — Type: *Herb. Willdenow s.n.* (n.v.), Java, Malabaria.

Crotalaria paniculata was described by Willdenow (1802) on a specimen said to be collected in 'Malabaria, Java'. As with *C. tetragona* Roxb. ex Andrews (see below) this may be a misquotation for Malabar in India. Another possibility was suggested by De Munk (1962): confusion with a specimen collected by Sonnerat. No Malesian specimen of *C. paniculata* is present in A, BO, K, L, PNH, SING.

9. *Crotalaria pilosa* Mill. (1768) Crotalaria 2. — Type: not indicated.

A specimen (*Herb. Hasskarl 16*, Java) originally identified as '*Crotalaria alata*' proved to be identical with a specimen from Colombia (*H.H. Smith 60*). The specimens '*Hasskarl 16*' (L 908.114-1226) and *H.H. Smith 60* (L 908.114-426) were mounted at about the same time. Probably some mistake was made in putting specimens and labels together.

10. *Crotalaria pulchra* Andrews (1810) t. 601; DC. (1825) 1267. — Type: not indicated.
Crotalaria pulcherrima Roxb. ex Sims (1819) t. 2027; DC. (1825) 125; Roxb. (1832) 287; Miq. (1855) 356. — Type: not indicated.

Miquel (1855) suggested that this species might be cultivated in the Sunda Islands. However, there is no evidence that *C. pulchra* ever was cultivated in the Flora Malesiana region.

11. *Crotalaria rubiginosa* Willd. (1802) 973; Miq. (1855) 328; De Munk (1962) 213; Backer & Bakh. f. (1964) 579. — Type: not indicated.
Crotalaria wightiana Graham ex Wight & Arn. (1834) 181; Miq. (1855) 329. — Type: *Wall. Cat. 5358* (n.v.), India, Dindygrah hills.

Miquel (1855) mentioned (sub *C. wightiana*) two Zollinger specimens of '*Crotalaria alata*' (*Zollinger 1116, 1184*) from 'Java, bij Gondang op woeste akkers'. Up to now I have not found these specimens.

12. *Crotalaria spectabilis* Roth (1821) 341; Niyomdham (1978) 155; Verdc. (1979) 584; Polhill (1982) 373. — Type: *Heyne s.n.* (iso L), India.
Crotalaria sericea Retz. (1789) 26, nom. illeg., non Burm. f. (1768); Miq. (1855) 330; Ridl. (1922) 561; Craib (1928) 373; De Munk (1962) 214. —Type: *Koenig s.n.* (n.v.), India.

In the Flora Malesiana area once collected in Papua New Guinea (*NGF 24013*) in a deserted garden. There is no evidence that the species is naturalized in the area.

Due to a misinterpretation by Willdenow (1802) of *C. juncea* a confusion arose by which *C. juncea* and *C. sericea* Burm. f. were separated. Malesian material referred to *C. sericea* belongs to *C. juncea* and not to *C. spectabilis* (see De Munk, 1962).

13. *Crotalaria tetragona* Roxb. ex Andrews (1810) t. 593; Zoll. (1846) 52; Miq. (1855) 335; De Munk (1962) 215; Backer & Bakh. f. (1964) 582. — Type: *Valentia s.n.* (n.v.), cultivated in a garden at Arly.
Crotalaria grandiflora Reinw. ex Miq. (1855) 333. — Type: *Reinwardt s.n.* (holo L; iso U), Java.

Zollinger (1846) cites one of his own collections from Java (*Zollinger 2205*). Miquel (1855: 335) adds a second specimen from Sumba (*Zollinger 1173*). Up to now I have not found these specimens. They may belong to *C. juncea*.

Miquel (1855: 333) described *C. grandiflora* using a manuscript name and a specimen of Reinwardt. The label of this specimen indicates 'Malabar' as locality. Some authors suggested that this could be Mt Malabar on Java; however, it is more probable that the plant came from Malabar in India, were *C. tetragona* is a part of the flora.

NOTES ON SPECIMENS

1. *Teruya 1726*, Malaysia, Johore, Senai Rubber Estate, 18 Aug. 1931; *Anonymous s.n.* (SING 41801), Malaysia, Johore, Chemara Rubber Estate at Layang Layang.

These specimens are quite similar to *C. valetonii* from Java or one of its close relatives. It is not clear whether they were cultivated at the Rubber estates or occurred as a casual. For the present I have identified these specimens as *C. valetonii*. See also the note on *C. valetonii* above.

2. *Ridley s.n.* (SING 41714), Malaysia, Pulau Penang, Tanjong Tokong, 1898.

This specimen looks in several characters like *C. valetonii* and related species. However, the flowers of this specimen are either young or eaten by insects and are insufficient for analysis. Remarkable for this specimen are the hollow, angular stems and the relatively large bracteoles inserted on the pedicel. The stipules are rather large, ± falcate. The leaf blades are large, up to 165 by 56 mm.

3. *Van der Pijl 674*, Java, Priangan, G. Goentoer, 750 m, May 1938.

Superficially this specimen looks like *C. albida*. However, it is completely glabrous, and furthermore it differs in a set of small characters such as narrower leaves, small flowers and totally glabrous standard. Up to now I have not matched it with any specimen in L or have identified it with keys for Africa, Asia or Australia (De Munk, 1962; Backer & Bakhuizen Jr., 1964; Niyomdham, 1978; Polhill, 1982; Holland, 2002). It may represent a new species.

ACKNOWLEDGEMENTS

The loan of material used in this study from the herbaria A, BO, E, K, L, PNH, SING is highly appreciated. J.F. Veldkamp kindly translated the English diagnoses into Latin. Ms. Anita Walsmit Sachs prepared the beautiful drawings. I. Nielsen provided information on Oersted. My colleagues from the Leguminosae-section at Kew are thanked for their hospitality during my visit there. I am grateful to Roger Polhill for all his useful comments. The staff of the herbarium of the Botanical Garden at Edinburgh, especially Mark Newman, is thanked for their hospitality during my stay there. My visits to Kew and Edinburgh were supported by a SyntheSys grant.

REFERENCES

Alston, A.H.G. 1931. A handbook of the Flora of Ceylon 6, Suppl. Dulau & Co, Ltd., London.
Andrews, H.C. 1810. Botanists Repository 9. H. Andrews, London.
Backer, C.A. 1920. Crotalaria valetonii Backer, nov. spec. Bull. Jard. Bot. Buitenzorg III, 2: 324, 325.

Backer, C.A. & R.C. Bakhuizen van den Brink Jr. 1964. Flora of Java 1. Noordhoff, Groningen.
Baker Jr., E.G. 1914. The African species of Crotalaria. J. Linn. Soc., Bot. 42: 241–425.
Baker, J.G. 1879. Leguminosae. In: J.D. Hooker, Flora of British India 2. Reeve & Co, Ltd., Brook, Nr Ashford, Kent, England.
Bartling, F.G. 1837. Crotalaria lejoloba Bartl. In: Index Seminum Horti Academici Gottingensis: 2.
Bartling, F.G. 1838. Crotalaria lejoloba Bartl. In: D.F.L. von Schlechtendal, Linnaea 12, Litr. Ber.: 80.
Bentham, G. 1843. Enumeration of Leguminosae, indigenous to Southern Asia, and Central and South Africa. London J. Bot. 2: 554–613.
Bentham, G. 1852. Leguminosae. In: F.A.W. Miquel, Plantae Junghuhnianae. Sijthoff, Leiden.
Bojer, W. 1837. Hortus Mauritius. Aimé Mamarot & Compagnie, Mauritius.
Burkill, I.H. 1935. A dictionary of the economic products of the Malay Peninsula 1. Crown Agents for the Colonies, London.
Burman Jr., N.L. 1768. Flora Indica. Haak, Leiden.
Chee, Y.K. & C.P. Chen. 1992. Crotalaria juncea L. In: L. 't Mannetje & R.M. Jones (eds.), Plant Resources of South-East Asia 4. Forages. Pudoc Scientific Publishers, Wageningen.
Craib, W.G. 1928. Florae Siamensis Enumeratio 1. Siam Society, Bangkok.
De Candolle, A.P. 1825. Prodromis Systematis Naturalis 2. Treuttel & Wurtz, Argenturat & Londini.
De Munk, W.G. 1962. Preliminary revisions of some genera of Malaysian Papilionaceae III – A census of the genus Crotalaria. Reinwardtia 6: 193–223.
Don, G. 1832. A general history of the dichlamydeous plants. London.
Faridah Hanum, I. & L.J.G. van der Maesen (eds.). 1997. Plant Resources of South-East Asia 11. Auxiliary plants. Backhuys Publishers, Leiden.
Gagnepain, F. 1916. Légumineuses. In: M.H. Lecomte, Flore générale de l'Indo-Chine 2: 57–613. Masson & Cie, Paris.
Hasskarl, J.K. 1844. Catalogus Plantarum in Horto Botanico Bogorensis Cultarum, ed. 2. Landsdrukkerij, Batavia.
Heyne, K. 1916. De nuttige planten van Nederlandsch Indië. Departement van Landbouw, Nijverheid en Handel in Nederlandsch Indië, Batavia.
Heyne, K. 1927. De nuttige planten van Nederlandsch Indië, ed. 2. Departement van Landbouw, Nijverheid en Handel in Nederlandsch Indië, Batavia.
Hochreutiner, B.H.P. 1925. Plantae Hochreutineranae II. Candollea 2: 317–513.
Holland, A.E. 2002. A review of Crotalaria L. (Fabaceae: Crotalarieae) in Australia. Austrobaileya 6: 293–324.
Koorders, S.H. 1900. Versuch einer Artenaufzählung der Hochgebirgflora von Tosari und Ngadisari II. Natuurk. Tijdschr. Ned.-Indië 60: 241–280.
Kumar, S. & P.V. Sane. 2003. Legumes of South Asia. A check-list. Royal Botanic Gardens, Kew.
Linnaeus, C. 1771. Mantissa plantarum, ed. 2. Laurent. Salvii, Holmiae.
Merrill, E.D. 1910. An enumeration of Philippine Leguminosae with keys to genera and species. Philipp. J. Sci., Bot. 5: 1–136.
Merrill, E.D. 1912. A Flora of Manila. Bureau of Printing, Manila.
Merrill, E.D. 1923. An enumeration of Philippine flowering plants, 2. Bureau of Printing, Manila.
Meyer, E.H.F. 1836. Commentarium de Plantis Africae Australioris. Leopoldum Vox, Lipsiae.
Miller, P. 1768. Gardener's Dictionary, ed. 8. London.
Miquel, F.A.W. 1855. Flora Indiae Batavae 1. Van der Post, Amsterdam.
Niyomdham, Chawalit. 1978. A revision of the genus Crotalaria Linn. (Papilionaceae) in Thailand. Thai Forest Bull., Bot. 11: 105–181.
Oersted, A.S. 1854. Vidensk. Meddel. Dansk Naturhist. Føren. Kjøbenhavn for 1853: 2.
Polhill, R.M. 1982. Crotalaria in Africa and Madagascar. Balkema, Rotterdam.
Polhill, R.M. 1990. Flore Mascareignes 80. Légumineuses. The Sugar Industry Research Institute, Mauritius, etc.
Retzius, A.J. 1789. Observationes Botanico 5. Siegfried Librecht Crusius, Lipsiae.

Ridley, H.N. 1922. The Flora of the Malay Peninsula, 1. Reeve & Co, Ltd., London.
Roth, A.W. 1821. Novae plantarum species. Vogleri, Halberstadii.
Roxburg, W. 1832. Florae Indica, ed. Carey, 3. Thacker, Spint & Co, Calcutta.
Rudd, V.E. 1991. Fabaceae (Leguminosae). In: M.D. Dassayake & F.R. Fosberg, A revised handbook to the Flora of Ceylon 7: 108–381. Balkema, Rotterdam.
Sims, J. 1819. Crotalaria pulcherrima. Curtis's Bot. Mag. 46: t. 2027.
Taubert, P. 1895. Leguminosae. In: A. Engler, Die Pflanzenwelt Ost-Afrikas und der Nachbar Gebiete C: Verzeichniss der bis jetz aus Ost-Afrika bekanntgewordenen Pflanzen: 193–224.
't Mannetje, L. & R.M. Jones (eds.). 1992. Plant Resources of South-East Asia 4. Forages. Pudoc Scientific Publishers, Wageningen.
Verdcourt, B. 1979. A manual of New Guinea Legumes. Bot. Bull. 11. Office of Forests, Division of Botany, Lae, Papua New Guinea.
Wight, R. & G.A.W. Arnott. 1834. Prodromus Florae Peninsulae Indiae Orientalis. Parburry, Allen & Co, London.
Willdenow, C.L. 1802. Species Plantarum 3, 2. Nauk, Berlin.
Willdenow, C.L. 1803. Anmerkungen zur J.P. Rottler, Botanische Bemerkungen aus der Hin und Ruckreise von Trankanbar nach Madras. Ges. Naturf. Freunde Berlin Neue Schriften 4: 180–224.
Zollinger, H. 1846. Observationes phytographicae praecipae genera et species nova nonulla respecienti. II. Natuur- Geneesk. Arch. Ned.-Indie 3: 51–82.

IDENTIFICATION LIST

Numbers are the same as the numbers used in the key. OS = Other species.

Crotalaria

1 = *acicularis*
2 = *aiantha*
3 = *alata*
4 = *albida*
5 = *assamica* var. *philippinensis*
6 = *beddomeana*
7 = *berteroana*
8 = *calycina*
9 = *chinensis*
10 = *cleomifolia*
11 = *goreensis*
12 = *humifusa*
13 = *incana*
14 = *juncea*
15 = *laburnifolia*
16 = *lejoloba*
17 = *linifolia*
18 = *luzoniensis*
19 = *medicaginea*
20 = *micans*
21 = *mysorensis*
22 = *nana*
23 = *pallida*
24 = *prostrata*
25 = *quinquefolia*
26 = *retusa*
27 = *semperflorens*
28 = *sessiliflora*
29 = *trichotoma*
30 = *triquetra*
31 = *uncinella* subsp. *elliptica*
32 = *valetonii*
33 = *verrucosa*
34 = spec.

Other species

OS1 = *barbata*
OS2 = *biflora*
OS3 = *guatamalensis*
OS4 = *lanceolata*
OS5 = *mesoponticum*
OS6 = *ochroleuca*
OS7 = *orixensis*
OS8 = *paniculata*
OS9 = *pilosa*
OS10 = *pulchra*
OS11 = *rubiginosa*
OS12 = *spectabilis*
OS13 = *tetragona*

AA 1065: 20 — Adelbert 364: 13; 443: 27 — Aet 713: 29 — Aet & Idjan 584: 20 — ALM 729: 23 — Alston 13783: 29; 13789: 27; 14747: 16; 16417: 29; 17041: 17 — Amano 7516: 28 — Ambri 233: 23 — Anang 103: 29 — Anderson 5: 25 — Ansari 101336: 14 — Anta 3: 29; 105: 29; 176: 29 — ANU 917 (Walker): 16; 2474 (Flenley): 16; 5753 (Wheeler): 20; 5836 (Wheeler): 16 — Aquilar 964: 17; 971: 4 — Asdat 114: 26 — Atasrip 132: 16.

Backer 33: 13; 34: 25; 35: 33; 41: 23; 667: 23; 847: 2; 856: 19; 1554: 26; 2730: 24; 2787: 33; 4171: 27; 5265: 4; 5782: 28; 6625: 8; 6703: 27; 6735: 4; 6750: 24; 7614: 25; 8000: 28; 8049: 33; 8121: 28; 8184: 26; 8190: 21; 8227: 30; 8310: 4; 8347: 2; 9458: 33; 9668: 16; 12143: 28; 12973: 21; 13398: 25; 13820: 28; 15338: 28; 16609: 1; 18167: 23; 18305: 13; 18541: 23; 18918: 15; 18954:

20007: 34; 25770: 7 — Elmer 10304: 26; 11134: 8; 11931: 33; 16490: 28 — Enoh 291: 29 — Evans 276: 23; 2068: 23 — Everaarts 102: 29; 104: 29 — Eyma 2872: 26; 3421: 17; 4182: 29.

Falls & Ebalo 1199: 23 — FB 2021 (Borden): 5; 3277 (Ahern's coll.): 25; 3297 (Ahern's coll.): 25; 26919: 23 — FMS 1064 (Haskim): 23; 8521 (Hume): 23; 17062 (Foxworthy): 20; 55050: 23 — Focke 56: 33; 100: 26 — Forbes 1076: 16; 1594: 27; 2103: 16; 3887: 8; 3921: 27 — Fosberg 24476a: 23; 26367: 23; 35342: 23; 37477: 29; 37488: 17; 50343: 26; 50661: 29; 50662: 20; 53946: 33; 55035: 23 — Fraser 237: 33 — FRI 965: 10; 5093: 23; 11773 (Bray): 33; 29267: 20; 36377 (Saw): 27; 36691 (Damahuri): 11 — Froggatt 3: 23 — Fuertes 508: 13.

Galoengi 107: 16 — Garber 387: 13 — Geerling 389: 26 — Geesink 5989: 23; 8039: 12 — Gibbs 2743: 33 — Gisius 49: 16 — Gjellerup 808: 25; 1229: 9 — Goodenough 10507: 23 — Grant 3657: 23; 4568: 23; 4569: 33 — Gravenstuk 13: 4 — Gregory 40: 25 — Grevenstuk 71: 28 — Griffith 1424: OS12 (Burma?); 1439: 15; 1440: 23; 1474: 34; 14257: 14; 14331: 19 — Gutterink 3228: 23.

Halliday 398: 8 — Hallier 70b: 23; 70c: 23; 71b: 13; 3365: 26; 4322: 5; 4357: 17; 4746: 33 — Hamel & Rahmat si Toroes 229: 16; 723: 16; 724e: 28 — Hansen 10791: 3 — Harten 103: 23 — Hartley 10270: 28; 10273: 16; 10276: 8; 12257: 17; 13728: 34 — Hassler 11747: 13 — Hatusima 17953: 29; 18948: 17 — Haviland 3281e: 33 — Helfer 83: 9; 102: 4; 1426: 4 — Hellendoorn 62: 29 — Herb. Hasskarl 16: OS9 — Herb. Lab. Takeda 6112304: 23 — Herbat 5026: 5 — Hermens 6: 29 — Hernaz 8513: 4 — Heyligers 1153: 28 — Hiepko & Schultze-Motel 610: 29; 1108: 23 — Hochreutiner 1364: 4; 1840: 23; 2287: 13; 2611: 2; 2747: 16 — Hollrung 521: 17 — Holstvoogd 62: 33; 174: 4; 179: 16; 179C: 16; 254b: 27; 275a: 19; 298: 17; 298a: 17; 370: 4; 377a: 27; 377b: 27 — Hoogland 3269: 29; 3281: 20; 4144: 26; 4361: 26; 4362: 23; 4680: 17; 4688: 17; 4759: 3; 4826: 17; 8515: 15 — Hoogland & Pullen 5267: 16 — Horsfield L43: 27; L44: 26; L45: 16; L46: 26; L47: 4; L48: 1; L53: 14 — Hosseus 49: 17; 59: 4; 712: 28 — How 70883: 26 — Huang 9133: 29 — Hubbard 2381: 17; 2383: 23; 2645: 17; 2935: 13; 3498: 13; 3735: OS12; 4829: 17; 5378: 13 — Hullett 245: 23.

Iboet 33: 17; 93: 26; 324: 23 — Idjan 73: 23 — Irawati & Sadili 562: 23 — Iwatsuki 281: 34; P1337: 23; P1348: 26; S107: 29; S819: 16.

Jaag 237: 4; 709: 15; 1140: 4; 1194: 8; 1197: 17; 1371: 12 — Janowski 532: 23 — Jayasuriya 701: 26 — Jeffrey 751: 23 — Jeng, Y.C. 643: 4 — Jeng, Y.T. 115: 29 — Jensma 27: 29 — Jeswiet 31: 8; 168b: 3; 169: 33; 173: 8; 251: 17; 271: 26; 300: 17; 372: 30; 373: 4; 375: 33; 625: 26; 635a: 4; 690: 3; 699: 21; 1012: 4; 1043: 15; 1048: 16; 1056: 26; 1444: 29; 1702: 16; 1705: 29; 1762: 16; 1841: 16; 1863: 16 — Johns 8309: 20 — Johnson 2363: 15 — Junghuhn 16: 13; 56: 1; 99: 4; 101: 33; 103: 2; 104a: 26; 104b: 26; 105: 7; 106: 26; 146: 1; 167: 2; 167a: 27; 274: 4; 720: 26.

Kairo 112: 11 — Karta 80: 23 — Kato 388: 28; 10128: 20 — Keng 1063: 34 — Kenneally 7516: 23 — KEP 11773: 33 — Kern 20255: 26 — Keßler 1747: 20; 2987: 29 — Keßler et al. PK2015: 26 — Kienh 2399: 23 — Kievits 1557: 26; 2213: 13; Banj22: 23 — King's Collector 274: 33; 1052: 33; 1200: 23; 1772: 25 — Kitamura PJE 857: 28 — Kjellberg 92: 8; 101: 17; 4089: 16 — Klein 1175: 23; 2027: 13 — Klein Hoonte 139: 26; 231: 23; 239: 23; 246: 16; 360: 33; 406: 29; 419: 15; 420: 26; 429: 26; 652: 27 — KL(U) 81 (Woods): 29; 88: 20; 2604 (Teo): 26; 3224 (Teo): 23; 3267 (Teo): 11 — Koch 623: 17; 624: 25 — Kofman 191: 29 — Kooper 312: 23; 525: 23 — Koorders 17586: 8; 17587: 26; 21520: 28; 21529: 33; 24928: 26; 26222: 23; 27435: 23; 27804: 23; 29780: 16; 37638: 2; 37639: 2; 37642: 16; 37950: 4; 42897: 16; 43094: 30 — Kooy 99: 17; 133: 20; 183: 26; 220: 19; 401: 8; 404: 15; 457: 15; 458: 20; 728: 34; 743: 23; 748: 14; 819: 26; 1265: 20 — Kornassi 60: 26; 781: 26; 800: 23; 1179: 23 — Kostermans 160: 33; 162: 23; 165a: 17; 357: 26; 967: 17; 1344: 3; 10015: 26; 18834: 4; 19045: 26; 23444: 34; 23612: 34; 24433: 34; 24836: 34; 28049: 33 — Kreulen 146: 16.

LAE 4974 (Womersley): 16; 9720 (Stone): 23; 56347: 6; 56738 (Kerenga): 16; 59072 (Isles): 20; 60498: 9; 62241 (Katik): 23; 66556 (Barker): 25; 70385 (Wiakabu): 16; 73386 (Wiakabu): 20; 73406 (Wiakabu): 17; 73408 (Wiakabu): 16; 73632 (Wiakabu): 23; 73865 (Kerenga): 25; 74300 (Kerenga): 29; 77451: 13 — Latz 6256: 12 — Lauterbach 1273: 17 — Leach 3779: 24 — Lewis 115: 23; 170: 10; 175: 13; 249: 27 — Loeters 1072: 4; 1109: 12; 1238: 16; 1281: 30; 1320: 4; 1419: 24; 1679: 19; 1725: 4; 1784: 16; 2000: 19; 2017: 4; 2057: 15; 2323: 12; 2324: 24; 2325: 4; 2326: 16 — Loher 2399: 24; 2400: 16; 2401: 16; 2405: 18; 2406: 5; 5906: 18; 5955: 16 — Lörzing

107: 16; 174: 23; 217: 27; 1095: 17; 5264: 26; 6429: 16; 6816: 29; 8559: 23; 11093: 16; 12121: 23; 14669: 9 — Lubigan 1: 14.

Mabesa 873: 23 — Maingay 514: 23; 515: 15; 516: 25; 2669: 23; 2981: 15; 3370: 25 — Manner 390: 20 — Matamin Rumuton 119: 33; 522: 33 — McDonald & Sunaryo 4470: 19; 4475: 15 — McKee 1298: 16; 1661: 23; 1690: 17; 1767: 17; 1780: 16; 1793A: 28; 1798: 8; 1896: 16; 1908: 23; 4638: OS12; 9163: 8; 9291: 11 — Meijer 1462: 20; 5586: 33; 5660: 9; 5733: 9; 9025: 1; 9193: 17; 10327: 26; 10358: 4; 10394: 16 — Meijer Drees 97: 16 — Merrill 911: 33; 3396: 33; 4266: 12; 4314: 18; 4316: 18; 6233: 14; Sp. Blanc. 29: 25; Sp. Blanc. 502: 17; Sp. Blanc. 937: 33 — Misikaram 26: 17 — Mogea 2821: 20 — Mondi 203: 23 — Monod de Froideville 6: 8; 79: 17; 86: 17; 90: 1; 104: 17; 310: 26; 314: 26; 320: 13; 348: 3; 413: 14; 480: 8; 602: 23 — Monterie 45: 27 — Mooney 3984: 17; 4041: 22; 4164: 3 — Moore 118: 23 — Morley 11: 29 — Morrison 105: 34 — Motley 394: 26 — Mousset 53: 2 — Mulhotva 18049: 3 — Mulyati et al. 553: 23 — Murata B79: 23; B2731: 4; B3001: 23; B4618: 23; J618: 29; J1023: 13; J1094: 16; J1588: 23; J2100: 23; J2118: 29.

Nakaike 613: 17 — Nedi 129: 13; 254: 23; 328: 26; 338: 14; 398: 17; 428: 26; 678: 26; 680: 13 — NGF 1598 (White): 20; 3619 (Fryar): 16; 3637 (Fryar): 28; 3654: 28; 3656 (Womersley): 28; 7394 (Wells): 23; 7649: 16; 10652: 13; 10657 (Henty): 25; 11585 (Henty): OS6; 12437 (Henty): 29; 14339: 3; 14514 (Millar): 20; 16713: 7; 16766 (Henty): 29; 17488 (Streimann): 16; 17559: 11; 17563 (Galore): 17; 17568: 17; 17575 (Galore): 33; 17602 (Womersley): 17; 17611: 8; 18910 (Sayers): 28; 18922 (Sayers): 17; 21172 (Streimann): 23; 21611 (Sayers): 20; 21830 (Sayers): 25; 21835 (Sayers): 23; 22051 (Gillison): 17; 22060 (Gillison): 23; 22069 (Gillison): 19; 22141 (Gillison): 17; 22184 (Gillison): 17; 22522 (Millar): 20; 23869 (Millar): 23; 24013 (Bruderus): OS12; 24410 (Kairo): 17; 25818 (Bruderus): 23; 26390 (Frodin): 20; 29512 (Coode): 23; 29809 (Coode): 23; 29822 (Coode): 26; 30934 (Sikuvea): 17; 32419 (Isles): 16; 35375: 11; 35443 (Millar): 29; 35784 (Kairo): 28; 38839 (Henty): 28; 39402 (Streimann): 29; 41130 (Galore): 29; 41131: 13; 43097 (Mann): 26; 45237 (Streimann): 26; 45345: 6; 45424 (Streimann): 17; 45427 (Streimann): 28; 47967 (Streimann): 17; 49613 (Henty): 28; 60498a (Foreman): 28 — NIFS 6630: 28; 6656: 28 — Nitta 15176: 29 — Noerkas 45: 17; 125: 8; 131: 1 — Nooteboom 5069: 17; 5389: 26.

O'Hara 3477: 23; 3487: 13 — Ogata 11272: 23 — Ouwehand 47: 23.

Philipson 10344: 23 — Pleyte 8: 17; 1152: 17 — PNH 4168: 17; 4610: 16; 7013 (Sulit): OS3; 7278: 23; 8287: 20; 8290: 23; 13426 (Fox): 28; 13474 (Anonuevo): 29; 13759 (Sulit): 24; 16444: 13; 16931: 14; 17029: 8; 17091 (Sulit): 26; 17154 (Sulit): 33; 17762 (Sulit): 17; 18033 (Edaño): 18; 18498: 8; 18558: 13; 18656 (Conklin): 23; 33557 (Gachalian): 20; 34071 (Sulit): 29; 35074 (Frohne): 26; 35084 (Frohne): 23; 35166 (Trono): 20; 37511 (Villaflor): 29; 38882 (Kondo): 23; 41323 (Mendoza): 26; 41574 (Steiner): 23; 42212 (Mendoza): 23; 72378 (Conklin): 20; 76784 (Mendoza): 23; 97871 (Mendoza): 29; 98616 (Mendoza): 23; 118487 (Madulid): 26; 118489 (Madulid): 23 — Popta 438/68: 20; 758/174: 27 — Posthumus 42: 23; 885: 27; 918: 27; 2368: 21 — Powell 368: 23 — PPI 857: 23; 1626: 26; 1726: 23; 2043: 23; 4102: 5; 4354: 23; 5387: 23; 5509: 23; 8310: 29; 8686: 23; 14861: 23; 21766: 23; 24659: 23; 29404: 23; 29519 (Romero & Majaducon): 23; 37669 (Romero & Fuentes): 23; 38705 (Fuentes & De la Rosa): 23 — Prawiroatmodjo 3: 23 — Prawiroatmodjo & Maskuri 1268: 29 — Pringo Atmodjo 101: 16; 152: 16; 243: 4 — Pullen 606: 20; 3087: 23; 6865: 23; 7592: 17; 8954: 34; 9065: 34; 9243: 34 — Purseglove 5439: 26; 6034: 26; 14611: 23— Purseglove & Shah 4847: 23.

Raap 45: 13; 50: 23 — Rachmat 112: 17; 138: 23; 424: 16 — Rahayu & Yusuf 718: 29 — Rahmat Si Boeea 940: 20; 6133: 16; 6157a: 9; 6157b: 28; 8389: 23; 8414: 29; 8415: 20; 10010: 20; 10110: 20; 10496: 20; 11115: 20 — Ramlanto 901: 26; 927: 29 — Rant 258: 23; 333: 17; 3669: 15 — Rappard 27: 21; 29: 4; 42: 4; 53: 15; 75: 21; 104: 28; 106: 33; 314: 16 — Rau 44: 23 — Raynal 16741: 17; 16757: 16; 16996: 20; 17097: 29 — Reeder 864: 16 — Reinwardt 253: 33; 1353: 28; 1353a: 8; 1402: 26; 1418: 26 — Rensch 851: 23 — Ridley 260: 23; 326: 23; 2595: 31; 6912: 31 — Robinson 2011: 23 — Rutten 1739: 26.

S 21479 (Ashton): 23; 43997 (Ilias): 26; 47232 (Mohtar): 26; 57400 (Banyeng et al.): 23; 57501(Banyeng et al.): 23 — Samat 22: 23 — Sambuling 214: 23; 599: 23 — SAN 43997: 26; 55918 (Rahim): 23; 56008 (Amin): 16; 56018 (Amin): 23; 57042 (Sinanggul): 25; 60846 (Amin): 16; 67114 (Gibot): 23; 74263 (Dewol): 20; 74325 (Leopold): 33; 79797(Gibot): 25; 81114 (Aban): 23; 82430: 33;

88862: 9; 89546: 23; 90235: 33; 90601 (Gibot): 17; 90639: 33; 91003: 9; 95336 (Amin): 20; 96723: 23; 97549 (Amin): 17; 99322 (Amin): 23; 99329 (Amin): 27; 99605: 23; 99981 (Aban): 33; 109476: 16; 109476 (L): 9; 113504 (Lantoh): 26; 113668: 25; 114706: 23; 116107: 23; 116286 (Amin): 33; 117804 (Amin): 20; 118973: 23; 120029: 23; 120843: 23; 125595: 23; 127720: 16; 128283: 23 — Sands 4921: 3; 6653: 17 — Sangat 389: 29 — Santos 4676: 25; 4835: 8; 4997: 16; 5009: 23; 5038: 29; 5096: 14; 5652: 29; 6054: 23; 6138: 4 — Sapini 2115: 23 — Saunders 155: 17; 685: 17 — Sawyer 277: 17 — Schiffner 2045: 27; 2046: 23; 2048: 27; 2053: 27; 2060: 23; 2072: 16; 2085: 23 — Schlechter 16066: 17 — Schmid 114: 34 — Schmutz 1181: 17; 1190: 8; 1974: 4; 2283: 34; 2286: 30; 3714: 28; 4148: 4; 4167: 1; 4314: 8; 5640: 20 — Schodde 2697: 17; 2901: 9 — Schodde & Craven 4571: 2 — Schröter 250: 16 — SF(N) 07: 23; 6959: 28; 10274: 23; 10354: 23; 11196 (Strugnell): 23; 16316: 23; 18634: 23; 22953 (Symington): 23; 29874: 31; 31185 (Schofield): 14; 38379: 20; 38874: 13; 38882: 13; 40427 (Sinclair): 28; 40505 (Sinclair): 31; 40908 (Sinclair): 25 — Shah 23: 23; 1099: 27; 1284: 26 — Shah & Kadim 354: 23 — Shah et al. 4225: 23 — Shaik Mokim 109: 19 — Shimizu & Fukuoka M14726: 20 — Shiu Ying Hu 7188: 23 — Shmull 23: 25 — Sibil 112: 23 — Sidek bin Kiah 93: 23; 395: 26 — Siew Wei Hoe 65: 13 — Sigafoos 103: 28 — Simaga 328: 17; 761: 20; 764: 25— Sinclair 5269: 23; 5407: 26; 5519: 25; 6408: 13; 9542: 17; 10698: 31 — Sinclair et al. 9245: 17 — Smith 60: OS9 — Soejarto et al. 6513: 23 — Soibeh 183: 16; 434: 23 — Sorgdrager 25: 20 — Spare 932: 23 — Sterly 80-399: 23; 80-400: 20; 80-588: 20 — Stewart 1492: 19 — Stone 4311: 25; 3972: 26 — Stuhlmann 4047: OS5 — Surbeck 197: 4; 201: 9; 490: 28; 562: 16; 563: 29 — Suzuki 6371: 16 — Sykes 150542: 33.

Tailer P210: 23 — Takamatsu 967: 23; 1911: 23 — Takeuchi 8635: 20; 12018: 6 — Takeuchi et al. 13775: 23; 14015: 23; 14140: 23; 14149: 26 — Tanaka 17876: 23 — Tang & Sidek 194: 23 — Tay 17: 23 — Tay & Shah 186: 20 — Teijsmann 10702: 15 — Teruya 1726: 32; 2269: 23; 2299: 27; 3984: 20 — Toxopeus 451: 16; 513: 26.

UPNG 140 (Pulsford): 23; 173 (Pulsford): 26; 273A (Pulsford): 17; 277 (Gebo): 20; 360: 14; 395: 11; 4278 (Frodin): 17; 4292 (Frodin): 11; 8580 (Pumina): 26.

Van Balgooy 1937: 34 — Van Borssum Waalkes 1664: 9; 2517: 16; 3008: 23; 3123: 8; 3155: 17 — Van der Meer 2076: 13; 2097: 23 — Van der Pijl 674: 34 — Van Heerdt 33: 34; 69: 26 — Van Niel 3442: 23; 3801: 23; 4055: 26; 4066: 25; 4135: 26 — Van Ooststroom 12508: 23; 12510: 29; 12511: 29; 12549: 23; 12727: 29; 12761: 23; 12785: 7; 12798: 20; 12969: 20; 13086: 20; 13143: 20; 13541: 20; 13542: 29; 13568: 13; 13685: 29; 13702: 16 — Van Royen 3011: 28; 3788: 16; 3817: 17; 4147: 17; 4497: 28; 4630: 17; 4939: 17; 5022: 17; 5049: 9; 5050: 28; 5675: 9; 6769: 9; 6770: 17; 6771: 28; 8243: 28; 9322: 17 — Van Royen & Sleumer 5688: 29; 7019: 20 — Van Steenis 11998: 16; 7597: 17; 7750: 28; 8167: 28; 10398: 17; 10666: 4; 11399: 17; 11554: 26; 11886: 16; 17529: 28; 17884: 17; 18587: 17; 19607: 3; 19608: 4; 19620: 28 — Van Welzen 383: 17; 731: 20 — Vaughan 608: 25 — Verboom 26: 28; 52: 9; 52a: 28 — Verdcourt 4922: 6; 4924: 23; 4925: 20; 4949: 29 — Verheijen 249: 16; 250: 16; 1522/23: 23; 1852/53: 19; 1858/59: 33; 1873/74: 26; 1888/89: 28; 2709: 8; 2731: 16; 2989: 19; 2992: 33; 3587: 23; 3712: 8; 3811: 4; 3898: 26; 4174: 26; 4424: 16; 4522: 23; 4549: 17 — Versteeg 1842: 17 — Versteegh 42: 17 — Vidal 1242: 5; 1283: 25; 1290: 5; 1292: 18; 1296: 33; 2645: 24.

Walker 203: 23; 5775: 29; 7193: 17 — Wallich Cat. 5394: OS1; 5398: 16 — Warnecke 25: 11; 289: 23 — Waterhouse 480: 23 — Weber 1039: 25 — Wenzel 1473: 26; 2507: 25; 2703: 25 — Whistler 986: 23 — Whitehead & Flenley 186: 34 — Whitford 743: 25 — Wichian 987: 33 — Widjaja 650: 23; 2169: 16; 2175: 23; 2948: 29; 2953: 16; 3082: 29; 4440: 23; 4698: 20 — Widjaja & Hamzah 3081: 20 — Widjaja et al. 6380: 29 — Wight 613: 34 — Williams 1411: 16 — Winckel 1401B: 27 — Winkler 3386: 9 — Wiriadinata 484: 8; 1349: 23; 2006: 16; 2949: 17; 2960: 17; 3018: 23 — Wisse 745: 24; 932: 16; 1043: 4 — Wong 46: 23; 458: 13 — Worthington 12342: 20; 12360: 23; 13412: 10 — Wray 1766: 23.

Yapp 384: 31 — Yates 2392: 29 — Yoshida 232: 16; 2306: 13; 2531: 29.

Zimmerman 135: 23 — Zollinger 178: 23; 614: 33; 965: 8; 965 (L): 28; 1555: 3; 1589: 16; 1617: 15; 1661: 14; 2283: 19; 2482: 17; 2482 (L): 4; 2561a: 26; 2561b: 2; 2561c: 27; 2753: 21; 3140: 4; 3358: 34 — Zwickey 197: 23.

INDEX

Accepted names are in roman type, synonyms in *italics* and new names in **bold** type. K = in key only [p. 319–322]; OS = in notes on other species [p. 322–325].