

## ***Mucuna* Adans. (Leguminosae) in Thailand**

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ABSTRACT. Keys and descriptions are provided for the fourteen species of *Mucuna* Adans. recorded from Thailand (thirteen native, one cultivated); two additional species from peninsular Malaysia are included in the key.

KEYWORDS: Leguminosae, *Mucuna*, Thailand, taxonomy, species.

### **INTRODUCTION**

This regional revision of *Mucuna* has been prepared for the Flora of Thailand and is an updated version of earlier work (Wilmot-Dear 1992 & 1993). Thirteen species are native to Thailand; three, *M. thailandica* Niyomdham & Wilmot-Dear, *M. oligoplax* Niyomdham & Wilmot-Dear and *M. gracilipes* Craib, are endemic, *M. stenoplax* Wilmot-Dear extends to Peninsular Malaysia and the remainder are more widespread, extending to the Indian subcontinent and/or China and Indochina. One species, *M. gigantea* (Willd.) DC, is widespread throughout Asia and the Pacific. Two Indonesian species which extend to Peninsular Malaysia, *M. acuminata* Grah. and *M. biplicata* Teysm & Binn ex Kurz, may also possibly occur in Thailand (the latter is recorded from the adjacent northern part of Perak) and are therefore included in the key. A further Indonesian species, *M. warburgii* Lauterb. & K. Schum., has been cultivated in Thailand.

A note on specialised characters useful in identification. Two pairs of stipels (small, terete, stipule-like structures) are often present on the leaves, the lower pair either side of the petiole at its junction with the petiolules of the lateral leaflets, the upper pair at the junction of the apex of the rachis and the base of the petiolule of the terminal leaflet; these stipels are consistently either persistent on very old leaves or absent from even very young leaves. Flowers are pedicellate, arising in a group of (usually) three from the apex of very short secondary axes (in this paper termed "ultimate branchlets") which are either distributed  $\pm$  uniformly throughout the main flowering axis or restricted to its distal part and are either reduced to small knobs (most species) or lengthened into distinct secondary peduncles; the main axis is mostly otherwise unbranched but sometimes several-branched near the base. The shapes and proportions of the calyx lobes and the relative lengths of the lowest and lateral lobes are consistent distinctions between certain species. Corolla colour is not always reliable because certain species may have white and purple variants. Petals are often hairy at the extreme base but indumentum elsewhere on the corolla is uncommon; presence or absence of a distinctly pubescent margin around the apex of the standard and

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wing petals is diagnostic and shape of the wings (somewhat narrowed towards the apex versus widened and rounded towards the apex) is sometimes diagnostic. Fruit texture (woody, leathery or fleshy), size and shape separates various groups of taxa. Ornamentation of fruit is important: dorsal and ventral sutures may be ornamented with a pair of wings and the lateral faces may be ornamented with transverse lamellae of uniform or irregular width; these lamellae are either simple raised flaps or are bifurcated distally to give "T-shape" in cross-section, and may be continuous across the whole pod width, all interrupted along its midline or irregularly interrupted.

## MUCUNA

Adans., *Fam. Pl.* 2:325. 1763; Prain, *J. Asiat. Soc. Bengal* 66: 404. 1897, nom. cons.

Herbaceous or woody climbers. Leaves trifoliolate, lateral leaflets  $\pm$  asymmetrical, stipules and often stipels caducous. Inflorescences axillary on leafy shoots or on old branches, mostly a pseudo-raceme through reduction of ultimate branchlets (secondary axes) or sometimes subumbellate; bracts and bracteoles caducous. Flowers conspicuous, purple, red, greenish, yellow or white. Calyx 4–5-lobed, 2-lipped, upper pair of lobes connate to form entire or bifid lip. Standard petal rounded with median claw and pair of inflexed lateral auricles at base, much shorter than other petals; wing and keel petals narrowed proximally into basal claw with small dorsal auricle; keel petals partly connate along lower margin, horny and usually pale and hooked at apex. Vexillary stamen free; 5 longer subbasifixed anthers alternating with 5 shorter versatile or dorsifixed often barbate anthers on apically swollen filaments. Ovary with few to many ovules; style long, filiform, sometimes pubescent but not bearded, bent; stigma small, terminal. Fruit ovoid, ellipsoid, oblong, linear or torulose, often markedly dorsiventrally flattened; valves thick and often ribbed or ornamented with raised lamellae and frequently bearing irritant bristles, septate between seeds, mostly dehiscent; margins often winged. Seeds globose or oblong with short or linear hilum and conspicuous rim-aril or discoid to oblong with elongated hilum occupying over  $\frac{1}{2}$  circumference and no aril.

Approximately 100 species in the tropics and subtropics. 13 species native to Thailand.

### KEY TO THE SPECIES IN THAILAND, INDOCHINA, PENINSULAR MALAYSIA AND SINGAPORE

#### A. Flowering material

1. Lateral veins of leaflets gently curved throughout most of their length but near margin more sharply curved and (in Thailand) never clearly running into margin but always becoming indistinct or running parallel to margin; terminal leaflet elliptic or ovate; wing petals narrowing near apex (**A. Subgenus *Mucuna***)
2. Stems and leaves with conspicuous red-brown indumentum.
3. Leaflets without persistent stipels, abaxial half of lateral leaflets truncate at base; distal part of margin of standard and wings with border of short but distinct pubescence; ultimate branchlets always reduced and knob-like
  1. ***M. macrocarpa***
3. Leaflets with persistent stipels, lateral leaflets rounded at base; petals glabrous except in basal (claw) region; ultimate branchlets of inflorescence often slightly lengthened (2–4 mm).

4. Pedicels (2-)2.5-3.5 cm long; pubescence on inflorescence golden-brown, flowers ca 5 cm long with light greenish-purple wings, pale brownish purple standard and pale purple keel; lowest calyx lobe long and narrow 6-8 mm long but only up to 1.5 mm wide except at extreme base (Peninsular region) **4. M. oligoplax**
4. Pedicels only to 1 cm long; pubescence on inflorescence deep red-brown; flowers to 4.4 cm long, all petals dark purple; lowest calyx lobe up to 4.5 mm and often 4 mm wide (Northern). **6. M. monosperma**
2. Stems and leaves glabrous or with pale indumentum
5. Standard and wings in apical part with short but distinct pubescence around the margin; wings and keel purple, standard pink or whitish; leaflets without persistent stipels, abaxial half of lateral leaflets truncate at base **1. M. macrocarpa**
5. Standard and wings glabrous in apical part, pubescent only in basal (claw) region, colour various; stipels present or not, lateral leaflets various
6. Corolla bright fiery red-orange, very long (6-8 cm) with wings and keel uniformly curved throughout their length to give distinct scimitar-shape to flower (cultivated) **M. warburgii**
6. Corolla purple or greenish white, usually shorter and never scimitar-shaped, wing  $\pm$  straight, keel straight with abruptly upcurved apex
7. Flowers very large, standard 4.5-5.5 cm, wings 7-7.5 cm long, keel 7.5-8.5 cm long; corolla greenish white; stipels absent **2. M. thailandica**
7. Flowers smaller, standard to 3.5(-3.8) cm, wings and keel to 6(-6.3) cm long, colour various; stipels present
8. Inflorescence axis with pedicels (often also ultimate branchlets) of very varying lengths and progressively shorter towards axis apex so as to form a pseudumbel; indumentum of stem, leaves and inflorescence axis absent or fine, pale and adpressed, flowers greenish-white, small 3-4.5 cm long
9. Inflorescence usually at least 8 cm, often up to 25 cm long, consisting of a single main axis with ultimate (flower-bearing) branchlets all crowded near its apex and remainder of axis devoid of bracts or scars, sparsely pubescent; standard relatively large,  $\frac{3}{5}$ - $\frac{3}{4}$  keel length, wings and keel 2.8-4 cm long; calyx lobes very short and relatively broad, lowest lobe 1-3 mm, laterals 1-2 mm long **3. M. gigantea**
9. Inflorescence either very short, 2.5-3 cm long consisting of a single main axis or rarely (Java)- 6 cm long and with main axis branched near base, ultimate branchlets throughout most of length of main axes, axes densely pubescent; standard shorter relative to other petals,  $\pm \frac{1}{2}$  keel length, keel  $\pm$  4.5 cm long, wings often shorter than keel; calyx lobes much longer and relatively narrower, lowest 6-9 mm, laterals 3-6 mm long (Peninsular Malaysia) **M. acuminata**
8. Inflorescence not pseudumbellate, pedicels of  $\pm$  uniform length, ultimate branchlets all of uniform length or all completely reduced and knob-like; flowers and indumentum various
10. Calyx lobes small, lowest  $<$  4.5 mm long, laterals  $<$  2 mm long; bracts small and caducous; flowers purple
11. Lowest calyx lobe 1.5-4 mm long, laterals often  $<$  0.5 mm (Peninsular Malaysia) **M. bispicata**
11. Lowest calyx lobe ca 4.5 mm long, laterals ca 2 mm **5. M. monosperma**
10. Calyx lobes larger, lowest at least 6 mm long and laterals at least 4 mm (bracts and flowers various)
12. Ultimate branchlets of inflorescence lengthened  $\pm$  3 mm long; pedicels very long, (1.5-)2 cm; flowers purple, small, 4.5 cm long; bracts caducous **6. M. stenoplax**
12. Ultimate branchlets of inflorescence reduced, knob-like, pedicels to 1 cm long (flowers and bracts various)
13. Fine hairs on inflorescence axis and calyx very short, 0.1-0.2 mm long, spreading and almost velvety, only coarse bristles (where present) adpressed; flowers usually pink or purple (rarely white), 4.5-4.8 cm long; bracts small, 5-17 by (2-)5-7 mm, moderately caducous **8. M. revoluta**
13. Fine hairs, at least most on inflorescence axis and calyx 0.4 mm long, not velvety, both hairs and bristles usually adpressed; flowers (purple or white) usually 5-6 cm long; at least the lower bracts often persistent, large and broad, 20-40 by 10-20 mm

14. Calyx lobes relatively broad and broad-acute at apex, lowest 6–10 by ca 5 mm; all bracts broadly ovate (22–)30–40 mm long with apex short-acuminate or acute but not hooded; flowers always white **9. *M. interrupta***
14. Calyx lobes relatively narrow and long-acuminate, lowest 8–10 by 2–3 mm; upper (flower-subtending) bracts elliptic or obovate 10–20 mm long with apex broadly rounded and often hooded; flowers usually dark purple **7. *M. halnanensis***
1. Lateral veins straight or uniformly curved throughout their length and clearly running into margin; terminal leaflet often rhombic or rhombic-ovate; wing petals with broadly rounded apex, not tapering (**B. Subgenus *Stizolobium***)
15. Flowers long, wings 6–6.3 by 1.5 cm, keel ± equalling wings **10. *M. gracilipes***
15. Flowers short, wings 2.5–3.5 by 0.6–0.8 cm; keel usually distinctly longer than wings, up to 4(4.5) cm long
16. Inflorescence axis with many bracts throughout length including lower, (flowerless) part, bracts 8–24 mm long but always some considerably over 8 mm, persistent to mature flowering and often to fruiting stage; leaflets beneath with veins usually conspicuously darker and less pubescent than surface **12. *M. bracteata***
16. Inflorescence axis without bracts or scars in lower, flowerless, part; bracts up to 8(–10) mm long, caducous; leaflets beneath with surface no more densely pubescent nor paler than veins
17. Bracts and bracteoles usually fairly broad and never acuminate; pubescence on stem, leaflets and inflorescence axis rather orange-brown giving distinct yellowish-orange tinge, especially to leaflet veins beneath **11b. *M. puriens* var. *hirsuta***
17. Bracts and bracteoles narrow, long-acuminate; pubescence on all parts of plant, where present, silvery (scattered irritant orange bristles often also present)
18. Irritant orange bristles, at least a few, usually present on stems, inflorescence axis or calyx **11a. *M. puriens* var. *puriens***
18. Irritant orange bristles always absent. **11c. *M. puriens* var. *utilis***

### B. *Fruiting material* (excluding *M. gracilipes* for which no fruit is known)

1. Fruits markedly laterally flattened, either woody, linear-oblong and > 25 cm long or leathery with pair of wings along each margin and broadly oblong at least 3.5 cm wide, or if only 2.5 cm wide then length < 3 times width; seeds discoid to flattened-oblong with elongated hilum occupying over ½ circumference and no aril; leaflets with lateral veins gently curved but near margin more sharply curved and (in Thailand) never clearly running into margin but always becoming indistinct or running ± parallel to margin; (**A. Subgenus *Mucuna***)
2. Stems and leaves with conspicuous dark red brown indumentum.
3. Leaflets without stipels, abaxial half of lateral leaflets truncate at base; fruits woody, linear-oblong at least 26 cm long without marginal wings or surface lamellae **1. *M. macrocarpa***
3. Leaflets with persistent stipels, lateral leaflets rounded at base; fruits leathery, broadly oblong, to 10 cm long with marginal wings and surface lamellae.
4. Fruit with only a few, scattered, partly developed lamellae arising erratically on face, extending transversely (never obliquely) across at most ½ of face, 1–10 mm long and to 3 mm high in places or merely slight protuberances; lowest calyx lobe 6–8 mm long; leaflets indistinctly short-acuminate (Peninsular) **4. *M. oligoplax***
4. Fruit with 5–6 well-developed lamellae running obliquely across face, converging and interrupted towards centre of pod; lowest calyx lobe to 4.5 mm long; leaflets abruptly short-acuminate (Northern). **5. *M. monosperma***
2. Stems and leaves glabrous or with pale indumentum
5. Fruits large, woody, linear-oblong but often swollen around seeds, length at least 8 times width, 23–45 by 3–5 cm; (margins winged or not)
6. Surface of fruit ornamented with very low transverse lamellae; margins narrowly winged (cultivated) ***M. warburgii***
6. Surface of fruit shallowly ridged but otherwise unornamented; margins not winged
7. Calyx very large, lowest lobe 10–13 mm long, laterals 5–8 mm; fruit at least 45 cm long; leaves always glabrous, terminal leaflet relatively wide, length/width ratio of terminal leaflet and ratio of abaxial to adaxial halves of lateral leaflets 1.5–1.75:1 **2. *M. thailandica***

7. Calyx smaller, lowest lobe 5–6 (–8) mm, laterals 2–3 (–4) mm; fruit usually < 45cm long; at least young leaves with pale or reddish indumentum, terminal leaflet narrower, length/width ratio of terminal leaflet and ratio of abaxial to adaxial halves of lateral leaflets 2:1
- 1. *M. macrocarpa***
5. Fruits medium or large, leathery, asymmetrically oblong, length only up to 4 times width, up to 17 cm long; each margin with a pair of wings
8. Fruit surface patterned with reticulation of raised lines but without lamellae
9. Reticulation of raised lines so distinct, fine and close as to give surface almost a pitted appearance; fruit ± straight, relatively broad (3.5–)4–5.5(–6) cm wide; infructescence axis sparsely pubescent
- 3. *M. gigantea***
9. Reticulation coarser and often indistinct; fruit distinctly curved, to 3 cm wide; infructescence axis often densely pubescent (Peninsular Malaysia)
- M. acuminata***
8. Fruit surface with at least a few partly developed lamellae running obliquely or transversely across face
10. Lamellae on fruit surface each a simple raised flap, usually continuous across face
11. Fruit 1(–very rarely 2)-seeded, oblong to elliptic, often broader than long and never more than 1.5 times as long as broad; surface lamellae tending to converge towards centre of pod; fruit with coarse red bristles and often also dark red, spreading fine pubescence
- 5. *M. monosperma***
11. Fruit (1–)2–3-seeded, oblong to linear-oblong, at least twice as long as broad; lamellae ± parallel; pubescence on vegetative parts absent or pale to golden; fruits with bristles but without conspicuous or red short fine pubescence
12. Lamellae on fruit of very irregular height (width) 1–2 mm high but increasing to 4 mm in places and all running to distal edge of wing; wing of irregular width 3–4 mm but widening sharply to 5–6 mm at points where lamellae occur, resulting in a jaggedly dentate appearance
- 6. *M. stenoplax***
12. Lamellae on fruit of fairly uniform height, 4–5 mm high, not extending across wings; wing wider 8–14 mm wide and of ± uniform width
- 7. *M. hainanensis***
10. Lamellae bifurcated distally to give a “T-shape” in cross-section and all interrupted along mid-line of fruit
13. Lamellae all extending to distal edge of marginal wings at which point wing widens sharply to give a jaggedly toothed appearance; calyx lobes extremely short, lowest 1.5–4 mm, laterals 0.5–2 mm (Peninsular Malaysia)
- M. biplicata***
13. Lamellae not extending across wings and wings of ± uniform width; calyx lobes long, lowest (6–) 7–10 mm, laterals 4–6 mm
14. Fruit (1–)2 seeded, 6–9 by 4–4.5 cm; lamellae 8–12 in number with strongly revolute apical halves; marginal wings strongly inrolled; bracts never persistent; hairs on infructescence axis and calyx very short, 0.1–0.2 mm, spreading, velvety
- 8. *M. revoluta***
14. Fruit 3-seeded, 13–14 by 6–7 cm; lamellae ± 18 in number with spreading or ± upcurved apical halves; marginal wings ± flat; some floral bracts usually persistent to fruiting stage, these large and conspicuous; hairs on calyx and infructescence axis > 0.4 mm, usually adpressed
- 9. *M. interrupta***
1. Fruits fleshy without marginal wings, linear-oblong (sometimes misshapen/swollen in parts), small < 10 by 1.5 cm, length 5–10 times width; seeds globose or ellipsoid with short hilum and conspicuous rim-aril; leaflets with lateral veins straight or uniformly curved throughout length and clearly running into margin; (**B. Subgenus *Stizolobium***)
15. Indumentum of fruit fine, silky, not irritant nor caducous, usually adpressed and pale, often sparse
- 11c. *M. puriens* var. *utilis***
15. Indumentum of fruit a dense covering of reddish or brown, spreading, irritant caducous bristles
16. Lower (non fruit-bearing) part of infructescence with numerous bract-scars, some bracts often still present especially near base, these conspicuous, 8–24 mm long; leaflets beneath usually with veins conspicuously darker and less pubescent than surface; fruit straight or slightly curved
- 12. *M. bracteata***
16. Lower part of infructescence lacking bracts and scars, bracts never persistent to fruit stage; leaflet surface not less pubescent nor paler than veins; fruit often markedly curved into “S shape”

17. Stems, petioles, leaflets beneath and infructescence axis with orange-brown pubescence giving distinctly yellowish-orange tinge especially to leaflet veins beneath

11b. *M. puriens* var. *hirsuta*

17. Stems, leaves and infructescence axis, if pubescent, silvery

11a. *M. puriens* var. *puriens*

### A. Subgenus *Mucuna*.

Woody climbers. Leaves with lateral veins usually (in Thailand always) becoming indistinct near margin or running parallel to it, not running clearly into margin. Seeds discoid or reniform, large and strongly laterally flattened with hilum extending around 3/4 of circumference.

**1. *Mucuna macrocarpa*** Wall., *Pl. Asiat. Rar.* 1: 41, t.47. 1830; Gagnep. in H.Lecomte, *Fl Indo-Chine* 2: 317. 1916; Van Thuan, *Fl. Camb. Laos Vietnam* 17: 35. 1979; Wilmot-Deare, *Kew Bull.* 47: 207 & figs 1 & 7E–F. 1992. Type: Nepal [*Wallich* 5618 (holotype **K!**)].— *M. collettii* Lace, *Bull. Misc. Inf. Kew* 1915: 398. 1915; Craib, *Fl Siam.* 1:443. 1925. Types: Burma [*Collett* 458, *Lace* 5866 (syntypes **K!**), *Hauxwell* s.n., *Rogers* 19 (syntypes not found)]; China, Yunnan [*Henry* 11702 (syntype **K!**; isosyntype **A!**)]. Figs. 1 Q–R, 2 N–P.

Woody climber up to 70 m; stems and petioles with sparse to dense, light brown or red-brown fine pubescence, sometimes later glabrous. Leaves with wide size range, terminal leaflet (7–)10–19 by (3–) 5–10 mm, elliptic to ovate (or obovate), length/width ratio ca 2:1, apex acute or short-acuminate, base rounded to slightly cuneate, lateral veins (3–)4–6(–7) pairs, curved; lateral leaflets usually markedly asymmetrical, width ratio of abaxial to adaxial halves 2:1, base of abaxial half truncate; thin-chartaceous to thick-coriaceous, young leaflets hairy like the stem, often later glabrous; stipels absent. Inflorescences from old wood, 5–23 cm, main axis unbranched with short (ca 0.3–0.4 mm) often spreading pubescence and fine brownish bristles; ultimate branchlets reduced, knob-like, spaced throughout length; pedicels 8–10 mm.; bracts and bracteoles ovate, bracteoles 2–5 by 1–4 mm, shorter than calyx. Calyx hairy like the axis, tube 8–12 by 12–20 mm, lowest lobe 5–6 (–8) mm, laterals usually half this length, all narrowly or broadly triangular. Corolla large, two-coloured, standard greenish or pinkish white, wings dark purple, keel lighter purple or yellowish green; standard 3–3.8 (–4.5) cm long, just over 1/2 keel length, wings rather broad 4–5.5(–6) by ca 1.5 cm, keel distinctly longer 5–6.5 (–7) cm; margin of standard and wings conspicuously pubescent in distal part up to 1/4 or 1/3 length. Fruit woody, greenish, linear-oblong 6–15-seeded with margins often markedly constricted between seeds, 26–45 (–48) by 3–5 cm, markedly laterally flattened, 0.7–1 mm thick, densely pubescent (rarely glabrescent), with irregular longitudinal wrinkles when dry; margins without wings or distinct thickened rim or central groove along suture. Seeds black with dark brown or black hilum, very large, 2.2–3.2 by 1.8–2.8 cm.

Thailand.— NORTHERN: Chiang Mai [Doi Inthanon, *Phengklai et al.* 6880 (**BKF**)], Lamphun [Mae Tan, *Maxwell* 94–164 (**BKF, GH**)]; NORTHEASTERN: Loei [Phu Kradueng, *Niyomdham* 2952 (**AAU, BKF**)]; EASTERN: Chaiyaphum [Nakhon Ratchasima, Khao Yai National Park, *Smitinand et al.* 8026 (**BKF**)]; SOUTHWESTERN: Kanchanaburi [Huai Kha Khaeng & Thung Yai Naresuan, *Smitinand et al.* 383 (**BKF**)]; CENTRAL: [sterile, identity

uncertain], Sing Buri [Suphi Ban, *Gentry et al.* 66475 (L, MO)]; SOUTHEASTERN: Sa Kaeo [*Wilkie et al.* PW 416a (E)], Chon Buri, Chanthaburi.

Distribution.— E Himalayas (Sikkim, Nepal, NE India), Burma, Vietnam, China (SW, S & Taiwan), S. Japan (Kyushu & Ryukyu Is.)

Ecology.— Evergreen or mixed forest, clearings and forest edges, often by rivers; 600–1600 m alt.

Conservation Status Assessment.— Least concern.

Notes.— *M. macrocarpa* is widespread and frequently collected (ca 40 collections seen from Thailand, 25 since 1992 of which those cited here represent additional locality records). It is distinguishable from all other Thai taxa by the pubescent apical margin of the standard and wing petals and from all except the rare and local *M. thailandica* by its large, woody, linear-oblong pod and the absence of stipels. *M. thailandica* is easily distinguished from it by much larger greenish-white flowers and larger calyx with longer lobes but easily confused in fruit, differing only in possessing leaflets which are always early-glabrescent, terminal leaflet which is usually slightly relatively wider, lateral leaflets less markedly asymmetrical and fruits usually slightly longer. Sterile material with red-brown pubescence is sometimes confused with *M. oligoplax* or *M. monosperma* (q.v.).

**2. *Mucuna thailandica*** Niyomdham & Wilmot-Deer, *Kew Bull.* 47: 211 & Fig 2. 1992. Type: Thailand. Northern: Chiang Mai [Doi Inthanon, 1 March 1978, *Niyomdham* 5 (holotype BKF!, isotype K!)]. Fig. 1 S–T.

Woody climber (10–) 25–40 m, very similar to *M. macrocarpa*; stems, petioles and young leaflets with sparse, pale adpressed hairs but leaflets soon glabrescent. Leaves always fairly large with terminal leaflet 9.5–14 cm, elliptic, length/width ratio only 1.5–1.75:1, apex acuminate, lateral veins (4–)5(–6) pairs; lateral leaflets only moderately asymmetrical with ratio of abaxial to adaxial halves 1.5–1.75:1, base of abaxial half rounded or truncate; thin-chartaceous or thin-coriaceous; stipels absent. Inflorescences from old wood, unbranched but several axes from same node, 10–50 cm, pubescent like *M. macrocarpa*; ultimate branchlets usually knob-like, rarely lengthened to ca 1.5 cm; pedicels (1.5–) 2–3 cm; bracts and bracteoles ovate-elliptic, acute, ca 7 by 5 mm, very early caducous. Calyx pubescent like the axis and with abundant fine orange bristles, tube very wide, 1 by 2.5 cm, lowest lobe 10–13 by ca 6 mm, laterals broadly triangular, acute or abruptly acuminate, 5–8 by 5–8 mm. Corolla greenish-white, extremely large, standard 4.5–5.5 cm long, wing relatively narrow 7–7.5 by 1.6–2.3 cm, keel 7.5–8.5 cm long. Fruit and seeds like those of *M. macrocarpa* but fruit slightly larger 47–60 by 4–4.5 cm, not or slightly constricted between seeds.

Thailand.— NORTHERN: Chiang Mai [Doi Inthanon, 1 March 1978, *Niyomdham* 5 (holotype BKF!, isotype K!); idem, *Niyomdham* 5266 & 5287 (BKF); idem, *Konta et al.* 4238 (BKF); idem, *Koyama et al.* 44203 (BKF); idem, *Nagamasu* T.50092 (BKF); idem, *Phengklai et al.* 11001 & 11026 (BKF); *Pooma* 1394 (BKF); idem, *Smitinand* 90–93 (BKF)].

Distribution.— Endemic (known only from Doi Inthanon)

Ecology.— Montane forest, gallery forest often in clearings and near streams, 1000–2400 m alt.

Notes.— *M. thailandica* appears to be very rare and local, known only from ten collections from Doi Inthanon (all material seen is cited here). It is distinguishable from all other Thai taxa in its very large calyx and corolla (especially the standard petal which is at least 5 cm long rather than at most 3.5 cm) and from all except *M. macrocarpa* in its long linear fruit and absence of persistent stipels; *M. macrocarpa* is easily distinguished from it in flower (corolla shorter with some parts purple and with a pubescent apical border, wing relatively broad), but is very similar in fruit, differing only in its fruits usually being shorter, mature leaflets which are often hairy, with the terminal leaflet slightly relatively narrower, and lateral leaflets more asymmetrical.

**3. *Mucuna gigantea* (Willd.) DC., Prodr. 2: 405. 1825; Ridley, Fl. Lower Siam in J. Straits Branch Roy. Asiat. Soc. 5: 1:93. 1911; Gagnep. in H. Lecomte, Fl. Indo-Chine 2: 318. 1916; Ridley, Fl. Malay Penins. 1: 577. 1922; Craib, Fl. Siam 1: 443. 1928; Merrill in Trans. Amer. Philos. Soc. 24: 210. 1935; Van Thuan, Fl. Camb. Laos Vietnam 17: 35 & 37, Fig. 3. 1979. Type: Rheede, Hort. Malab. 8: 63 t.36 (1688). Figs. 1 A–C, 2 A–C.**

subsp. ***gigantea***; Wilmot-Deare, Kew Bull. 45: 5 & Fig 1. 1990 & Kew Bull. 47: 213. 1992.

Large sprawling climber; stems, petioles and leaflets glabrous or sparsely fine-adpressed-hairy. Leaves with terminal leaflet 7–13 by 4–8.5 cm; elliptic-ovate (sometimes elliptic or rhombic), length/width ratio ca 2:1, apex short-acuminate, base rounded, lateral veins 4–6, gently curved; lateral leaflets markedly asymmetrical with width ratio of abaxial to adaxial halves ca 2.2:1, base of abaxial half rounded to slightly cordate; rather thin-chartaceous; stipels 3–5 mm long. Inflorescences axillary, 8–25 cm long, often branched near apex, ultimate branchlets few–6, all crowded at apex, these and pedicels of very varying lengths, progressively shorter near apex such that inflorescence is distinctly corymbose or “pseudumbellate” even in young bud stage; pedicels and axis with short, fine, pale pubescence; bracts narrowly ovate to elliptic, 3–5 mm long, caducous, bracteoles 6–18 by 5–7 mm, distinctly longer than calyx and persistent to well-developed bud stage. Calyx pubescent like pedicels and with abundant irritant bristles, tube 8–10 by 11–15 mm, lobes short and broad, lowest (1–) 2–3 mm long, laterals 1–2 mm. Corolla white, tinged green, yellow or pink; standard 2.5–3 (–3.8) cm long, large relative to keel  $\frac{2}{3}$ – $\frac{3}{4}$  times keel length; wings 2.8–4 by 0.8–1 cm, equalling keel length. Fruit leathery, asymmetrically oblong or elliptic-oblong, (1–) 3 (–4)-seeded, (7–)10–15(–18) by (3.5–)4–5.5(–6) cm, length up to 3 times width, markedly laterally flattened, up to 0.5 cm thick, surface with sparse fine, brown pubescence and scattered bristles but glabrous with age, also ornamented with a pattern of strongly raised vein-lines so close and fine as to give a pitted appearance; each margin with a pair of conspicuous wings 5–10 mm broad. Seeds dark brown or black, 2–3 by 1.8–2.5 cm.

Thailand.—NORTHERN: Chiang Mai [*Kerr* 33 (BM)]; CENTRAL: Bangkok; SOUTHEASTERN: Trat [*Ko Kadat*, *Schmidt* 568 & 577a. (C)]; PENINSULAR: Ranong [*Fukuoka et al.s.n.* (BKF)], Nakhon Si Thammarat, Satun, Songkhla [*Maxwell* 85–631 & 85–741, (BKF, GH, L)].

Distribution.— Widespread throughout Asia and Pacific, especially coasts and Islands; Japan, India, Burma, Indochina, Indonesia, Philippines, Australia, Pacific islands.



Ecology.— Littoral forest, estuaries, rainforest or riverbanks but always near coast and at low altitude. Its coastal distribution is partly due to the fact that its seeds can be dispersed by sea.

Conservation Status Assessment.— Least concern

Notes.— Twenty collections have been seen from Thailand (eight subsequent to 1992 of which those here cited represent additional locality records). *M. gigantea* is distinguished from all other Thai species in its leathery, broadly oblong, marginally winged pod with lateral faces patterned but without lamellae, its distinctly pseudumbellate inflorescence (pedicels and ultimate branchlets of varying lengths) and its often very short, broad calyx lobes and short corolla with keel only 3–4 cm long. The other subspecies (ssp. *plurisemina* Verdc., differing in fruit with narrower wings and 5–6 seeds, is known only from Philippines and New Guinea. The only similar species, *M. acuminata*, (recorded from Malaysia and Java) can be distinguished from *M. gigantea* by the surface patterning of its fruit being indistinct, inflorescence axis densely (rather than sparsely) pubescent and always short, long-acuminate calyx lobes, flowers which are usually longer (ca 4.5 cm) and different relative lengths of the petals, with the keel longer than wings and the standard relatively short compared to the keel. *M. oligoplax* is somewhat similar to *M. gigantea* in its (indistinctly) pseudumbellate inflorescence and similarly shaped fruit but is distinguished by conspicuous red-brown indumentum on the leaves and stems and fruit faces ornamented with distinct, partly developed lamellae.

**4. *Mucuna oligoplax*** Niyomdham & Wilmot-Dear in Kew Bull. 48: 29 & Fig. 1. 1993. Type: Thailand, Peninsular, Songkhla [Nathawi, Khao Nam Khang National Park, 20 Oct. 1991 *Larsen et al.* 42455 (holotype K!; isotypes AAU!, BKF!, L!, MO! PSU!)]. Figs. 1 D–E, 2 E.

Woody trailing plant or climber, 10–40 m long; young stems and petioles with dense, often somewhat crisped, dark red-brown, soft hairs 0.3–0.5 mm long. Leaves with terminal leaflet 12–14 by 7–8 cm, elliptic, length: width ratio 1.5–2:1, apex with short, broad acumens, base rounded, lateral veins 6–7 pairs, gently curved but abruptly looping near margin; lateral leaflets markedly asymmetrical with width ratio of abaxial: adaxial halves 2:1, base of abaxial half truncate; thin-chartaceous with ± adpressed, straight red-brown hairs, sparse above, more dense below especially on veins; stipels fairly robust, 3 mm long. Inflorescence axillary, axis very short and robust, 3–4 cm long by 1.5 mm diam. but becoming extremely thick and woody, ± 5 mm diam. in fruit, 2–3 main axes arising from same axil but each unbranched with 3(–4) ultimate branchlets which are each slightly lengthened, 2–3 mm long and spaced throughout length; pedicels very long, (2–)2.5–3.5 cm, lower ones often longer than upper ones giving inflorescence an indistinctly pseudumbellate appearance, fairly robust, 1 mm in thickness (3–4 mm in fruit), pedicels and axis with dense hairs like the stem but pale yellowish-orange; bracts and bracteoles very early caducous, bracts ovate or narrowly ovate, long-acuminate, 7 by 3.5 mm, red-brown pubescent outside. Calyx with hairs like the axis and long coarse yellowish-orange bristles, fairly broadly cup-shaped, 7–8 by 12–14 mm; lobes very distinct, lowest 6–8 mm long, narrowly acuminate, laterals 2–3 by ± 1.5 mm. Corolla with standard pale brownish or greenish purple, ca 3 cm long; wings purple with darker veins, rather narrow 4.9–5.2 by ca 1.2 cm, apex tapering, ± acute; keel pale purple, slightly shorter than wing, ± 4.5 cm long. Fruit black, leathery, oblong, 2-seeded,

both margins slightly convex but not constricted between each seed, 8–9 by 3.5–4 cm, markedly laterally flattened; surface with sparse red-brown hairs like the stem and dense irritant red-brown bristles and with a fine pattern of raised vein-lines resembling that of *M. gigantea* but coarser and shallower, also ornamented with a few transverse lamellae arising erratically but mostly close to upper margin, these of irregular size and poorly developed, never extending across more than  $\frac{1}{4}$ – $\frac{1}{3}$  of fruit surface, 1–10 mm long, 1–3 mm high: each margin with a pair of irregularly dentate wings 3–5 mm wide. Seed 2.2 by 1.8 by 1 cm, shiny light orange-brown mottled with dark brown; hilum black, extending through  $\frac{1}{3}$  of circumference.

Thailand.— PENINSULAR: Trang [Yan Ta Khao district, 16 Dec. 1995, *Mauric* 41 (BKF)], Songkhla [Nathawi, Khao Nam Khang National Park, 20 Oct. 1991 *Larsen et al.* 42455 (holotype K!; isotypes AAU!, BKF!, L!, MO! PSU!)].

Distribution.— Endemic to peninsular Thailand

Ecology.— Clearings and disturbed areas in evergreen rainforest; 150 m alt.

Notes.— *M. oligoplax* is apparently very rare, known only from two collections. It is similar to *M. gigantea* in fruit shape and somewhat in its inflorescence architecture with lengthened ultimate branchlets but *M. gigantea* is easily distinguished by pubescence which is pale or absent, a distinctly pseudumbellate inflorescence with flowers crowded in the distal part of the axis and pedicels markedly shorter towards apex, flowers which are greenish-white with shorter calyx lobes, pedicels and wing petals, the complete absence of fruit lamellae and seeds which are not mottled. Red-brown pubescence also distinguishes *M. oligoplax* from most other Thai taxa but *M. macrocarpa* and *M. monosperma* often have similar pubescence and sterile material can be misidentified. *M. macrocarpa* differs in its relatively narrower leaflets, the lateral ones  $\pm$  truncate, stipels absent, longer inflorescences from old wood, flowers with a pubescent apical border and pod long, narrow and woody. *M. monosperma* has a similarly short inflorescence and short oblong leathery fruit but differs in shorter pedicels, calyx lobes and corolla, dark (rather than pale) purple petals and fruit with many well-developed lamellae; leaflets are also mostly smaller.

**5. *Mucuna monosperma* DC.** ex Wight in Hook., Bot. Misc. 2: 346. 1831; Craib, Fl. Siam. 1: 444. 1928; Wilmot-Deer, Kew Bull. 42: 28 & Fig. 1. 1987 & 47: 217. 1992. Type: Eastern India [March 1910, *Roxburgh* 276 (lectotype BM!., ?isolecotype K!)]. Figs. 1 F–G, 2 F.

Climber, stems and petioles rarely glabrescent, usually with abundant red-brown  $\pm$  spreading hairs ca 0.4 mm long. Leaves with terminal leaflet 7–13(–15.5) by (3–)5–7(–9) cm, elliptic or ovate (–obovate), length/width ratio 1.5–1.8: 1, apex with abrupt short, wide acumen, base broad-cuneate or truncate, lateral veins (4–)5–6, gently curved; lateral leaflets markedly asymmetrical with width ratio of abaxial to adaxial halves 2:1, base of abaxial half rounded; membranous to thin-chartaceous, sometimes completely glabrous, more often with hairs at least beneath, those on veins red-brown spreading like the stem hairs, those elsewhere paler  $\pm$  adpressed; stipels often inconspicuous, 0.5–3 mm. Inflorescences very short, 3–6 cm, often branched once or more close to base, ultimate branchlets 2–5, knob-like or rarely 3–4 mm long; pedicels only 6–10 mm, these and axis hairy like the stem and with sparse irritant bristles; bracteoles soon caducous, narrowly ovate or  $\pm$  linear, 1.5–3 cm.

Calyx with shorter, finer hairs than axis and abundant irritant bristles, tube only ca 7 by 10 mm, lobes short and wide, lowest ca 4.5 by 1.5–4 mm, laterals ca 2 by 2 mm. Corolla dark purple, standard ca 2.5 cm, wings 4–4.5 by 0.6 cm with narrowly rounded apex, keel  $\pm$  equalling wing. Fruit leathery, 1–(in literature rarely 2)-seeded, asymmetrically oblong to elliptic in outline with very convex margins and often wider than long, 4.5–7.5 by 3.5–5 cm, laterally flattened around the large seed, to 2 cm thick, with hairs like the stem and abundant irritant bristles, surface with 5–6 lamellae of irregular height up to 5 mm in parts, running obliquely transversely from both margins, converging and often interrupted in centre of pod face; both margins with a pair of somewhat undulating wings  $\pm$  5 mm wide, some lamellae extending into wings. Seed red-brown, ca 2.8 by 2.4 cm, hilum black.

Thailand.— NORTHERN: Tak [to Pang Ma Kham Pom, *Rock* 1005 (US); *ibid*, to Mesawt [Mae Sot], *Rock* 676 & 1081(US)]; Kamphaeng Phet, [*Kerr* 2993 (BM, E, K)]; SOUTHWESTERN: Uthai Thani [Ban Rai District, *Maxwell* 76–51 (AAU)]; PENINSULAR: Krabi [*Niyomdham* 2857 (AAU, BKF)].

Distribution.— Indian subcontinent, Sri Lanka, Burma.

Ecology.— Thickets, disturbed forest and clearings; ca 300 m alt

Notes.— Many collections of *M. monosperma* exist from the Indian subcontinent but only six collections (all cited above) have been seen from Thailand, five from a small part of the N and SW regions (adjacent to its few known localities in Burma) and one from much further south. It is presumed to be uncommon but this scattering of records suggests that it is also under-collected. It differs from the six other Thai species with lamellate fruit in its lamellae converging towards the centre of the pod rather than  $\pm$  parallel obliquely across the pod face. It is also distinguished from most Thai species in often having conspicuous red-brown indumentum on stems and leaves, otherwise seen only in *M. oligoplax* (which is distinguished by fruit lamellae few and scarcely developed, pedicels, calyx lobes and flowers longer and corolla paler) and sometimes in *M. macrocarpa* (which is distinguished by narrower  $\pm$  truncate lateral leaflets, stipels absent, long inflorescences from old wood, flowers with a pubescent apical border and long narrow woody pod). When this indumentum is absent, flowering material of *M. monosperma* is easily confused with *M. biplicata* (Peninsular Malaysia, not recorded from Thailand) which has markedly different bifurcated fruit lamellae (“T-shaped” in cross-section rather than simple) but very similar broad leaves and short inflorescence axes, short calyx lobes and short purple corolla, although calyx lobes of *M. biplicata* are often very indistinct, the lowest only 1.5–4 cm rather than ca 4.5 cm and laterals often  $<$  0.5 mm.

**6. *Mucuna stenoplax*** Wilmot-Dear, *Kew Bull.* 47: 218 & Fig 4. 1992. Type: Peninsular Malaysia, Perlis, [*Chan* in FRI 19916 (holotype **K!**; isotype **KEP**)]. Figs. 1 H–J, 2 G.

Climber; stems and petioles with sparse fine, adpressed pale hairs. Leaves with terminal leaflet 9–11 by 5–7 cm, elliptic, apex gradually or abruptly short-acuminate, base broad-cuneate, lateral veins 4–5 pairs, gently curved; lateral leaflets with width ratio of abaxial to adaxial halves 1.5:1, base of abaxial half  $\pm$  truncate; thin-chartaceous, with abundant but rather inconspicuous hairs like the stem beneath and sometimes above; stipels slender, 4–5 mm. Inflorescences only 2–7 cm long, main axis unbranched, ultimate branchlets

distinctly lengthened, 3–4 mm; pedicels (1.5–) 2 cm, these and axis with denser hairs than stem, somewhat spreading, > 0.4 mm long; bracts caducous, bracteoles fairly persistent, slightly exceeding calyx, narrowly ovate, 12 by 6 mm. Calyx densely hairy like pedicels, tube ca 8 by 14 mm, lowest lobe 7–8 mm, laterals 4–5 mm long, all narrow < 2 mm wide, long-acuminate. Corolla purple, small, standard ca 3 cm long, wings ca 4.5 by 1.2 cm, apex tapering, keel ± equalling wing. Fruit leathery, 2-seeded, narrowly oblong, somewhat constricted between seeds, 5–9 by 2.5–4 cm, markedly laterally flattened up to 1 cm thick, with dense coarse, irritant bristles and sparse shorter, finer bristles, faces with 12–15 obliquely transverse, ± parallel, simple, thin-textured narrow lamellae of irregular height, 1–2 mm irregularly widening to 4 mm, mostly interrupted near middle of pod and all extending to distal edge of marginal wing, each margin with a pair of wings 3–4 mm wide but with irregularly dentate outline, widening to 5–6 mm where lamellae run into it. *Seeds* black, 2–2.4 by 1.5–1.8 cm, hilum black.

Thailand.— PENINSULAR: Krabi [*Larsen* 43470 (GH)], Trang [*Phusomsaeng et al.* 49 (AAU, K, L)], Satun [*Congdon & Hamilton* 296 (A); *idem*, *Maxwell* 87–361 (BKF, GH, L)], Songkhla [*Maxwell* 86–64 (BKF, GH, L, MO)].

Distribution.— Southern Peninsular Thailand and the northern border of Peninsular Malaysia

Ecology.— Evergreen and secondary forest, open thickets near streams or by seashore; sea level to 150 m

Notes.— *M. stenoplax* appears to be rare and localised; only five collections (cited above) have been seen from Thailand and one from Peninsular Malaysia. Even young fruits can be distinguished from most Thai species in having lamellae of irregular height extending to the distal edge of the marginal wing which is wider at this point, giving a jagged irregularly dentate appearance; it is frequently misidentified as *M. biplicata* (Peninsular Malaysia, not recorded from Thailand) which has similar leaves and superficially very similar fruits but differs in that its fruit lamellae are bifurcated (rather than simple raised flaps) and calyx lobes much shorter. *M. stenoplax* is ± indistinguishable vegetatively from three other lamellate-fruited Thai species, *M. hainanensis*, *M. interrupta* and *M. revoluta*, but distinguished from the first two (often all three) by its distinctly lengthened, rather than knob-like, ultimate inflorescence branchlets. Its flowers are smaller than in *M. interrupta* and often in *M. hainanensis* but of similar size to those of *M. revoluta*, which differs in that its calyx lobes are broadly acute and its axis and pedicels with minute (0.1–0.2 mm rather than ca 0.4 mm), spreading pubescence.

7. *Mucuna hainanensis* Hayata, *Icon. Pl. Formos.* 3:72. 1913; Van Thuan, *Fl. Camb. Laos Vietnam* 17: 39. 1979. Wilmot-Dear, *Kew Bull.* 46: 205–212. 1991. Type: China, Hainan [May 1910, *Katsumada* s.n. (holotype TI!; ?isotype K!)].

subsp. *hainanensis*; Wilmot-Dear, *Kew Bull.* 46: 207 & Fig. 1 J–N .1991 & *Kew Bull.* 47: 218 & Fig. 7 C–D. 1992.— *M. suberosa* Gagnep. in *Notul. Syst. (Paris)* & in H.Lecomte, *Fl. Indo-Chine* 2: 319. 1916. Types: Vietnam, Tonkin [*D'Aleizette* 345, *Balansa* 2260, *Bon* 2925 & 332 (syntypes P!), *Balansa* 2257 (syntype P!; isosyntypes AAU!, K!), *Balansa* 4402, *Bon* 2938 (syntypes P!; isosyntypes K!)].— *M. nigricans* sensu auctt. non (Lour.)

Steud.; Van Thuan, Fl. Camb. Laos Vietnam 17: 36. 1979.— *M. nigricans* sensu auctt. var. *hainanensis* (Hayata) Wilmot-Dear, Kew Bull. 39: 43. 1984.— *M. nigricans* sensu auctt., var. *hongkongensis* Wilmot-Dear, Kew Bull. 39: 45. 1984. Type: China, Hong Kong [New Territories, Lau 3234 (holotype **K!**; isotype **HK!**)].— *M. interrupta* sensu Averyanov in Averyanov *et al.*, Contrib. Viet. Isl. Fl. Veg.: 58. 1988; non Gagnep.

Vegetatively very similar to *M. stenoplax* but more variable; stems and leaves glabrous or sparsely adpressed-hairy. Leaves with terminal leaflet very variable in size, 4.5–12 by 2.5–5.5 cm, elliptic or elliptic-obovate, lateral veins (3–)5(–7) pairs; stipels 1–2 mm long. Inflorescences 4–40 cm long, unbranched, ultimate branchlets spaced through most of length but absent from basal part, knob-like; bracts often present in flowerless part of axis, broadly ovate, long-acuminate, 20–30 by 10–16 mm, upper bracts of different form, broadly elliptic or obovate with rounded and often hooded apex, 10–20 by 8–18 mm; bracteoles narrowly obovate or ± linear to narrowly elliptic, 9–13 by 2–4 mm; pedicels 0.8–1.3 cm, these and main axis with dense adpressed, fine, pale pubescence. Calyx with hairs like the axis and abundant red bristles, tube broadly cup-shaped, 0.6–1 by 1–1.3 cm, lobes long, narrow, acuminate, lowest 8–10 mm, laterals 5–6 mm long, all 2–3 mm wide. Corolla purple (rarely white), standard 2.7–3.2 cm, wing (4.2–) 5–5.5 by (8–)12–15 mm, tapering to acute apex, keel ± equalling wing. Fruit leathery, varying widely in shape from broadly asymmetrically oblong with very convex upper margin, straight lower margin and only 2 seeds to linear-oblong but strongly indented between 3–4 seeds, 7–17 by 3–5 cm, length/width ratio 2–4:1, markedly laterally flattened, to ca 1 mm thick; surface with abundant irritant red bristles but otherwise glabrescent and rather shiny, lamellae 8–12(–14), very oblique, simple, parallel, thin-textured, not interrupted nor running into wings, uniformly 4–5 mm high; marginal wings uniformly 8–14 mm wide. Seeds black, 1.7–2(–2.5) & 1.5(–2) cm, strongly laterally flattened; hilum black.

Thailand.— NORTHERN: Chiang Mai [*Pooma* 289 (**BKF**)], Tak [*Maxwell* 94–904 (**GH, L**)]; SOUTHWESTERN: Prachuap Khiri Khan [*Middleton et al.* 1255 [white-flowered form] (**GH**); *ibid.*, Huai Yang, *Put* 3198 (**K., L.**)]; SOUTHEASTERN: Chanthaburi [*van Beusekom et al.* 2058 [form with white keel petals] (**C, P**)]; PENINSULAR: Surat Thani [*Ko Samui, Put* 1280 (**K, L**)].

Distribution.— Vietnam (mainly eastern part), China (Hong Kong, Hainan).

Ecology.— Forests, thickets, rocky areas, hedges; low altitude.

Notes.— Only six collections of *M. hainanensis* have been seen from Thailand (all cited above) and the wide scattering of these few records suggests that it may be overlooked and under-collected. It is easily distinguished in fruit from other lamellate-fruited taxa by its combination of simple lamellae (not bifurcated) and of ± uniform height, running parallel obliquely across the pod face, and a wide and even marginal pod wing. Vegetatively it is ± indistinguishable from *M. stenoplax*, and two species with bifurcated lamellae, *M. interrupta* and *M. revoluta*. Its flowers are often larger than in *M. stenoplax* and *M. revoluta*. *M. stenoplax* also differs through its lengthened (not knob-like) ultimate inflorescence branchlets, *M. revoluta* in its often small flowers and in pedicels and axis with minute spreading pubescence, *M. interrupta* in its calyx lobes broad-acute with lateral lobes almost equalling lowest and always white flowers (only one collection of *M. hainanensis* seen with cream rather than purple flowers). The other subspecies, *M. hainanensis* subsp.

*multilamellata* Wilmot-Deare (1991), known from the Philippines, N and E Indian subcontinent and possibly Burma, is distinguished from subsp. *hainanensis* mainly by its fruit with dense short, spreading indumentum and more numerous, scarcely oblique lamellae, an often much larger and ovate terminal leaflet, inflorescence axis branched near base, upper bracts mostly longer, wings and keel often longer, to 6 cm.

**8. *Mucuna revoluta*** Wilmot-Deare, Kew Bull. 47: 222 & Figs 5 & 6K. 1992. Type: Vietnam [Trian, Feb. 1877, *Pierre* s.n. (holotype P!)]—*M. interrupta* Gagnep. in H.Lecomte, Fl Indo-Chine 2: 321. 1916, *pro parte* (citation of *Harmand* 272; see notes below); Van Thuan, Fl. Camb. Laos Vietnam 17: 38. 1979, *pro parte* (some citations and part of flower description); Wilmot-Deare, Kew Bull. 39: 46. 1984, *pro parte* (citation of *Wang* 8065, Figs. 3G & 3H & note on red flower colour).—*M. imbricata* DC ex Bak. var. *bispicata* Gagnep. in *op. cit* 2: 320. 1916. Types: Vietnam [Delta, *Harmand* s.n. & Trian, *Pierre* s.n. (syntypes P!)]—*M. nigricans* sensu Van Thuan, *op. cit* 17: 38. 1979, *pro parte* (citations only, but excluding Loureiro); non (Lour.) Steud.—*M. biplicata* sensu Van Thuan, *op. cit* 17: 40. 1979, *pro parte* (citations and part of description); non Teijsm. & Binnend. ex Kurz. Figs. 1 L–M, 2 K.

Vegetatively very similar to *M. stenoplax*; stems glabrous or with sparse adpressed, fine hairs. *Leaves* with terminal leaflet 8–10 by 4–5.5 cm, elliptic or ovate, apex abruptly acuminate, base narrowly rounded; lateral leaflet more markedly asymmetrical with width ratio of abaxial to adaxial 1.75–2:1; hairy (rarely glabrous) both sides; stipels shorter, 2–4 mm. *Inflorescences* (3–)8–16 cm, unbranched or once–twice branched near base, ultimate branchlets knob-like or sometimes slightly lengthened, evenly distributed in upper  $\frac{2}{3}$  of axis; pedicels only 5–10 mm, these and main axis with dense, very short (0.1–0.2 mm), fine, spreading, velvety, light brown pubescence; bracts and bracteoles more sparsely hairy, shape and size widely varying, elliptic or narrowly obovate to linear oblong, (5–)10–17 by (2–)5–7 mm, bracteoles exceeding calyx. *Calyx* densely hairy like the axis and with irritant red bristles, narrowly cup-shaped, tube ca 8 by 8–10 mm, lobes conspicuous, lowest 8–9 mm, laterals 4–6 mm long, all broadly triangular with an abrupt fine acumen. *Corolla* dark purple or pinkish-purple with paler keel (rarely white), relative proportions  $\pm$  as in *M. stenoplax* but petals often slightly larger, standard up to 3 cm long, wings and keel up to 4.8 cm. *Fruit* leathery, broadly oblong, sometimes asymmetrical, (1–)2-seeded, margins markedly convex, scarcely or not indented between seeds, 6–9 by 4–4.5 cm, length up to twice width, somewhat laterally flattened, to 2.5 cm thick; surface pubescent like the axis and with abundant irritant bristles, also with 8–12 thick-textured, very obliquely transverse parallel lamellae, these bifurcated at apex (“T shaped” in cross-section) with apical halves up to 5 mm broad and strongly revolute, uniformly interrupted along midline of fruit and not extending into marginal wings; both fruit margins with a pair of strongly inrolled wings ca 4 mm wide. *Seeds* shiny, red brown with black mottling, very large, 2.5–2.8 by ca 2 cm.

Thailand.—NORTHERN: Chiang Mai [*Maxwell* 89–532 (GH, L., MO)], Chiang Rai, [*Pooladda*, *Smitinand* 1664 (BKF, L)], Lamphun [*Maxwell* 94–1248 (BKF, GH)]; NORTHEASTERN: Loei; EASTERN: Nakhon Ratchasima; SOUTHEASTERN: Chon Buri, Rayong [*Maxwell* 94–1200 (BKF, GH)], Chanthaburi, Trat [*Ko Kut*, *Phengklai et al.* 13147 (BKF)]; PENINSULAR: Krabi, Nakhon Si Thammarat [*Ko Kra*, *Phengklai et al.* 12466 (BKF)].

Distribution.—Throughout much of Cambodia, Laos and Vietnam, extending to SW China (Yunnan).

Ecology.— Seasonal rainforest often by streams, dry evergreen forest, primary and slightly disturbed evergreen hardwood forest, swamp forest, degraded deciduous forest and bamboo, scrub roadsides; 300–800 m alt.

Notes.— Nineteen collections of *M. revoluta* have been seen from Thailand (11 since 1993 of which those here cited represent additional locality records) and it appears to be not uncommon. Its fruits are easily distinguished from those of all other taxa by rigid, thick-textured, strongly revolute lamellae, all uniformly interrupted along the pod midline and not extending into the marginal fruit wings which are strongly inrolled. It is vegetatively almost identical to *M. interrupta* and two species with simple lamellae, *M. stenoplax* and *M. hainanensis*, but is usually easily distinguished from all three by its distinctively minute (0.1–0.2 mm rather than at least 0.4 mm), velvety, spreading pubescence on the inflorescence axis, pedicels and calyx. Its flowers are often relatively small as in *M. stenoplax* and *M. biplicata* (Peninsular Malaysia, not recorded from Thailand) but its relatively long, broad, acute calyx lobes differ from both: in *M. biplicata* the calyx lobes are minute and in *M. stenoplax* narrow-acuminate; *M. stenoplax* also differs in its ultimate branchlets of the inflorescence being more distinctly lengthened. *M. revoluta* is often misidentified as *M. interrupta* which differs in possessing thin-textured and upcurved fruit lamellae, a flat marginal wing, ultimate branchlets of the inflorescence which are always knob-like and flowers always white; flowers of *M. revoluta* are usually pinkish or brownish-purple (keel sometimes whitish) but two collections otherwise conforming to this species are said to have all petals white or light greenish.

Gagnepain (1916) confused two taxa in his original description of *M. interrupta*, citing specimens which included *Harmand* 272, a flowering and fruiting specimen of *M. revoluta*. Therefore his description includes certain characters, notably the pink flower colour, which belong to *M. revoluta*.

**9. *Mucuna interrupta*** Gagnep. in H.Lecomte, *Fl Indo-Chine* 2 : 321. 1916, *pro parte* (see note above under *M. revoluta*); Craib, *Fl Siam* 1 : 444. 1928; Van Thuan, *Fl Camb. Laos Vietnam* 17 : 38. 1979, *pro parte*; Wilmot-Dea, *Kew Bull.* 47 : 227 & Figs. 6 A–J & 7 A–B. 1992. Type: Cambodia [Angkor, *Thorel* 2098 (lectotype P!)].— *M. nigricans* (Lour.) Steud. var. *cordata* Craib, *Fl Siam* 1 : 444. 1928. Type: Thailand, Central, Saraburi [17 July 1925, *Noe* 125 (holotype K!)]. Figs. 1 N–P, 2 L–M.

Vegetatively very similar to *M. stenoplax*; differences as follows; stems glabrous or with sparse adpressed or abundant spreading fine hairs. Leaves with terminal leaflet to 12 by 6.5 cm, elliptic or ovate, lateral veins 5–6 pairs; hairy (rarely glabrous) both sides; stipels only 2–4 mm. Inflorescences 10–14 cm long, main axis unbranched and with few–6 knob-like ultimate branchlets towards apex, pedicels ca 10 mm, these and main axis with dense usually adpressed, pale hairs, finer than on stem; bracts very large, some usually persistent even with mature fruit and some present on lower, flowerless, part of axis, broadly ovate, acute to short-acuminate, largest towards apex, (22–) 30–40 by (7–) 18–20 cm; bracteoles much longer than calyx, narrowly obovate or ± linear, acute, 22–30 by 5 cm. Calyx hairy like the axis and with irritant red bristles, narrow, tube 8 by 8–10 mm, lobes conspicuous, lowest 8–9 mm, laterals 4–6 mm long, all broadly triangular, 5–6 mm wide, broad-acute, never acuminate. Corolla white or cream, tinged purple at base, fairly large, standard 3–3.5 cm

long, wings 5.5–6 cm long, keel equalling wings. Fruit large, (very rarely 2-)3-seeded, 13–14 by 6–7 cm, broadly oblong, markedly laterally flattened, up to 2.5 cm thick; surface with abundant, fine, spreading, red brown hairs and irritant bristles, lamellae 10–15, oblique, bifurcated and interrupted as in *M. revoluta* and not running into wings but apical halves somewhat upcurved, never revolute; marginal wings flat, very wide, 12–15 mm. Seeds orange-brown, even larger than in *M. revoluta*, 3 by 2.5 cm, hilum black.

Thailand.—NORTHERN: Chiang Mai, Nan, Lampang [*Maxwell* 95–149 & 96–1027 (**BKF, GH, L**)], Phitsanulok [Bandong, *Wongprasert et al.* 0212–01 (**BKF**)]; EASTERN: Nakhon Ratchasima [*Wongprasert et al.* 83 (**BKF**); Pak Chong, *Marcan* 1554 (**BM**)]; SOUTHWESTERN: Prachuap Khiri Khan [*Middleton* 1255 (**AAU, P**)]; CENTRAL: Saraburi.

Distribution.—Cambodia, Laos, Vietnam, SW China, Burma.

Ecology.—Evergreen forest and mixed forest in shade or on river banks, secondary forest amongst bamboo, open thickets; 75–600 m alt.

Notes.—18 collections of *M. interrupta* have been seen from Thailand (13 since 1992 of which those here cited represent additional locality records) and it appears to be not uncommon. It is easily recognised in fruit, but vegetatively almost identical to three of the other lamellate-fruited Thai taxa, *M. stenoplax*, *M. hainanensis* and *M. revoluta*. Its relatively large flowers with persistent bracts are often confused with those of *M. hainanensis*, which differs in its simple fruit lamellae, narrow-acuminate rather than broad-acute calyx lobes and usually purple corolla with upper floral bracts obovate with a hooded apex. *M. revoluta* is often misidentified as this species but easily distinguished by its extremely short, spreading indumentum on the inflorescence, mostly shorter, usually purple flowers, thick-textured, strongly revolute fruit lamellae and inrolled marginal wing. *M. stenoplax* has much smaller purple flowers and simple lamellae. The most closely similar species, *M. imbricata* (known only from NE Himalaya and N Burma) differs only in that its fruits are 2- (never 3-) seeded, lamellae and marginal wing undulate or slightly revolute, calyx lobes narrower and flowers shorter with bracts caducous.

### B. Subgenus *Stizolobium* (P.Br.) Prain.

Annual or sometimes perennial slender climbers. Seeds oblong-ovoid with a very short hilum surrounded by a conspicuous rim-aril. Lateral veins of leaflets running clearly into margin.

**10. *Mucuna gracillipes*** Craib, Bull. Misc. Inform. Kew 1927: 378. 1927 & Fl. Siam 1: 444. 1928; Wilmot-Dear, Kew Bull. 47: 233 & Fig. 9 A–E. 1992. Type: Thailand, Northern, Lamphun [Me Kaw, *Winit* 1541 (holotype K!)]. Fig. 1 V–W.

Trailing slender herb, stems with abundant conspicuous long (1–1.7 mm) weak, spreading, pale orange hairs. Leaves and leaflets very similar to those of *M. pruriens*, terminal leaflet ca 9–10 by 5.5 cm, elliptic, apex rounded and abruptly fine-mucronate, base rounded, lateral veins (5–)6–7 pairs, gently curved and running right into margin; lateral leaflets slightly larger than terminal, markedly asymmetrical with ratio of width of abaxial to adaxial 2.3–3:1, abaxial half with base truncate; rather thick-chartaceous, with hairs like



those on the stem, sparse above, abundant beneath especially on veins; stipels 4–5 mm. Inflorescences axillary, ca 17 cm long, main axis unbranched with ultimate branchlets knob-like, rather few, only 3–5, all crowded in upper third of axis; pedicels only ca 8 mm long with short (ca 0.4 mm) dense adpressed, silvery, silky pubescence, main axis similarly hairy towards apex but pubescence more like the stem towards base; bracts and bracteoles small relative to flower size, 10 by 4 mm, narrowly ovate, acute. Calyx with dense silky hairs like the pedicels and fine brownish bristles, tube ca 8 by 12 mm, lobes long, lowest ca 8 mm, laterals ca 6 mm long, all 2–3 mm wide, triangular, acute; upper lip well marked, exceeding lateral lobes. Corolla long and narrow, 2-coloured, standard and wings dark bluish-purple, keel white; standard 3 cm long, wings 6–6.3 by 1.5 cm equalling keel. Fruit unknown.

Thailand.—NORTHERN: Lamphun [Me Kaw, *Winit* 1541 (holotype K!).]

Distribution.—Endemic to Northern Thailand.

Ecology.—Forest, 250 m alt.

Notes.—This distinctive species is only known from one collection and is presumed to be very rare and local. The full range of variation in leaves and flowers may not be completely apparent from the only collection known of this species. Its fruit and seed are unknown but assumed to conform to *M.* subgenus *Stizolobium*, since vegetatively *M. gracilipes* is almost identical to *M. pruriens* and *M. bracteata* in its rhombic-ovate leaves with lateral veins running into the margin. It differs markedly in that its petals are much larger (wings twice as long) with different relative proportions and clearly two coloured, the keel being white rather than light purple and not longer than wing.

**11. *Mucuna pruriens* (L.) DC.**, Prodr. 2: 405. 1825; Gagnep. in H.Lecomte, Fl. Indo-Chine 2: 323. 1916; Craib, Fl. Siam 1: 444. 1928; Van Thuan, Fl. Camb. Laos Vietnam 17: 31. 1979; Pinratana, Flowers in Thailand 9: 47 & Fig. 1981. Type: Indonesia, Amboina [Rumphius, Herb. Amb. 3 t. 142. 1750].

Slender climber often up to several metres long. Leaves and leaflets very variable in size; terminal leaflet 3–16 cm long, elliptic to rhombic-ovate, lateral veins 5–8, (straight or) gently curved throughout length and running clearly into margin; lateral leaflets with base of abaxial half usually truncate; stipels conspicuous 4–5 mm long, filiform or robust. Inflorescence usually long, up to 40 cm, main axis slender, unbranched with (few–)10–20 knob-like ultimate branches in upper  $\frac{1}{2}$ – $\frac{2}{3}$  of axis; lower part of axis without either bracts or scars. Calyx with dense adpressed, silvery or brownish pubescence and often also irritant red bristles, tube 5–10 mm long, upper lip usually exceeding lateral lobes. Corolla dark purple (rarely white); wings broadly rounded, usually shorter than keel. Fruit narrowly linear-oblong, 3–6-seeded, often curved into “S-shape”, 5–9 by 0.8–1(–2) cm, slightly laterally flattened ca 0.5 cm thick; surface with dense irritant bristles or silky hairs, sometimes ornamented with partial longitudinal ridges. Seed ellipsoid, small, 1–1.7(–2) by 0.7–1.3 cm, hilum occupying ca 1/8 of circumference.

*M. pruriens* is similar to *M. bracteata* in its rhombic-ovate leaves with lateral veins running into margin, inflorescence axis with flowers all in upper  $\frac{1}{2}$ – $\frac{3}{4}$  of axis, small flowers and small linear oblong fleshy fruit usually with irritant hairs. It differs in its thin-textured leaves with slender, less conspicuous lateral veins, slender inflorescence axis without

bracts or scars in lower (flowerless) part and bracts soon caducous; fruit in *M. bracteata* is also never "S-shaped". *M. gracilipes* is vegetatively indistinguishable from *M. pruriens* but with much larger, two coloured flowers.

**11a. var. *pruriens*.** Wilmot-Dea, Kew Bull. 47: 235 & Fig. 10A–H. 1992. Figs. 2 S, 5 A–H.

Stems and petioles glabrous or with sparse, fine, adpressed or spreading, pale hairs and often darker bristles. Terminal leaflet 3–16 cm long, elliptic to rhombic-ovate, length/width ratio 1.5–1.75:1, apex acute or shortly mucronate, lateral leaflets not markedly larger; thin-chartaceous or membranous, rarely glabrous, usually with hairs like those on the stem, less sparse below especially on veins. Inflorescence axis and pedicels with dense, fine, adpressed, silvery, silky hairs and often also sparse red bristles; bracts and bracteoles small, soon caducous, seen only in young bud stage, bracts narrowly ovate or linear-ovate, 6–10 by 2–3 mm with a distinct acumen often comprising  $\frac{1}{2}$  length; bracteoles of similar length but narrower. Calyx with dense silky hairs and bristles like the pedicels; lowest lobe relatively long and narrow 6–10 by 2–3 mm, lateral lobes broadly triangular, 2–4 by 1.5–3.5 mm. Corolla purple but keel lighter than wings; standard 1.6–2.5 cm long, keel 3–4(–4.5) cm long. Fruit narrowly linear-oblong, usually distinctly curved often into "S-shape", up to 1 cm wide, with dense, irritant, red-gold or brownish caducous bristles completely concealing surface. Seeds fawnish-brown; aril orange.

Thailand.— NORTHERN: Mae Hong Son, Chiang Mai, Chiang Rai, Lampang, Lamphun, Phrae [*Franck* 1153 (C); *ibid.*, *Maxwell* 91–857 (E, GH)]; Sukhothai, Phitsanulok; NORTHEASTERN: Nong Khai, *Koyama et al.* T. 31145 (BKF); EASTERN: Buri Ram, *Phengkhlai et al.* 3410 (BKF); SOUTHWESTERN: Uthai Thani, Kanchanaburi [Ban Kao, *Larsen* 8183 (C)], Ratchaburi, Prachuap Khiri Khan; CENTRAL: Lop Buri, *Mitsuta et al.* 38201 (BKF), Saraburi; SOUTHEASTERN: Chanthaburi; PENINSULAR: Songkhla.

Distribution.— Very widely distributed: tropical Africa, Madagascar, Asia, tropical America.

Ecology.— Dry mixed deciduous or bamboo forest and forest edges, thickets, disturbed areas (hedges, roadsides); sea level–1100 m alt.

Conservation Assessment.— Least concern.

Notes.— Over 40 collections of this common and widespread variety have been seen from Thailand (24 since 1992, of which those cited represent additional locality records). The distinction from var. *hirsuta* is not always clear (see below) unless the diagnostic acuminate bracts and bracteoles are present. Specimens with straight fruits are distinguishable from *M. bracteata* by inflorescence characters (see above under whole species) and the fruit in *M. bracteata* is often broader (to 1.5 cm broad).

**11b. var. *hirsuta*** (Wight & Arn.) Wilmot-Dea, Kew Bull. 42: 44 & Fig. 4. 1987 & Kew Bull. 47: 218 & Fig 9 F–G. 1992.—*M. hirsuta* Wight & Arn., Prod. Fl. Ind. Orient. 1(2): 254. 1834. Type: India, W Peninsular [*Wight* 750 (holotype K!; isotype E!)].

Stems, petioles, inflorescence axis and pedicels with distinctly orange-brown indumentum of long, spreading, somewhat crisped hairs. Terminal leaflet always rhombic-ovate, often broadly rounded at apex (extreme tip acute), rarely over 12 cm long, rather

thick-chartaceous, lower surface with silky or  $\pm$  spreading, usually dense, yellowish-orange hairs, especially along veins which thus appear distinctly orange. *Bracts* slightly shorter than bracteoles, broadly ovate to 9 by 7 mm and up to twice as long as wide, acute or broadly rounded; bracteoles later caducous than in var. *pruriens*, narrowly ovate to narrowly elliptic ovate, 5–6(–11) by 2(–3) mm. *Corolla* purple. *Fruit* linear, often slightly downcurved at apex, to 1 cm wide, with dense dark brown irritant bristles. *Seeds* dark red brown; aril and hilum black.

Thailand.— NORTHERN: Chiang Mai [*Phengkhlai et al.* 6533 (BKF); *ibid*, *Mitsuta et al.* 50209 (BKF)]; Phitsanulok; NORTHEASTERN: Khonkaen [*Murata et al.* 50398 (BKF)]; EASTERN: Chaiyaphum [*Phengkhlai et al.* 6116 (slightly intermediate with var. *pruriens*) (BKF)]; SOUTHWESTERN: Uthai Thani.

Distribution.— Vietnam; India (W. Peninsular).

Ecology.— Dense or disturbed forest, clearings and forest edges; 300–1200 m. alt.

Notes.— Only seven collections of this variety have been seen from Thailand (four since 1992, all cited here). It is seldom collected (less than 25 collections have been seen throughout its distribution) and presumably rare. It is distinguished from the typical variety mainly by its long spreading and often crisped (never adpressed), soft, orange hairs on most parts and rounded to acute (rather than acuminate) broader bracts and bracteoles. The few collections seen from Thailand are less distinctly orange-pubescent than those found in India and harder to distinguish unless bracts are present. The rather thick-textured, often densely hairy, leaflets and almost straight fruit are more like those of *M. bracteata* which is distinguishable by flowers or bract-scars also present in lowest part of inflorescence axis.

**11c. var. utilis** (Wall. ex Wight) Baker ex Burck., *Ann. Jard. Bot. Buitenzorg* 11: 187. 1893; Wilmot-Dear, *Kew Bull.* 47: 239 & Fig. 10 J. 1992.— *M. utilis* Wall. ex Wight, *l.c. Pl. Ind. Or.* 1: 280. 1840; Gagnep. in H.Lecomte, *Fl. Indo-Chine* 2: 321. 1916. Type: not indicated. Fig 5J.— *M. capitata* Wight & Arn., *Prod. Fl. Ind. Orient.* 1(2): 255. 1834; Gagnep. in *op. cit.*: 322. 1916. Type: Roxburgh drawing no. 285 (lectotype **K!**).— *M. cochinchinensis* (Lour.) A. Chev., *Bull. Agr. Inst. Sci. Saigon* 1: 91. 1919; Merr., *Trans. Amer. Phil. Soc.* 24: 209. 1935; Van Thuan, *Fl. Camb. Laos Vietnam* 17: 32. 1979. Type: Vietnam, Cochinchina [*Loureiro* s.n. (holotype **BM!**)].

Plant very similar to var. *pruriens* but irritant bristles completely lacking. Leaves with terminal leaflet relatively broad, length/width ratio rarely over 1.5:1; lateral leaflets often markedly larger than terminal and to 20 cm long. Calyx without red bristles but often with fine long hairs; length of lowest lobe to twice (never 3 x) that of laterals. *Corolla* purple or white, often rather short, standard up to 1.8 cm, keel to 3.5(–4.5) cm. *Fruit* linear-oblong, but often misshapen due to irregular sizes of swellings around seeds and sometimes to 2 cm broad in parts; surface with dense or sparse, short, soft, adpressed or spreading, light brown hairs. *Seeds* very variable in colour, whitish, fawn, orange or black, sometimes marbled in various colours or obliquely dark marked; aril orange.

Thailand.— NORTHERN: Chiang Mai.

Distribution.— Cultivated widely in the tropics.

Ecology.— Cultivated (possibly also naturalised).

Notes.— Its fruits are easily distinguished from those of the other varieties and the similar species *M. bracteata* by the dense covering of soft hairs (rather than irritant bristles) and the irregular sizes of the often much larger swellings around each seed. Flowering specimens are often not distinguishable from the typical variety (which can also lack irritant bristles from flowers and leaves) but the leaflets of var. *utilis* sometimes differ in relative proportions, lateral leaflets being often much larger than terminal one and terminal leaflet very broad.

**12. *Mucuna bracteata*** DC. ex Kurz, J. Asiat. Soc. Bengal Pt. 2, Nat. Hist. 42: 231. 1873; Gagnep. in H.Lecomte, Fl Indo-Chine 2: 323. 1916; Van Thuan, Fl. Camb. Laos Vietnam 17: 32. 1979; Wilmot-Deare in Kew Bull. 47: 240 & Fig. 11. 1992. Types: Burma, Pegu [Martaban, Ava, ?Kurz s.n. (syntypes CAL); Roxburgh drawing 138 (syntype ?CAL; copy K)].— *M. brevipes* Craib, in Bull. Misc. Inform. Kew 1927:378. 1927 & Fl. Siam 1: 443. 1928. Type: Thailand. Northern, Chiang Mai [Doi Sutep, Kerr 1572B, holotype K!, isotype BM!]. Figs. 1 X–Z, 2 Q–R.

Slender climber; stems and petioles glabrous to densely covered with short, pale, adpressed hairs. Leaves and leaflets very variable in size; terminal leaflets 7–14 by 5.5–11 (–13) cm, rhombic (rarely broadly elliptic), lateral veins 5–7 pairs, apex acute (rarely acuminate), base rounded; lateral leaflets with base of abaxial half truncate; lateral veins scarcely curved, often dark and thickly prominent at least beneath, scalariform tertiary venation often prominent beneath; mostly rather thick-chartaceous and markedly paler beneath; rarely glabrous, usually with sparse to abundant, short, fine, adpressed (or spreading) pale hairs above especially on veins, hairs denser beneath but conspicuously less dense on veins; stipules 2–5 mm, usually robust. Inflorescence 10–41 cm long, main axis often thick and robust even in flower, rarely once-branched close to base or a pair arising from same axil, ultimate branchlets 10–many, knob-like, often all in upper  $\frac{2}{3}$  of axis but bracts or scars always present in lower, flowerless region; pedicels and axis with dense, short, spreading, pale or dark brown pubescence and frequent fine bristles; bracts and bracteoles conspicuous and long-persistent, often even to fruiting stage, 8–24 & 2–10 mm, of very varied form, lowermost bracts mostly long-acuminate, narrowly ovate or triangular, upper (flowering) bracts mostly obovate broadly rounded; bracteoles obovate, ovate or linear-ovate, rounded or acute to acuminate. Calyx with hairs and fine bristles like the axis; lobes short and broadly triangular, lowest (3–)5–6 mm long, laterals 2–4 mm long, upper lip often exceeding laterals. Corolla dark purple, petals as in *M. pruriens*. Fruit linear-oblong, often slightly wider than in *M. pruriens*, 6–9 by 1–1.5 cm, straight or slightly curved. Seeds ellipsoid as in *M. pruriens*, 1–2 cm long, brown or black usually with pinkish brown mottling; rim-aril black.

Thailand.— NORTHERN: Chiang Mai [Doi Sutep, Kerr 1572B (BM, K)], Chiang Rai [Maxwell 94–1304 & 97–1396 (BKF, GH)], Lampang, Lamphun [Maxwell 94–182 (BKF, GH)], Phrae, [Konta et al. 4462 (BKF)]; NORTHEASTERN: Loei [Phu Kradueng, Shimizu et al. 22746 (BKF)]; EASTERN: Chaiyaphum; SOUTHWESTERN: Kanchanaburi; PENINSULAR: Phuket.

Distribution.— Laos, south and southwest China, Burma, East Himalayas

Ecology.— Forest (seasonal evergreen hardwood, pine or mixed forest, especially disturbed or degraded areas, bamboo thickets and scrub, roadsides; often dry or sandy soil; 150–1700 m alt.

Notes.— Over 30 collections of *M. bracteata* have been seen from Thailand, 22 since 1992 (of which those here cited represent additional locality records). It is similar to *M. pruriens* in its rhombic-ovate leaves with lateral veins running into margin, small flowers and small linear-oblong fleshy fruit, differing in leaves which are mostly thicker-textured, veins usually conspicuous, inflorescence more robust with bracts or scars in lower, flowers part, bracts often long persistent and fruit often broader (to 1.5 rather than to 1 cm) and never markedly “S-shaped”.

### INTRODUCED SPECIES

***Mucuna warburgii*** Lauterb. & K.Schum., Fl. Schutzgeb. Sudsee: 365. 1910;. Verdcourt, Man. New Guinea Leg: 457. 1979.

Very different from all native species in flower colour and shape. Flowers large bright orange-red, wings and keel 6–8 cm, narrow and curved throughout length rather than straight with sharply curved apex. Fruit large linear-oblong at least 20 cm long with obliquely transverse lamellae.

Thailand.— NORTHERN: Chiang Mai [Chiang Mai City, 6 Oct 1984, *Anderson* 5236 (A); Bang Khen Experimental Station, 4 Oct. 1958, *Smitinand* 5063 (BKF)].

Distribution.— Native to Indonesia (Sulawesi, Moluccas, Papua New Guinea, Irian Jaya (Papua Barat))

Ecology.— Occasionally cultivated as an ornamental.

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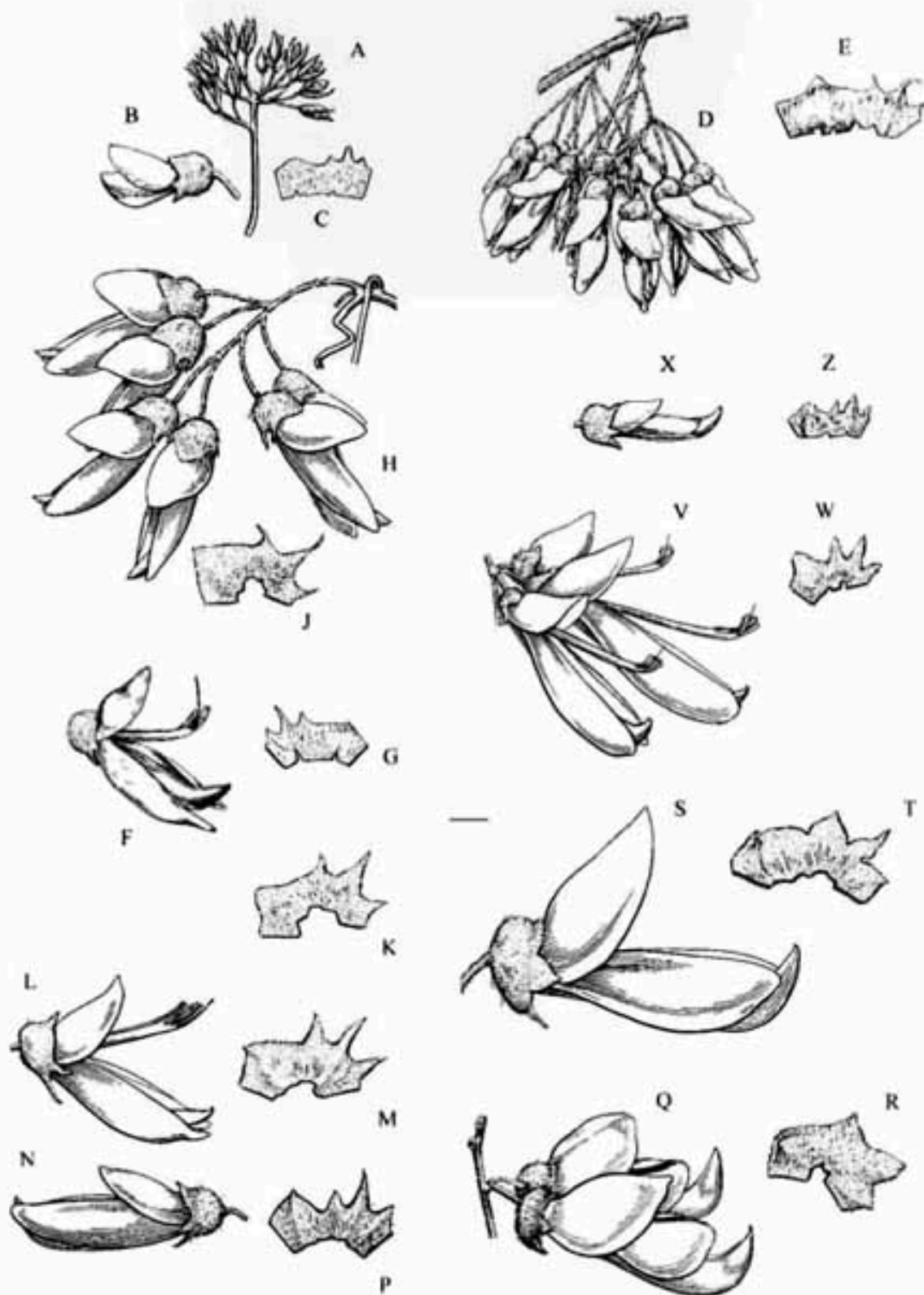


Figure 1. *Mucuna* flowers, calyx (opened out) and inflorescences. *M. gigantea*: A. inflorescence in bud stage; B. flower; C. calyx; *M. oligoplax*: D. inflorescence; E. calyx; *M. monosperma*: F, G. *M. stenoplax*: H, J; *M. hainanensis*: K; *M. revoluta*: L, M; *M. interrupta*: N, P; *M. macrocarpa*: Q, R; *M. thailandica*: S, T; *M. gracilipes*: V, W; *M. bracteata*: X, Z. Scale bar for A, D, H = 1.5 cm, for all others = 1 cm. Drawn by E. Catherine (reprod. from Kew Bull. (1987, 1990, 1991, 1992, 1993).

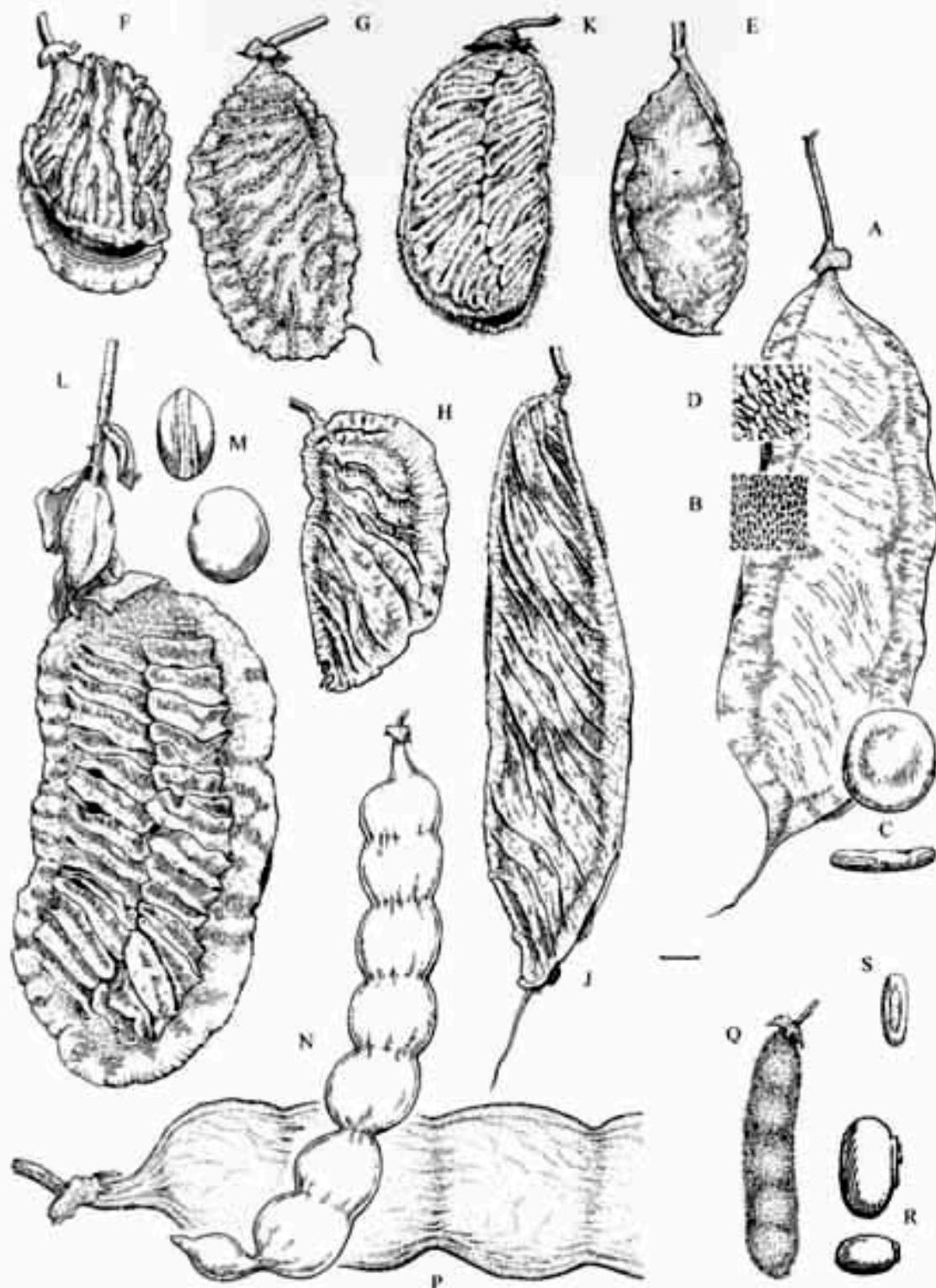


Figure 2. *Mucuna* fruits and seeds. *M. gigantea*: A. fruit; B. detail of fruit surface; C. seed side and face view; *M. acuminata*: D. detail of fruit surface; *M. oligoplax*: E. fruit; *M. monosperma*: F. fruit; *M. stenoplax*: G. fruit; *M. hainanensis*: H, J. fruits; *M. revoluta*: K. fruit; *M. interrupta*: L. fruit; M. seed side and face view; *M. macrocarpa*: N. young fruit; P. part of fruit; *M. bracteata*: Q. fruit; R. seed, apical and lateral view; *M. pruriens* var. *hirsuta*: S. seed side view showing aril. Scale bar for R, S = 0.5 cm, for all others = 1 cm. Drawn by E. Catherine (reprod. from Kew Bull. (1987, 1991, 1992, 1993)).

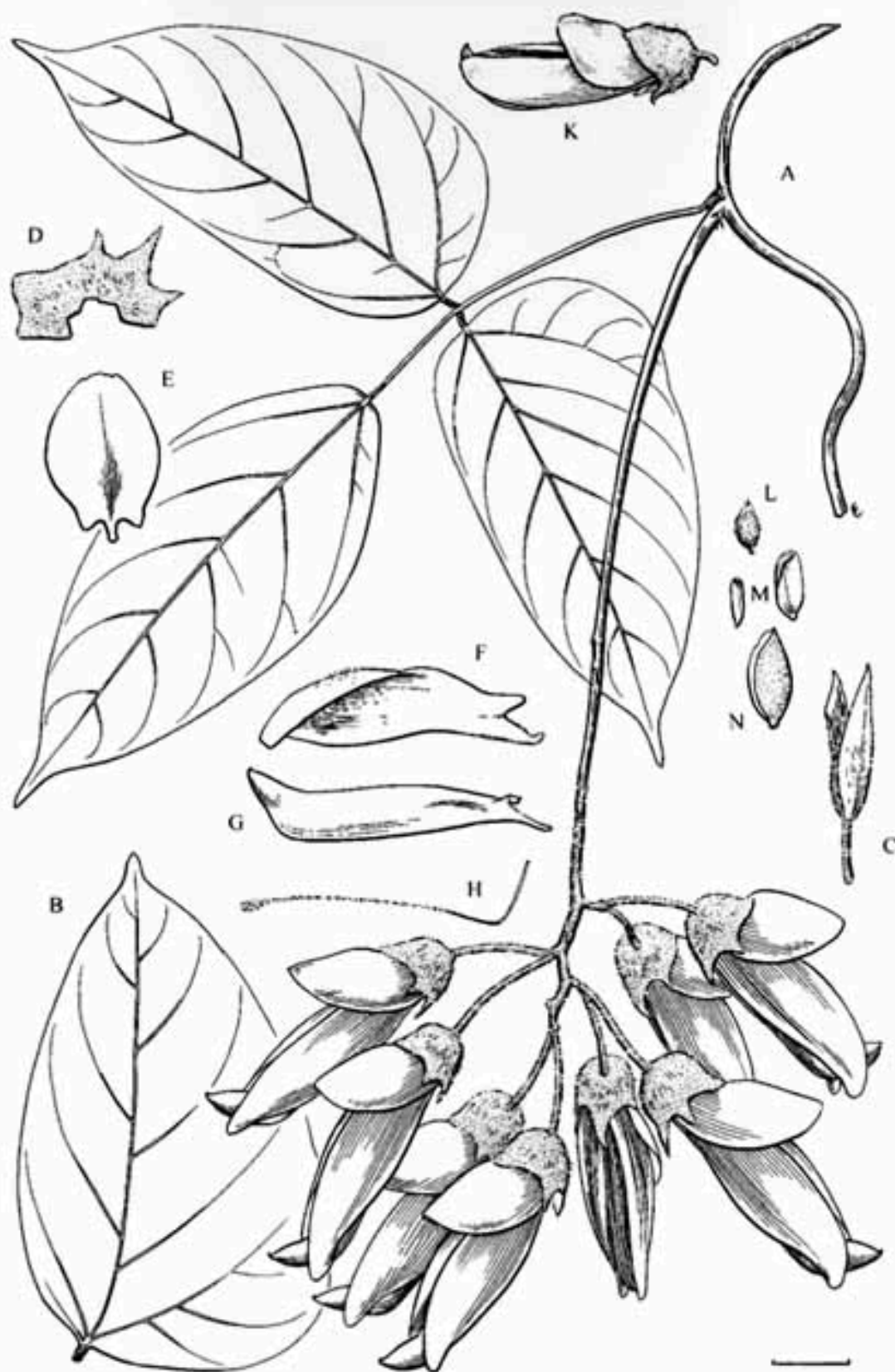


Figure 3. *Mucuna hainanensis*: A. habit; B. leaf; C. bud and bracteoles; D. calyx; E. standard; F. wing; G. keel; H. pistil; K. flower; L. bud; M. bracts; N. bracteole. Scale bar for C = 1 cm, for all others = 1.5 cm. Drawn by E. Catherine (reprod. from Kew Bull. 46: 206 (1991)).





Figure 4. *Mucuna hainanensis* coll. Vietnam, HNK 1809 (photo T. Utteridge).