THAI FOR. BULL. 15 : 29–57. 1985.

4. ARISTOLOCHIACEAE

Leena Phuphathanaphong *

A family of tropical and temperate plants, they are more abundant in the tropics of South America. Only 2 genera and 17 (included 2 cultivated) species are represented in Thailand.

KEY TO THE GENERA

1. Climbing herbs or woody climbers. Flowers irregular, base of perianth utricular. Capsule 6-angled, splitting from base upwards **1. Aristolochia**

1. Perennial upright herbs, undershrubs or shrublets. Flowers regular, base of perianth not utricular. Capsule siliquiform, 4-angled, splitting from top downwards **2. Thottea**

ARISTOLOCHIA

Linn., Sp. Pl. 1 : 960. 1753; Schmidt in Nat. Pflanzenfam. ed. 2. 16b : 235. 1935; Ding Hou, Blumea 29 : 223. 1983.

Prostrate scrambing herb or woody climber. *Leaves* entire or 3-lobed, palmately or pinnately-nerved. *Flowers* solitary, racemose or paniculate, irregular; perianth basally forming the utricle, then contracted into a slender tube; limb 1–2-lipped. *Stamens* 6, adnate to the style to form a gynostemium. *Ovary* 6-locular; ovules many in each locule. *Stigmatic lobes* 3 or 6. *Capsule* septicidal dehiscing from base upwards 6-valved. *Seeds* numerous, flat, winged, verrucose.

* The Forest Herbarium (BKF), Royal Forest Department, Bangkok, Thailand, 10900.

A genus of about 400 species, widely distributed chiefly in the tropics and subtropics and some in the temperate regions, 13 (included 2 cultivated) species in Thailand.

KEY TO THE SPECIES

(based on vegetative characters)

1. Stem zigzag; petiole less than 0.5 cm long
   2. Leaves sessile or subsessile, apex rounded **1. A. arenicola**
   2. Leaves petiolate, apex acute
      3. Blade lanceolate or ovate, much longer than wide, more than 6 cm long **2. A. harmandiana**
      3. Blade broadly ovate, base cordate, as long as broad, less than 1.5 cm long **3. A. helix**

1. Stem not zigzag; petiole 1 cm or more
   4. Leaves lobed
      5. Blade deeply 3-lobed, middle lobe oblong-lanceolate, acuminate, lateral lobes sickle-shaped, obtuse **4. A. curtisii**
      5. Blade shallowly lobed, about half the length of blade **5. A. pothieri**
   4. Leaves entire
      6. Venation palmately 3–5-nerved
         7. Blade as long as broad
            8. Pseudo-stipules present, leaf-like
               9. Blade rounded or kidney-shaped (cultivated) **6. A. ringens**
               9. Blade triangular (cultivated) **7. A. elegans**
            8. Pseudo-stipule absent **5. A. pothieri**
         7. Blade longer than broad
            10. Blade glabrous on both surfaces **8. A. tagala**
            10. Blade puberulous beneath
               11. Blade 3–4 times longer than broad, narrowly oblong-lanceolate, apex tapering acuminate, margin finely pubescent **9. A. pierrei**
               11. Blade less than twice as long as broad, triangular, apex acute, margin glabrous **10. A. kerrii**
      6. Venation pinnately nerved

12. Petiole 1–2 cm long; blade lanceolate **11. A. versicolor**
12. Petiole 8–10 cm long; blade oblong or ovate
    13. Blade oblong, base obtuse to cuneate, apex obtuse **12. A. grandis**
    13. Blade ovate, base cordate, apex acuminate **13. A.** cf. **saccata**
(Hansen & Smitinand 12745)

KEY TO THE SPECIES

(based on flower and fruit characters)

(13. *A.* cf. *saccata* excluded)

1. Flowers solitary
    2. Flowers curved, more than 7 cm long; pedicels 6.5–8.5 cm
        3. Perianth 2-lipped; utricle more than 4 cm long (cultivated) **6. A. ringens**
        3. Perianth orbicular; utricle less than 3 cm long (cultivated) **7. A. elegans**
    2. Flowers straight, less than 5 cm long; pedicels 0.4–1.5 cm
        4. Perianth more than 3.5 cm long, outside densely hairy **1. A. arenicola**
        4. Perianth less than 2 cm long, outside glabrous **3. A. helix**
1. Flowers in racemes or panicles
    5. Flowers in panicles; seeds winged
        6. Panicles lax; seeds as long as broad or slightly broader than long, conspicuously heart-shaped **8. A. tagala**
        6. Panicles dense at the base; seeds (incl. wing) longer than broad, nearly orbicular **5. A. pothieri**
    5. Flowers in racemes
        7. Bracts amplexicaul; seeds not winged, verrucose on both sides **4. A. curtisii**
        7. Bracts not amplexicaul
            8. Racemes lax, few-flowered
                9. Perianth tomentose or pilose outside
                    10. Pedicel more than 3 cm; perianth brown tomentose; stigmatic lobes 6 **12. A. grandis**
                    10. Pedicel less than 2 cm; perianth outside yellowish pilose; stigmatic lobes 3 **11. A. versicolor**
                9. Perianth laxly hairy outside, dirty purplish hairy inside **8. A. tagala**
            8. Racemes dense, flowers many

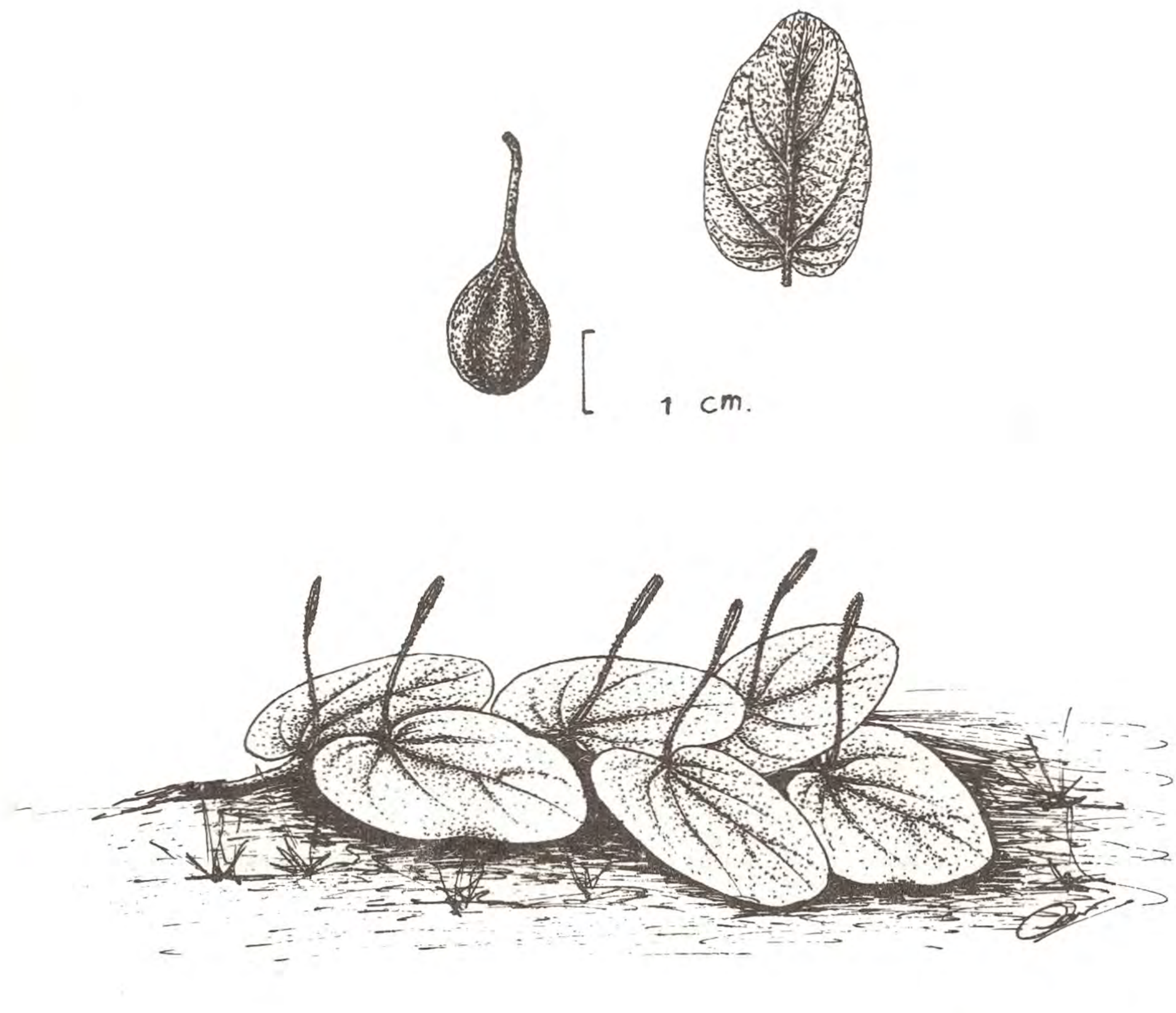

Figure 14. *Aristolochia arenicola* Hance

11. Fruits velutinous; pedicel less than 1 cm; seeds not winged **2. A. harmandiana**

11. Fruits glabrous or nearly glabrous; pedicel more than 1 cm; seeds winged or not

12. Pedicel 3.2–4.5 cm; seeds winged **9. A. pierrei**

12. Pedicel 1.8–2.2 cm; seeds not winged **10. A. kerrii**

1. **Aristolochia arenicola** Hance, J. Bot. 14 : 261. 1876. Figure 14.

Thailand.—NORTH-EASTERN : Nakhon Phanom (Mukdahan); EASTERN : Surin (Kapchoeng), Ubon Ratchathani.

Distribution.—Cambodia (type).

Ecology—On sandy saline soil along road-sides, at 100-200 m. alt.

Note.—This is the only one species having leaves lying flat on ground.

2. **Aristolochia harmandiana** Pierre ex Lec., Notul. Syst. (Paris) 1 : 75. 1909; Lec. in Fl. Gén. I.-C. 5 : 56. 1910; Schmidt in Nat. Pflanzenfam. ed. 2. 16b : 241. 1935. Figure 15.

Thailand.—SOUTH-WESTERN : Prachuap Khiri Khan (Sam Roi Yot).

Distribution.—Cambodia (type), Laos.

Ecology.—On limestone hills near the sea, at 0-250 m. alt.

3. **Aristolochia helix** Phuphathanaphong, Nord. J. Bot. 4 : 467. 1984. Figure 16.

Thailand.—PENINSULAR : Phangnga (Khao Phangnga, type), Krabi (Khao Khanap Nam).

Distribution.—Endemic.

Ecology.—On limestone hills.

Figure 15. *Aristolochia harmandiana* Pierre ex Lec.

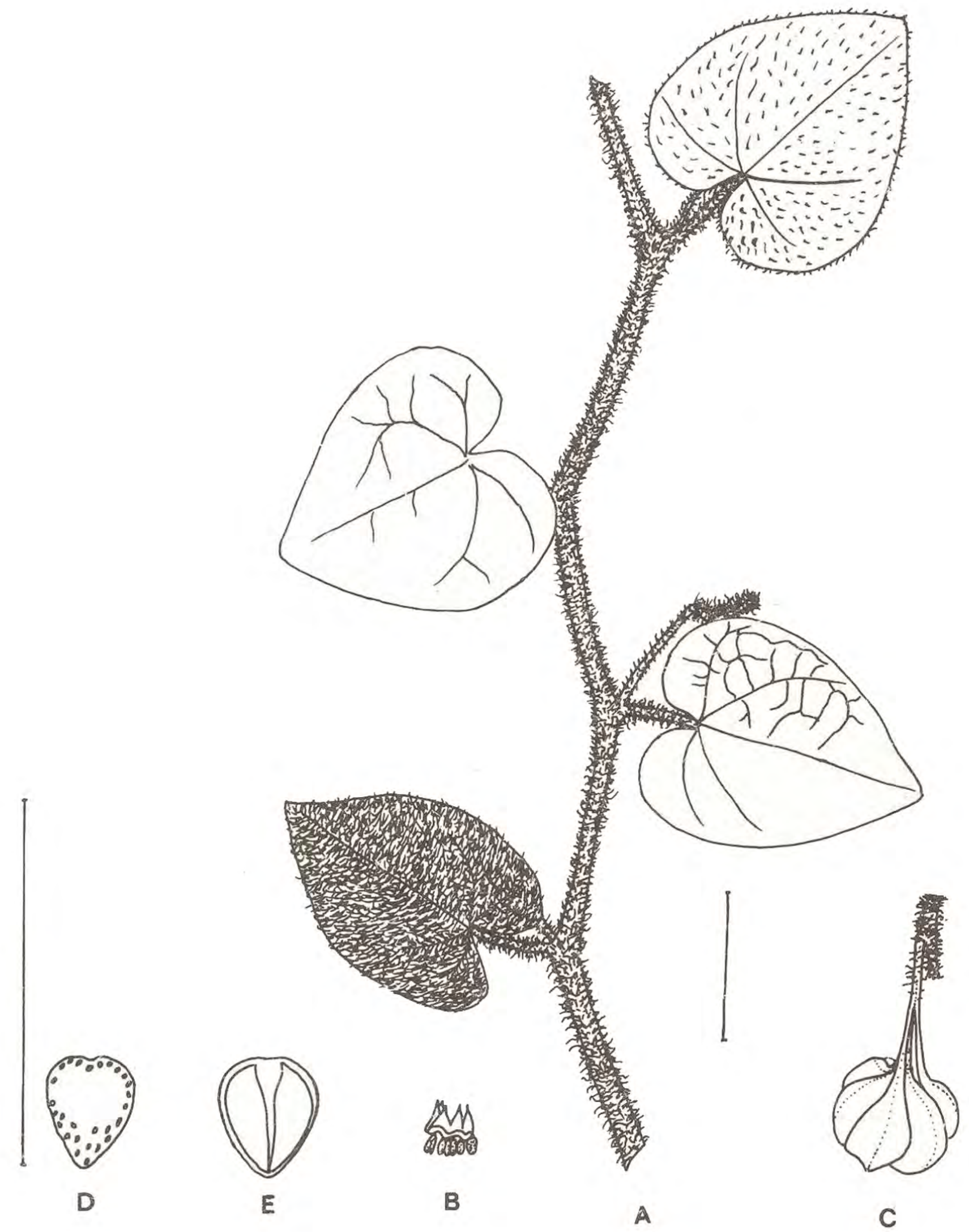

Figure 16. *Aristolochia helix* Phuphathanaphong

4. **Aristolochia curtisii** King, Ann. Roy. Bot. Gard. Calc. 5 : 161. Pl. 195. 1896; Gamble, Kew Bull. 1910 : 78; Ridl., Fl. Mal. Pen. 3 : 18. 1924; Ding Hou in Fl. Mal. I. 10 : 89. 1984. Figure 17.

T h a i l a n d.— PENINSULAR : Phuket (Khao Phara).

D i s t r i b u t i o n.— Malay Peninsular (Penang, type).

E c o l o g y.— On mountains, at 250-440 m. alt.

5. **Aristolochia pothieri** Pierre ex Lec., Notul. Syst. (Paris) 1 : 74. 1909; Lec. in Fl. Gén. I.-C. 5 : 56. 1910; Schmidt in Nat. Pflanzenfam. ed. 2. 16b : 241. 1935.— *A. siamensis* Craib, Kew Bull. 1913 : 203. Figure 18.

T h a i l a n d.— NORTHERN : Chiang Mai (Mae Ping Rapids), Lampang (Doi Pang La, Tham Pha Thai), Tak (Khuean Phumipol); NORTH-EASTERN : Loei (Si Than), Khon Kaen (Don Muang near the University Campus); EASTERN : Chaiyaphum (Ban Lat); CENTRAL : Lop Buri (Chai Badan), Saraburi (Ban Khrua, Ban Nong Bua, Khao Song Phinong, Sam Lan), Nakhon Phanom (W. of Nakhon Phanom); SOUTH-EASTERN : Chon Buri (Khao Khieo); SOUTH-WESTERN : Kanchanaburi (Sai Yok), Prachuap Khiri Khan (Sam Roi Yot).

D i s t r i b u t i o n.— Cambodia (type).

E c o l o g y.— Common on limestone hills, scattered in deciduous forests, evergreen forests, and savanas; at 100-400 m alt.

6. **Aristolochia ringens** Vahl, Symb. Bot. 3 : 99. 1794; Willd., Sp. Pl. 4 : 155. 1805; Persoon, Syn. : 526. 1807; Kostel., Allg. Med.-Pharmac. Fl. : 468. 1833; Duchartre in DC., Prod. 15 : 471. 1864; Gregory, Amer. J. Bot. 43 : 111. 1956. Figure 19.

T h a i l a n d.— NORTHERN : Chiang Mai (Doi Chiang Dao, cultivated); EASTERN : Chaiyaphum (Agricultural Research Station, cultivated); CENTRAL : Nakhon Nayok (Wang Takhrai, cultivated).

D i s t r i b u t i o n.— Tropical S. America (type from Jamaica).

E c o l o g y.— On sandy soil at ca 1000 m. alt. Introduced, sometimes escaped from cultivation.

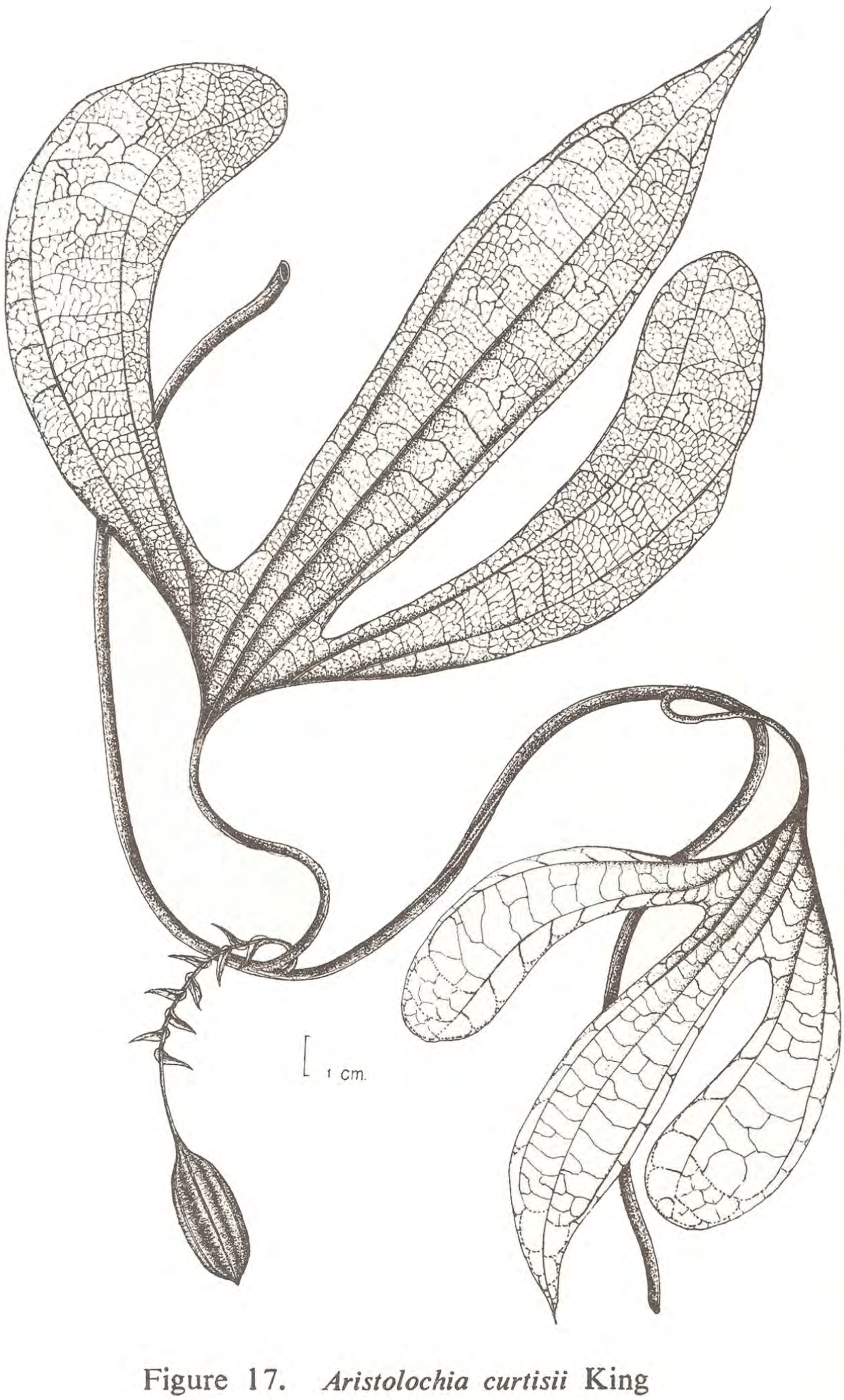

Figure 17. *Aristolochia curtisii* King

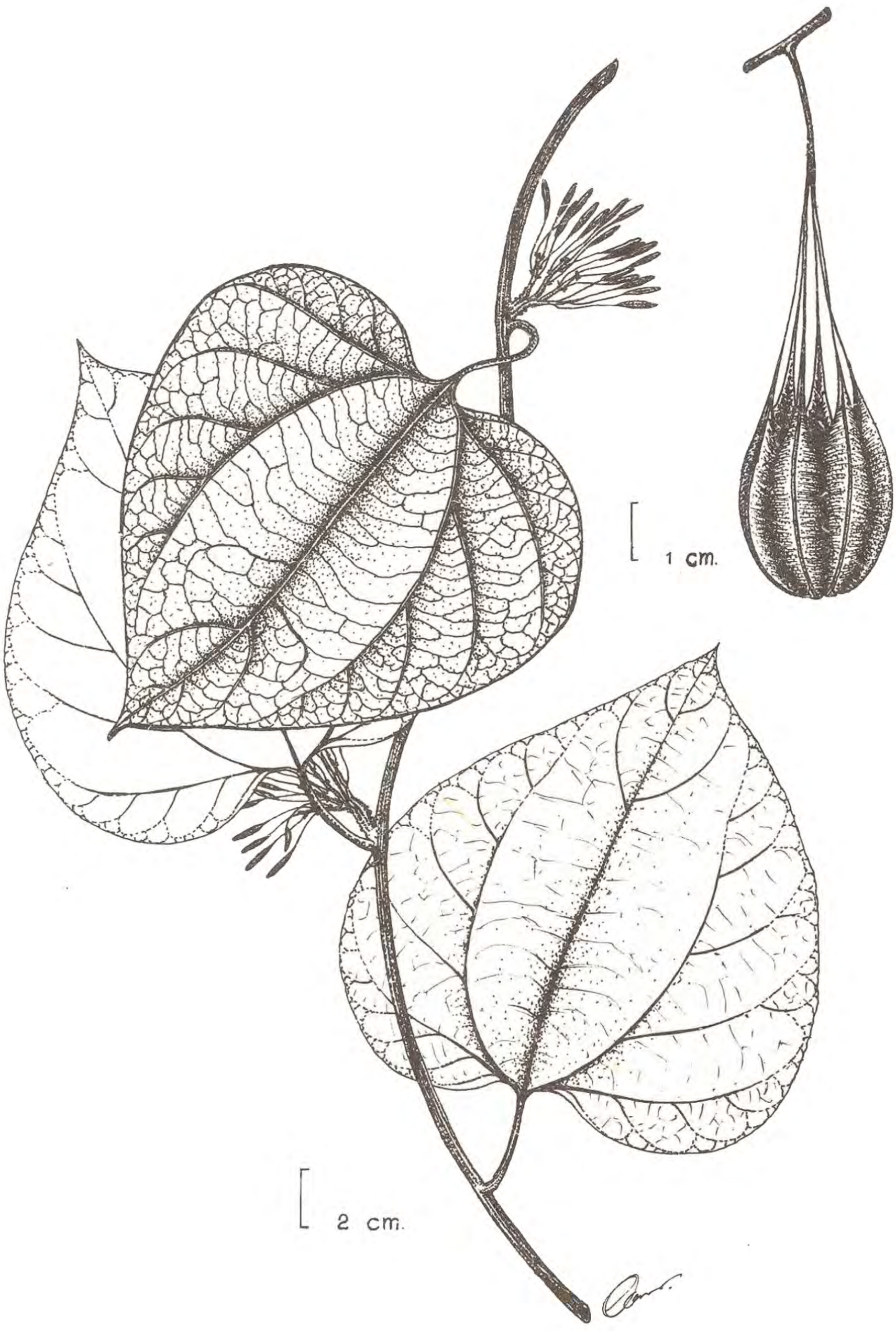

Figure 18. *Aristolochia pothieri* Pierre ex Lec.

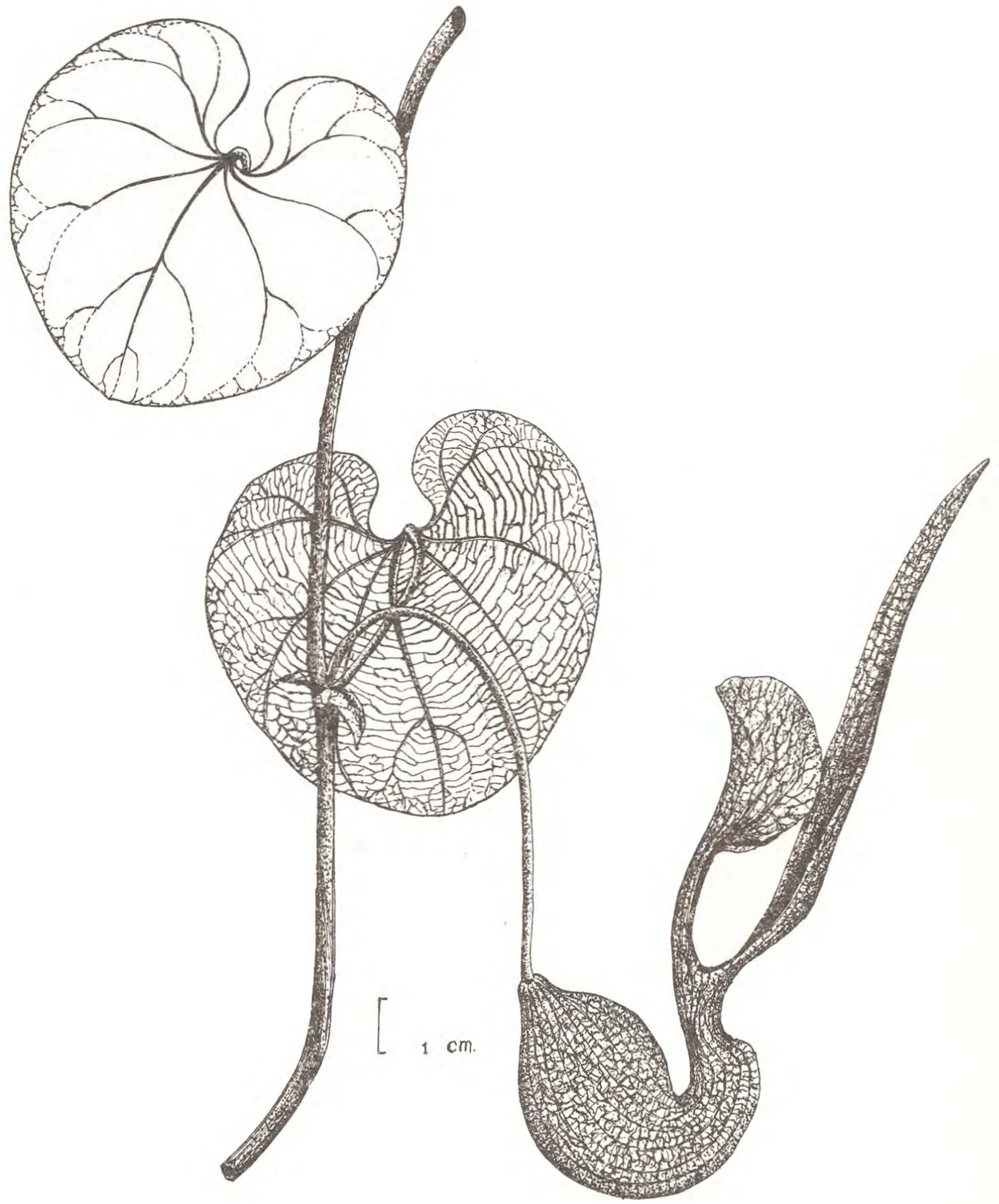

Figure 19. *Aristolochia ringens* Vahl.

7. **Aristolochia elegans** Mast., Gard. Chron. 2 : 301. 1885; Schmidt in Fedde, Repert. 23 : 299. 1927. Figure 20.

T h a i l a n d.— NORTHERN : Chiang Mai (cultivated); CENTRAL : Krung Thep (Bang Khen, cultivated).

D i s t r i b u t i o n.— Brazil.

E c o l o g y.— Introduced, rarely escaped from cultivation.

8. **Aristolochia tagala** Cham., Linnaea 7 : 207. t. 5. f. 3. 1832; Duchartre in DC., Prod. 15. 1. : 480. 1864: Forbes & Hemsl., Inf. Fl. Sin. 26 : 363. 1891; Lév., Bull. Soc. Bot. France 56 : 607. 1909; Ridl., Fl. Mal. Pen. 3 : 18. 1924; Schmidt in Nat. Pflanzenfam. ed. 2. 16b. : 241. 1935; Merr. & Perr., J. Arn. Arb. 23 : 384. 1942; 29 : 153. 1948; Gregory, Amer. J. Bot. 43 : 111. f. 142-144. 1956; Liang, Acta Phytotax. Sin. 13.2 : 17. f. 1, 5. 1975; Ding Hou in Fl. Males. I. 10 : 94. f. 1. *f.* 1984.— *A. roxburghiana* Klotzsch, Monatsber. Königl. Preuss. Akad. Wiss. Berlin : 596. 1859; Duchartre in DC., Prod. 15. 1 : 480. 1865; Hook. f., Fl. Br. Ind. 5 : 75. 1886; Lec., Notul. Syst. (Paris) 1 : 76. 1909; in Fl. Gén. I.-C. 5 : 58. 1910; Lauterbach, Bot. Jahrb. Syst. 52 : 106. 1914; Schmidt in Nat. Pflanzenfam. ed. 2. 16b : 241. 1935. Figure 21.

T h a i l a n d.— NORTHERN : Chiang Mai (Doi Chiang Dao), Tak (Doi Musoe); SOUTH-EASTERN : Chanthaburi (Khlong Kloi); SOUTH-WESTERN : Kanchanaburi (Khao Yai, Kwae Noi Basin); PENINSULAR : Surat Thani (Ko Samui), Nakhon Si Thammarat (Thap Chang), Phuket (Ko Nakha), Trang (Huai Yot).

D i s t r i b u t i o n.— Srilanka, Bangladesh, Burma, Cambodia, Vietnam, India, China, Malesia (Luzon, type), to Solomon Is. and Australia.

E c o l o g y.— In evergreen forests, mixed deciduous forests, and open places, on sandy loam soil; at 5-1030 m alt.

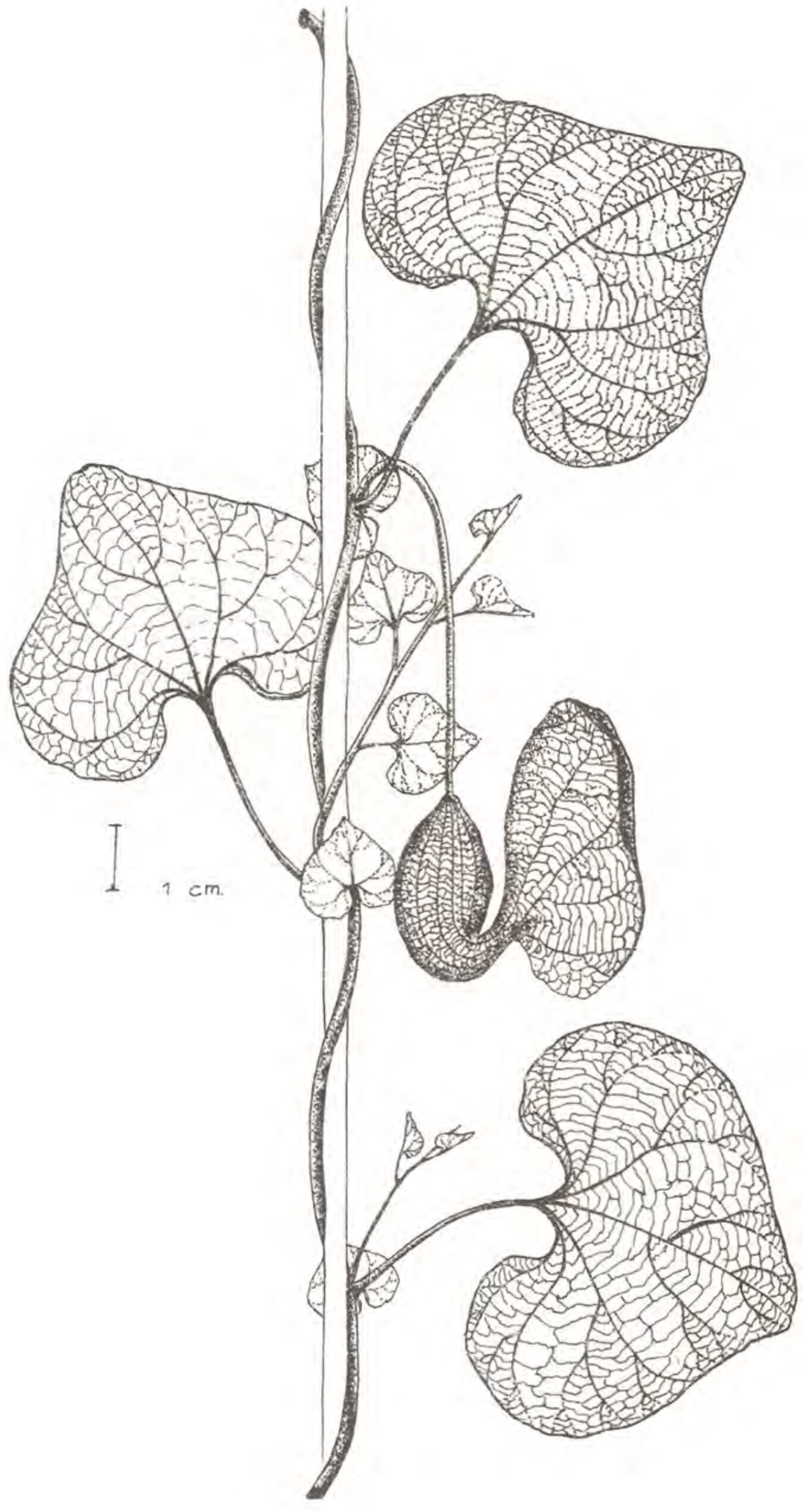

Figure 20. *Aristolochia elegans* Mast.

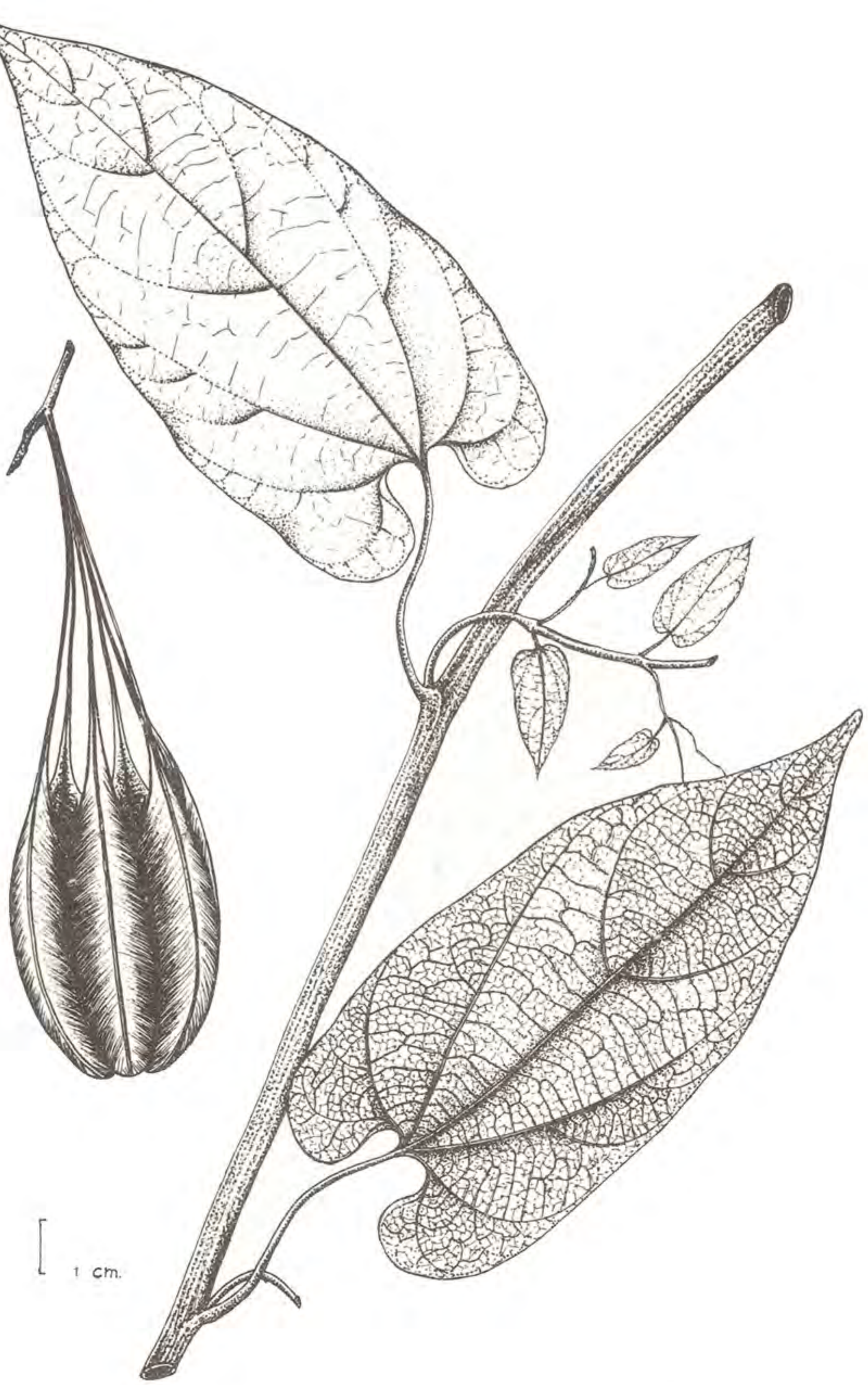

Figure 21. *Aristolochia tagala* Cham.

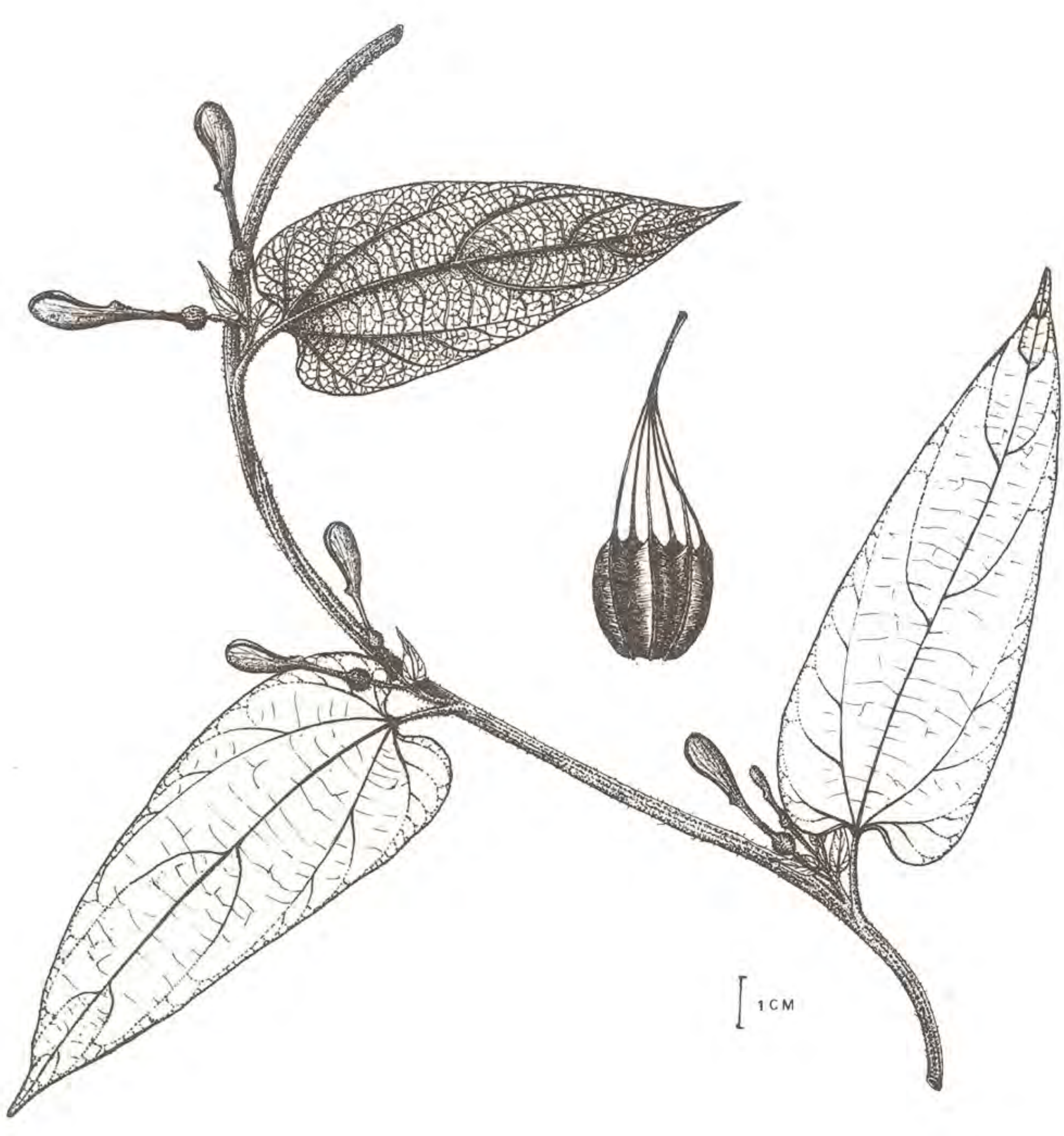

Figure 22. *Aristolochia pierrei* Lec.

9. **Aristolochia pierrei** Lec., Notul Syst. (Paris) 1 : 76. 1909; in Fl. Gén. I.-C. 5 : 57. 1910; Schmidt in Nat. Pflanzenfam. ed. 2. 16b : 241. 1935.— *A. hookeriana* Craib, Kew Bull. 1911 : 450; Schmidt in Nat. Pflanzenfam. ed. 2. 16b : 241. 1935. Figure 22.

T h a i l a n d.— NORTHERN : Chiang Mai (Doi Chiang Dao, Doi Suthep, Mae Klang, Mae Pao), Chiang Rai (Doi Tung), Lampang (Pang La, Mae Li), Phrae (Huai Khamin), Phitsanulok, Sukhothai (Mueang Kao); NORTH-EASTERN : Loei (Phu Kradueng), Sakon Nakhon (Phu Phan); SOUTH-WESTERN : Uthai Thani (Ban Rai), Kanchanaburi (Huai Ban Kao, Sai Yok).

D i s t r i b u t i o n.— Laos (type), Burma.

E c o l o g y.— Open spaces in evergreen forests, at 150-900 m alt.

10. **Aristolochia kerrii** Craib, in Kew Bull. 1911 : 450. Figure 23.

T h a i l a n d.— NORTHERN : Chiang Mai (Bo Luang, Doi Hua Mot, Doi Pha Dam, Doi Suthep-type, Mae Wang), Chiang Rai (Phayao), Mae Hong Son (Mae Sariang, Pang Mu), Tak (near Doi Ka, Ban Na); NORTH-EASTERN : Khon Kaen (Ban Nong Khuean); EASTERN : Chaiyaphum (Nong Bua Daeng); SOUTH-WESTERN : Kanchanaburi (Bo Phloi, Erawan, Huai Ban Kao, Khao Tong, Khwae Noi Basin, Sai Yok, Si Sawat, Thung Kang Yang Hill, Wang Khanai); PENINSULAR : Surat Thani (Ko Tao).

D i s t r i b u t i o n.— Endemic.

E c o l o g y.— In all types of forests; at 10-1370 m alt.

11. **Aristolochia versicolor** Hwang, Acta Phytotax. Sin. 19. 2 : 224. f. 4. 1981. Figure 24.

T h a i l a n d.— NORTH-EASTERN : Loei (Phu Paek, Phu Ruea).

D i s t r i b u t i o n.— China (Yunnan, type).

E c o l o g y.— In lower montane forests and in mixed deciduous forests on sandstone formation.

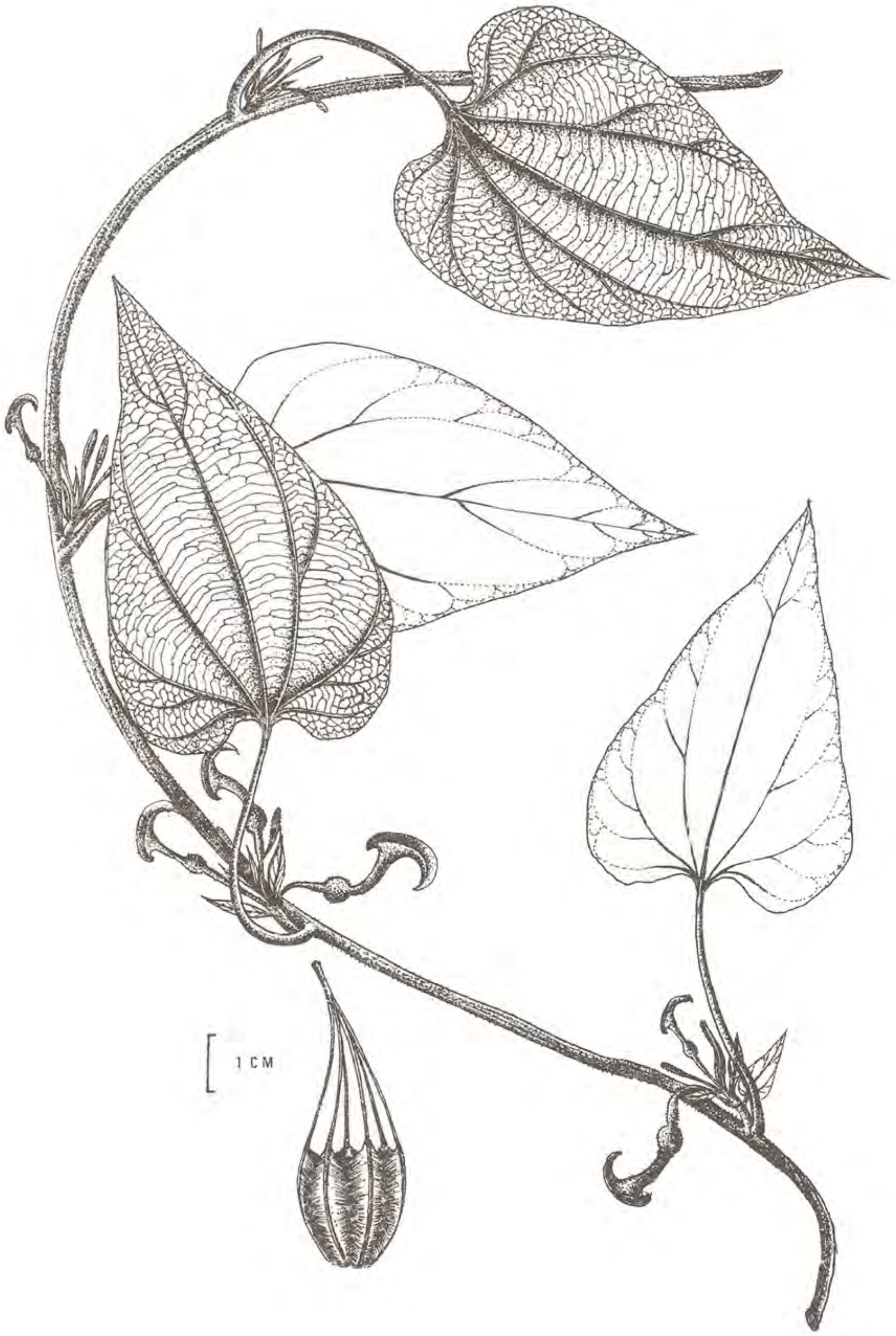

Figure 23. *Aristolochia kerrii* Craib

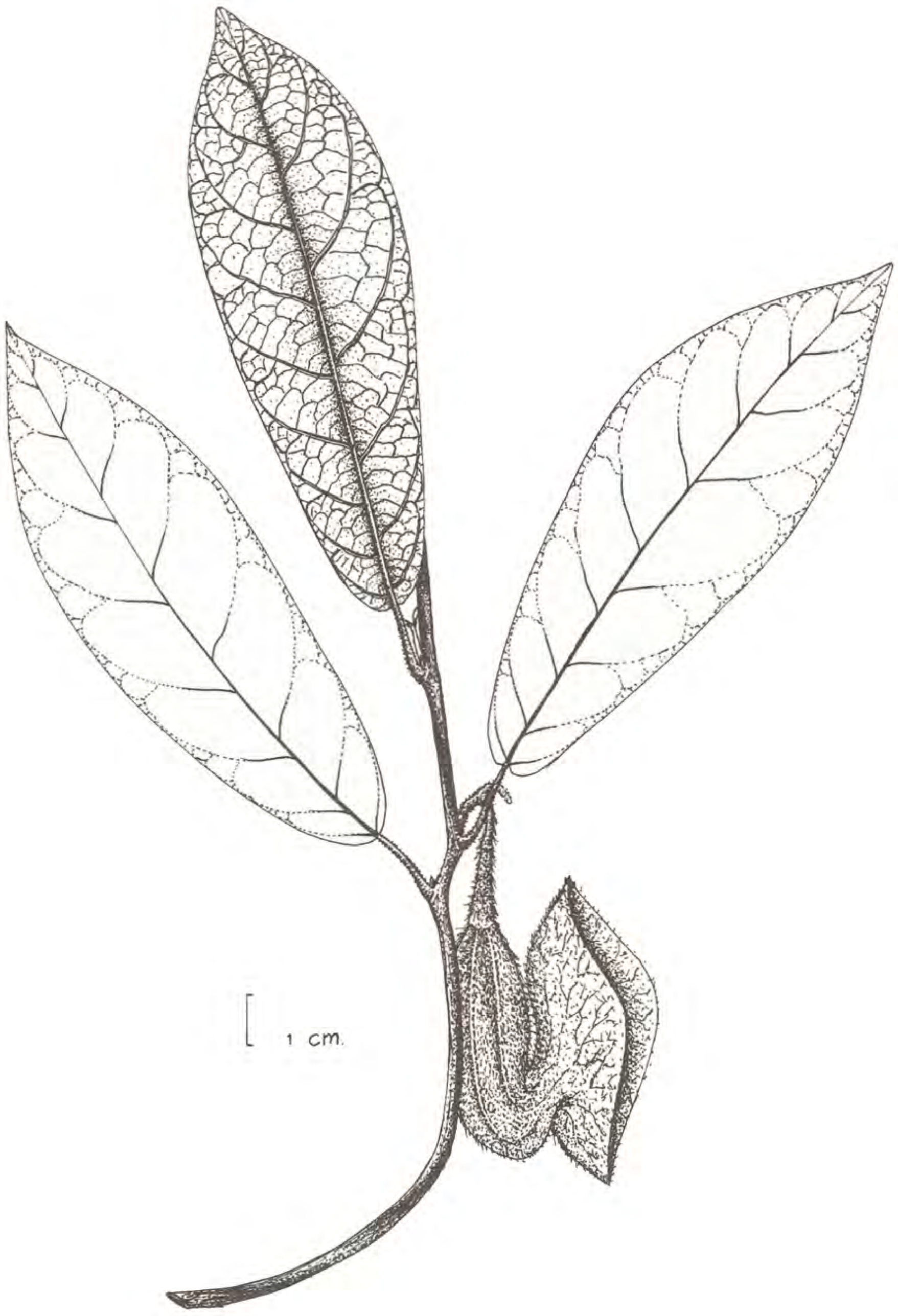

Figure 24. *Aristolochia versicolor* Hwang.

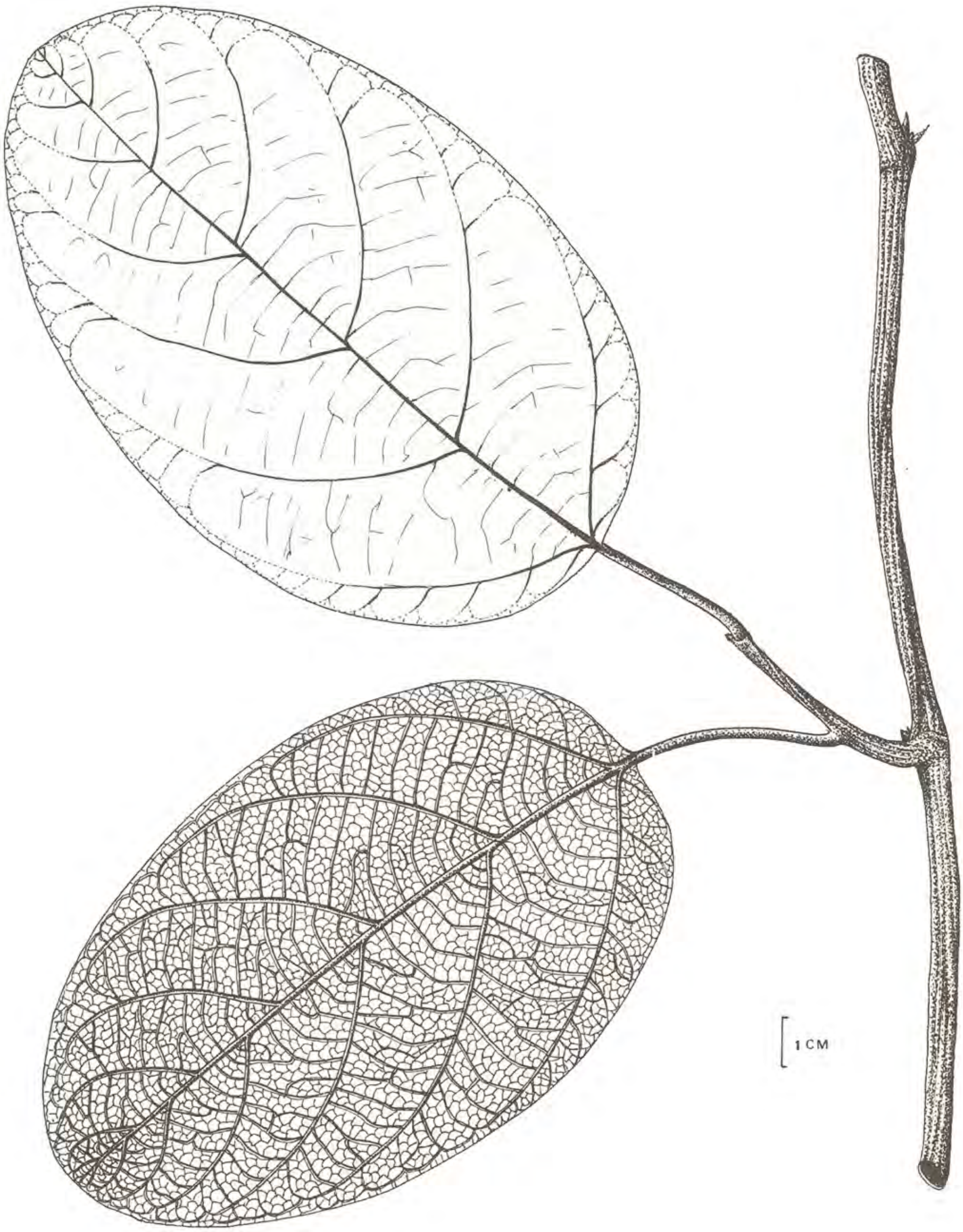

Figure 25. *Aristolochia grandis* Craib

12. Aristolochia grandis Craib, Kew Bull. 1914 : 10. Figure 25.

T h a i l a n d.—NORTHERN : Chiang Mai (Doi Suthep, type).

D i s t r i b u t i o n.—Endemic.

E c o l o g y.—In evergreen and dry evergreen forests often by streams, at 750-1300 m alt.

13. Aristolochia cf. **saccata** Wall. Figure 26.

T h a i l a n d.—NORTHERN : Mae Hong Son (Pang Mapha).

D i s t r i b u t i o n.—India, Nepal (type), Bangladesh.

E c o l o g y.—In evergreen forests on black soil over limestone formation; at 800 m alt.

N o t e.—Only fruiting material from one collection (Hansen & Smitinand 12745) is available for the study. It shows remarkable similarities to *A. saccata* Wall. in its large, cordate leaves and in its large fruits on lower part of the stem lying on the ground, suggesting that the flowers appear on the old wood close to the ground. However, the entire plant is much less villous than in *A. saccata*, and the leaves are slightly broader.

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Figure 26. *Aristolochiacf. saccata* Wall.

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Figure 27. *Thottea grandiflora* Rottb.

THOTTEA

Rottb., Nye Saml. Kongel. Danske. Vidensk, Selsk. Skr. 2 : 529. 1783; Ding Hou, Blumea 27 : 303. 1981; in Fl. Males. I. 10 : 65. 1984.

Undershrub or shrublet. *Leaves* short-petioled, entire, more or less hairy on the lower surface; nervation pinnate. *Inflorescences* axillary, racemose, bracts usually opposite to the flowers. *Flowers* regular, 3-lobed, lobes valvate, distinctly triangular. *Stamens* 6-36(-46), in 1, 2 or 4 series, inserted around the stylar column forming a gynostemium. *Ovary* elongate, 4-angular, 4-locular stigmatic lobes 2-(5)-20; ovules many in each locule. *Capsules* elongate, siliquiform, often 4-angular and twisted when young, dehiscing apically towards the base. *Seeds* ellipsoid or oblong, 3-angular often coated with remains of the placenta, usually transversely corrugated.

A genus of 25 species, 4 species found in Thailand.

KEY TO THE SPECIES

1. Flower large; perianth 5–10 cm long, 4–9 cm diam. Stamens 36(–46), arranged in 2 series, connective brown. Stigmatic lobes 8–15 **1. T. grandiflora**
1. Flower small; perianth less than 2.5 cm long and 2 cm diam. Stamens 6; connective not brown. Stigmatic lobes 3
   2. Leaves densely tomentose or villous below, hairs pale yellowish; veins closely reticulate. Stigmatic lobes hooked, hairy **2. T. tomentosa**
   2. Leaves laxly tomentose or pubescent below, veins transverse; stigmatic lobes glabrous
      3. Stamens many, arranged in 4 series, connective hooked hairy **3. T. parviflora**
      3. Stamens 6, arranged in 1 series, connective glabrous **4. T. sumatrana**

1. **Thottea grandiflora** Rottb., Nye Saml. Kongel. Danske. Vidensk. Selsk. Skr. 2 : 529, t. 2. 1783; Klotzsch, Monatsber. Königl. Preuss. Akad. Wiss. Berlin : 589. 1859; Duchartre in DC., Prod. 15. 1 : 428. 1864; Hook. f., Fl. Br. Ind. 5 : 74. 1886; van Steenis, Bull. Jard. Bot. Buit. 3. 12 : 205. 1932; Ding Hou in Fl. Males. I. 10 : 69. f. 3. 1984. Figure 27.

Figure 28. *Thottea tomentosa* (Bl.) Ding Hou

Thailand.—PENINSULAR : Narathiwat (Waeng).
Distribution.—Malay Peninsula (type).
Ecology.—In evergreen forests.

2. **Thottea tomentosa** (Bl.) Ding Hou, Blumea 27 : 328. f. 48 & 49. 1981; Ding Hou in Fl. Males. I. 10 : 79. 1984.—*Bragantia tomentosa* Bl., En. Pl. Jav. 1 : 82. 1827; Duchartre in DC., Prod. 15.1 : 431. 1864; Hook. f., Fl. Br. Ind. 5 : 73. 1886; Ridl., J. Str. Br. Roy. Asiat. Soc. 57 : 89. 1911; van Steenis, Bull. Jard. Bot. Buit. 3. 12 : 204. 1932;—*Apama tomentosa* (Bl.) Engl., Nat. Pflanzenfam. ed. 1.3.1 : 272. 1889 ; Ridl., Fl. Mal. Pen. 3 : 15. 1924; Schmidt in Nat. Pflanzenfam. ed. 2. 16b : 234. 1935. Figure 28.

Thailand.—PENINSULAR : Ranong (Kapoe, Khao Lukkum), Phangnga (Khao Phra Mi, Khlong Nang Yon), Krabi (Nai Chong), Phuket (Samu), Trang (Chong), Songkhla, Satun (Khuan Kalong), Pattani (Sai Khao Falls).

Distribution.—India (incl. Andaman Isl.), Bangladesh, Burma, Vietnam and Malesia (type from Java).

Ecology.—In evergreen forests, common by streams, in bamboo forests, on hill slopes under 150 m alt.

3. **Thottea parviflora** Ridl., J. Str. Br. Roy. Asiat. Soc. 57 : 89. 1911; Fl. Mal. Pen. 3 : 17. 1924; van Steenis, Bull. Jard. Bot. Buit. 3. 12 : 205. 1932; Schmidt in Nat. Pflanzenfam. ed. 2. 16b : 232. 1935; Ding Hou in Fl. Males. I. 10 : 67. f. 7. n-p. 1984. Figure 29.

Thailand.—PENINSULAR : Ranong (Khlong Kamphuan, Kra Buri), Surat Thani (Khlong Namwong), Phangnga (Khao Katha Khwam, E. of Takua Pa), Phuket (Kathu), Trang (Chong), Satun (Ban Ton).

Distribution.—Malay Peninsula (type from Perak).

Ecology.—In evergreen forests, some on hill slopes, up to 300 m alt.

Figure 29. *Thottea parviflora* Ridl.

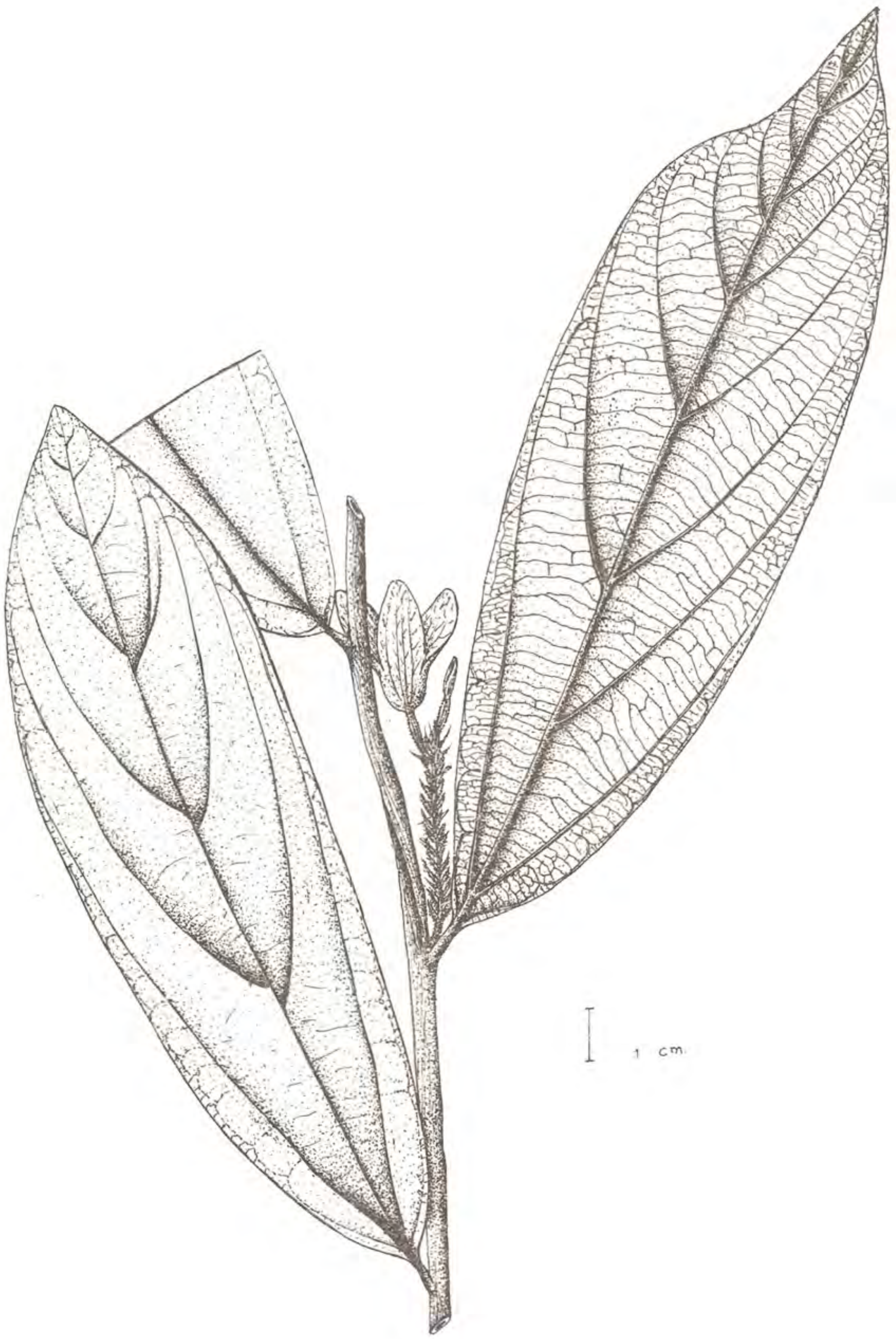

Figure 30. *Thottia sumatrana* (Merr.) Ding Hou

4. **Thottea sumatrana** (Merr.) Ding Hou, Blumea 27 : 328. f. 70C. 1981; in Fl. Males. I. 10 : 81. f. 7, j-m. 1984.— *Apama sumatrana* Merr., Pap. Michigan Acad. Sci. 23 : 178. 1937. Figure 30.

T h a i l a n d.— SOUTH-WESTERN : Kanchanaburi (Khwae Noi River Basin near Wangka); PENINSULAR : Pattani (Bannang Sta).

D i s t r i b u t i o n.—Sumatra (type), Malay Peninsula, Lower Burma.

E c o l o g y.— In evergreen forests, by streams on sandy loam soil, under 150 m alt.

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