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PRELIMINARY REVISION OF TRIBE SOPHOREAE (LEGUMINOSAE – FABOIDEAE) IN THAILAND : *ORMOSIA* JACKS. AND *SOPHORA* LINN.

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SUMMARY

Two genera, 12 species of the tribe Sophoreae indigenous to Thailand are treated in this revision, of which one new species, **Ormosia kerrii** Niyomdham, is described.

The following species are recorded from Thailand for the first time: *Ormosia fordiana* Oliv., *O. grandistipulata* Whitmore, *O. henryi* Prain, *O. macrodisca* Baker, *O. pinnata* (Lour.) Merr. and *Sophora wightii* Baker.

Ormosia yunnanensis Prain = **O. sumatrana** Prain

Sophora dispar Craib = **S. velutina** Lindl.

SOPHOREAE

Sophoreae (Bronn.) DC., Prodr. **2** : 94. 1825; Brumm., Gill. et Polhill in Fl. Trop. East Afr. Leg. 3 Pap. 1 : 31. 1971.

Trees or shrubs. Leaves odd-pinnate, 5–many-foliolate, rarely simple or 1-foliolate. Petals subequal to clearly differentiated into standard, wings and keel. Stamens with filaments all free or only united at the very base; anthers uniform. Ovary with style glabrous on upper part. Fruit not jointed, dehiscent or not.

KEY TO GENERA

1. Stigma terminal; calyx caducous in fruit
   2. Calyx-teeth shorter than the tube or obscure; pod moniliform *Sophora*
   2. Calyx-teeth longer than the tube; pod flat, oblong or strap-shaped. Ceylon (type!); Malesia : S. Sumatra, Borneo, Celebes, Talaud Is., Philippines, New Guinea and Micronesia; expecting to be found in peninsular Thailand *Pericopsis mooniana*
1. Stigma lateral; calyx persistent in fruit, teeth as long as or longer than tube *Ormosia*

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ORMOSIA

Ormosia Jack., Trans. Linn. Soc. **10** : 360, t. 25. 1811, nom. cons.; Taubert, in Engl. & Plantl, Pflanz. Fam. **3** (3) : 194. 1894; Prain, J. As. Soc. Bengal **69** (2) : 175. 1900; Merr. & Chen, Sargentia **3** : 77–117. 1943; Knaap-van Meeuwen, Reinw. **6** : 225. 1962; Backer, Fl. Java **1** : 576. 1963; Hutch., Gen. Fl. Pl. **1** : 323. 1964; Whitmore, Tree Fl. Malaya **1** : 299. 1972.—*Toulichiba* Adans., Fam. **2** : 326. 1763.— *Macrotropis* DC., Prod. **2** : 98. 1825.—*Layia* Hook. & Arn., Bot. Beech. Voy. : 183, t. 38. 1833.— *Placolobium* Miq., Fl. Ind. Bat. **1** : 1082. 1858; Yakovl., Acad. Sci. URSS. **13** : 169. 1976.—*Chaenolobium* Miq., Fl. Ind. Bat. Suppl. : 302. 1861.— *Macroule* Pierce, Trop. Woods **71** : 2. 1942; Yakovl., Acad. Sci. URSS. **13** : 172. 1976.— *Podopetalum* F. Muell. in Melb., Chemist. and Drug. 12 June 1882; Merr. & Chen, ibid. **3** : 79. 1943.— *Fedorovia* Yakovl., ibid. **13** : 170. 1976.— *Ruddia* Yakovl., ibid. **13** : 169. 1976.— *Trichocyamos* Yakovl., ibid. **9** : 200. 1972; ibid. **13** : 172. 1976.

Tree. *Leaves* impari-pinnate, rarely simple or 1-foliolate; leaflets opposite, chartaceous to coriaceous, quite entire; stipels rare; stipules small, caducous, rarely large and persistent. *Flowers* in terminal and axillary panicle or racemes, yellow, pink or white; bracts small, caducous; bracteoles obscure. *Calyx* campanulate, finely hairy inside, 5-toothed; 2-upper ones connate halfway up or even higher. *Corolla* slightly exserted. *Petals* 5 subequal, free, shortly clawed; standard orbicular; wings and keel oblong-obtuse. *Stamens* normally 10, free or joined at the very base; anthers uniform. *Ovary* almost sessile; style glabrous, long, filiform, circinate at tip; stigma lateral. *Fruit* a shortly-stalked pod, orbicular, ovate, obovate to oblong, septate or not; valves coriaceous or woody; seeds rather large; testa hard, indurate to fleshy or fragile and easily separable from the cotyledons.

Distribution.— About 90 species in Asia and South America, only 8 species so far are known to occur in Thailand.

KEY TO SPECIES

1. Stipules large, ovate-acute, 2–5 by 1–3 cm, persistent. Fruit ca 5 by 3 cm, valves thick, coriaceous; seeds oblong, ca 2.5 by 1.5 cm with red papillate testa ..... *O. grandistipulata*

1. Stipules very small, caducous
   2. Leaflets glabrous or widely scattered with short hairs beneath especially when young, downy along the midrib in maturity, never conspicuously and uniformly pubescent
      3. Leaf-rachises and inflorescences glabrous to puberulous
         4. Pod with thick woody valves
            5. Seeds uniformly red, brownish-red or scarlet

6. Pod oblong, falcate, 5–6 by 2.5–3 cm; seeds oblong, ca 30 by 7 mm, uniformly brownish-red. Cambodia: Talung Mountain near Kampot (Type! *Pierre s.n.*) *O. cambodiana* Gagnep.

6. Pod elliptic to broadly obovate-lunate, 5–8 by 3.5–5 cm; seeds red or scarlet

7. Pod with long apiculate tip; seeds oblong

8. Pod obliquely obovate, 5–6.5 by 3.5 cm; seeds ca 20 by 15 mm, scarlet. India, Travancore and South Tinnevelly Hill (Type! *Plate 45 in Fl. Syl.* 1 : 45. 1870) *O. travancorica* Bedd.

8. Pod elliptic, 8 by 4.5 cm; seeds 25–28 by 18 mm, bright red. Burma, Tavoy (Type! *Manson 301*) *O. tavoyana* Prain

7. Pod with very short, not distinct apiculate tip, broadly obvate, 8 by 5 cm; seeds broadly obovate or orbicular, ca 25 by 20 or ca 22 mm diam., scarlet *O. kerrii*

5. Seed black-mottled red and with a distinct red band surrounding the edges. Pod ellipsoid, ca 6.5 by 4.5 cm. Indo-China : Cochinchina, Saigon River and the Cai-cong forest (Type! *Thorel 1415*) *O. crassivalvis* Gagnep.

4. Pod with thick coriaceous valves

9. Pod flat oblong, 5–7 by 3.5–4 cm, non septate *O. fordiana*

9. Pod subterete, obovoid to subcylindric, septate or not

10. Pod when more than 1-seeded, non-septate between seeds. Calyx glabrous outside; ovary glabrous. China : Yunnan, Szemao (Type! *Henry 11886*), Burma *O. striata* Dunn

10. Pod when more than 1-seeded, septate between seeds. Calyx and ovary hairy *O. pinnata*

3. Leaf-rachises and inflorescences appressed pubescent or velvety

11. Pod woody, very densely hairy, septate between seeds; seed with hard testa. China : Hainan, Mo Shan Leng (Type ! : *Chun & Tso 44382A*); Indo-China: Annam, Na Trang and Laos *O. xylocarpa* Chun

11. Pod coriaceous, shortly hairy, 1-seeded; seed with leatherly testa *O. robusta*

2. Leaflets uniformly hairy beneath

12. Pod strongly compressed, septate or torulose between seeds

13. Pod woody, septate between seeds *O. heyryi*

13. Pod crustaceo-coriaceous, torulose between seeds *O. sumatrana*

Figure 1. *Ormosia fordiana* Oliv. : A. fruiting branch; B. valves of pod; C. seed. From *Charoenphol et al. 424.*

12. Pod subterete, non-septate
    14. Leaflets oblong, oblong-oblanceolate to oblong-elliptic, 20–32 by 8–12 cm; apex shortly cuspidate. Pod ovate to oblong, 6–12 by 5.5–7 cm; seeds oblong-ellipsoid *O. macrodisca*
    14. Leaflets elliptic-lanceolate, 6–9 by 2.5–3.5 cm; apex acute. Pod oblong, ca 6 by 2.5 cm; seeds orbicular. Malay Peninsula, Penang (Type) *O. penangensis* Ridl.

1. **Ormosia fordiana** Oliv., Hook., Ic. Pl. : 25, t. 2422. 1895; Dunn & Tutch., Kew Bull. Add. Serr. **10** : 88. 1912; Merr., Lingnan. Sci. J. **5** : 91. 1928; Chun, Sci. J. Col. Sci. Sunyatsen Univ. **2** (3) : 54. 1930; Hu & Chun, Ic. Pl. Sin. **4** : 17, t. 167. 1935; Merr. & Chen, Sargentia 3 : 101. 1943.— *Ruddia fordiana* (Oliv.) Yakovl., Acad. Sci. URSS. 13 : 169. 1976.—Figure 1.

Tree 15–18 m high, young shoots, leaf-rachises, inflorescences and calyces, slightly shortly hairy. *Leaves* rachises 8–13 cm long; stipules small, caducous; leaflets 7–9, coriaceous, elliptic to lanceolate, 7–15 by 2.5–4 cm, upper surface glabrous, lower surface glabrescent; apex acuminate to cuspidate; base cuneate; petiolules ca 5 mm long. *Inflorescence* a terminal panicle or sometimes axillary racemes, 10–15 cm long; pedicels ca 10 mm long. *Calyx* ca 20 mm long; teeth oblong, acute, longer than the tube. *Corolla* lavender, fragrant; limb of standard suborbicular, ca 21 mm diam.; claw short,ca 2 mm long; wings oblong-obovate, ca 18.5 by 9 mm; keel oblong-elliptic, ca 17 by 8.5 mm. *Ovary* appressedly shortly hairy; ovules 5. *Pod* flat, broadly oblong, 5–7 by 3.5–4 cm; valves thick coriaceous, yellowish when dry, glabrous; seeds 1–3, oblong-ellipsoid, 25–30 by 15–20 mm, testa crustaceous, red, fragile when dry and free from cotyledons.

Thailand.— NORTHERN : Chiang Rai (Phra That Doi Tung).

Distribution.— China (Type!, Kwang Tung Province, *C. Ford 231*, K.), Indo-China and Burma.

Ecology.— Dry evergreen forest; 500–1,000 m alt.

2. **Ormosia grandistipulata** Whitmore, Gard. Bull. Sing. **24** : 6. 1969; Tree Fl. Malaya 1 : 301. 1972.—Figure 2.

Tree 10 m high; young shoots, inflorescences and calyces pubescent. *Leaves* rachises 20–25 cm long, puberulous; stipules large, ovate-acute, 2–5 by 1–3 cm, persistent; leaflets 9–11, coriaceous, oblong-obovate, 4–18 by 2.5–8 cm, upper surface glabrous, lower surface glabrescent; apex acuminate, base cuneate. *Inflorescence* a terminal panicle. *Flowers* unknown . *Pod* elliptic, ca 5 by 3 cm; valves thickened, coriaceous, yellow, yellowish-brown when dry, glabrous; seed 1, laterally compressed, oblong, ca 25 by 15 mm, testa hard, scarlet, papillate, not easily separable from the cotyledons.

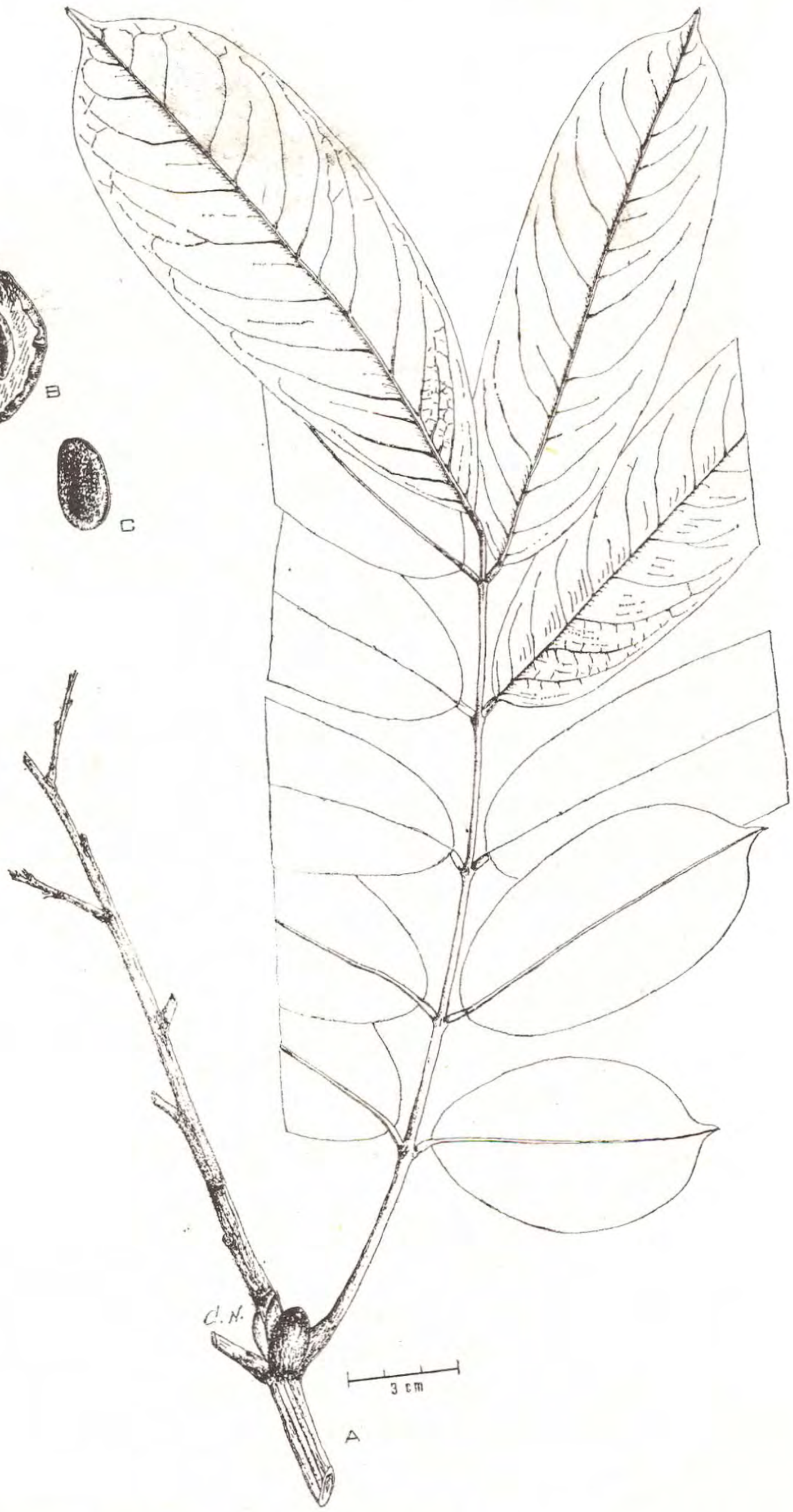

Figure 2. *Ormosia grandistipulata* Whitmore : A. fruiting branch; B. valve of pod; C. seed. From *Kerr 7729*.

Figure 3. *Ormosia henryi* Prain : A. flowering branch, B. flower; C. standard; D. wing; E. keel; F. ovary. From *Bunpheng 95*.

Thailand.— PENINSULAR : Yala.

Distribution.— Malaya (Trengganu, Type!, *Sinclair & Kiah bin Salleh S.F. 40851*, K, L, Sing.).

Ecology.— Tropical rain forest, ca 50 m alt.

3. **Ormosia henryi** Prain, J. As. Soc. Bengal **69** (2) : 180. 1900; Craib in Sargent, Pl. Wils. **2** : 93, 1914; Gagnep in Fl. Gén. I.-C. **2** : 511. 1920; Hu, Contr. Biol. Lab. Sci. Soc. China **2** (5) : 9. 1926; Chun, Sci. J. Coll. Sci. Sunyatsen Univ. **2** (3) : 46. 1930; Merr. & Chun, Sunyatsenia **1** : 60. 1930; Hand.-Maz., Beih. Bot. Centralbl. **52B** : 157. 1934; Merr. & Chen, Sargentia **3** : 109. 1943.— *O. henryi* Hemsl. & Wils., Kew Bull. : 156. 1906; Chun, Chinese Econ. Trees : 187. 1922.— *O. mollis* Dunn, J. Bot. **47** : 198. 1909; Dunn & Tutch., Kew Bull. Add. Ser. **10** : 88. 1912.— *Fedorovia henryi* (Prain) Yokovl., Acad. Sci. URSS. **13** : 170. 1976.—Figure 3.

Tree 10 m high, young shoots, leaf-rachises, inflorescences and calyces tawny velvety. *Leaves* rachises 15–18 cm long; stipules small, caducous; leaflets 7–9, coriaceous, oblong-lanceolate, 6–12 by 2.5–4.5 cm, upper surface slightly hairy, lower surface buff velvety; apex acute; base cuneate or rounded; petiolules 3–5 mm long. *Inflorescence* axillary racemes, 8–10 cm long; pedicels ca 10 mm long. *Calyx* ca 10 mm long; teeth ovate-lanceolate, longer than tube. *Corolla* yellow with purple stripes; limb of standard suborbicular, emarginate, ca 12 by 14 mm, with 2 callus-like appendages on inner side at base; claw short, ca 3 mm long; wings and keel oblong, obtuse, 12–12.5 by 5–6 mm. *Ovary* hairy along margins; ovules 9–10. *Pod* oblong, strongly compressed, septate between seeds, 7–11 by 2–3 cm; valves thick, woody, dark brown, grabrous; seeds ovate, ca 10 by 7.5 mm; testa hard, bright scarlet, not easily separable from the cotyledons.

Thailand.— NORTH-EASTERN : Loei (Phu Kradung).

Distribution.— China : Hupeh (Type!, *Henry 7577*, K.); Indo-China : Tonkin.

Ecology.— Hill evergreen forest, up to 1,300 m alt.

4. **Ormosia kerrii** Niyomdham ; *O. crassivalvis* Gagnep. *affinis sed foliola glabrae utrinque paginae, legumina late ovatae, semina late obovatae vel orbicularlae scarlatinae.* — Figure 4.

Tree 20–25 m high, young shoots, inflorescences and calyces puberulous. *Leaves* glabrous on both surfaces; rachis 12–25 cm long; stipules small, caducous; leaflets 7–13, coriaceous, ovate-lanceolate to oblong, 3–11.5 by 2–4 cm; apex long acuminate; base cuneate to rounded; petiolules ca 5 mm long. *Inflorescence* axillary racemes, 10–15 cm long; pedicels ca 6 mm long. *Calyx* ca 7 mm long; teeth oblong-acute, longer than tube. *Corolla* creamy white; limb of standard orbicular, ca 10 mm diam., claw ca 6 mm long; wings oblong-obtuse, ca 13 by 3.5 mm; keel oblique, oblong-acute, ca 14 by 4 mm. *Ovary* glabrous; ovules 2. *Pod*

Figure 4. *Ormosia kerrii* Niyomdham : A. flowering branch, a. calyx, b. standard, c. wing, d. keel, e. ovary; B. valve of pod; C. seed. From *Kerr 16680 & 18499*.

oblique, broadly obovate, ca 8 by 5 cm; valves thick, woody, brown when dry; seeds 1–2, broadly obovate or orbicular, ca 25 by 20 mm or 22 mm diam., testa hard, scarlet not easily separable from the cotyledons.

Thailand.— PENINSULAR : Ranong, Kamphuan; *Kerr 16680*, January 16th, 1929 (Type — Flowering specimen, BK — Holo., BM, C, K, L, P); Phangnga, Khao Katha Khwam, *Kerr 18499*, March 10th 1930 (Type — Fruiting specimen, BK — Holo., BM, C, K, L, P).

Distribution.— Malay Peninsula.

Ecology.— Lowland tropical evergreen forest, 10–100 m alt.

Note.— This species is closely related to *O. crassivalvis* Gagnep. and *O. tavoyana* Prain, they can be separated by characters followingly tabulated :

Characters	*O. kerrii*	*O. crassivalvis*	*O. tavoyana*
Leaflets	glabrous on both surfaces	puberulous beneath	glabrescent on both surfaces
Pods	broadly obovate, 8 by 5 cm, very short apiculate tip	ovate-elliptic, 6–7 by 4.5 cm, very short apiculate tip	elliptic, 7 by 4.5 cm, with a long apiculate tip
Seeds	broadly obovate or orbicular ca 25 by 20 or 22 mm diam., scaret	elliptic, 30 by 22 mm, black and brownish-red and with a distinct red band surrounding the margin	oblong, ca 25–28 by 18 mm, bright red

5. **Ormosia macrodisca** Baker in Hook.f., Fl. Br. Ind. **2** : 253. 1878; Prain, J. As. Soc. Bengal **66** (2) : 148, 467. 1897; ibid. **69** (2) : 179. 1900; Ridl., Fl. Mal. Pen. **1** : 613. 1922; Back., Bekn. Fl. Java (em. ed.) **5** : fam. 120, 24. 1914; Merr. & Chen, Sargentia **3** : 82. 1943; Knaap van Meeuwen, Reinw. **6** : 230. 1962; Back., Fl. Java **1** : 576. 1963; Whitmore, Tree Fl. Mal. **1** : 301. 1972.— *Placolobium sumatranum* Miq., Fl. Ind. Bat. **1** : 1082. 1858; Knaap van Meeu-

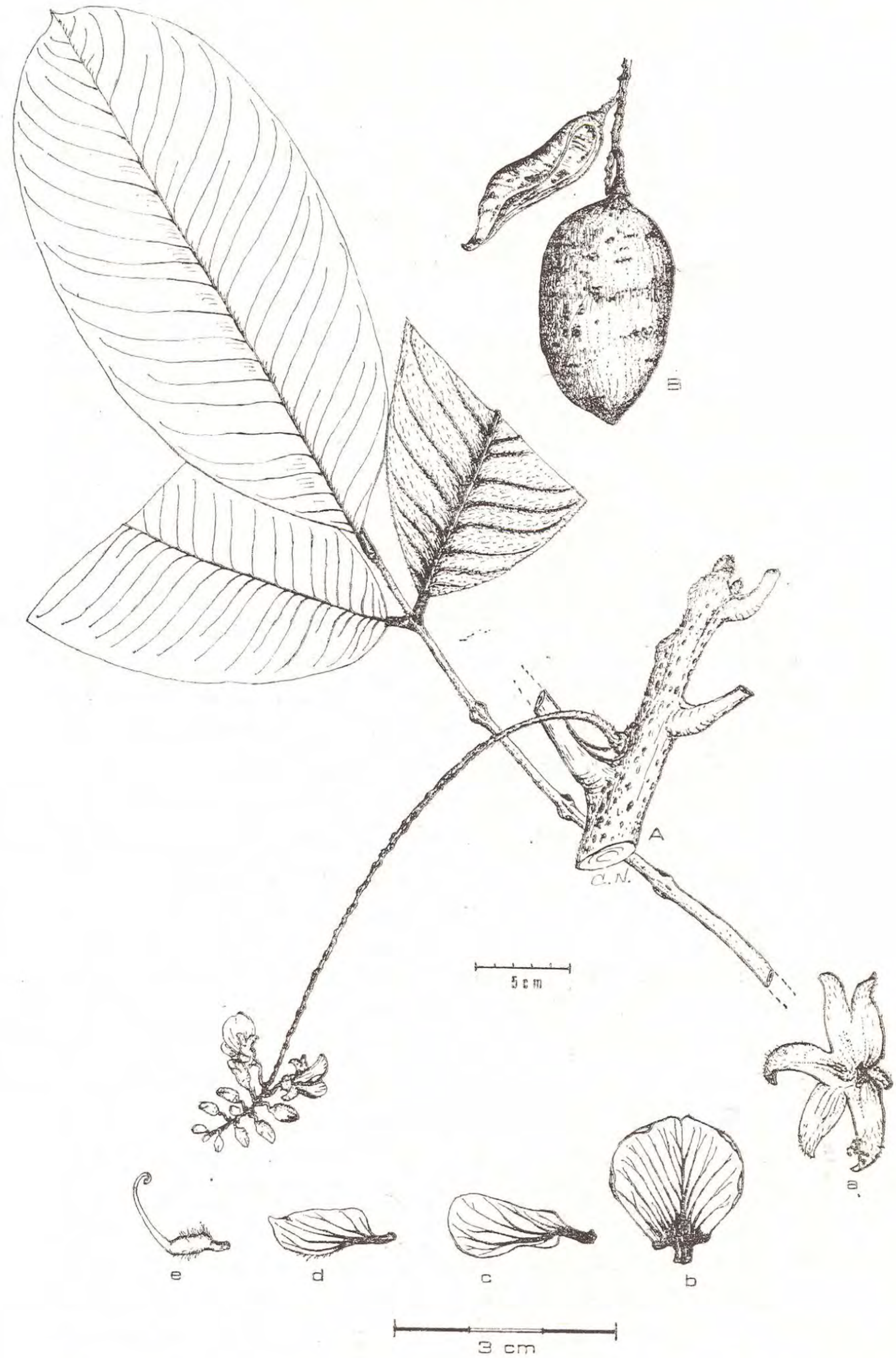

Figure 5. *Ormosia macrodisca* Baker : A. flowering branch; B. fruit & valve, a. calyx opened out, b. standard, c. wing, d. keel, e. ovary. From *Charoenphol et al. 185.*

wen & van Steenis, Blumea **12** : 70. 1963; Yakovl., Acad. Sci. URSS. **10** : 191. 1973.— *Ormosia monchyana* Koord. & Boerl. ex Koord., Med.'s-Lands Plant. **19** : 441. 1898; Merr. & Chen, ibid. **3** : 82. 1943, "monochyana".— *O. basilanensis* Merr., Philip. J. Sci. **14** : 407. 1919; En. Philip. **2** : 269. 1923; Merr. & Chen, ibid. **3** : 81. 1943.— *O. clemensii* Merr., ibid. **14** : 406. 1919; ibid. **2** : 270. 1923; Merr. & Chen, ibid. **3** : 81. 1943.— *O. grandifolia* Merr., ibid. **14** : 408. 1919; ibid. **2** : 270. 1923; Merr. & Chen, ibid. **3** : 81. 1943.— *O. palembanica* S. Moore, J. Bot. **64**. Suppl. : 145. 1925; Merr. & Chen, ibid. **3** : 83. 1943.— Figure 5.

Tree, 8–12 m high, young parts, leaf-rachises, inflorescences and calyces more or less ferrugineous pubescent. *Leaves* rachises 25–30 cm long; stipules small, caducous; leaflets 7–9, subcoriaceous, oblong, oblong-oblanceolate to oblong-elliptic, 20–32 by 8–12 cm, upper surface glabrous, lower surface ferruginous pubescent; apex shortly cuspidate; base rounded; petiolules ca 1 cm long. *Inflorescence* axillary racemes, 30–40 cm long; pedicels ca 15 mm long. *Calyx* ca 15 mm long; teeth oblong, obtuse, longer than tube. *Corolla* creamy white, becoming yellowish when old; limb of standard suborbicular, ca 18 mm diam., claw short, ca 2 mm; wings oblong-obovate, ca 16 by 8 mm; keel oblong, falcate, ca 15 by 6 mm. *Ovary* hairy along the margins; ovules 5. *Pod* subterete, ovate to oblong, 6–12 by 5.5–7 cm, glabrous; valves very thick coriaceous, reddish, dark brown when dry; seeds 1–3, oblong-ellipsoid, 30–35 by 20–25 mm, testa bright scarlet, with a black spot around the hilum, easily separable from the cotyledons.

T h a i l a n d.— PENINSULAR : Narathiwat (Waeng).

D i s t r i b u t i o n.— Malesia : Sumatra, Malay Peninsula (Malacca, Type!), West Java, Borneo, Celebes, and the Philippines.

E c o l o g y.— In evergreen forest, ca 800 m alt.

6. **Ormosia pinnata** (Lour.) Merr., Lingnan Sci. J. **14** : 12. 1935; Trans. Am. Philos. Soc. **24** (2) : 192. 1935; Merr. & Chen, Sargentia **3** : 103. 1943.— *Cynometra pinnata* Lour., Fl. Cochinch. : 268. 1790; Gagnep. in Fl. Gen. I.-C. **2** : 155. 1913.— *Ormosia hainanensis* Gagnep., Not. Syst. **3** : 31. 1914; in Fl. Gen. I.-C. **2** : 511. 1920; Merr., Philip. J. Sci. **15** : 240. 1915; Lingnan Sci. J. **5** : 91. 1928; Chun, Sci. J. Coll. Sci. Sunyatsen Univ. **2** (3) : 52. 1930.— *Fedorovia pinnata* (Lour.) Yakovl., Acad. Sci. URSS. **13** : 171. 1976.—Figure 6.

Tree 15–20 m high; young shoots, leaf-rachises, inflorescences and calyces appressedly tawny puberulous. *Leaves* rachises 9–13 cm long; stipules small, caducous; leaflets 7–9, subcoriaceous, lanceolate to oblong-lanceolate, 6–19 by 2.5–5 cm, glabrous on both surfaces; apex acuminate with a small mucronate tip; base cuneate to obtuse; petiolules ca 5 mm long. *Inflorescence* a terminal panicle, 20–30 cm long; pedicels 3–5 mm long. *Calyx* ca 10 mm long; teeth ovate-acute, ± as long as the tube. *Corolla* yellowish, pinkish when old; limb of standard

Figure 6. *Ormosia pinnata* (Lour.) Merr. : A. flowering branch; B. flower; C. standard; D. wing; E. keel; F. ovary. From *Sangkhachand et al. 1037.*

orbicular, ca 12 mm diam., with 2 callus-like appendages on inner side at base; claw short, ca 2 mm long; wings and keel obovate-oblong, 14–15 by 6–7 mm. *Ovary* appressedly puberulous; ovules 5. *Pod* obovoid when 1-seeded, subcylindric-torulose and septate between seeds, if more than 1-seeded, 2–3.5 by 1.5–2 cm, glabrescent; valves thick coriaceous, yellowish-brown when dry; seeds 1–3, oblong-ellipsoid, 15–20 by 9–15 mm, testa fragile, bright red, free from the cotyledons when dry.

Thailand.— PENINSULAR : Narathiwat (Waeng).

Distribution.— China : Kwangtung, Hainan; Indo-China : Vietnam (Type!, *Clemens 4015*).

Ecology.— Evergreen forest, 250–600 m alt.

Note.— The type specimen of *Cynometra pinnata* Lour. is not available to me, but *Clemens 4015*, which Merrill has choosen as the lecto-type, and *Henry 443* (Type of *O. hainanensis* Gagnep.) have been studied.

According to Merrill, l.c. pods of this species are very woody; testa hard and usually wrinkle when dry. The examination of more specimens shows pods with thick, coriaceous valves and wrinkle when dry; testa fragile and easily separable from the cotyledons.

O. hoaensis Pierre (Type!, *Pierre 6041*) seems to be conspecific with this species, but a thorough study is needed to draw a conclusion.

7. **Ormosia robusta** (Roxb.) Wight ex Baker, Hook.f., Fl. Brit. Ind. **2** : 252. 1878; Prain, J. As. Soc. Bengal **69** (2) : 179. 1900; ibid. **73** (2) : 45. 1904; Craib, Fl. Siam. En. **1** : 497. 1928; Merr. & Chen, Sargentia **3** : 83. 1943.— *O. floribunda* Wall., Cat. no. 5337. 1832, *nomen nudum*.— *Sophora robusta* Roxb., Hort. Beng. : 31. 1814, *nomen nudum*; Wight, Ic. **1** : 25, t. 245. 1840.— *Arillaria robusta* Kurz, J. As. Soc. Bengal **42** (2) : 71. 1873; For. Fl. Brit. Burma **1** : 334. 1877.— *Placolobium robustum* (Roxb.) Yakovl., Acad. Sci. URSS. **10** : 191. 1973.

Tree 30 m high; young shoots, leaf-rachises, inflorescences and calyces tawny velvety tomentose. *Leaves* rachises 10–18 cm long; stipules small; leaflets 9–11 subcoriaceous, oblong, 3.5–10.5 by 1.5–3.5 cm, upper surface glabrous, lower surface glabrescent or downy along the midrib; apex acute; base rounded to subcordate; petiolules ca 5 mm long. *Inflorescence* a terminal panicle, sometimes axillary racemes; pedicels ca 8 mm long. *Calyx* ca 10 mm long; teeth ovate-acute, ± as long as the tube. *Corolla* dull white; limb of standard rotundate, emarginate, ca 10 by 12 mm, with 2 callus-like on inner side at base, claw short ca 2 mm long; wings oblong-obtuse, ca 10 by 4 mm; keel oblong, falcate, ca 15 by 5 mm. *Ovary* hairy; ovules 4–5. *Pod* ellipsoid, 5–6 by 2.5–3 cm; valves thick, fleshy, coriaceous, yellow, becoming yellowish-brown when dry, slightly hairy; seeds 1 or very rarely 2, oblong, 30 by 15 mm (immature), testa bright red, wrinkled when dry.

Thailand.— NORTHERN : Chiang Mai; PENINSULAR : Phangnga.

Distribution.— India (Type!, Assam, *Wight, Ic. t. 245*) and Burma.

Ecology.— Along streams in evergreen forest.

Vernacular.— Chakhai ton จะไค้ต้น

8. **Ormosia sumatrana** (Miq.) Prain, J. As. Soc. Bengal **66** (2) : 150, 469. 1897; ibid., **69** (2) : 183. 1900; Ridl., Fl. Mal. Pen. **1** : 614. 1922; Back., Schoolfl. Java : 394. 1911; Koord., Exk. Fl. Java **2** : 372. 1912; Heyne, Nutt. Pl. : 759. 1927; Merr. & Chen, Sargentia 3 : 83. 1943; Knaap van Meeuwen, Reinw. **6** : 234. 1962; Back., Fl. Java **1** : 577. 1963; Whitmore, Tree Fl. Mal. **1** : 301. 1972.— *Macrotropis sumatrana* Miq., Fl. Ind. Bat. Suppl. : 294. 1861.— *Chaenolobium septemjugum* Miq., ibid. 302.— *C. decemjucum* Miq., ibid. 302.— *Ormosia coarctata* (non Jacks.) Kurz, J. As. Soc. Bengal **43** (2) : 71. 1873.— *O. microsperma* Bak., Hook.f., Fl. Br. Ind. **2** : 253. 1878; Prain, ibid. **66** (2) : 151, 468. 1897, incl. var. *ridleyi*; ibid **69** (2) : 183. 1900; Ridl., Fl. Mal. Pen. **1** : 614. 1922.— *O. septemjuga* (Miq.) Prain, ibid. **66** (2) : 468. 1897; ibid. **69** (2) : 184. 1900; Merr. & Chen, ibid. **3** : 83. 1943.— *O. decemjuga* (Miq.) Prain, ibid. **66** (2) : 468. 1897 ; ibid. **69** (2) : 84. 1900; Merr. & Chen, ibid. **3** : 81. 1943.— *O. yunnanensis* Prain, ibid. **69** (2) : 183. 1900; ibid. **73** (2) : 46. 1904; Craib, Fl. Siam. En. **1** : 497. 1928; Chun, Sci. J. Coll. Sci. Sunyatsen Univ. **2** (3) : 45. 1930; Merr. & Chen ibid. **3** : 84. 1943.— *O. euphorioides* Pierre & Gagnep., Not. Syst. **3** : 30. 1914; Gagnep. in Fl. Gén. I.-C. **2** : 508. 1920.

Tree 25–40 m high, young shoots, leaf-rachises, inflorescences and calyces velvety tomentose. *Leaves* rachises 9–16 cm long; stipules small caducous; leaflets 5–13, coriaceous, oblong to oblong-oblanceolate, 5.5–10 by 2.5–5.5 cm, uppersurface glabrous or glabrescent along the midrib, lower surface velvety to tomentose; apex acute to short acuminate; base rounded to subcordate; petiolules 5–6 mm long. *Inflorescence* a terminal panicle, up to 15 cm long; pedicels short, 3–4 mm long. *Calyx* ca 5 mm long; teeth ovate acute, ± as long as tube. *Corolla* pinkish-white; limb of standard orbicular, emarginate, ca 8 mm diam., claw short; wings and keel oblong, ca 9.5 by 3.5 mm. *Ovary* densely hairy; ovules 2–3. *Pod* 1–3-seeded, broadly elliptic, oblong, torulose between the seeds if more than 1-seeded, 2.5–5 by 2.5 cm, glabrescent; valves thin, crustaceo-coriaceous; seeds compressed, broadly elliptic, ca 10 by 9 mm, testa hard, smooth, shining, red or scarlet, not easily separable from the cotyledons.

Thailand.— NORTHERN : Chiang Mai (Doi Pha Khao); EASTERN : Nakhon Ratchasima (Khao Yai Nat. Park); PENINSUPAR : Songkhla (Saba Yoi), Trang (Sikao).

Distribution.— China : Yunnan; Indo-China : Vietnam; Malesia : Sumatra (Type), Malay Peninsular, Java and Borneo.

Ecology.— Evergreen forest, up to 1,100 m alt.

Vernacular.— Phai lek ไพเล็ก (Peninsular).

INDEX TO COLLECTOR'S NUMBERS

Bunpheng 95 : 3.; *Charoenphol et al. 185* : 5, *424* : 1; *Geesink et Santisuk 5014* : 7; *Kerr 5370* : 8, *7729* : 2, *14803* : 8, *16680* : 4, *18499* : 4, *19008* : 8, *19008A*: 8; *Sangkhachand et al. 1037* : 6; *Smitinand s.n.* : 8; *Winit 1133* : 7.

SOPHORA

Sophora Linn., Gen. Plant. ed. **1** : 125. 1737; Sp. Pl. **1** : 373. 1753; DC., Prod. **2** : 95. 1825; Baker in Hook.f., Fl. Br. Ind. **2** : 248. 1879; Gagnep. in Fl. Gén. I.-C. **2** : 501. 1916; Polhill in Fl. Trop. East Africa Leg. 3 Pap. **1** : 43. 1971.— *Broussonetia* Orteg., Hort. Matr. : 61, t. 7. 1798.— *Edwardsia* Salisb., Trans. Linn. Soc. **9** : 298, t. 26. 1808.— *Patrinia* Rafin., J. Phys. **89** : 97. 1819.— *Radiusa* Reichb., Consp. : 148. 1828.— *Pseudosophora* Sweet, Hort. Brit. ed. 2 : 122. 1830.— *Styphnolobium* Schott, Wien. Zeitschr. **3** : 844. 1830; Schott ex Endl., Linnaea **6** : Litt. 54. 1831; Yakovl., Acad. Sci. URSS. **12** : 228. 1975; ibid. **13** : 173. 1976.— *Vibexia* Rafin., Atl. J. : 144. 1832; Yakovl., ibid. **12** : 230. 1975.— *Agastianis* Rafin., New Fl. Am. **3** : 85. 1836.— *Zanthyrsis* Rafin., ibid. **3** : 84. 1836.— *Ammothamnus* Bunge, Arb. Naturf. Ver. Riga: 213. 1847; Yakovl., ibid. **12** : 230. 1975.— *Dermatophyllum* Scheele, Linnaea **21** : 458. 1848.— *Goebelia* Bunge ex Boiss. in Fl. Orient. **2** : 628. 1872.— *Keyserlingia* Bunge ex Boiss., ibid. 629. 1872; Yakovl., ibid. **12** : 229. 1975.— *Echinosophora* Nakai, Bot. Mag. Tokyo **37** : 33. 1923.— *Cephalostigmaton* Yakovl., ibid. **13** : 173. 1976.

Trees, shrubs or rarely perennial herbs. *Leaves* alternate, odd-pinnate; leaflets usually opposite; petiolules very short; stipules present or absent; stipels setaceous or often absent. *Flowers* in terminal or axillary, racemes or panicles; bracts small; bracteoles very small when present, but usually absent. *Hypanthium* often well developed. *Calyx* ± obique, campanulate to tubular, with very short to prominent teeth, the upper 2 often connate up nearly to the apex. *Corolla* white, yellow, blue or purple; standard spatulate, oblong, obovate or orbicular, often emarginate apex, base attenuate to auriculate, claw short; wings oblique, oblong; keel oblong, falcate. *Stamens* 10, free or shortly joined at the very base; anthers uniform. *Ovary* shortly stipitate; style glabrous, with a small terminal stigma; ovules 5-many. *Pod* moniliform, often winged, dehiscent or indehiscent; valves coriaceous to fleshy; seeds ellipsoid, obovoid or globose, brown or red.

Distribution.— About 50 species in tropic and subtropic, only 4 species are found in Thailand.

KEY TO SPECIES

1. Leaflets broadly elliptic to suborbicular, with rounded apex
   2. Calyx campanulate; teeth very short, obscure. Corolla yellow; limb of standard broadly obovate. Leaflets densely white tomentose beneath *S. tomentosa*
   2. Calyx tubular; teeth prominent, triangular-acute. Corolla purple; limb of standard spatulate. Leaflets glabrescent beneath, with densely tawny pubescent along the margins and the midrib *S. exigua*
1. Leaflets elliptic, oblong to lanceolate, with obtuse, acute or acuminate apex
   3. Calyx campanulate; limb of standard broadly ovate-oblong to suborbicular
      4. Pod fleshy, indehiscent; seeds ellipsoid, yellowish-brown. Cultivated as ornamental plant in several parts of the world, type from Japan *S. japonica* Linn.
      4. Pod coriaceous, dehiscent; seeds ovoid, black. China : Kouy-tcheou; Indo-China : Tonkin (type!) *S. tonkinensis* Gagnep.
   3. Calyx tubular; limb of standard spatulate
      5. Calyx-teeth very short, obscure; corolla creamy white; seeds ellipsoid, bright red. Indumentum of young parts puberulous *S. wightii*
      5. Calyx-teeth prominent; corolla dark purple; seeds oblong-ellipsoid, dark brown. Indumentum of young parts velutinous *S. velutina*

1. Sophora exigua Craib, Kew Bull. : 71. 1927; Fl. Siam. En. 1 : 496, 1928; Yakovl., Acad. Sci. URSS. **13** : 173. 1976.— *S. violacea* Thw. var. *pilosa* Gagnep. in Fl. Gén. I.-C. **2** : 505. 1920.— *S. violacea* Thw. ssp. *pilosa* (Gagnep.) Yakovl., ibid. **21** : 51. 1967.—Figure 7.

Shrub, ca 0.5 m high; young shoots, leaf-rachises, inflorescences, calyces and pods densely tawny pubescent to tomentose. *Leaves* 15–30 cm long; stipules absent; leaflets coriaceous, 11–15, lateral ones slightly oblique, broadly elliptic to suborbicular, rounded at both ends, terminal one broadly obovate, cuneate at the base, apex rounded, 2–3 by 1.5–2.5 cm, upper surface glabrous, lower surface glabrescent with densely pubescent along margins and midrib. *Inflorescence* terminal racemes, soon leaf-opposed, up to 20 cm long; bracts small, subulate, 2–3 mm long; pedicels 4–5 mm long; bracteoles absent. *Calyx* tubular, ca 8 mm long; teeth triangular-acute. *Corolla* purple; standard ca 20 by 9 mm, spatulate-emarginate, base attenuate; wings ca 16 by 3 mm; keel ca 11.5 by 3 mm. *Ovary* hairy; ovules 10. *Pod* not seen in maturity.

Thailand.— NORTH-EASTERN : Khon Kaen (Phu Wiang); Loei (Phu Kradung); Udon Thani (Nong Bua); EASTERN : Chaiyaphum (King Ban Yang); Ubon Ratchathani; Nakhon Ratchasima (Ban Chum Saeng).

Distribution.— Cambodia; Type! from Thailand (Udon Thani, *Kerr 8427A*).

Ecology.— In open deciduous forest, up to 1,300 m alt.

Figure 7. *Sophora exigua* Craib : A. flowering branch; B. flower; C. standard; D. wing; E. keel; F. ovary. From *Kerr 8427A*.

2. Sophora tomentosa Linn., Sp. Pl. **1** : 373. 1753; DC., Prod. **2** : 95. 1825; Beddome, Fl. Sylv. S. Ind. **1** : 89. 1871; Kurz, For. Fl. Brit. Burma **1** : 335. 1877; Baker in Hook.f., Fl. Br. Ind. **2** : 249. 1878; Gagnep. in Fl. Gén. I.-C. **2** : 501. 1916; Craib, Fl. Siam. En. **1** : 497. 1928; Van Steenis, Bull. Bot. Gard. Buit. **17** : 423. 1948; Back., Fl. Java **1** : 578. 1963; Polhill in Fl. Trop. East Afr. Leg. 3 Pap. **1** : 44. 1971.

Shrub up to 4 m high; young shoots, leaf-rachises, inflorescences, calyces and pods densely white pubescent to tomentose. *Leaves* 10–30 cm long; stipules absent; leaflets coriaceous, 11–21, broadly elliptic to suborbicular, terminal one equal-sided, lateral ones slightly oblique, 3–5 by 2–3 cm, upper surface glabrescent, lower surface densely white tomentose; apex rounded or subemarginate, base cuneate to rounded; petiolules ca 2 mm long. *Inflorescence* terminal racemes, up to 25 cm long; bracts linear, 3–5 mm long, caducous; pedicel ca 5 mm long; bracteoles absent. *Calyx* campanulate, ca 6 mm long; teeth very short, obscure. *Corolla* yellow; standard ca 15 by 12 mm, limb broadly obovate, with emarginate apex base cuneate; wings ca 16 by 4 mm; keel ca 14.5 by 3.5 mm. *Ovary* densely appressed pubescent; ovules 10. Pod 5–19 by 1 cm, 3–9-seeded; seeds subglobose 6–7 mm long, brownish.

Thailand.— SOUTH-EASTERN : Chanthaburi (Ko Chang, Khlong Kloi); Chon Buri (Ko Khram); PENINSULAR : Surat Thani (Ko Tao, Ko Phangan, Than Sadet); Phangnga (Ko Pipidon); Trang (Ko Mu); Krabi (Ko Lanta Yai).

Distribution.— Pantropic and subtropic (type! from Ceylon : *Hermann*, BM).

Ecology.— In open grassland along the beach.

3. Sophora velutina Lindl., Bot. Reg. **14** : t. 1185. 1828; Walp., Rep. Bot. Syst. **1** : 806. 1842.— *S. glauca* Lesch. ex DC., Ann. Sci. Nat. **4** : 98. 1825; DC., Prod. **2** : 95. 1825; Beddome, Fl. Sylv. S. Ind. **1** : 89. 1871; Baker in Hook.f., Fl. Br. Ind. **2** : 249. 1878.— *S. philippinensis* Merr., Philp. J. Sci. **9** : 449. 1915; van Steenis, Bull. Bot. Gard. Buit. **17** : 427. 1948.— *S. dispar* Craib, Kew Bull. : 71. 1927; Fl. Siam. En. **1** : 496. 1928.

Shrub up to 2 m high; young shoots, leaf-rachises, inflorescences, calyces and pods tawny velutinous. *Leaves* 10–20 cm long; stipules linear, 5–10 mm long, caducous; leaflets subcoriaceous, 19–25, elliptic-oblong to lanceolate or oblanceolate, 2–5.5 by 1–2.5 cm, upper surface glabrous, lower surface velvety; apex acute-mucronate; base cuneate to rounded; petiolules 1–2 mm long. *Inflorescence* terminal racemes, soon leaf-opposed, up to 20 cm long; bracts linear, 3–5 mm long, caducous; pedicels 3–4 mm long; bracteoles absent. *Calyx* tubular, 9–10 mm long; teeth triangular-acute. *Corolla* dark purple; standard 14–15 by 5 mm, spatulate-emarginate, base attenuate; wings, ca 13 by 3 mm; keel, ca 12 by 3 mm. *Ovary* hairy; ovules 10. *Pod* 8–15 by 0.5–0.6 cm, 2–9-seeded; seeds oblong-ellipsoid, ca 8 by 4 mm, dark brown.

Thailand.— NORTHERN : Chiang Mai (Doi Chiang Dao, Mae Sanam, Hot); SOUTH-WESTERN : Kanchanaburi (Bo Rae).

Distribution.— From Nepal (type!), India through S.E. Asia to Malaysia and the Philippines.

Ecology.— On open, rocky slopes in hill evergreen and pine-dipterocarp forest, up to 1900 m alt.

4. **Sophora wightii** Baker in Hook.f., Fl. Br. Ind. **2** : 250. 1878; van Steenis, Bull. Bot. Gard. Buit. **17** : 424. 1948.— *S. prazeri* Prain, J. As. Soc. Bengal **66** (2) : 466. 1897.— *S. mairei* Pampan., Nuov. Giorn. Bot. Ital. **17** : 31. 1910.— *S. duclouxii* Gagnep., Not. Syst. **3** : 17. 1914.— *S. wilsonii* Craib in Sargent, Pl. Wilson. **2** : 94. 1914.— *Millettia esquirolii* Levl., Fl. Kouy-Tcheou : 239. 1914–15.— *S. bhutanica* Ohashi, J. Jap. Bot. **43** (7) : 206, t. 14. 1968.—Figure 8.

Shrub or small tree 4–6 m high; young shoots, leaf-rachises, inflorescences, calyces and pods densely appressed, brown puberulous. *Leaves* 15–24 cm long; stipules linear-subulate, 5–7 mm long; leaflets subcoriaceous, 13–15, ovate-lanceolate to elliptic-lanceolate, lateral ones slightly oblique, 1.5–7 by 1–3 cm, upper surface glabrous, lower surface puberulous to pubescent; apex acute to acuminate; base rounded to attenuate. *Inflorescence* terminal, pendulous racemes, soon leaf-opposed, 5–20 cm long; bracts small, subulate ca 3 mm long; pedicels ca 4 mm long; bracteoles absent. *Calyx* tubular, ca 10 mm long; teeth very short, obscure. *Corolla* creamy white; standard ca 10 by 5 mm, spatulate-emarginate, base attenuate; wings ca 15 by 4 mm; keel ca 13 by 4 mm. *Ovary* hairy; ovules 5. *Pod* 8–12 by 1 cm, 1–4-seeded; seeds ellipsoid, ca 15 by 7 mm, shining, bright red.

Thailand.— NORTH-EASTERN: Loei (Phu Luang); EASTERN: Chaiyaphum (Phu Khieo, Nam Phrom).

Distribution.— From India (type!), Assam through S.E. Asia to Java, northwards to China (Yunnan, Kweichau).

Ecology.— In dry evergreen and deciduous forests, ca 600 m alt.

Vernacular.— Ma klam soi มะกล่ำสร้อย.

INDEX TO COLLECTOR'S NUMBERS

Beusekom et al. 4419 : 4; *Bunpheng 416* : 1, *972* : 4; *Collins 946* : 2; *Hansen & Smitinand 12281* : 2; *Kai Larsen et al. 31323* : 4; *Kerr 2864* : 3, *5416* : 3, *5578* : 3, *8427A* : 1, *9246* : 2, *11130* : 2, *20431* : 1, *21535* : 1; *Kloss 5648* : 2; *Lakshnakara 1340* : 1; *Niyomdham et al. 113* : 3; *Phromdej 234* : 2; *Put 189* : 3, *2820* : 1; *Robinson 6463* : 2; *Smitinand 4237* : 3, *4709* : 3, *6789* : 3, *11471* : 1; *Suvatabandhu 158* : 1.

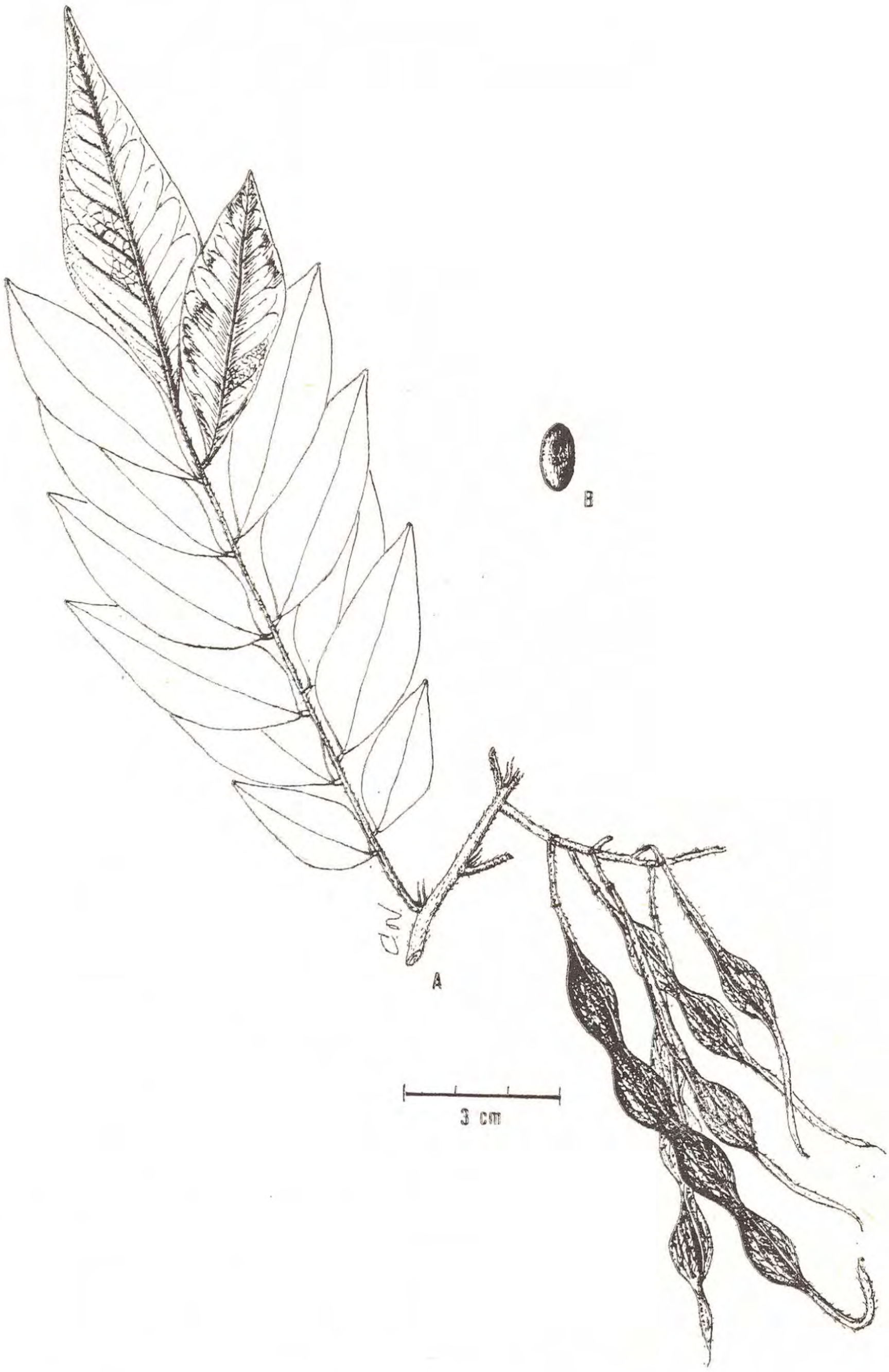

Figure 8. *Sophora wightii* Baker : A. fruiting branch; B. seed. From *Bunpheng 972.*