CHAPTER IV

# RESULTS

## Taxonomic result

Twenty six species and one variety of ten genera of Thai Convolvulaceae have been studied. Among these, two new recorded species, Evolvulus nummularius (Linn.) Linn. and Operculina riedeliana (Oliv.) Van Ooststr., are reported. Description of family, key to genera and species, full descriptions of genera and species, line drawing and photographs of the whole plants are as follow.

### CONVOLVULACEAE

Herbs, shrub, sometimes parasitic, usually with twiner stems, often with milky Juice, occasionally prostate, creeping or erect, rarely tree. Leaves alternate, exstipulate, mostly simple, somewhat palmately compound, usually petiolated. Inflorescences axillary, pseudoterminal or terminal, usually in cyme, rarely racemose, bracteolate. Flowers 5-merous, bisexual or unisexual, actinomorphic or slightly zygomorphic. Sepals 5, usually free, imbricate with quincuncial aestivation. Corolla gamopetalous, funnel-formed or campanulate, rarely rotate or urceolate. Stamens 5 or 10, epipetalous, alternate to the corolla lobe, filament usually hairy, sometimes sessile, anthers 2 cell. Pollen smooth or spinulose. Disk mostly present, annular or cupular. Ovary superior, 2 carpels, 2 or 1-celled, sometimes 4-celled by false septum, 2 ovules in each carpel. Style 1, often filiform, simple or fork, or 2 free styles. Stigma varied in shapes, globular, ellipsoid, filiform, rarely peltate. Fruits capsular, dehiscing by valve or circumcissile or irregular. (Van Ooststroom, 1953, Austin, 1980).

KEY TO GENERA

1. Leafless parasitic plants. .....3 Cuscuta
1. Non parasitic plants.
   2. Styles 2.
      3. Styles united near the base. .....2 Bonamia
      3. Styles free.
         4. Each style forked, stigma filiform. .....4 Evolvulus
         4. Each style not forked, stigma peltate lobe or kidney shaped. .....8 Neuropeltis
   2. Style 1
      5. Stem and leaves with stellate hairs, stigma elliptic, oblong, corolla blue, pale blue, rarely white. .....6 Jacquemontia
      5. Stem and leaves without stellate hairs, stigma globose, oval-oblong, oblong complanate, corolla yellow, pale yellow, creamy white, white, neither blue nor lilac.
         6. Sepals not concave, the outer ones distinctly longer and broader than the inner ones.
            7. Ovary glabrous. .....1 Aniseia
            7. Ovary hairy. .....5 Hewittia
         6. Sepals concave, the outer ones not distinctly longer and broader than the inner ones.
            8. Fruits with operculum. .....9 Operculina
            8. Fruits without operculum, opening by valves.
               9. Anthers twisted when dehisced, pollens colpate. .....7 Merremia
               9. Anthers straight when dehisced, pollens panto-porate. .....10 Xenostegia

## 1 Aniseia

Choisy in Mem.Soc.Phys.Geneve.6:481.1833; Backer And Rendle in This.-Dyer, Fl. Trop. Afr.4, 2:88.1905; Ridley, Fl.Mal. Pen. 2:456.1923; Merrill, Enum.Philipp.Fl.Pl.3:359.1923; Van Ooststr.,Blumea 3:279.1939; id. in Fl.Mal.1, 4:435.1953; Verdcourt, Fl.Trop.E.Afr.11:48.1963; Khan, Fl.Bangladesh 30:3.1985.- Ipomoea subgenus Aniseia Clarke in Hook.f., Fl.Brit.Ind.4:200.1883.

A herbaceous twiner, sometimes prostrate. Leaves elliptic-oblong, oblong, linear, lanceolate, ovate, often mucronulate at the apex. Flowers axillary, usually one to few-flowered cymes. Sepals 5, unequal, acute or acuminate at the apex, often decurrent on the pedicel, enlarge in fruit. Corolla broadly tubular to funnel-formed, limb 5-lobed, hairy on the outside of midpetaline band. Stamens and style included, stamens 5 inserted on the corolla tube, filament filiform; pollens smooth, polyrugate. Disk small or absent. Ovary glabrous, 2 locules, each locule with 2 ovules. Style 1. Stigma 2, globular or oblong. Fruits capsule. Seeds 4 or less, black.

A small genus of about 5 species, confined to tropical and subtropical America, except one species occurs in the tropics of New and the Old World (Van Ooststroom, 1953). One species found in Thailand.

1 Aniseia martinicensis (Jacq.) Choisy in Mem. Soc. Phys.Geneve 8: 66.1838; id.in DC.,Prodr.9:430.1845; Hall.f.in Engl.,Bot.Jahrb.18:96. 1894; Ridley, Fl.Mal.Penins. 2:456.1923; Merrill, Enum.Philipp.Fl.Pl.3: 359.1923; Burkill, A Dict. Econ. Prod. Mal. Pen. 1 : 160.1935; Van Ooststr., Blumea 3 : 279.1939; Kerr in Fl. Siam. En. 3, 1:99.1951; Van Ooststr., Fl.Mal.1, 4:435.1953; Verdcourt in Fl.Trop.E.Afr.11:48.1963; Back. and Bakh.f.,Fl.Java 2:488.1965; Austin in Dassanayake, Fl.Ceylon 1 : 291. 1980; Khan, Fl. Bangladesh 30:3.1985.- Convolvulus martinicensis Jacq., Select.Stirp.Amer.:26, t.17.1763.- Convolvulus uniflora Burm.,Fl.Ind.:47,t.21,Figure 2.1768; Desr.in Lam.,Encycl.3:544. 1789.- Ipomoea martinicensis (Jacq.) Mey., Prim.fl.Esseq.:98.1818.- Ipomoea uniflora (Burm.) R.et S., Syst.Veg.4:247.1819; Clarke in Hook.f., Fl.Brit.Ind.4:201.1883; Trimen, Handb.Fl.Ceylon 3:215.1895; Gagnep.et Courch. in Lec., Fl.Indo-Chine 4 : 244, and 236, Figure 29 (5).1915.- Convolvulus rheedii Wall.in Roxb., Fl.Ind.:70.1824;- Convolvulus pterocarpus Bert.ex Colla, Hort.Ripul.:37.1824.- Aniseia uniflora (Burm.) Choisy in Mem.Soc.Phys.Geneve 6:48, t.2, Figure 9.1833; id.in DC.,Prodr.9:431.1845; Wight, Icon.3:t.850.1843-47; Peter in Engl.-Prantl, Nat,Pfl.fam.4, 3a;25. Figure 12A.1891; 231.1905; Gamble, Fl.Pres.Madras 5:924.1923.- Ipomoea pterocarpus (Bert.) Don, Gen.Syst.4:282.1838.- ?Ipomoea lanceolata Don, l.c.; Choisy in DC., Prodr. 9: 390.1845.- Aniseia emarginata (Vahl) Hassk., Cat.Hort.Bogor.:139.1844. -Fig.1-2; Plate 1.

A herbaceous twiner sometimes prostate, glabrous or covered with short hairs. Leaves elliptic-oblong or oblong, 3.5-8 by 1-3 cm, apex mucronulate or emarginate, base acute or cuneate, margin entire, glabrous, more or less pilose at the margin and midrib or veins, nerves 5-7 on either side of the midrib; petioles short, 0.3-0.8 cm long, covered with short hairs. Flowers usually 1-flowered sometimes 2-flowered, peduncles more or less pilose, 2.5-4 cm long; bracts 2, minute, linear to linear-lanceolate, pilose, 2.5-3 mm long; pedicels pilose, 1.2-5 mm long. Sepals green, more or less pilose, distinctly

reticulated nerves, 2 outermost sepals ovate, acute, 1.8-2 by 1.1-1.2 cm, the third one oblique or falcate, 1.5 by 0.7 cm, 2 innermost lanceolate, 1.5 by 0.3-0.4 cm. Corolla funnel-shaped, 2-2.5 cm long, 2.5 cm in diameter, white; midpetaline bands pale yellowish white, hairy on the outer sufaces. Base of filament dilated and covered with white hairs, anther glandular. Disk absent. Ovary glabrous; stigma 2, oval-oblong. Fruit capsule, brown, ovoid, glabrous. Seeds dull black, wooly on the angles, more or less pubescent.

**Thailand.**- EASTERN : Nakhon Ratchasima, Surin, Ubon Ratchathani; SOUTH-WESTERN : Prachuap Khiri Khan; CENTRAL : Chai Nat, Sing Buri, Saraburi, Ayutthaya, Nakhon Nayok, Pathum Thani, Bangkok; SOUTH-EASTERN : Chachoengsao, Chanthaburi; PENINSULAR : Surat Thani, Songkhla, Pattani.

**Distribution.**- Through out the tropic (Kerr, 1951) and a species originally from the tropics of Central and South America. (Austin, 1980).

**Ecology.**- In high-moisted and open area, beside the canals, swamping ground along the roadside. Altitude from sea level upto 25 m. Flowering in October-May.

**Vernacular.**- Ching cho (จิงจ้อ : Bangkok).

**Uses.**- Used as a vegetable in the Malay Peninsular, Borneo (Van Ooststroom, 1953), and Malacca (Burkill, 1935).

**Specimens examined.**- C. Khunwasi 26 (CU), E. Smith 150 (BK), Kai Larsen 33738 (BKF), M.C. Laksanakorn 455 (BK), Put s.n. (BK), Staples & Wathaniyakom 337 (BKF).

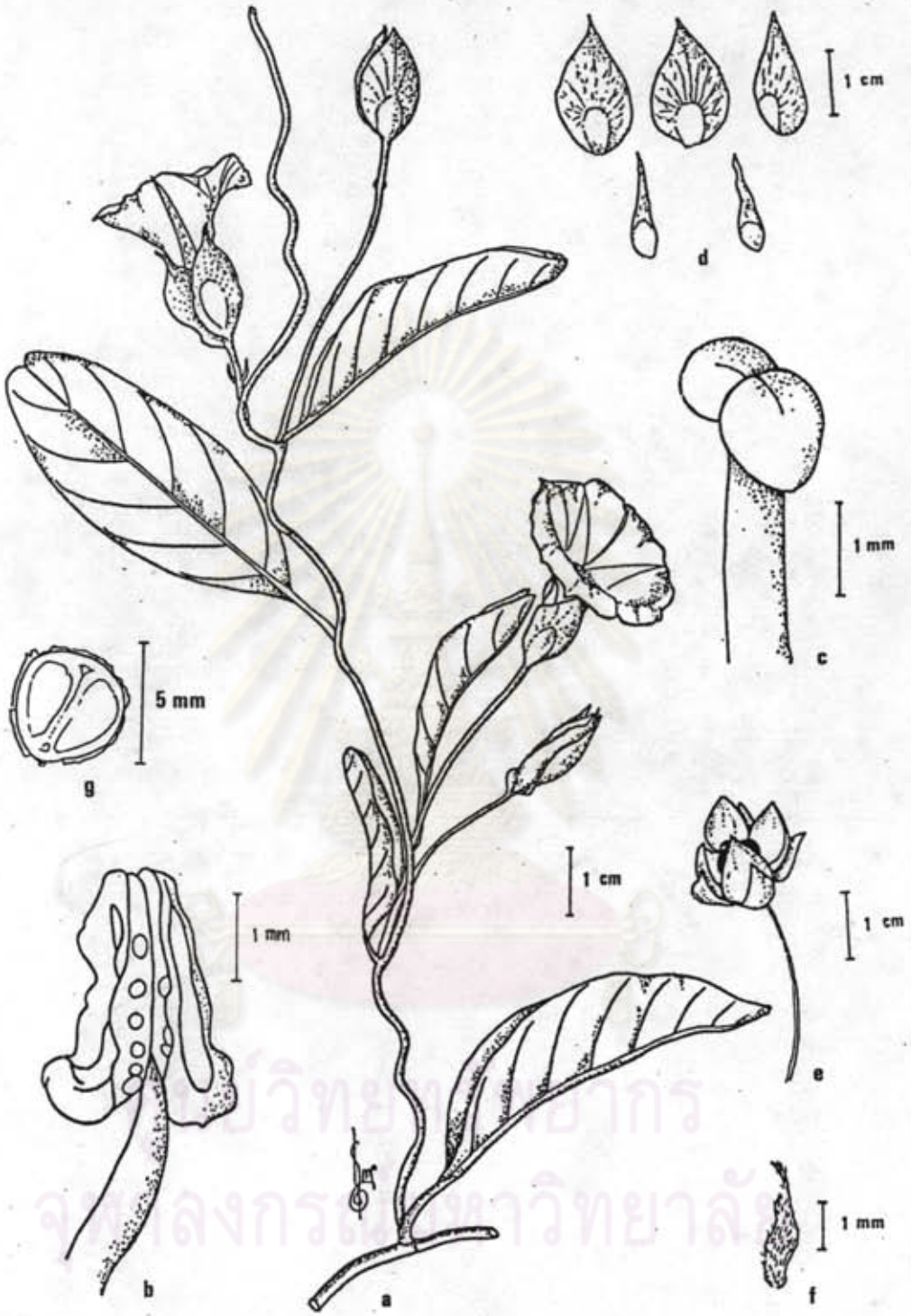



Figure 1. Aniseia martinicensis (Jacq.) Choisy - a. flowering branch, b. anther, c. stigma, d. sepals, e. fruit with calyx f. bract, g. seed.

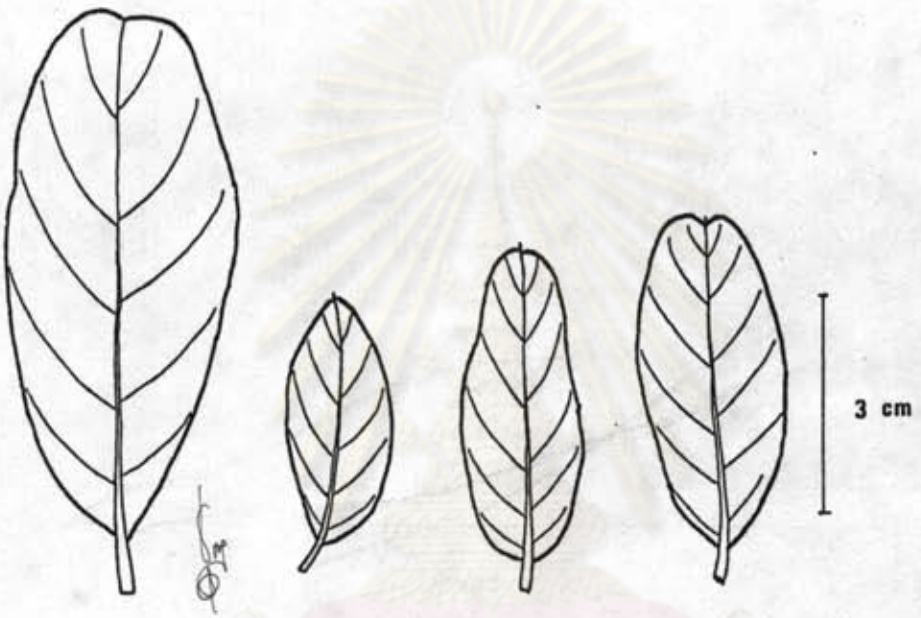



Figure 2. A. martinicensis (Jacq.) Choisy - variation of leaves

PLATE 1. Aniseia martinicensis (Jacq.) Choisy

## 2 BONAMIA

Thouars, Hist. Veg. Isl. Frans 1:33.1804; Hallier.f., Bull.Herb.Boiss. 5:804, 996. 1897; Van Ooststr., Blumea 3:75. 1938; id.in Fl.Mal. 1, 4.: 398. 1953; Khan, Fl. Bangladesh 30:10.1985.- Breweria R.Br.,Prod.: 487.1810.- Trichantha Karst.& Triana, Linnaea 28:437.1856.

Herbaceous twiner or undershrub. Leaves ovate, lanceolate or elliptic, entire. Flowers axillary, solitary or cymose sometimes panicle; bracts small. Sepal 5, acute, equal or subequal, lanceolate to orbicular Corolla campanulate or funnel-formed, limb 5-lobed, blue or white, midpetaline band hairy outside. Stamens and style included or slightly exserted, filament inserted on the corolla tube, glandular-pilose at the base or glabrous; pollen smooth,colpate or rugate. Ovary 2 cells, each cell with 2 ovules; style filiform, bifid or 2 free styles; stigma peltate or globose. Fruits capsule. Seeds 4 or fewer, glabrous or pilose.

A genus of about 40 species, widely distributed in the tropics of both hemispheres (Van Ooststroom, 1953; Austin, 1980). In Thailand found only one species.

2. Bonamia semidigyna (Roxb.) Hall.f., Engl.,Bot.Jahrb.16:528.1893; Boerl.,Handl.Fl.Ned.2:507.1899; Prain, Journ.As.Soc.Bengal 74:299.1906; Gagnep. et Courch.in Lec., Fl.I.-C. 4 : 289. 1915; Ridl., Fl. Mal. Pen. 2:454.1923; Merrill, Enum.Philipp.Fl.Pl.3:357.1923; Van Ooststr., Blumea 3:76.1938; Kerr, Fl.Siam.En.3. 1:90.1951; Van Ooststr., Fl.Mal. 4. 1:398.1953; Austin in Dassanayake, Fl.Ceylon 1:303.1980; Khan, Fl. Bangladesh 30:11.1985.- Convolvulus semidigynus Roxb.,Hort.Beng:13.1814.- Breweria cordata Bl.,Bijdr.:722.1825; Choisy in DC., Prodr.9:438.1845; Clarke in Hook.f.,Fl.Brit.Ind.4:223.1883; Gamble, Fl.Pres.Madras 5:923. 1923.- Breweria roxburghii Choisy in Mem.Soc.Phys.Geneve 6:493.1834; id.in DC.,Prodr.9:438.1845.- Breweria madagascarensis Choisy in Mem. Soc,Phys.Geneve 6:493.1833; id.in DC.,Prodr.9:438.1845.- Breweria semidigyna (Roxb.) O.Ktze.,Rev.Gen.:440.1891. -Fig.3-4.

A herbaceous twiner, terete, covered with densely brown hairs. Leaves ovate, 4-9 cm by 2.5-6 cm, apex acute or acuminate, base cordate, margin entire, densely appressed brown pubescent on both surfaces, more densely below, nerve 5-7 pairs; petioles pubescent, 1-3 cm long. Flowers in umbelliform cyme, usually 3-5 flowered; peduncles pubescent, 3-11 cm long; bracts pubescent, lanceolate, 0.2-1 cm long; pedicels pubescent, 0.4-1 cm long. Sepals subequal, ovate to ovate-oblong, 8-9 by 0.5 mm, obtuse at the apex, short brown tomentose outside, the inner one with scarious margin. Corolla funnel-formed, 3-4 cm long, 3-3.5 cm in diameter, white, midpetaline band pilose outside. Base of filaments dilated, sparsely pilose, anthers direct downwards. Disk present. Ovary oval, hairy; style bifid; stigma peltate. Fruits ovoid to subglobose, hairy at the top. Seeds 4, greyish-black, glabrous.

Thailand.- CENTRAL : Nakhon Nayok; SOUTH-EASTERN : Rayong, Chanthaburi, Trat; PENINSULAR : Chumpon, Phangnga, Songkhla.

Distribution.- Madagascar, India, Indo-China, Thailand, Malaysia (Van Ooststroom, 1953, Austin, 1980).

Ecology.- Climbing on a Melaleuca sp., edge of stagnant brackish canal, along the roadside over grasses and low shrubs, in scrub and evergreen forest. Altitude from sea level upto 100 m. Flowering in October to February.

Vernacular.- Ching cho khon daeng (จิงจ้อกแดง : author).

Uses.- -

Specimens examined.- D. Bunpeng 194 (BKF), Kerr 9399 (BK), 13535 (BK), Sakol 58 (BK), Staples & Wathaniyakom 257 (BKF), 267 (BKF), T. Smitinand 3527 (BKF), Vacharapong 057 (BK).

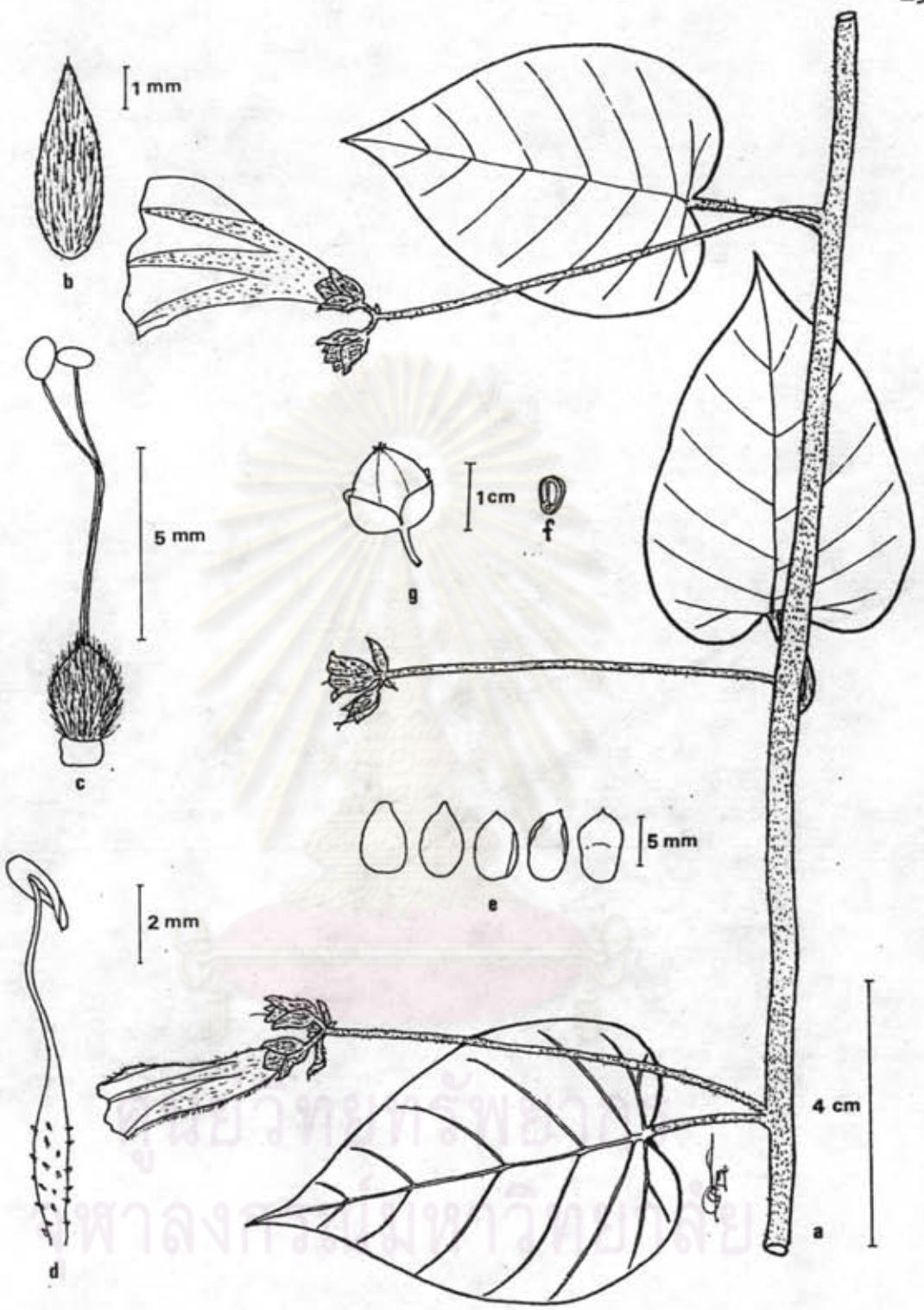



Figure 3. Bonamia semidigyna (Roxb.) Hall.f. - a. flowering branch, b. bract, c. pistil, d. stamen, e. sepals, f. seed, g. fruit.

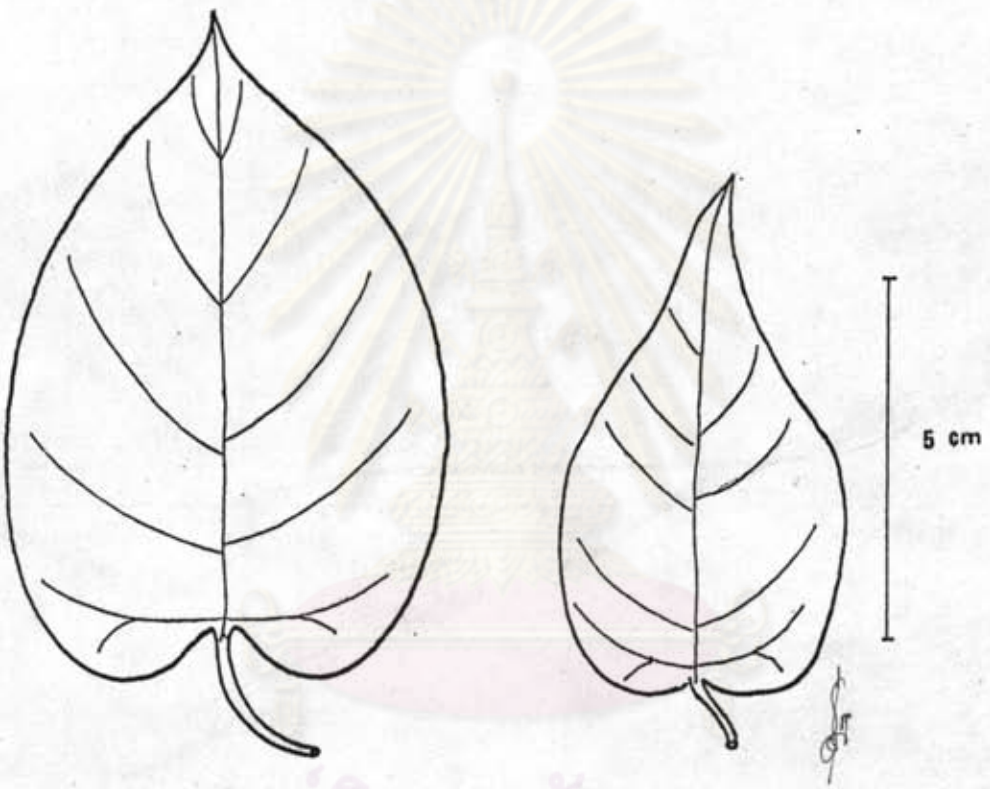





Figure 4. B. semidigyna (Roxb.) Hall.f. - varition of leaves

## 3 CUSCUTA

Linn.,Sp.Pl.:124.1753; Gen.Pl.,ed.5:60.1754; Van Ooststr., Blumea 3:63. 1938; id.in Fl.Mal.1, 4:391.1953. Verdcourt, Fl.Trop.E.Afr.:3.1963.

Leafless parasitic herb; stems slender, twining, yellow or brownish green, attached to host plants by haustoria. Flowers small in cluster dense cymoses or subglobular groups, sessile. Calyx gamosepalous, 5 lobed. Corolla white to pale yellow, urceolate, tubular or campanulate, lobes 5, usually with scale-like appendages inside the corolla tube and opposite to stamens. Stamens 5 with filaments or sessile; pollen smooth, 3 or 5-colpate. Disk present or absent. Ovary glabrous, 2 locules, each locule with 2 ovules; styles 2 or united, stigma 2, capitate or elongate. Fruits dry or fleshy capsule. Seeds 4 or less, glabrous.

A cosmopolitan rather large genus of about 165 species centering in the Americas (Van Ooststroom, 1953), 2 species found in Thailand.

### Key to species

1. Stamens with filaments, scale-like appendages just below the base of filaments, styles 2, stigmas capitate, corolla yellow, stems slender, smooth, not fragrant. .....3.1 C. chinensis
1. Stamens sessile, scale-like appendages distant from anthers, styles 1, stigmas elongate, corolla white, stems stout, rough, strongly fragrant. .....3.2 C. reflexa

3.1 Cuscuta chinensis Lamk.,Enc.2:229.1786; Clarke in Hook.f.,Fl.Br. Ind.4:227.1883; Trimen, Handb.Fl.Ceylon 3:229.1895; Yuncker, Mem.Torrey Bot.Club 18:209.1932; Kerr, Fl.Siam.En.3, 1:89.1951; Austin in Dassanayake, Fl.Ceylon 1:305.1980. -Fig.5; Plate 2.

Parasitic twining herb, stems slender, 1 mm in diameter or less, bright yellow. Flowers in cluster dense-cymoses, sometimes solitary; pedicels glabrous, 1-2 mm long or none. Calyx white, fleshy and rough, 2.5-3 mm long, 3 mm in diameter, calyx lobes 5, ovate or triangular. Corolla urceolate with the basal portion globose, white to pale yellow, fleshy, corolla lobes triangular, the tips usually inflexed, 3 mm long, 2.5-3 mm in diameter. Filaments with the whitish fimbriate epipetalous scales at the base; anthers distinctly yellow. Disk absent. Ovary glabrous, rough; styles 2; stigma 2, globose. Fruits capsule, globose, pericarp thin, enclosed in the persistent calyx. Seeds brownish yellow, glabrous.

**Thailand.**- NORTHERN : Chiang Rai; NORTH-EASTERN : Maha Sarakham; CENTRAL : Nakhon Pathom, Pathum Thani, Bangkok.

**Distribution.**- From Abyssinia, Sokrotra, Afghanistan and eastwards to Ceylon, Australia and China (Austin, 1980).

**Ecology.**- Usually found as weed on bushes such as Wedelia sp., Solanum torvum Sw., Panicum repens Linn., in an open sunny places, along the roadside. Altitude upto 340 m. Flowering in August to April.

**Vernacular.**- Foi thong (ฝอยทอง : Central), Phak mai (ผักไหม : Udon Thani), Foi mai (ฝอยไหม : Nakhon Ratchasima).

**Uses.**- -

**Specimens examined.-** C. Khunwasi 36 (CU), Kerr 1105-6 (BK), Maxwell 73-55 (BK).

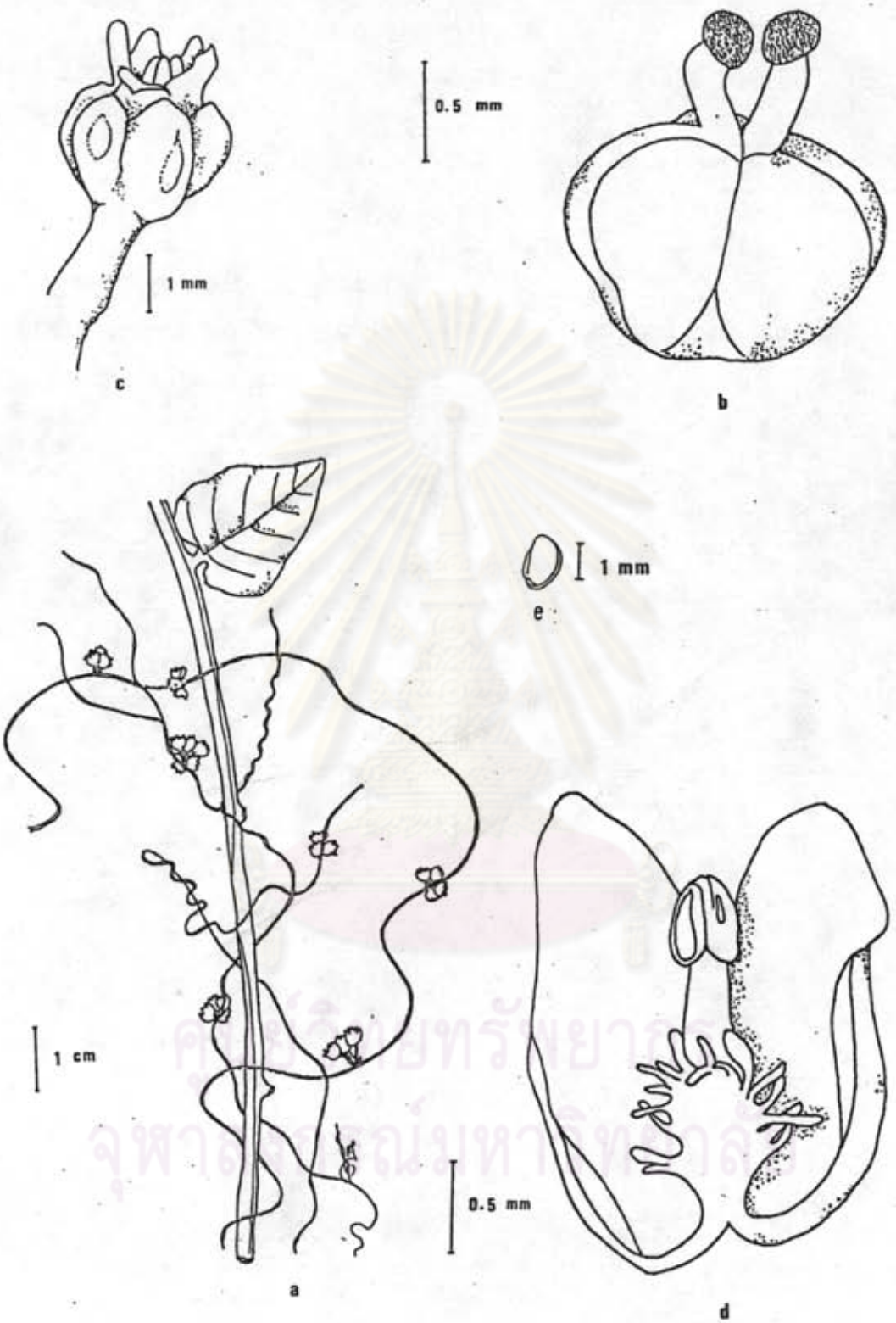



Figure 5. Cuscuta chinensis Lamk. - a. habit, b. pistil, c. flower, d. stamen and scale with some parts of corolla, e. seed.

Plate 2. Cuscuta chinensis Lamk.

3.2 Cuscuta reflexa Roxb., Pl. Corom. 2:3.t.104.1798; Thw.,Enum.Pl. Zeyl.213.1860; Clarke in Hook.f.,Fl.Br.Ind.4:226.1883; Trimen, Handb. Fl.Ceylon 3:229.1895; Yuncker, Mem.Torrey Bot.Club 18:259.1932; Kerr, Fl. Siam. En. 3 ,1 :89.1951; Van Ooststroom, Fl. Mal. 1, 4:393.1953; Back. and Bakh.f., Fl.Java:2:485.1965. -Fig.6; Plate 3.

Parasitic twining herb, stems 1-2.5 mm in diameter, brownish green, fleshy. Flowers in small subglobular groups, sometimes solitary, sessile, strongly fragrant. Calyx cup-shaped, 1-2 mm long, calyx lobes obtuse, verrucose-carinate outside. Corolla tubular-campanulate, white, fleshy, corolla lobes 5, triangular, obtuse or acute, the tips usually reflexed, 0.6-0.8 mm long, 0.5-0.7 mm in diameter. Stamens sessile or filaments very short, inserted just below the sinus of corolla lobes; corolla scales at the base of corolla tube and opposite with anthers; anthers yellow; Disk present. Ovary oval-conical, green; style 1; stigmas 2, elongate. Fruits not seen.

Thailand.- Northern : Chiang Mai.

Distribution.- From Afghanistan through India, Ceylon, China, Malaysia (Austin, 1980), Java in the east half of the islands, in west Java only found once on Tegal Pandjama, Mt. Papandajan (Van Ooststroom, 1953).

Ecology.- On unidentified dicotyledonous shrub, on limestone soil, in evergreen forest, Altitude 1400-1900 m. Flowering in December.

Vernacular. Khruea Khao Kham (เครือเขาคำ : Northern).

Uses.- -

Specimens examined.- E. Smith 4501 (BK), O. Thaithong 578 (CU). T. Smitinand 6209 (BKF), 7257 (BKF).

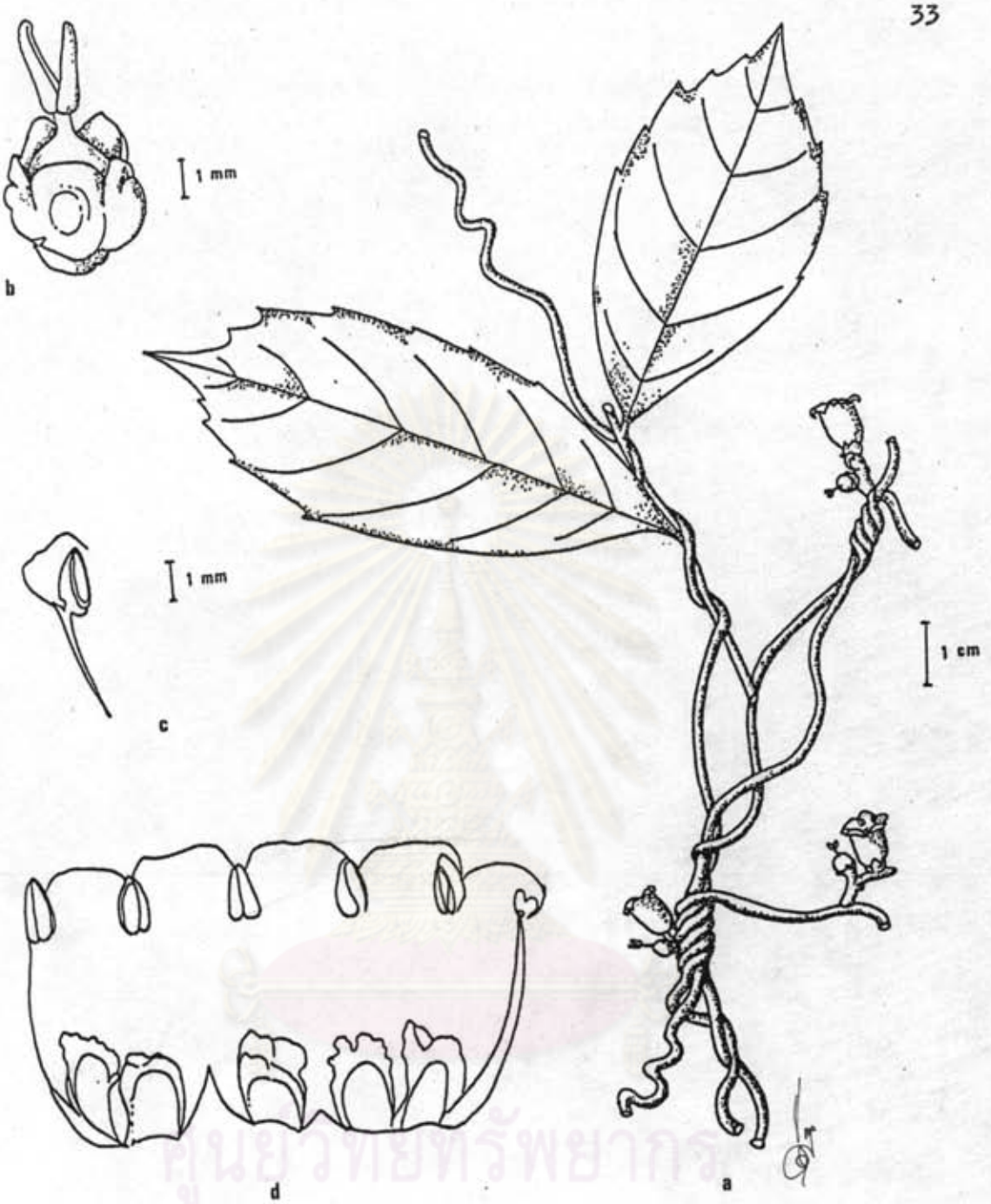





Figure 6. Cuscuta reflexa Roxb. - a. habit, b. pistil, c. stamen, d. stamens and scales with some parts of corolla.

Plate 3. Cuscuta reflexa Roxb.

## 4 Evolvulus

Linn., Sp.Pl.ed.2:391.1762; Van Ooststr., Mon.Evolv., Thesis, Utrecht 19.1934; id. in Blumea 3:74.1938; id. in Fl. Mal.1, 4:395.1953; Back. & Bakh., Fl. Java 2 :485.1965; Austin & Ghazanfar in Nasir & Ali, Fl. W.Pakistan 126:32.1979; Austin, Fl.Ceylon 1:30.1980; Khan, Fl.Bangladesh 30:16.1985.

Undershrub or prostrate herbs, sometimes ascending or erect, never twining. Leaves lanceolate to ovate or orbicular, hairy or glabrous. Flowers axillary, pedunculate, 1-several-flowered cymes or solitary. Sepal 5, free, equal or subequal, acute , acuminate or obtuse Corolla small , funnel, salver or rotate, limb 5 lobed, midpetaline band often hairy outside, bright blue or bluish white or white. Stamens 5, included or slightly exserted; filaments inserted on the corolla tube; pollen smooth, rugate. Disk small cupular or absent. Ovary glabrous, sometimes pilose, 1-2 celled, 1 or 2 ovule in each cell; styles 2, filiform, free or united at base, each style 2-cleft; stigma terete, filiform or clavate. Fruits capsule, small, globose to subglobose. Seeds 4 or fewer, glabrous or slightly verrucose.

A genus of about 100 species, mostly found in Americas. Two species are found in the Old World and also in Thailand.

### Key to species

1. Ascending or erect shrub, leaves lanceolate, pilose, corolla shallowly lobed.

.....4.1 E. alsinoides

1. Prostate herb, leaves broadly ovate to orbicular, glabrous, corolla deeply lobed.

.....4.2 E. nummularius

4.1 Evolvulus alsinoides (Linn.) Linn. Sp. Pl. ed.2 : 392.1762; Van Ooststr.,Mon.Evolv.:26.1934; id.in Blumea 3:74.1938; id.in Fl.Mal. 1, 4: 395.1953; Back. and Bakh.f., Fl.Java 2:485.1965; Austin & Ghazanfar in Nasir & Ali, Fl.W.Pakistan 126.32.1979; Austin, Fl.Ceylon 1:309.1980; Khan, Fl.Bangladesh 30:16.1985.

Key to varieties

1. Leaves distinctly in two rows, approximate, internodes short, upto 4 mm, stem prostrate. ..... var. hirsutus
1. Leaves not in two rows, more remote, internodes longer, stem ascending or erect. ..... var. alsinoides

var. alsinoides -E. pumilis Spanoghe in Hook., Comp.Bot.Mag.1:348.1835. nom.nud. -?E. linifolius Blanco (non Linn.), Fl.Filip.:221.1837. -E. pseudo-incans Spanoghe, Linnaea 15:341.1841. nom.nud. -Fig.7a-g., Plate 4

A perennial herb. Stem erect with ascending branches, slender, sparsely appressed pilose. Leaves lanceolate, linear, oblong or elliptic, 0.7-2 cm by 0.3-0.5 cm, apex acute, acuminate or obtuse to slightly emarginate, base acute or rounded, margin entire, appressed pilose on both surfaces, lateral nerves hardly visible; petioles sessile or subsessile. Flowers usually in 1-flowered or 1 to few-flowered cyme; peduncles filiform longer than the leaves, 1.5-2.5 cm long, pilose; bract minute, linear-lanceolate, 1-2 mm long, appressed pilose; pedicels filiform, 0.5 - 0.8 cm long, pilose. Sepals narrowly lanceolate, apex acute, 2-3 by 0.8 mm, villose. Corolla rotate, 4-5 mm long, 6 - 7 mm broad, pale blue or blue with bluish white midpetaline bands, pilose outside. Stamens included, base of filaments with a tooth at both sides. Disk absent. Ovary oval, glabrous. Styles 2, each style bifid; stigmas clavate. Fruits globose. Seeds 4 or less, glabrous.

Thailand.- NORTHERN : Chiang Rai, Tak; NORTH-EASTERN : Loei; EASTERN : Nakhon Ratchasima; SOUTH-WESTERN : Kanchanaburi, Prachuap Khiri Khan; PENINSULAR : Chumphon, Surat Thani.

Distribution.- Tropical East Africa, South China, Indo-China, Malaysia, Philippines, Pacific Islands and Australia (Van Ooststroom, 1953).

Ecology.- In dry, open area, rocky area, sandy soil, along the roadside, in dry deciduous forest. Altitude from sea level upto 400 m. Flowering in September - April.

Vernacular.- Bai to kaan (ใบต่อก้าน : Khon Kaen).

Uses.- Used as a bitter tonic, vermifuges, antipyreutics; relieve inflammation; applied for hair tonic and alterrative. (ก่องกาน-ดา, 2528).

Specimens examined.- Dee 353 (BKF), H.M. Burkill 1244 (BKF), Kanya 3 (CU), O. Thaithong 191 (CU), T. Santisuk 2733 (BKF), T. Smitinand 3896 (BKF).

var. hirsutus (Lamk.) Van Ooststr.,Mon.Evolv.:29.1934. -E. hirsutus Lamk.,Enc.3:538.1789. -Fig. 7h.

Stem prostrate, covered with short patent hairs. Leaves more or less distinctly in two rows, elliptic, oblong or ovate-oblong, apex acute or obtuse and mucronulate, base rounded, hairy; petioles very short. Peduncles at most as long as the leaves, hairy; bracts minute, linear; pedicels shorter or longer than calyx. Sepals lanceolate 1.5-2 mm long. Corolla ca.5 mm in diameter.

Thailand.- PENINSULAR : Phuket, Satun.

Distribution.- India, Malaysia, Philippines. (Van Ooststroom, 1953).

Ecology.- On sandy soil. Flowering in July - March.

Specimens examined.- C. Niyomdham et al 280 (BKF), H.M. Burkill 4007 (BKF).


Figure 7. Evolvulus alsinoides (Linn.) Linn. var. alsinoides - a. flowering branch, b. stamen, c. pistil, d. sepal, e. fruit, f. seed, g. bract, h. flowering branch of var. hirsutus (Lamk.) Van Ooststr.

Plate 4. Evolvulus alsinoides (Linn.) Linn. var. alsinoides

4.2 Evolvulus nummularius (Linn.) Linn.,Sp.Pl.ed.2:391.1762; Senaratana, Ceylon J.Sci.sect.A.Bot.12:214.1947; Abeywick.,Ceylon J.Sci.,Biol. Sci.2 :214.1959; Van Ooststr.,Fl.Mal.1, 4:558.1958; Verdcourt, Fl.Trop. E.Afr.:16.1963; Austin in Dassanayake, Fl.Ceylon 1:311.1980; Khan, Fl. Bangladesh.30:16.1985.- Convolvulus nummularius L.,Sp.Pl.:157.1753.- Volvulopis nummularium (L.) Roberty, Candollea 14:28.1952. -Fig.8; Plate 5.

Creeping herbs, usually rooting at the nodes. Stems covered with short or long white hairs, in the older parts sometimes glabrous. Leaves broadly ovate, orbicular; 2-2.5 by 1.8-2 cm, apex rounded and slightly emarginate; base slightly cordate; margin entire; glabrous on both surfaces; petioles grooved, slightly pilose, reddish-purple, 1-1.3 cm long. Flowers solitary, pedicels 2.5-3.5 mm long, hairy, green with reddish-purple tinged. Sepals elliptic, elliptic-ovate, elliptic lanceolate, concave at the base, green with reddish-purple tinged, distinctly pilose at the margin, 2 innermost thinner than 3 outer ones, 2.5-3 by 1.1-1.3 mm. Corolla broadly funnel form, 5-7 mm long, 5-7 mm in diameter, white, the tip of the midpetaline band slightly hairy outside. Stamens exerted, base of filament dilated, sparsely pubescent, anthers straight. Disk very thin. Ovary glabrous, ovate, green, styles 2, free, each style forked with 2 filiform stigmas. Fruits reflexed, appressed globose or triangular, brown, 2.5-3 mm in diameter. Seeds 4, glabrous, brown.

Thailand.- NORTHERN : Chiang Mai; SOUTH-WESTERN : Kanchanaburi.

Distribution.- Originally a species in the American tropics, this plants has been introduced into several Old World regions including Africa, Malaysia and Ceylon (Austin, 1980), Dangladesh (Khan, 1985).

Ecology.- On sandy soil and open area.

Vernacular.- Bai taang rian (ใบต่างเหรียญ : author).

Uses.- -

Specimens examined.- Supachai 799 (CU).

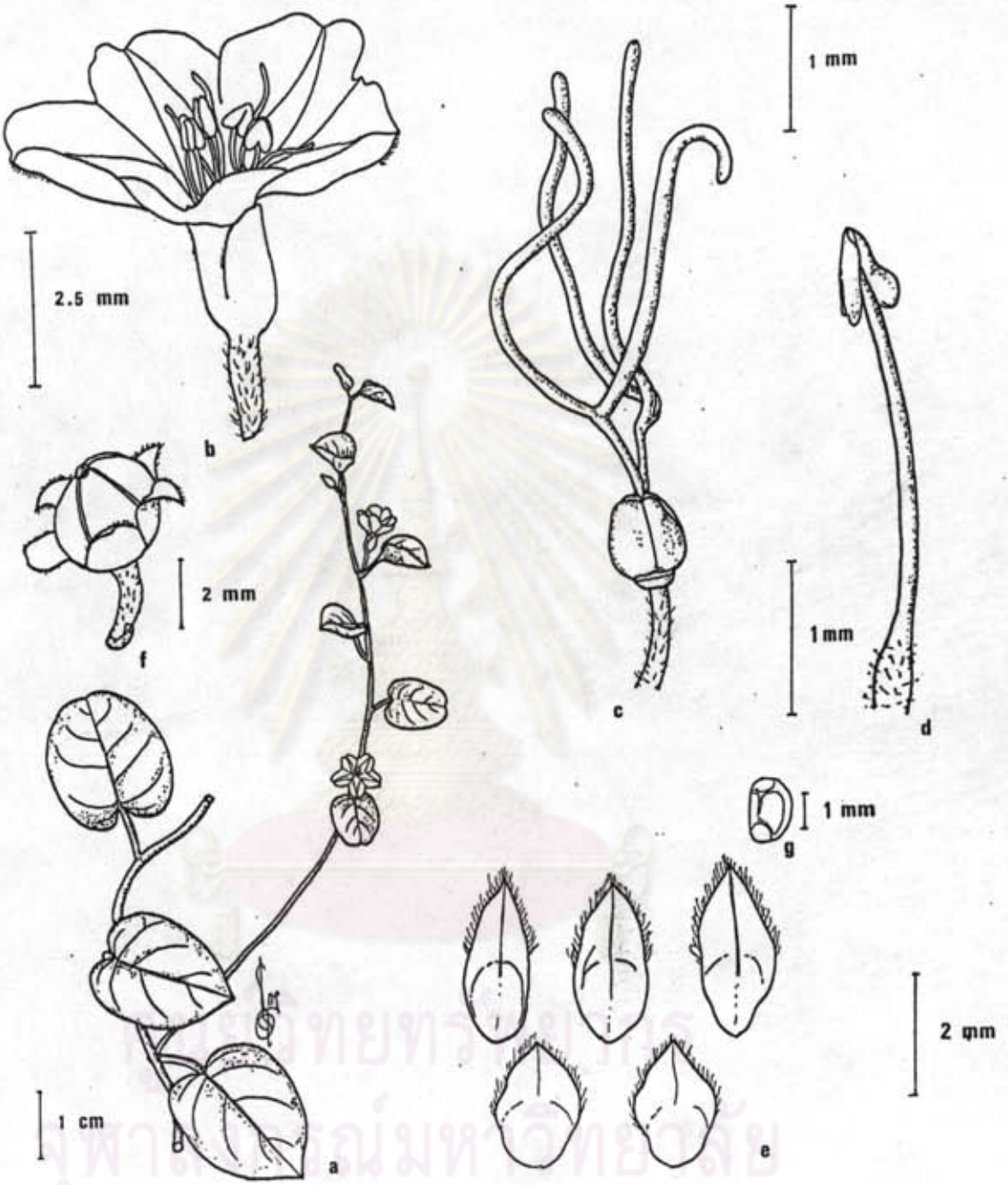



Figure 8. Evolvulus nummularius (Linn.) Linn. - a. flowering branch, b. flower, c. pistil, d. stamen, e. sepals, f. fruit, g. seed.

Plate 5. Evolvulus nummularius (Linn.) Linn.

5 Hewittia

Wight & Arnott, Madras J. Sci.1 (5):22.1837; Van Ooststr., Fl. Mal.1, 4:438.1965; Back. & Bakh.,Fl.Java 2:488.1965; Austin in Dassanayake, Fl.Ceylon 1:312.1980; Khan, Fl. Bangladesh 30:17.1985.- Shutereia Choisy, Mem.Soc.Phys.Geneve 6:485, t.2, f.11.1834; Van Ooststr., Blumea 3:286.1939; non Shuteria Wight & Arn.,1834. nom. cons. Legum.

A prostrate or twining herb, Leaves cordate at base, entire, undulate or lobed. Flowers axillary in 1-few-flowered cyme; bract lanceolate, acute. Sepals 5, herbaceous, distinctly unequal, the 2 outer ones larger than the 3 inner ones, accrescent in fruit. Corolla broadly campanulate, limb shallowly 5 lobed, midpetaline band hairy outside. Stamens and style included. Stamens 5, inserted on the corolla tube; pollen rugate. Disk present. Ovary hairy, 1-celled; style 1; stigmas 2, ovate-oblong, complanate. Fruits capsule, pubescent. Seeds 4 or fewer, black or dark brown.

Monotypic genus widely distributed through the tropical Old World.

5 Hewittia scandens (Milne) Mabberley in Taxon 29 (5/6):606.1980.- Convolvulus scandens Milne, Descr. Cat. Seeds E. Indies : 2. 1773.- Convolvulus sublobatus Linn.f., Suppl.: 135.1781.- Convolvulus bracteatus Vahl,Symb.Bot.3 :25.1794.- Convolvulus bicolor Vahl,I.c.25.- Ipomoea bracteata R.& Sch.,Syst.4:227.1819.- Ipomoea malabarica (non R.& Sch.) Bl.Bijdr.:715.1825.- Shutereia bicolor Choisy, Mem.Soc. Phys.Geneve 6:486, t.2, Figure 11.1833.- Convolvulus hederaceus Blanco, Fl.Filip. ed.1:90.1837.- Hewittia bicolor Wight & Arnott, Madr.J. Sc.I, 5:22.1837.- Aniseia bracteata Hassk.,Pl.Jav.Rar.:516.1848- Argyreia cymosa (non Sweet) Clarke in Hook.f.,Fl.Brit.Ind.4:190.1833, quoad specim. Philip.- Shutereia sublobata House, Bull.Torr.Bot.Club 33:318.1906; Van Ooststr.,Blumea 3:287.1939.- Hewittia sublobata (Linn. f.) O.Ktze.in Rev.Gen.Pl.:441.1891; Van Ooststr.,Fl.Mal.1, 4:438. 1953; Austin in Dassanayake, Fl.Ceylon 1:312.1980; Khan, Fl.Bangladesh: 18.1985. -Fig.9-10; Plate 6.

A prostrate or twining herb. Stem striate, angular, pubescent. Leaves ovate to broadly ovate in outline; 3.5-10 by 3-8 cm, apex acute, cuneate or mucronulate; base cordate or truncate, basal lobes entire or angular, sometimes hastate, margin undulate or entire, sparsely pilose on both surfaces or slightly glabrous; petioles pubescent, 1-5 cm long. Flowers in 2-3-flowered cymes; peduncles pubescent, 3-10 cm long; pedicels pubescent, 2 mm long; bracts elliptic-lanceolate to lanceolate, more or less pubescent, 0.8-1 cm long. Sepals pubescent, distinctly reticulated nerves, 2 outermost ones broad ovate, 1.2 by 1 cm, the third one oblique, 1.2 by 0.6 cm, 2 inner sepals smaller than three outer, ovate-lanceolate, 1.2 cm long. Corolla campanulate, yellow with dark purple centre, 2.5-3 cm long, 3-3.3 cm in diameter, midpetaline band pilose outside; filaments dilated at base and covered with whitish hairs; anthers sometimes pilose. Disk annular. Ovary oval-conical; style filiform; stigma ovate-oblong, complanate. Fruits capsule, depressed-globose, light brown, hairy. Seeds glabrous.

**Thailand.**- NORTHERN : Nan, Nakhon Sawan; SOUTH-WESTERN : Phetchaburi, Prachuap Khiri Khan; CENTRAL : Bangkok; SOUTH-EASTERN : Prachin Buri, Chon Buri, Rayong; PENINSULAR : Chumphon, Surat Thani.

**Distribution.**- Tropical Africa and tropical Asia from India, Ceylon, Indochina, North to China, Polynesia and throughout Malaysia. (Van Ooststroom, 1953).

**Ecology.**- On bushes in clearing, or in open places, waste ground, along the roadside, in scrub and the forest margin, on sandy river bank, on mountain in dry evergreen forest. Altitude from sea level upto 990 m. Flowering in September-April.

**Vernacular.**- Ching chaw lek (จิงจ้อเล็ก : Prachuap Khiri Khan).

**Uses.**- According to one source the stems of this vine are strong enough that villagers (in Ceylon) use them for tying fences or the wattle for houses (Austin, 1980).

**Specimens examined.**- B. Na Songkhla 618 (CU), Busekom et al 4670 (BKF), C. Khunwasi 34 (CU), Maxwell s.n. (BK), Put 1344 (BK), Staples & Wathaniyakom 287 (BKF), Umpai 458 (BK), Vacharapong s.n. (BK), Y. Paisook-santivatana 2067-89 (BK).

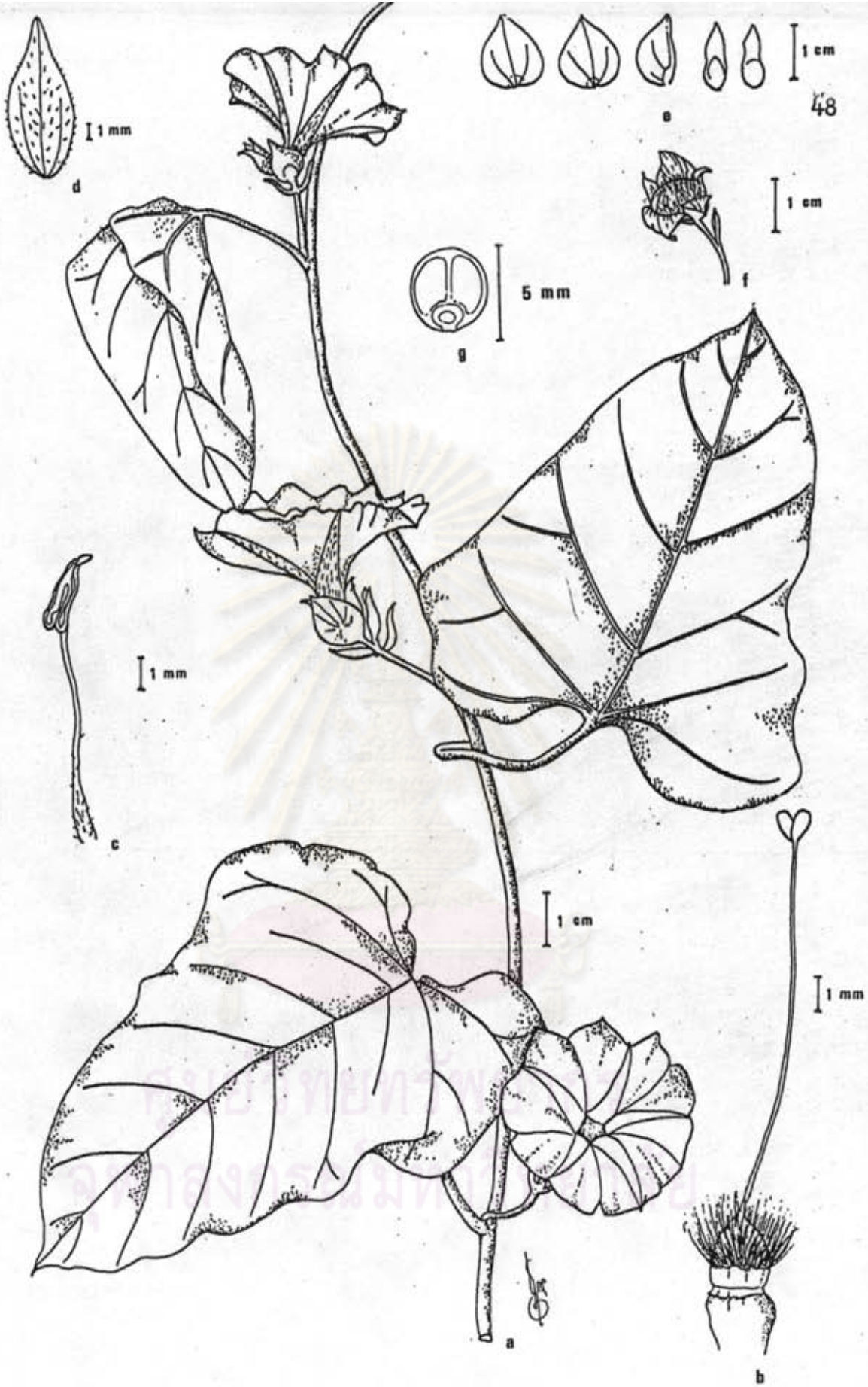



Figure 9. Hewittia scandens (Milne) Mabberley - a. flowering branch, b. pistil, c. stamen, d. bract, e. sepals, f. fruit, g. seed.

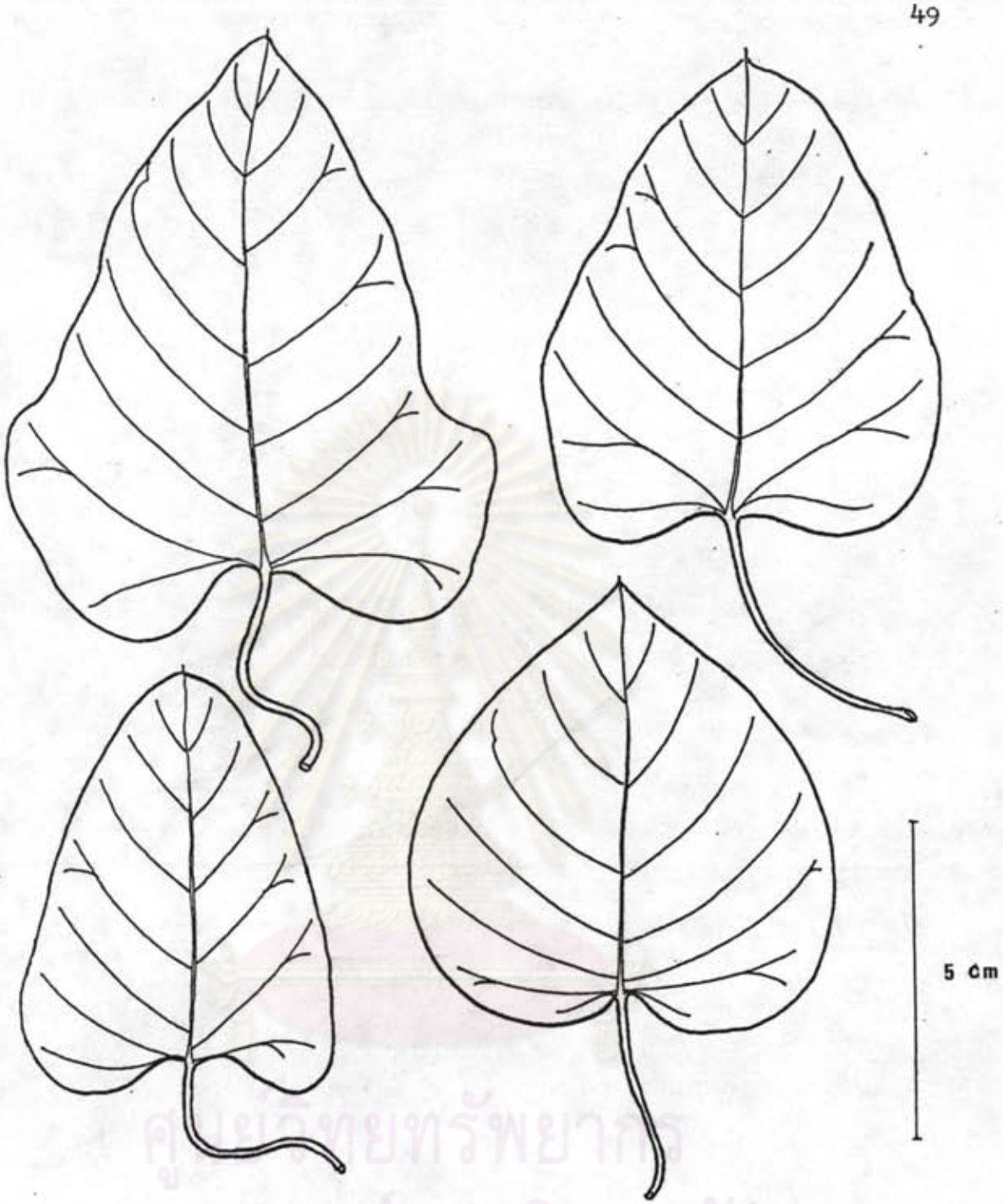





Figure 10. II. scandens (Milne) Mabberley - variation of leaves.

Plate 6. Hewittia scandens (Milne) Mabberley

## 6. Jacquemontia

Choisy, Mem.Soc.Phys.Geneve 6:476.1833; Van Ooststr.,Blumea 3:267.1939; id. in Fl. Mal.1, 4:431.1953; Back. and Bakh.f., Fl. Java 2:487.1965; Austin in Dassanayake, Fl.Ceylon 1:344.1980; Khan, Fl.Bangladesh 30:37. 1985.

Herbaceous or woody twiners, generally with stellate hairs, rarely glabrous. Leaves vary in shapes, often cordate at base, entire or slightly undulate. Flowers axillary, umbelliform or capitate cymes, sometimes solitary or in dense terminal spike; bracts small to large, linear to linear-lanceolate. Sepals 5 equal or unequal. Corolla funnel-formed or campanulate, limb slightly 5-lobed, pale blue, blue or lilac. Stamens and style mostly included rarely exserted. Stamens 5; filament filiform, dilated at base; pollen smooth, polyrugate. Disk small or none. Ovary 2 celled, each cell with 2 ovules; style 1, stigmas 2, elliptic or oblong and complanate, rarely globose. Fruits capsule. Seeds 4 or fewer, glabrous or minutely papillose, the dorsal edges often with a narrow scarious wing.

A genus of about 120 species, (Van Ooststroom, 1953) mostly distributed in Americas, but also with a few in tropical Africa, Asia and Australia (Austin. 1980). In Thailand found 2 species

### Key to species

1. Corolla small, not larger than 1.5 cm in diameter; bracts minute, 1-2 mm long. ..... 6.1 J. paniculata
1. Corolla large, more than 2 cm in diameter; bract larger, 5-10 mm long. ..... 6.2 J. pentantha

6.1 Jacquemontia paniculata (Burm.f.) Hall.f.in Engl.,Bot.Jahrb.16:541. 1893; Baker & Rendle in This.-Dyer,Fl.Trop.Afr.4,2:87.1905; Gamble, Fl. Pres. Madras 5:926.1923; Ridley, Fl. Mal. Pen. 2:456.1923; Merrill, Enum. Philipp.Fl.Pl.3:359.1923; Van Ooststr.,Blumea 3:269.1939; Kerr in Fl.Siam.En.3, 1:98.1951; Van Ooststr., Fl.Mal.1, 4:432.1953; Austin in Dassanayake, Fl. Ceylon 1:345.1980; Khan, Fl. Bangladesh 30:37.1985.- Ipomoea paniculata Burm.f.,Fl.Ind.:50.1768.- Convolvulus parviflorus Vahl, Symb.Bot.3:29.1794, non Sal.,non Desr.- Ipomoea parviflora (Vahl) Pers.,Syn.1:183.1805.- Jacquemontia umbellata Boj.,Hort.Maurit:229.1837.- Convolvulus valerianoides Blanco, Fl. Filip.: 90.1837.- Convolvulus boerhaavoides Blanco, I.c. ed.2:67.1845.- Breweria valerianoides F.-Vill.,Novis App.:143.1880.- Convolvulus paniculatus (Burm.f.) O.K., Rev.gen.pl.:440.1891. -**Fig.11; Plate 7.**

A herbaceous twiners. Stems terete, green, covered with short white hairs, densely in the younger parts, sometimes glabrescent. Leaves ovate to ovate-oblong, 2-6 by 1.5-4.5 cm, apex acute and mucronulate, base cordate, subcordate or rounded, margin entire or slightly undulate, glabrous, sometimes pilose at the midrib and veins on the lower surfaces, nerves 6-8 pairs; petioles finely pilose, 0.8-3 cm long. Flowers few to many, loose or dense umbelliform cymose; peduncles more or less pubescent, 1-7 cm long; bracts lanceolate, pubescent, 1-2 mm long; pedicels pubescent, 0.2-0.5 cm long. Sepals green, unequal, 3 outer ones pubescent, 2 inner ones pilose at the apex, ovate, elliptic or ovate-elliptic, apex acute to long acuminate, base rounded or attenuate, mostly undulate, 3-5.5 by 2.5-3 mm. Corolla funnel-formed, distinctly 5-lobed, 1 cm long, 0.8-1.2 cm in diameter, blue, pale blue, rarely white, glabrous. Stamens exerted, subequal, the base of filaments dilated, pubescent. Disk absent. Ovary glabrous; stigma elliptic-oblong. Fruits capsule, globose, glabrous. Seeds light brown, glabrous with sparsely verrucose, margin with short scarious wing.

Thailand.- NORTHERN : Chiang Mai, Kamphaeng Phet; NORTH-EASTERN : Phetchabun, Loei, Udon Thani, Kalasin; EASTERN : Chaiyaphum, Nakhon Ratchasima, Buri Ram; SOUTH-WESTERN : Uthai Thani, Kanchanaburi, Ratchaburi, Phetchaburi, Prachuap Khiri Khan; CENTRAL : Saraburi, Bangkok; SOUTH-EASTERN : Chon Buri, Chantaburi, Trat; PENINSULAR : Surat Thani, Nakhon Si Thammarat, Phatthalung.

Distribution.- Tropical Asia, Africa, Madagascar and adjacent islands, India, Ceylon, Malaysia, North Caledonia, (Van Ooststroom, 1939) Tropical Australia, Philippines (Van Ooststroom, 1953), Polenesia (Austin, 1980).

Ecology.- Climbing on bush, in open wet thicket, in evergreen forest, open waste area, exposed dry ravine, along gallery forest by stream, along the roadside, in sunny places, edge of the rice field, slope of hill in mixed deciduous forest. Altitude from sea level upto 600 m. Flowering in October - March.

Vernacular.- Chingcho phee (จิงจ้อผี : Northern)), Ching cho (จิงจ้อ), Chingcho khao (จิงจ้อเขา : Prachuap Khiri Khan), Chingcho noi (จิงจ้อน้อย), Ching cham (จิงจำ, จิงจ้ำ : Bangkok).

Uses.- -

Specimens examined.- B. Na Songkhla 608 (CU), Bunchai 1002 (BKF), C. Chermsirivatana 1022 (BK), C. Khunwasi 30 (CU), 35 (CU), D.J.Collins 2038 (BK), H.M. Burkill 1261 (BKF), Maxwell 73-555 (BK), Murata et al 50398 (BKF), 51396 (BKF), Pradit 589 (BK), S + J 2061 (BK), Y. Paisook-santivatana 1950-86 (BK).

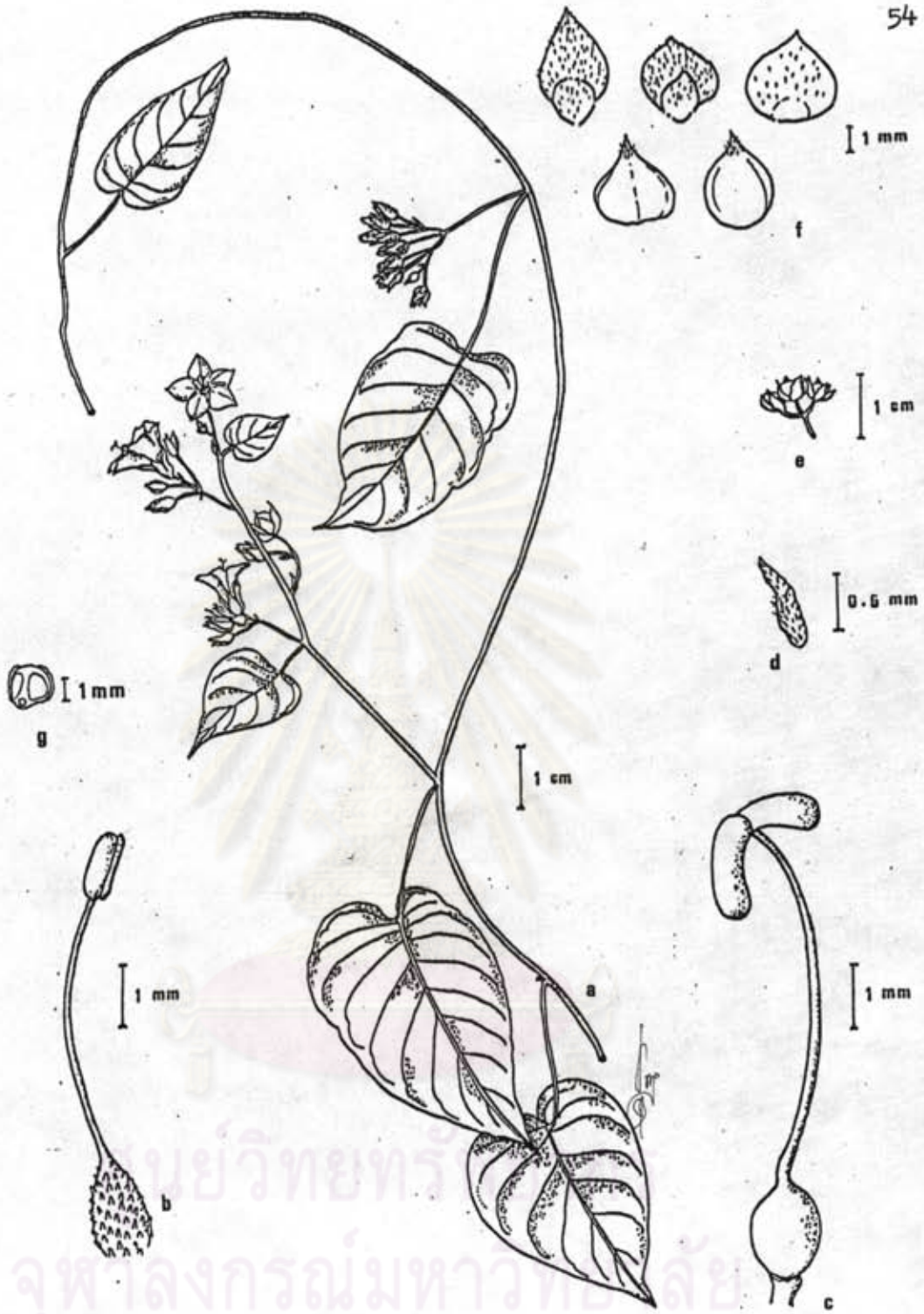



Figure 11. Jacquemontia paniculata (Burm.f.) Hall.f. - a. flowering branch, b. stamen, c. pistil, d. bract, e. fruit, f. sepals, g. seed.

Plate 7. Jacquemontia paniculata (Burm.f.) Hall.f.

6.2 Jacquemontia pentantha (Jacq.) G.Don, Gen.Syst.4:283.1838; Van Ooststr.,Blumea 3:278.1939, Kerr in Fl.Siam.En.3, 1:99.1951; Van Ooststr., Fl.Mal.1, 4:434.1953; Austin & Ghazanfar in Nasir & Ali, Fl.West.Pakistan 126:31.1979; Austin in Dassanayake, Fl.Ceylon 1:346.1980; Khan, Fl. Bangladesh 30.38.1985.- Convolvulus pentanthus Jacq.,Coll.4:210.1790.- Convolvulus zimmermanii Gagnep., Fl. Gen. I.-C. 4:302.1915. -Fig.12; Plate 8.

A herbaceous twiner. Stem terete, slightly striate, mostly glabrous, sometimes sparsely pilose, young part pubescent. Leaves ovate-elliptic or broadly ovate, 1.5-3.5 by 1.5-3 cm, apex acuminate, base cordate or subcordate, margin entire, glabrous; petioles slender, glabrous, sometimes sparsely pubescent, 1-2.5 cm long. Flowers few to many, umbelliform cyme; peduncles glabrous, slender, very long, 3.5-9 cm long; bracts linear-lanceolate, glabrous, 0.5-1 cm long; pedicels slender, pilose, 0.5-1 cm long. Sepals unequal, sparsely pilose, two outer ones ovate in outline, apex attenuate , 0.8-0.9 by 0.3-0.4 cm, the third sepals elliptic in outline, attenuate at the apex, 0.7 by 0.2 cm, two inner ones oblique, lanceolate, shorter than the 3 outer ones, 0.5 by 0.1 cm. Corolla funnel-formed, 1-1.5 cm long, 2.2-2.5 cm in diameter, blue with midpetaline bands pale blue, glabrous. Stamens exserted, filaments dilated at base, pubescent. Disk absent. Ovary glabrous, stigma filiform. Fruit not seen.

**Thailand.-** Cultivated as ornamental plants.

**Distribution.-** Subtropical and tropical America, Malaysia (Van Ooststroom, 1953), Singapore (Van Ooststroom, 1939), Pakistan (Nasir & Ali, 1979), Ceylon and Asia (Austin, 1980), Bangladesh (Khan, 1985).

**Ecology.-** Cultivated as ornamental plants in sunny or semishaded area.

Vernacular.- Sae thao (แสเถา : Bangkok), Sae (แส).

Uses.- Ornamental plants.

Specimens examined.- Busekom et al 3383 (BKF), C. Khunwasi 37 (CU), Kerr 10699 (BK), Maxwell 72-330 (BK).

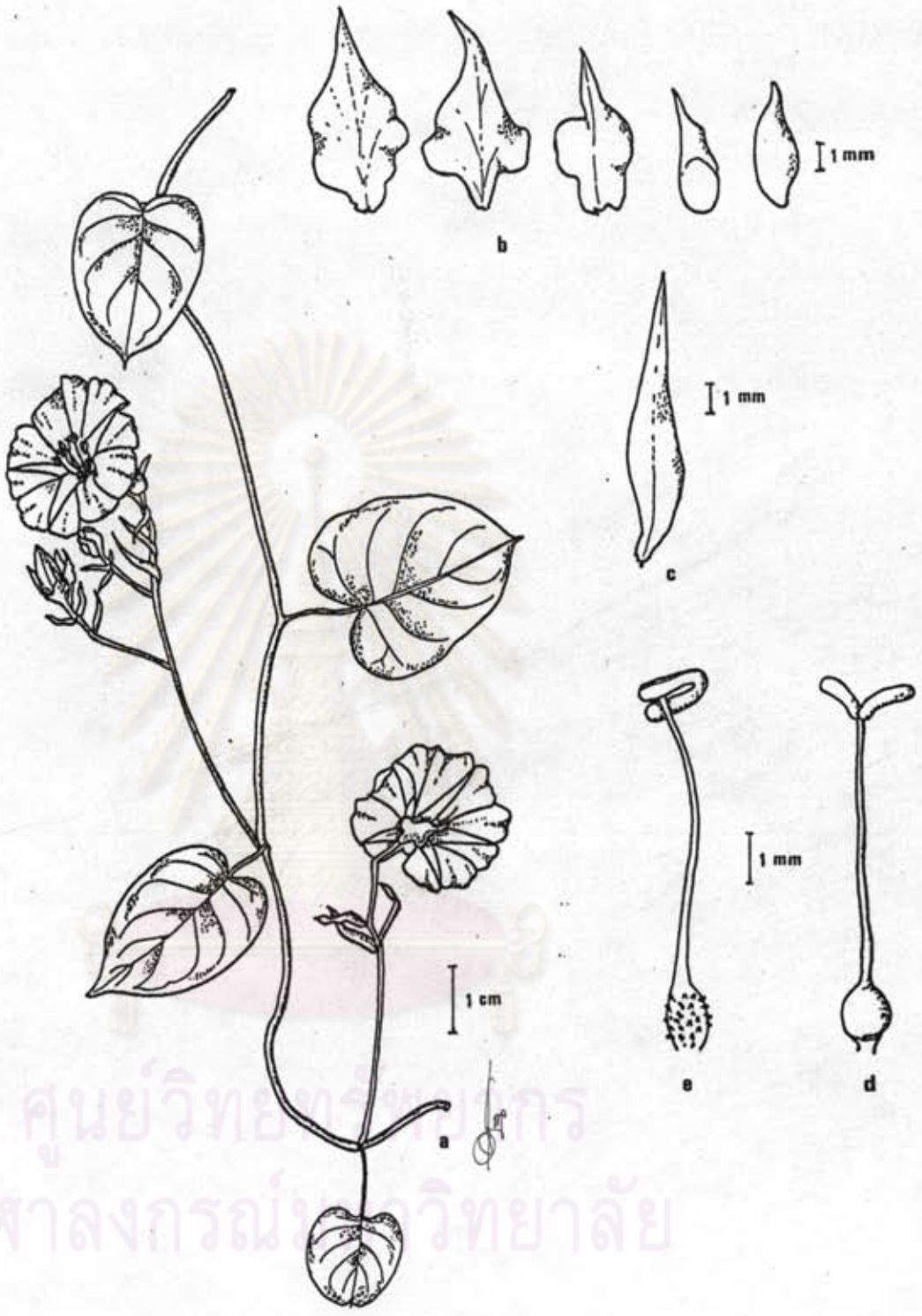



Figure 12. Jacquemontia pentantha (Jacq.) G.Don - a. flowering branch, b. sepals, c. bract, d. stamen, e. pistil.

Plate 8. Jacquemontia pentantha (Jacq.) G. Don

## 7 Merremia

Dennst.,Schluss.Hort.Malab.:12, 23, 34.1818 (nom. nud.); Hall.f.in Engl., Bot.Jahrb.16:581.1893; Peter in Engl.,Prantl.,NatPfl.fam.4, 3a: 377.1895; Boerl.,Handl.Fl.Ned.Ind.2:501, 509.1899; Baker and Rendle in This.-Dyer, Fl.Trop.Afr.4, 2:101.1905; Prain in Journ.As.Soc.Bengal 74: 302.1906; Koorders, Exk.fl.Java 3:111.1912; Ridley, Fl. Mal. Pen. 2: 456.1923; Van Ooststr.,Blumea 3:292.1939; id.in Fl.Mal.1, 4:439.1953; Merrill, Enum,Philipp.Fl.Pl.3:360.1923; Backer, Onkruidfl.Jav.Suikerrietgr.:515.1931.- Skinneria Choisy in Mem.Soc.Phys.Geneve 6:487, t.6: 1833; id. in DC., Prodr. 9 : 435. 1845; Miq.,Fl.Ned.Ind.2:487.1857.- Spiranthera Boj.,Hort.Maurit.:226.1837.

A herbaceous or woody twiner or prostrate, sometimes erect herb or low erect shrub. Leaves mostly simple, sometimes palmately compound, entire, lobed, dentate, palmatifid divided, vary in shapes. Flowers axillary, solitary, 1 to few, mostly in cyme rarely raceme; bracts usually small, deciduous. Sepals 5, concave, equal to subequal, some species enlarged in fruit. Corolla funnel-formed or campanulate, limb slightly 5-lobed, mostly glabrous, somewhat hairy at the top of midpetaline bands, yellow or pale yellow, orange or white generally with 5 nerves midpetaline band. Stamens 5, inserted on the corolla tube, mostly included, rarely slightly exserted, filaments filiform, often broadened at the base, anther twisted; pollen smooth, colpate or rugate. Disk present, often annular. Ovary 2-or 4-celled; style 1; stigma 2-globular, undulate. Fruits capsule generally dehiscing by 4 valves or more or less irregular dehiscing, 4-1-celled. Seeds 4 or less, glabrous or hairy especially at the margin.

The genus of about 80 species, widely distributed in the tropics of both hemispheres. About 22 species in Malaysia, 11 species in Java, 8 species in Ceylon, 4 species in Pakistan, 7 species in Bangladesh. Twelve species found in Thailand.

Key to species

1. Leaves palmately 5-7 lobed to palmately compound, with 5 leaflets.
   2. Leaves palmately 5-7 lobed ....7.12 M. vitifolia
   2. Leaves palmately compound; leaflets 5. .....7.10 M. quinata
1. Leaves entire, crenate, or at most 3-lobed.
   3. Leaves peltate. .....7.9 M. peltata
   3. Leaves not peltate.
      4. Corolla entirely glabrous outside.
         5. Peduncles very short or nearly absent, midpetaline band with 5-red nerves. ....7.3 M. emarginata
         5. Peduncles longer, midpetaline band not with 5-red nerves.
            6. Large woody climber, sepals more than 15 mm long. .....7.8 M. mammosa
            6. Twining or prostrate herb, sepals less than 15 mm long.
               7. Peduncles clasped by leaf base, sepals yellowish green with red tinged. .....7.2 M. collina
               7. Peduncles not as above, sepals entirely green.
                  8. Fruits with transeverse wrinkled on surfaces.
                     9. Sepals broadly notched, flowers small, ca 1 cm in diameter, persistent calyx reflexed to the pedicels. .....7.5 M. hederacea
                     9. Sepals emarginate, flowers larger ca. 2.5 cm in diameter, persistent calyx not reflexed to the pedicels. .....7.4 M. gemella
                  8. Fruits not wrinkled. .....7.6 M. hirta
      4. Corolla pilose at the top of midpetaline band.
         10. Peducles short, 0.5-1.3 cm, pubescent, flowers usually in umbelliform cyme, sometimes 1-3 flowered. ....7.11 M. umbellata

10. Peduncles longer, 1.8-5 cm long, glabrous; flowers usually in 1-2-(3)-flowered.

    11. Sepals 0.6-1 cm long, bracts ovate.

    ..7.1 M. bambusetorum

    11. Sepals 1.5-2.3 cm, bracts oblong ovate.

    .....7.7 M. kingii

7.1 Merremia bambusetorum Kerr in Kew Bull.:18.1941; id.in, Fl.Siam. En.3, 2:1.1954. -Fig.13-14; Plate 9.

A herbaceous twiner, glabrous, finely striate. Leaves oblong-elliptic or oblong, 6-9 by 1.2-3.5 cm, apex acute, obtuse and mucronulate, base more or less cordate, auriculate, sometimes truncate or obtuse, margin entire, glabrous on both surfaces, nerves 7-11 pairs; petioles glabrous, slender, groove at the base on the upper side, 1-1.3 cm long. Flowers usually 1-2-flowered, sometimes 3-flowered; peduncles glabrous, 1.8-2.3 cm long; bracts ovate, glabrous, ridged at the center, 0.8 cm long; pedicels glabrous, slightly thickened upward, 1.5 by 0.7-0.8 cm. Sepals elliptic to broadly elliptic, apex acute and sometimes mucronulate, membranous at the margin, 1-1.3 cm long, glabrous. Corolla funnel-formed, 3.5-5 cm long, 3.5-4 cm in diameter, pale yellow, glabrous except on the upper part of midpetaline band pilose. Filaments slightly dilated at base, hairy. Ovary conical, glabrous. Fruits capsule, globose, blackish brown, 1.2 cm in diameter. Seeds dark brown with patent hairs.

Thailand.- EASTERN : Nakhon Ratchasima; SOUTH-EASTERN : Trat, Chanthaburi.

Distribution.- Yunnan (Kerr, 1954).

Ecology.- In the bamboo forest (Kerr, 1951), climbing on the tree along the roadside in high altitude about 400-750 m. Flowering in November - February.

Vernacular.- Ching cho lueang on (จิงจ้อเหลืองอ่อน : author).

Uses.- -

Specimens examined.- C. Khunwasi 40 (CU); Kerr 17704 (BK); O. Thaithong 185 (CU); Sakol 59 (BK); Y. Paisooksantivatana 571-81 (BK), 2179-87 (BK).

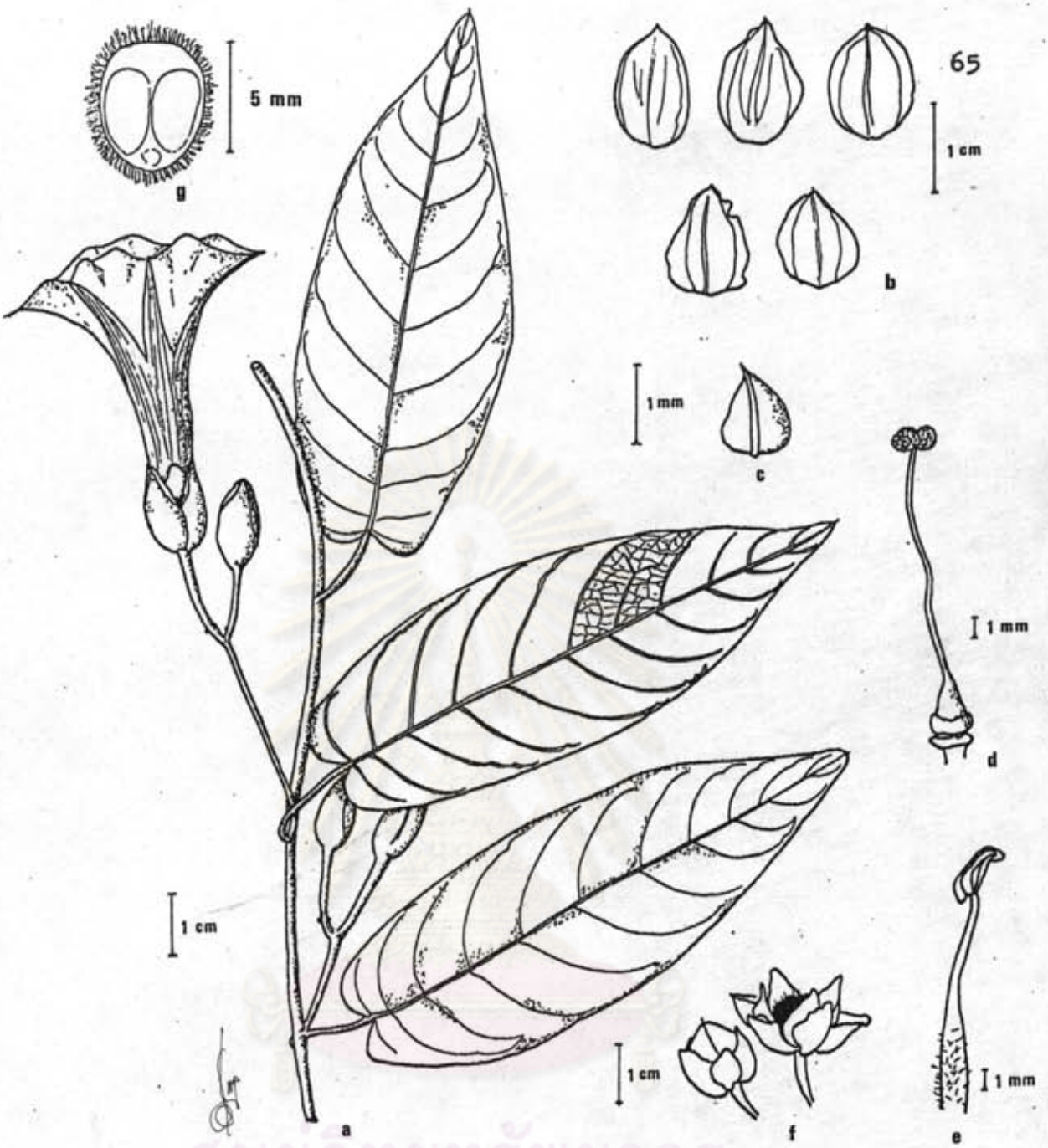





Figure 13. Merremia bambusetorum Kerr - a. flowering branch b. sepals, c. bract, d. pistil, e. stamen, f. fruit, g. seed.

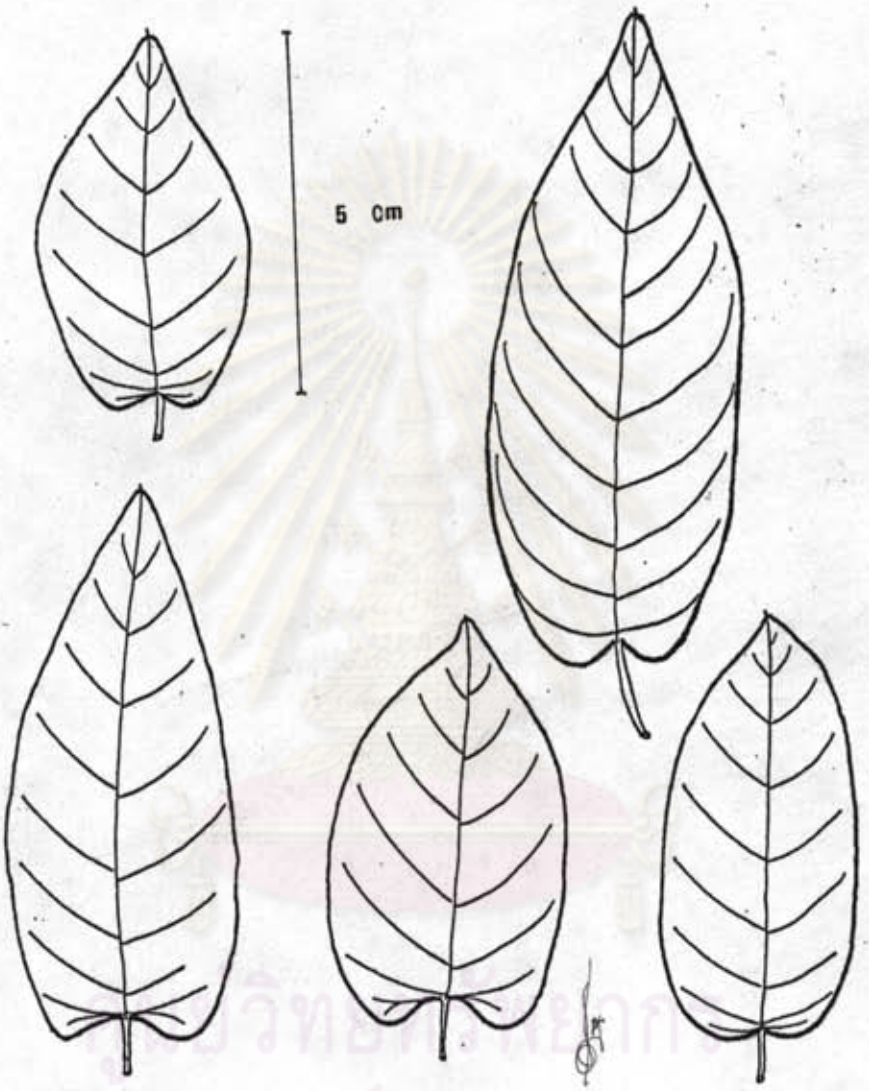



Figure 14. M. bambusetorum Kerr - variation of leaves

Plate 9. Merremia bambusetorum Kerr

7.2 Merremia collina S.Y. Liou in Guihaia. 1984-1985. -Fig.15; Plate 10.

A prostrate herb. Stem terete, younger parts reddish-purple, glabrous. Leaves ovate, ovate-oblong or elliptic, 3-4 by 2-2.5 cm, apex acute or short acuminate, base cordate to subcordate, margin entire, glabrous, nerves 6-7 pairs; petioles short, 3-4 mm long, glabrous. Flowers axillary on the short and long branches, the leaves on the flowering branch usually red to reddish green and occasionally conduplicate or the leaf blade roll up; peduncles glabrous with some verrucate, slender, 2-5 cm long; bracts lanceolate or needle-shaped, 0.8-1.2 cm long, glabrous; pedicels glabrous, 0.5-1 cm long. Sepals unequal, yellowish green with red tinged, leathery, scarious at the margin, glabrous, 2 outer ones shorter than 3 inner ones, ovate-lanceolate, apex acute, 0.7-0.8 by 0.3 cm, sparsely verrucate outside, 3 inner ones elliptic to elliptic-oblong, apex acute sometimes emarginate, 1-1.3 by 0.3-0.4 cm. Corolla broadly funnel-formed, 2.5-3 cm long, 3-3.5 cm in diameter, pale yellow with dark yellow or orange-yellow throat, distinctly nerves on the midpetaline band, glabrous. Base of filaments slightly dilated with fimbriate hairs. Ovary conical, glabrous. Fruits not seen.

**Thailand.-** NORTHERN : Sukhothai, Phitsanulok; NORTH-EASTERN : Phetchabun, Udon Thani.

**Distribution.-** China.

**Ecology.-** On sandy soil in disturbed area, in sunny place, deciduous forest. Flowering in November - December.

**Vernacular.-** Chingcho bai rua (จิงจ้อใบเรือ : author).

**Uses.-** -

Specimens examined.- C. Khunwasi 42 (CU), Maxwell 71-730 (BK), Pradit 671 (BK), Staples & Wathaniyakom 403 (BKF).

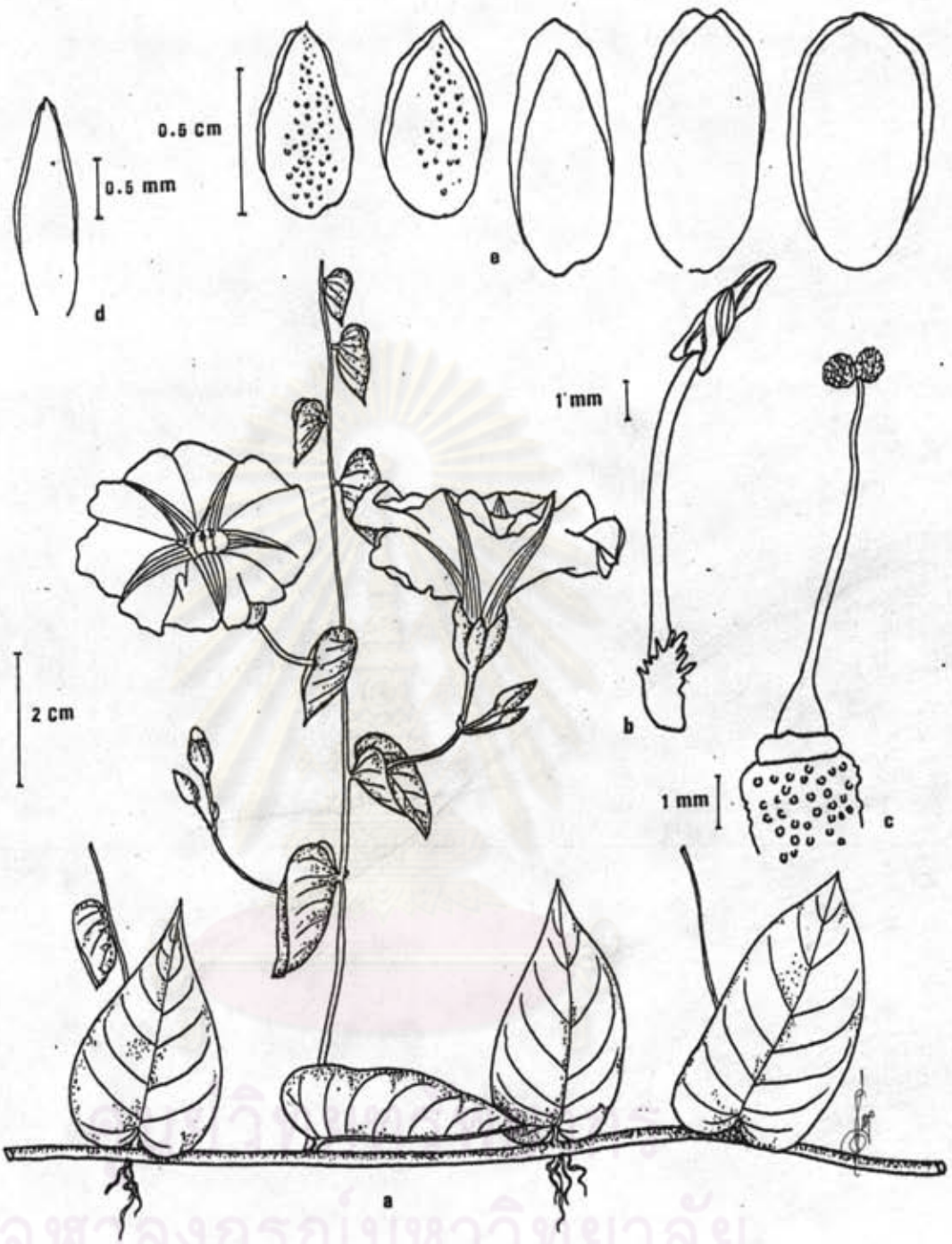



Figure 15. Merremia collina S.Y. Liou - a. flowering branch, b. stamen, c. pistil, d. bract, e. sepals.

Plate 10. Merremia collina S.Y. Liou

7.3 Merremia emarginata (Burm.f.) Hall.f., Engl.,Bot.Jahrb.16:552.1893; Boerl.,Handl.Fl.Ned.Ind.2:510.1899; Cooke, Fl.Bombay 2:236.1905; Baker and Rendle in This.-Dyer, Fl.Trop.Afr.4, 2:113.1905; Gamble, Fl.Pres. Madras 5:928.1923; Merrill, Enum.Philipp.Fl.Pl.3:360.1923; Van Ooststr., Blumea 3;312.1939; id. in Fl.Malesiana 4. ser.1:443.1953; Kerr; Fl.Siam. En.3, 2:2.1954; Backer and Bakhuizen, Fl.Java 2:490.1965. Austin in Dassanayake, Fl.Ceylon 1: 349.1980; Khan, Fl.Bangladesh 30:41.1985.- Evolvulus emarginatus Burm.f.,Fl.Ind.:77,t.30,fig.1.1768.- Convolvulus reniformis Roxb.,Fl.Ind.2:67.1824.- Ipomoea reniformis (Roxb.) Choisy, Mem.Soc.Phys.Geneve 6:446.1833; id.in DC.Prodr.9:351.1845; Clarke in Hook.,Fl.Brit.Ind.4:206.1883.- Convolvulus exisus Zipp., Linnaea 15.338. 1841.- Ipomoea cymbalaria Fenzl.,Flora 27.312.1844. -Lepistemon reniformis (Roxb.) Hassk.,Pl.Java.Rar.:524.1848.- Evolvulus glechoma Welw.,Apont.Phytogeogr.Angola:589.1859.- Ipomoea emarginata (Burm.f.) O.K.,Rev.Gen.:444.1891. **-Fig. 17-18; Plate 11.**

A prostate herb, stem rooting at the node, purplish-red in the younger part, sparsely hairy. Leaves kidney-shaped or ovate in outline, 0.6-2.2 by 0.6-2.5 cm, apex rounded, obtuse or emarginate, base cordate with a broadly rounded sinus and rounded basal lobe, margin undulate or crenate, glabrous or sparsely hairy; petioles sparsely hairy, 0.5-2 cm long. Flowers solitary or in 2-3-flowered cymes; peduncles subsessile; bracts linear, 1.5 mm long, sparsely hairy. Sepals green, the outer ones obovate, mucronulate, 2.5 mm long, 4 inner ones larger, obovate or orbicular, emarginate, more or less long ciliate at margin. Corolla campanulate, 5-5.2 mm long, 5 mm in diameter, yellow, midpetaline band with 5 red line outside, glabrous but hairy inside below the base of filament. Stamen slightly unequal. Disk absent. Ovary conical. Fruits capsule, subglobose, 5-6 mm in diameter, dark brown. Seeds 4, brown, glabrous.

Thailands. CENTRAL : Sing Buri, Saraburi, Pathum Thani, Bangkok; SOUTH-WESTERN : Ratchaburi.

Distribution.- Tropical Africa, tropical Asia, India, Ceylon, Malaysia, Indonesia. (Van Ooststroom, 1939).

Ecology.- On the sandy soil, open and sunny places, dry and waste area. Altitude from sea level upto 800 m. Flowering in August - March.

Vernacular.- Sa uek (สะอึก), Sa uek klet hoi (สะอึกเกล็ดหอย : Bangkok).

Uses.- The leaves and tops in decoction are somtimes uused as a diuretic in Philippines, and in Java for coughs. (Van Ooststroom, 1953)

Specimens examined.- C. Khunwasi 39 (CU); Kerr 3862 (BK); Put s.n. (BK); Staples & Wathaniyakom 316 (BKF); T. Smitinand 4441 (BKF); Y. Paisooksantivatana 1846-86 (BK).

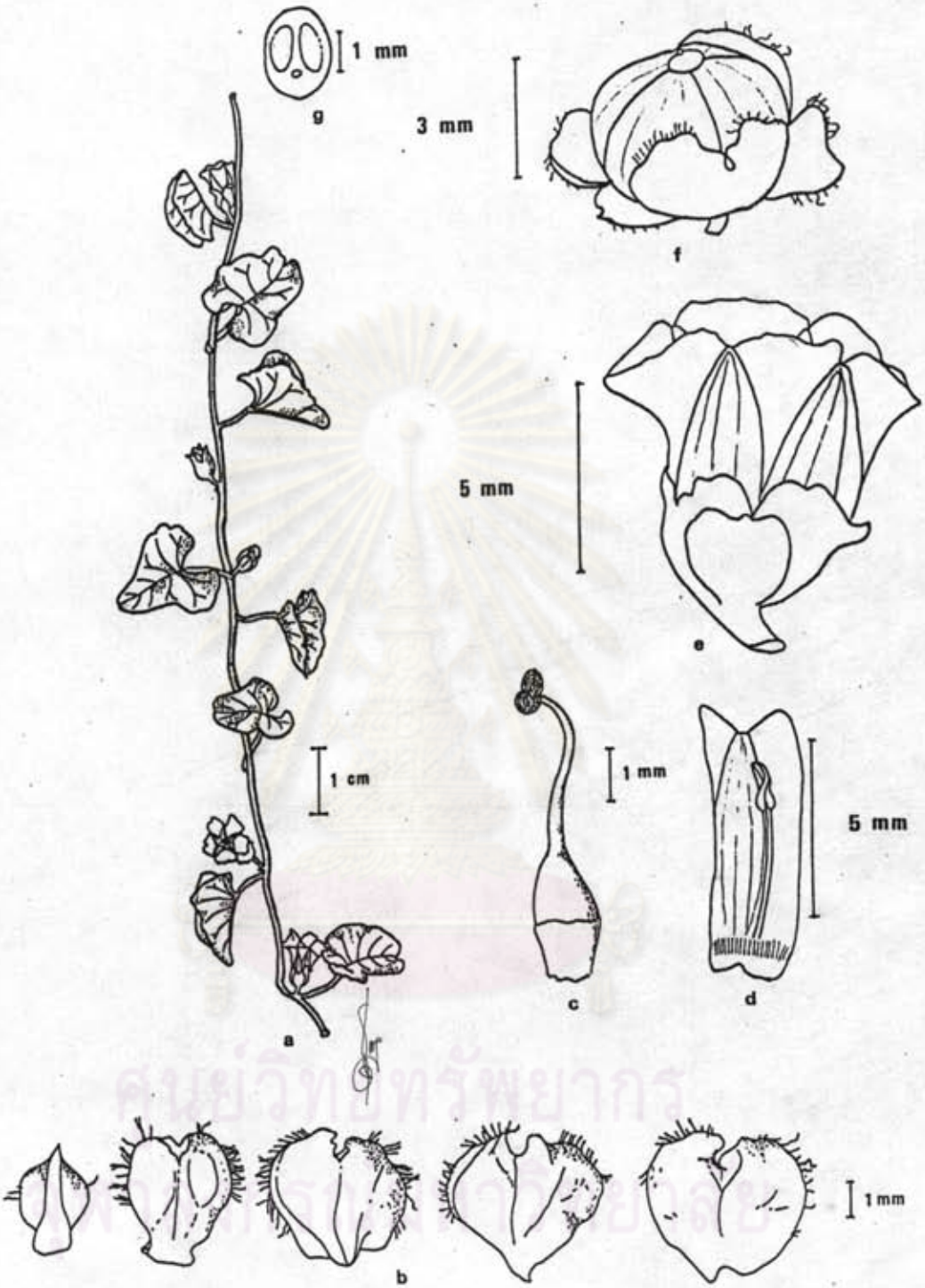



Figure 16. Merremia emarginata (Burm.f.) Hall.f. - a. flowering branch, b. sepals, c. pistil, d. stamen with some parts of corolla, e. flower, f. fruit, g. seed.


Figure 17. M. emarginata (Burm.f.) Hall.f. - variation of leaves.

Plate 11. Merremia emarginata (Burm.f.) Hall.f.

7.4 Merremia gemella (Burm.f.) Hall.f.in Engl.,Bot.Jahrb.16:552.1893; id. in Versl.'s Lands Plantent.1895:132.1896; id. in Bull.Herb.Boiss.5: 380.1897; id.in Meded.'s Lands Plantent.14:544.1898; Boerl.,Fl.Ned.Ind. 2:510.1899; Merrill in Phillip.Journ.Sc.1:120.1906; Hall.f. in Valeton, Pl.Pap. in Bull.Dep.Agric.Ind.Neerl.10:50.1907; id. in Meded.Rijksherb. Leiden 12:14.1912; Koorders, Exk.fl.Java 3:112.1912; Hall.f. in Engl., Bot.Jahrb.49:378.1913; Koord-Schum., Syst.Verz., Conv.:2.1910-13; id.: 1029.1914; Bold.,Zakfl.Java:n.834.1916; Merrill in Philipp.Journ.Sc.19: 374.1921; id. in Journ.Roy.As.Soc.Str.Br.Spec.Numb.:508.1921; id.,Enum. Phillip.Fl.Pl.3:360.1923; Backer, Onkruidfl.Jav.Suikerrietgr.:519.1931; Van Ooststr., Blumea 3 :297, Fig. 1, g-h.1939; id.in, Fl.Mal.1, 4:441, Fig. 23c. 1953; Kerr, Fl.Siam.En.3, 2:2.1954; Back.and Bakh.f.,Fl.Java 2:490.1965.- Convolvulus gemellus Burm.f.,Fl.Ind.:46, t.21, Fig.1.1768. -Ipomoea gemella Roth, Nov.Pl.Sp.:110.1821; Choisy in Mem. Soc.Phys. Geneve 5:469.1833; id.,in DC.,Prodr.9:380.1845; Zoll.,Syst.Verz.2 Heft: 129.1854; Miq., Fl.Ned. Ind. 2:616.1857; F.-Vill.,Novis.App.:142.1880.- Ipomoea radicans Bl.,Bijdr.:712.1852, non Bert.- Ipomoea polyantha Miq.,Fl.Ned.Ind.2:613.1857; Clarke in Hook.f.,Fl.Brit.Ind. 4:206.1883; Prain in Journ.As.Soc.Bengal.63:105.1894; Gagnep.et Courch. in Lec.,Fl. Indo-Chine.4:256.1915; non Convolvulus polyanthus Wall.- Ipomoea cymosa (Desr.) R.et Sch. var. radicans (Bl.) Miq.,Fl.Ned.Ind.2:613.1857. -Fig.18; Plate 12.

A herbaceous twiner. Stem greyish green, covered with short white hairs, especially at the nodes or sometimes glabrous. Leaves ovate, broadly ovate or reniform-ovate in out line, 2.5-3 by 2-3.5 cm, apex acute, mucronulate, retuse or rounded, base cordate or deeply cordate, margin entire or crenate, undulate, sometimes 3-lobed, glabrous on both surfaces or pilose on the midrib or the veins on both sides; petioles pubescent, 1.5-2.5 cm long. Flowers cymose, peduncles covered with short hairs, 2-4 cm long; pedicels pilose, 0.5-1 cm long; bracts minute, ovate, 1.5 mm long. Sepals unequal, orbicular, emarginate and mucronulate at the apex, margin scarious, 2 outermost 4-5 by 3-4 mm, 3 inner ones 6-7

by 4-5 mm, the outer sepals more pilose than the inner ones. Corolla funnel-formed, 1.6-2 cm long, 2.5 cm in diameter, limbs slightly lobed, midpetaline band distinctly 5 nerves, yellow, glabrous. Stamens slightly exserted, base of filaments with white hairs. Ovary conical. Fruit depressed globose, glabrous, wrinkled. Seeds 4 or fewer, dark grey or brown, glabrous.

**Thailand.**- NORTHERN : Chiang Rai; NORTH-EASTERN : Maha Sarakham; SOUTH-WESTERN : Kanchanaburi, Ratchaburi; CENTRAL : Saraburi, Pathum Thani, Bangkok; SOUTH-EASTERN : Chon Buri, Rayong, Chanthaburi.

**Distribution.**- India to China (Kerr, 1951), southeast Asia to tropical Australia through out Malaysia (Van Ooststroom, 1953).

**Ecology.**- Climbing on the other shrub, open area, the forest margin, along the roadside, in dry paddy field, waste ground, beside canal bank. Altitude from sea level upto 375 m. Flowering in October - January.

**Vernacular.**- Thao sa uek dok yai (เถาสะอึกดอกใหญ่ : author).

**Uses.**- -

**Specimens examined.**- C. Khunwasi 23 (CU), 28 (CU); E. Smith 152 (BK); Garrett 251 (BK); Kerr 3857 (BK); Put 16924 (BK); Sorensen et al 14 (BKF); Staples & Wathaniyakom 340 (BKF).

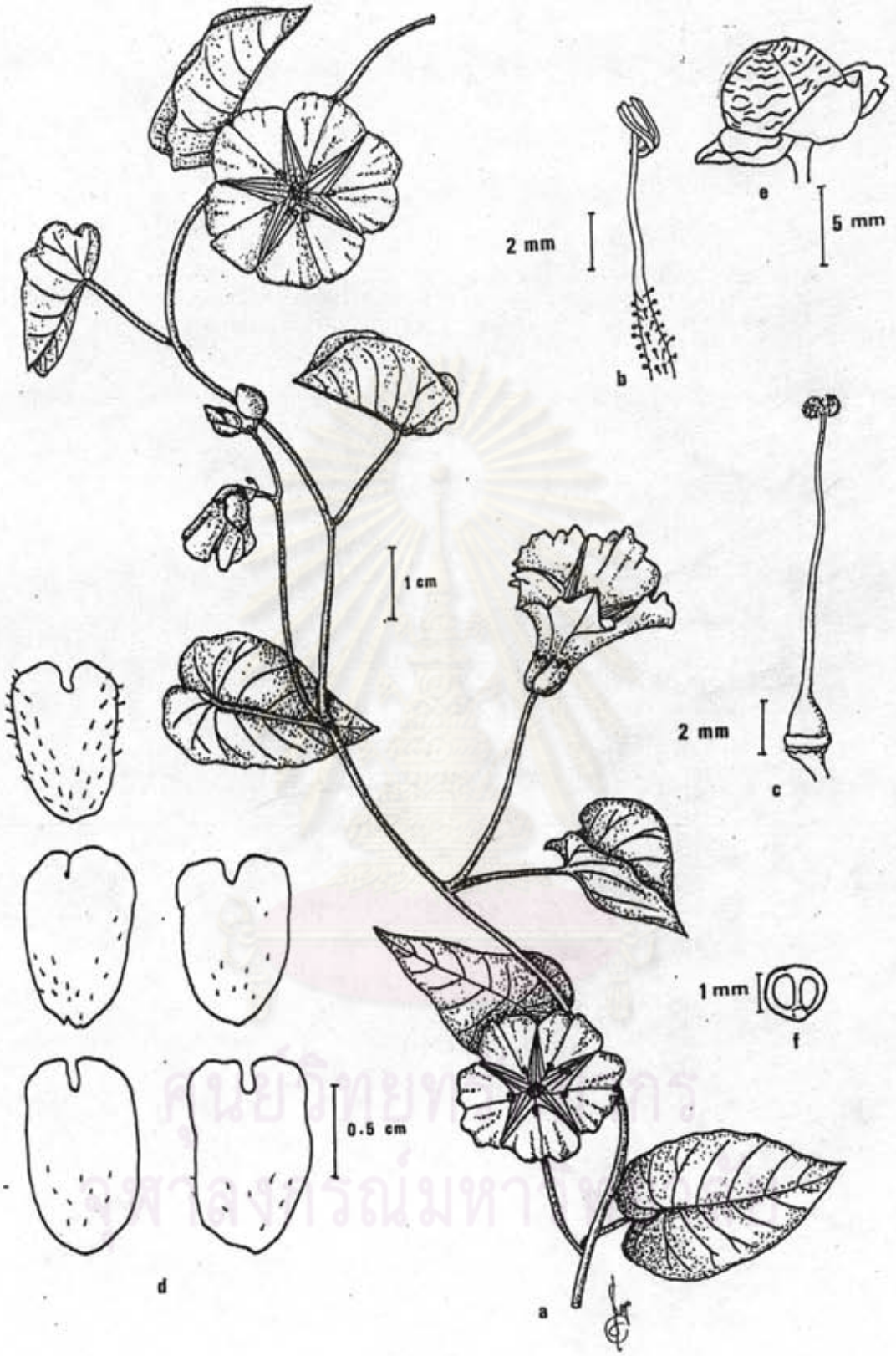



Figure 18. Merremia gemella (Burm.f.) Hall.f. - a. flowering branch, b. stamen, c. pistil, d. sepals, e. fruit, f. seed.

Plate 12. Merremia gemella (Burm.f.) Hall.f.

7.5 Merremia hederacea (Burm.f.) Hall.f.in Engl.,Bot.Jahrb.18:118.1894; Merrill in Enum.Philipp.Fl.Pl.3:361.1923; Burkill, Dict.Econ.Prod.Mal. Pen. 2: 1456.1935; Kerr, Fl. Siam.En.3, 2:3.1951; Van Ooststr., Blumea 3:302.1939; id.in Fl.Mal.1, 4:441.1953; Verdcourt, Fl.Trop.E.Afr.:54. 1963; Back.& Bakh.f.,Fl.Java 2:490.1965; Henderson, Mal.Wild Fl.(Dicot.) :317.1974; Nasir & Ali, Fl.W.Pakistan.126:55.1979; Austin in Dassanayake, Fl.Ceylon 1:350.1980; Khan, Fl. Bangladesh 30 : 42.1985.- Evolvulus hederaceus Burm.f., Fl. Ind. : 77.1768, t.30, fig.2.- Convolvulus acetosellaefolius Desr.in Lamk.,Encycl.3:564.1789.- Convolvulus dentatus Vahl.,Symb.Bot.3:25.1794.- Convolvulus flavus Willd.,Spec.Pl.1:852.1797.- Merremia convolvulacea Dennst., Schluss.Hort.Mal.:12,23,34.1818. nomen nudum.- Ipomoea chryseides Ker-Gawl.in Bot.Reg.t.270.1818.- Ipomoea dentata Willd.ex R.et S.,Syst.4:789.1819.- Convolvulus chryseides (Ker-Gawl.) Spreng., Syst.1:598.1825.- Convolvulus lapathifolius Spreng., Syst.1:604.1825.- Lepistemon muricatuum Spanoghe in Linnaea 15:339. 1841.- Ipomoea zebrina Perr.ex Choisy in DC.,Prodr.9:382.1845.- Ipomoea acetosellaefolia (Desr.) Choisy in DC., Prodr. 9 :383.1845.- Ipomoea subtriflora Zoll. et Mor. in Mor., Syst.Vrez.Zoll.: 51.1846.- Merremia chryseides (Ker-Gawl.) Hall.f. in Engl.,Bot.Jahrb.14:552.1893. -Fig.19; Plate 13.

A herbaceous twiner. Stem glabrous or sparsely pubescent, finely striate. Leaves ovate in outline, 2.5-5.5 by 2-4 cm, apex acute and mucronulate, base cordate or broadly cordate, margin entire or crenate, undulate, sometimes 3-lobed, glabrous or sparsely pubescent or hairy on the midrib and veins, nerves 8-10 pairs; petioles glabrous or glabrescent, 1.5-8 cm long. Flowers dichasium or monochasium; peduncles mostly glabrous sometimes sparsely pubescent, tuberculate, 0.8-9 cm long; bracts ovate-orbicular, minute, 1.5-2 cm long; pedicels glabrous, tuberculate, 2-4 cm long. Sepals broadly obovate, apex broadly notched and mucronulate, sparsely covered with short white hairs, 4-5 by 2.4-3.2 mm. Corolla campanulate, yellow, 0.8-1 cm long, 1 cm in diameter, glabrous, midpetaline band distinctly 5-nerved, corolla lobes emarginate.

Stamens exserted, base of filaments slightly dilated and covered with hairs. Ovary conical, glabrous. Fruits capsular, globose, 4-angled, wrinkled, persistent calyx reflex. Seeds 4 hairy at hilum and edges of seeds.

**Thailand.**- NORTHERN : Chiang Mai, Chiang Rai, Phitsanulok; NORTH-EASTERN : Khon Kaen; EASTERN : Nakhon Ratchasima, Buri Ram, Surin; SOUTH-WESTERN : Kanchanaburi, Phetchaburi, Prachuap Khiri Khan; CENTRAL : Ang Thong, Saraburi, Bangkok; SOUTH-EASTERN : Chon Buri, Rayong, Chanthaburi; PENINSULAR : Surat Thani, Nakhon Si Thammarat.

**Distribution.**-Tropical Africa, Mascarene Islands, tropical Asia from Himalaya southwards to Ceylon and eastwards to Burma, China, the Malay Peninsula and Archipilago, North Australia (Van Ooststroom, 1939), and some pacific islands (Austin, 1980).

**Ecology.**- In dry deciduous forest, along the roadside, climbing on the small shrubs and tall grasses near the paddy field and the disturbed open area. Altitude from sea level upto 375 m. Flowering in September - March.

**Vernacular.**- Thao sa uek (เถาสะอึก : Central), Cha uek (ฉะอึก), Ma uek (มะอึก : Nakhon Ratchasima).

**Uses.**- A poultice of leaves, with tumeric and broken rice, is used upon chapped hands and feet, and used as the fodder. (Burkill, 1935).

**Specimens examined.**- B. Na Songkhla 570 (CU); C. Khunwasi 27 (CU); C. Phengkhlai et al 3359 (BKF); D.J. Collins 1652 (BK); E. Smith 188 (BK); Maxwell 73-660 (BK), 87-170 (BK); Put 2565 (BK); Staples & Wathaniyakom 347 (BK), 411 (BKF); T. Piyakarn 4 (BK),

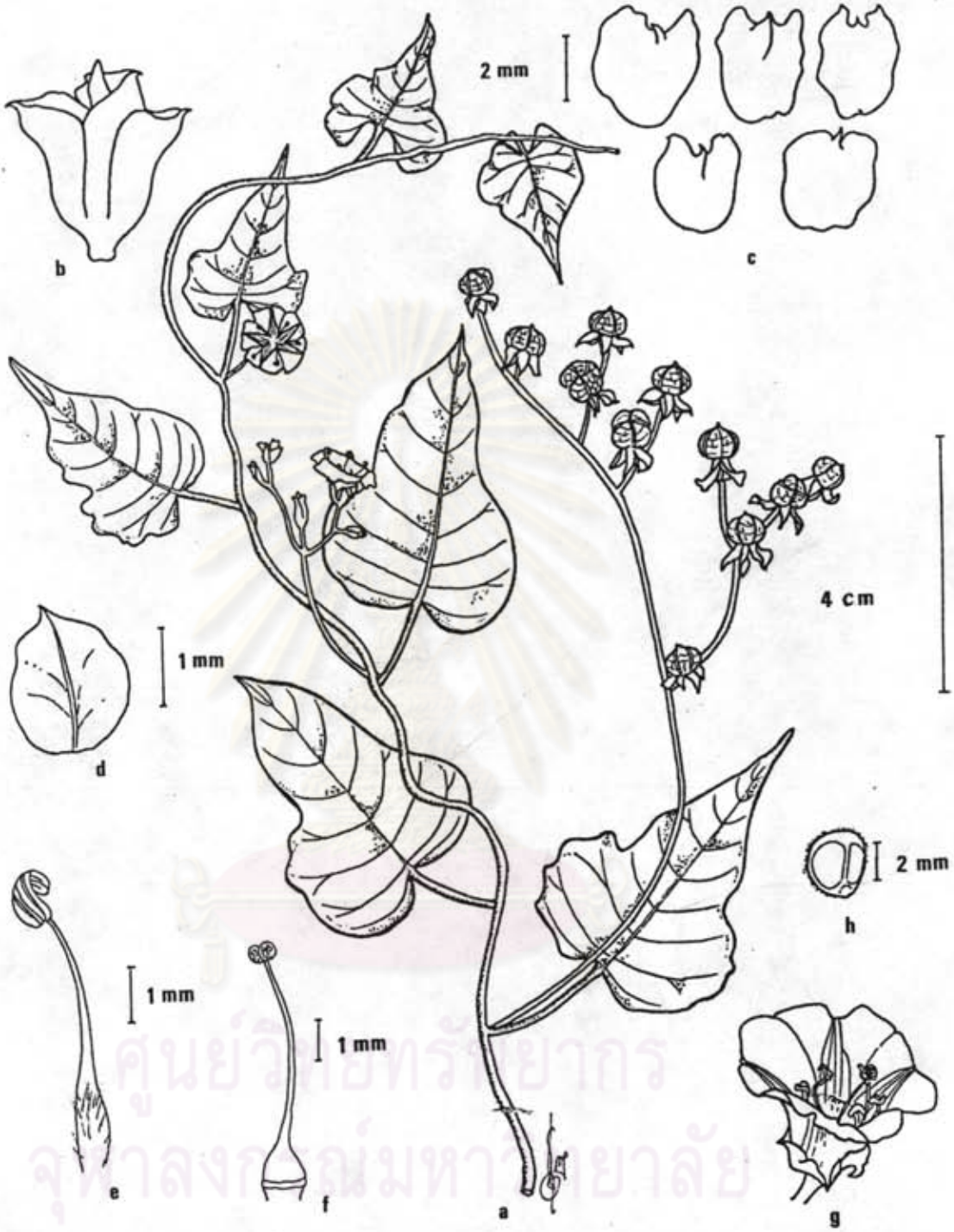



Figure 19. Merremia hederacea (Burm.f.) Hall.f. - a. flowering branch and fruiting branch, b. calyx, c. sepals, d. bract, e. stamen, f. pistil, g. flower, h. seed.

Plate 13. Merremia hederacea (Burm.f.) Hall.f.

7.6 Merremia hirta (L.) Merrill in Philipp.Journ.Sc.Bot.7:244.1912; Merrill, Enum.Philipp.Fl.Pl.3:361.1923; Van Ooststr.,Blumea 3,no.2:307. 1939; Kerr in Fl.Siam.En.3, 2:4.1954; Van Ooststr.,Fl.Mal.1,4:442.1954; Back. & Bakh.f.,Fl.Java 2:490.1965; Khan, Fl.Bangladesh 30:43.1985.- Convolvulus hirtus Linn.,Spec.Plant.ed.1:159.1753.- Convolvulus caespitosus Roxb.,Fl.Ind.2:70.1824.- Ipomoea linifolia Bl.,Bijdr.:721. 1825.- Convolvulus benthamii Wall.,Cat.n.1393.1828.- Ipomoea philippinensis Choisy in Mem.Soc.Phys.Geneve 6:487.1833.- Skinneria caespitosa (Roxb.) Choisy in Mem.Soc.Phys.Geneve 6:487.1833.- Convolvulus pratensis Buch.-Ham. ex Choisy in Mem.Soc,Phys.Geneve 6:487.1833.- Hewittia caespitosa (Roxb.) Steud.,Nom.ed.2,I:757.1840.- Convolvulus hibridus et Mor.in Nat.en Geneesk.Arch.Nederl.Ind.2:6.1845.- Ipomoea setulosa Zoll. et Mor.in Mor.,Syst.Verz.:51.1846.- Ipomoea caespitosa (Roxb.) O.K.,Rev.gen.2:443.1891.- Merremia caespitosa (Roxb.) Hall.f.in Engl. Bot.Jahrb.16:552.1893. -Fig.20-21; Plate 14.

A prostrate or twining herb. Stem slender, terete, sparsely patently hirsute. Leaves oblong-lanceolate to ovate-oblong, 2.5-4 by 0.7-2.5 cm, apex obtuse or acute amd mucronulate, base rounded or cordate, margin entire, sparsely hirsute on both surfaces and along the margin; petioles with long patent hairs, 0.5-2 cm long. Flowers raceme-like and unilateral; peduncles sparsely patently hirsute near the base, 1-2.5 cm long; bracts ovate, acute or short acuminate at the apex, glabrous, 1-1.5 mm long; pedicels glabrous, 0.5-0.8 mm long. Sepals subequal, elliptic-oblong, apex obtuse or acute, base rounded or truncate, 4-7 by 3.3-3.5 mm, fleshy and waxy, thin and dull in dried state, glabrous with few parallel nerves. Corolla broadly funnel-formed, 1.5-2 cm long, 2.5-3 cm in diameter, pale yellow with distinctly nerves on midpetaline bands. Base of filaments dilated covered with fimbriate-like hairs. Ovary conical. Fruits capsule, globular,glabrous, enclosed in enlarged calyx. Seeds 4, black, glabrous or sparsely hairy at the edge.

**Thailand.-** NORTHERN : Chiang Mai, Phitsanulok; NORTH-EASTERN : Loei, Maha Sarakham, Khon Kaen; EASTERN : Nakhon Ratchasima, Buri Ram, Surin, Ubon Ratchathani; CENTRAL : Saraburi; SOUTH-EASTERN : Prachinburi, Chachoengsao, Chon Buri, Rayong, Chanthaburi; PENINSULAR : Krabi, Trang, Songkhla, Yala.

**Distribution.-** India to Southern China, Malaysia and tropical Australia (Van Ooststroom, 1939).

**Ecology.-** In open deciduous forest, scrub on open grassland, edge of the forest, along the roadside, in clay soil edge of paddy field. Altitude from sea level upto 1000 m. Flowering in October - March.

**Vernacular.-** Ching cho nuan (จิงจ้อนวล : author).

**Uses.-** -

**Specimens examined.-** C. Khunwasi 41 (CU); C. Phengkhlai et al 2649 (BKF); Dee 952 (BKF); Kerr 13605 (BK), 14734 (BK), 19817 (BK); Sakol 194 (BK); Umpai 213 (BK).

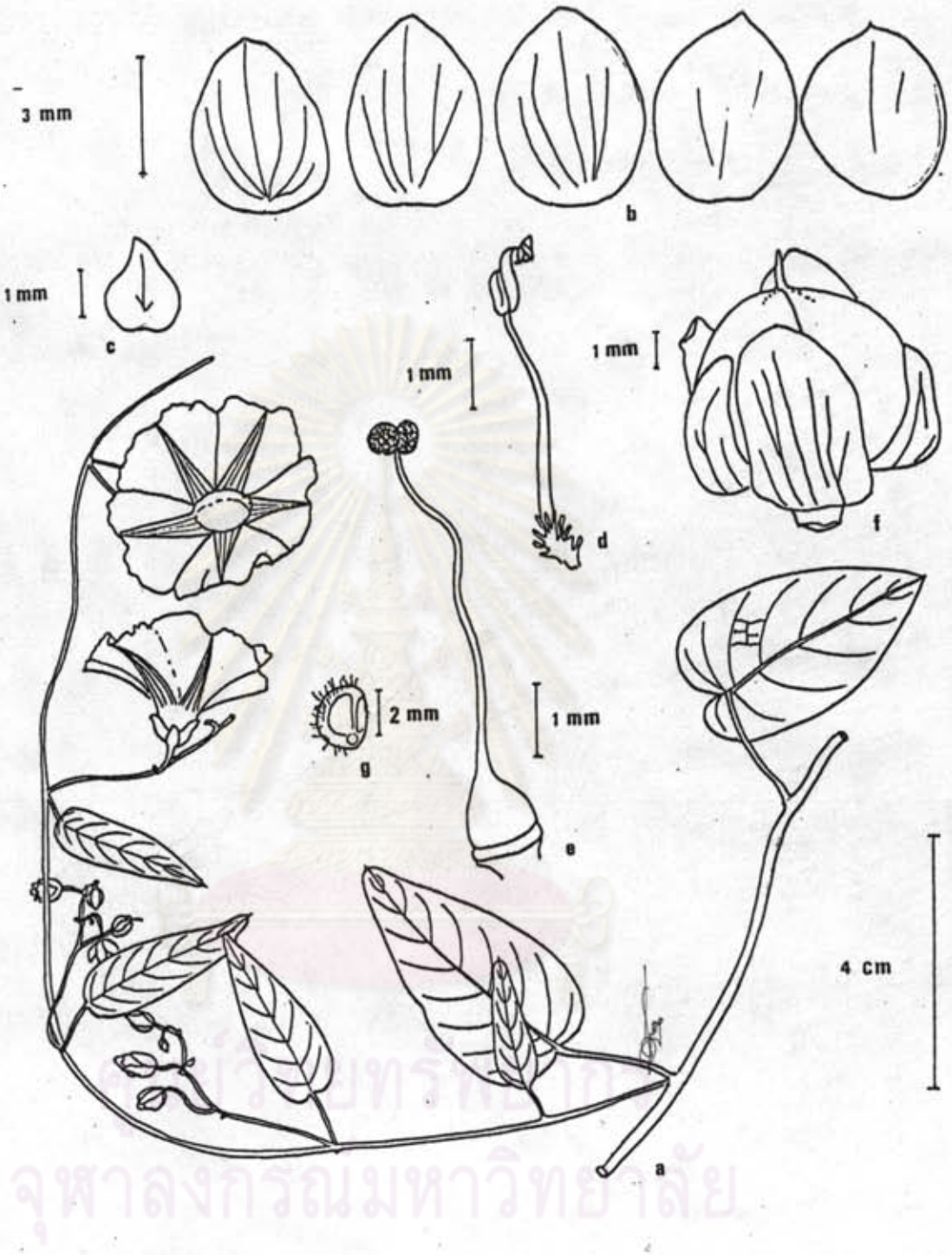



Figure 20. Merremia hirta (Linn.) Merrill - a. flowering branch, b. sepals, c. bract, d. stamen, e. pistil, f. fruit, g. seed.

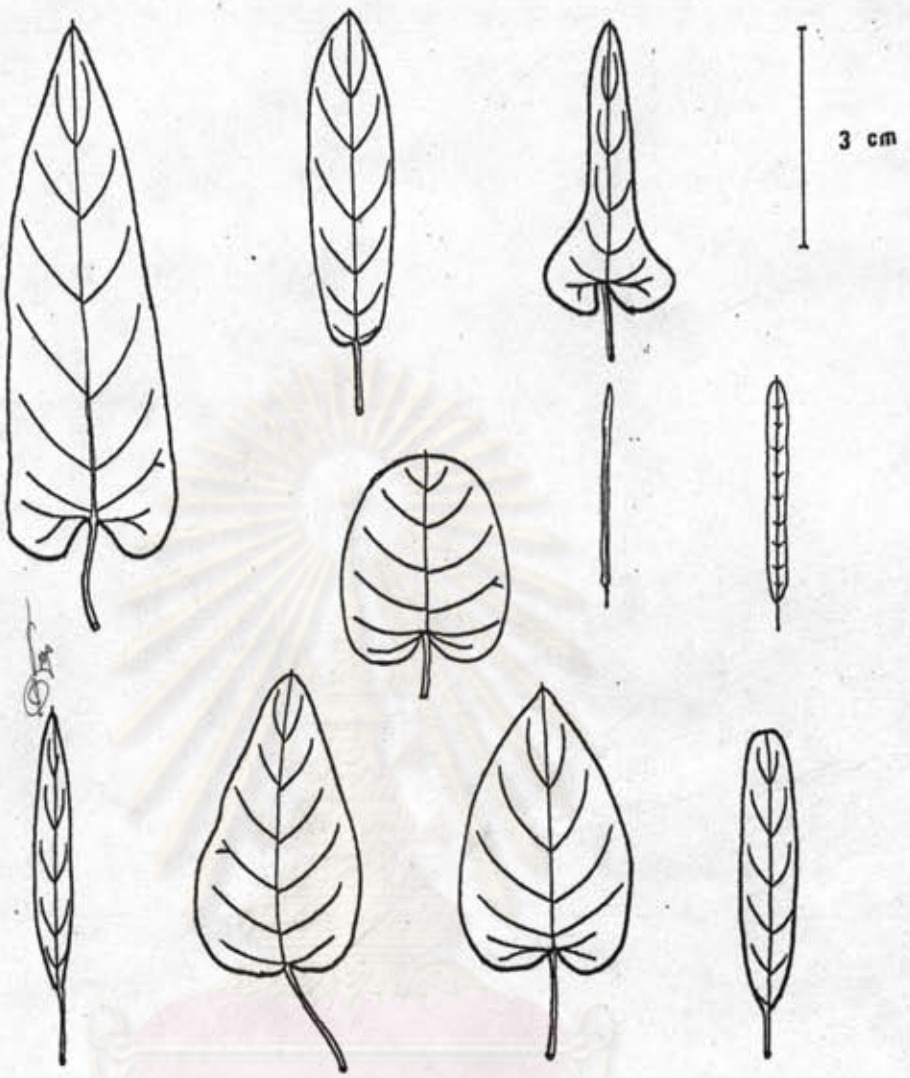





Figure 21. M. hirta (Linn.) Merrill - variation of leaves.

Plate 14. Merremia hirta (Linn.) Merrill

7.7 Merremia kingii (Prain) Kerr in Fl.Siam.En.3, 2:5.1954.- Ipomoea kingii Prain in Journ.As.Soc.Beng.1, 13, pt.2:108.1894.- Ipomoea cymosa Roem.& Sch. var. macra C.B. Clarke Hook.f., Fl. Brit. Ind. 4:212.1885. -Fig.22-23; Plate 15.

A herbaceous twiner. Stem glabrous, finely striate. Leaves oblong-ovate, ovate, sometimes lanceolate, 5-14 by 1.5-9 cm, apex acute and mucronulate or obtuse mucronulate, rarely acuminate, base cordate, sometimes slightly rounded or auriculate, margin entire, glabrous on both surfaces, nerves 5-7 pairs; petioles glabrous, 0.8-5.5 cm long, usually with two stipule-liked appendage at each node just below the petioles. Flowers usually 1-3-flowered; peduncles glabrous, striate, 3-5.5 cm long; bracts oblong, 1.4-1.5 mm long, glabrous; pedicels glabrous, thickened upward, angled above, 1.8-2 cm long. The 2 outer sepals elliptic; apex mucronulate, 2-2.3 by 1-1.2 cm, the 3 inner ones oblong-elliptic to oblong ovate, apex mucronulate, 1.5-1.8 by 1.2 cm. Corolla broadly funnel-formed, 6-7 cm long, 6.5-7 cm in diameter, yellow, glabrous except on the upper part of midpetaline band pilose. Stamens unequal in length, included, base of filaments dilated, slightly hairy. Ovary conical. Fruits capsule.

Thailand.- NORTHERN : Chiang Mai, Phitsanulok; EASTERN : Nakhon Ratchasima; SOUTH-WESTERN : Kanchanaburi.

Distribution.- Sikkim, Assam, Burma.

Ecology.- On bush in open space in evergreen forest, and mixed deciduous forest. Altitude 500-900 m. Flowering January - March.

Vernacular.- Ching cho doi (จิงจ้อดอย : author).

Uses. -

Specimens examined.- C. Chermsirivatana 669 (BK); C. Khunwasi 45 (BK); Kerr 10427 (BK); T. Koyama 15543 (BKF); T. Smitinand 5521 (BKF).

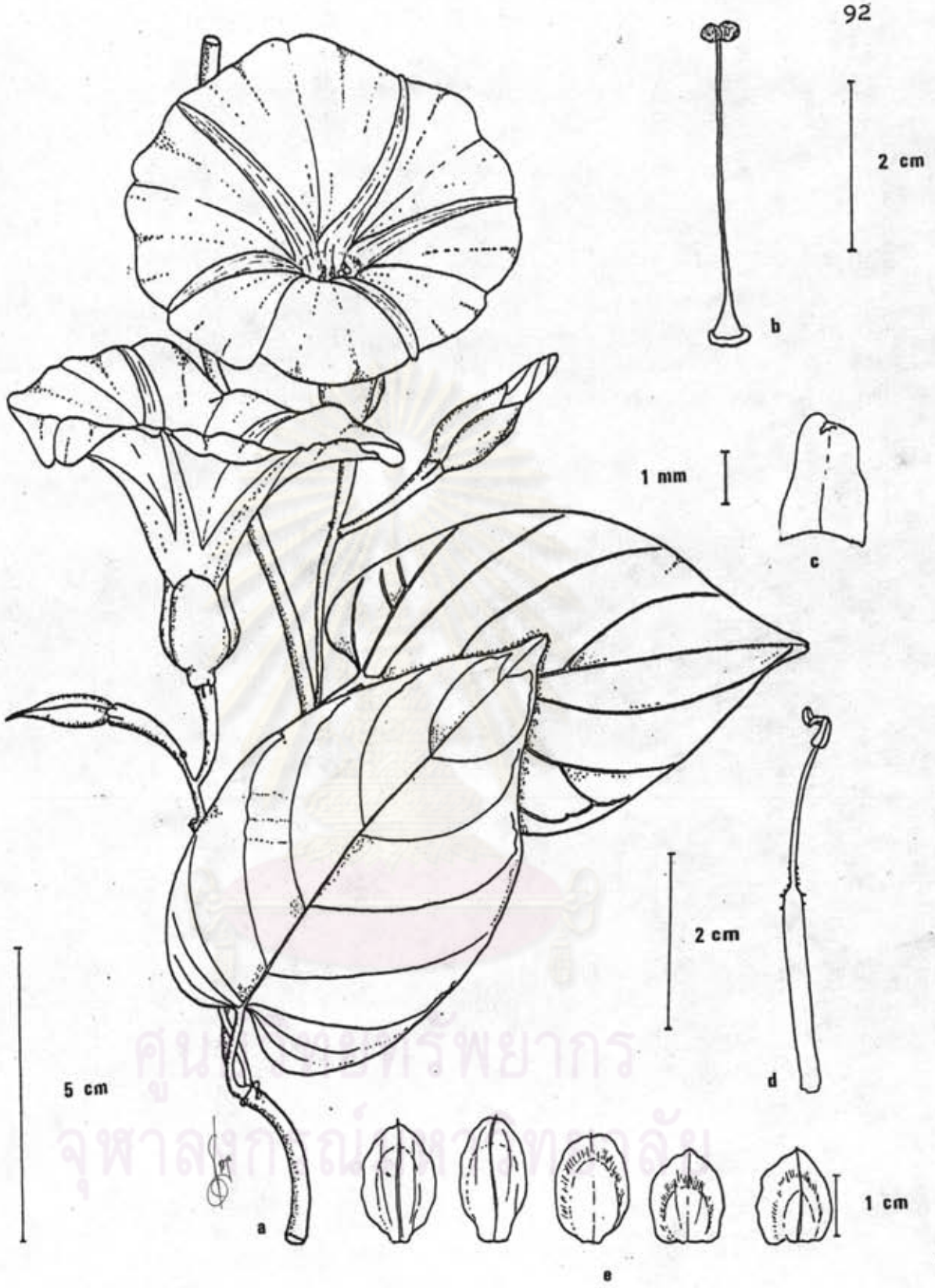



Figure 22. Merremia kingii (Prain) Kerr - a. flowering branch, b. pistil, c. bract, d. stamen, e. sepals.

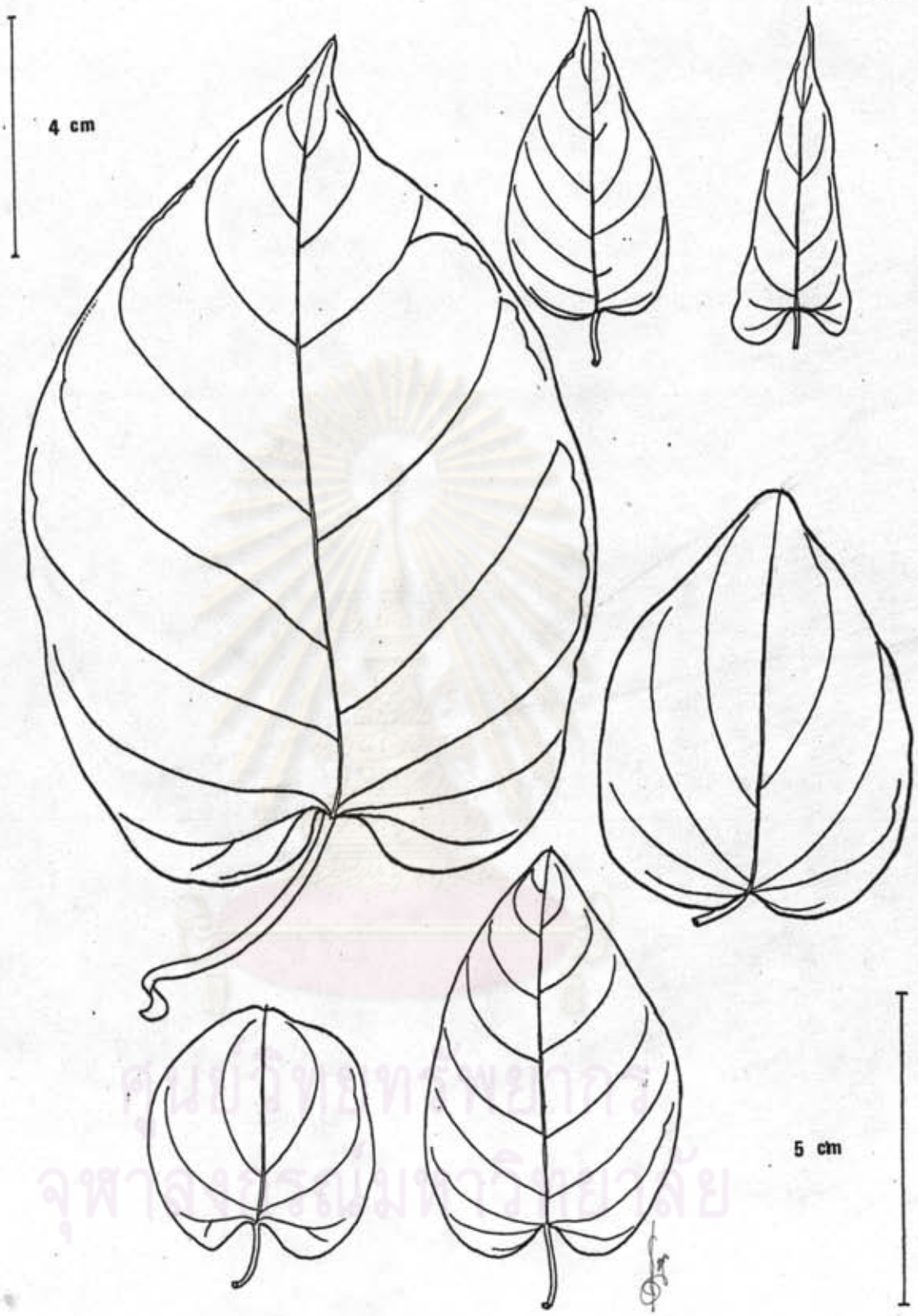



Figure 23. M. kingii (Prain) Kerr - variation of leaves.

Plate 15. Merremia kingii (Prain) Kerr

Distribution. India, Indo-China, Andamans, Philippines, cultivated in Indonesia. (Van Ooststroom, 1953).

Ecology Edge of the forest on the mountain. Altitude ca.320 m. Flowering in November - January.

Vernacular. -

Uses. The tubers are edible and also used as native medicine in Malay Archipelago. (Van Ooststroom., 1939).

Specimens examined.- Staples & Wathaniyakom 297 (BKF); C. Khunwasi 46 (CU).

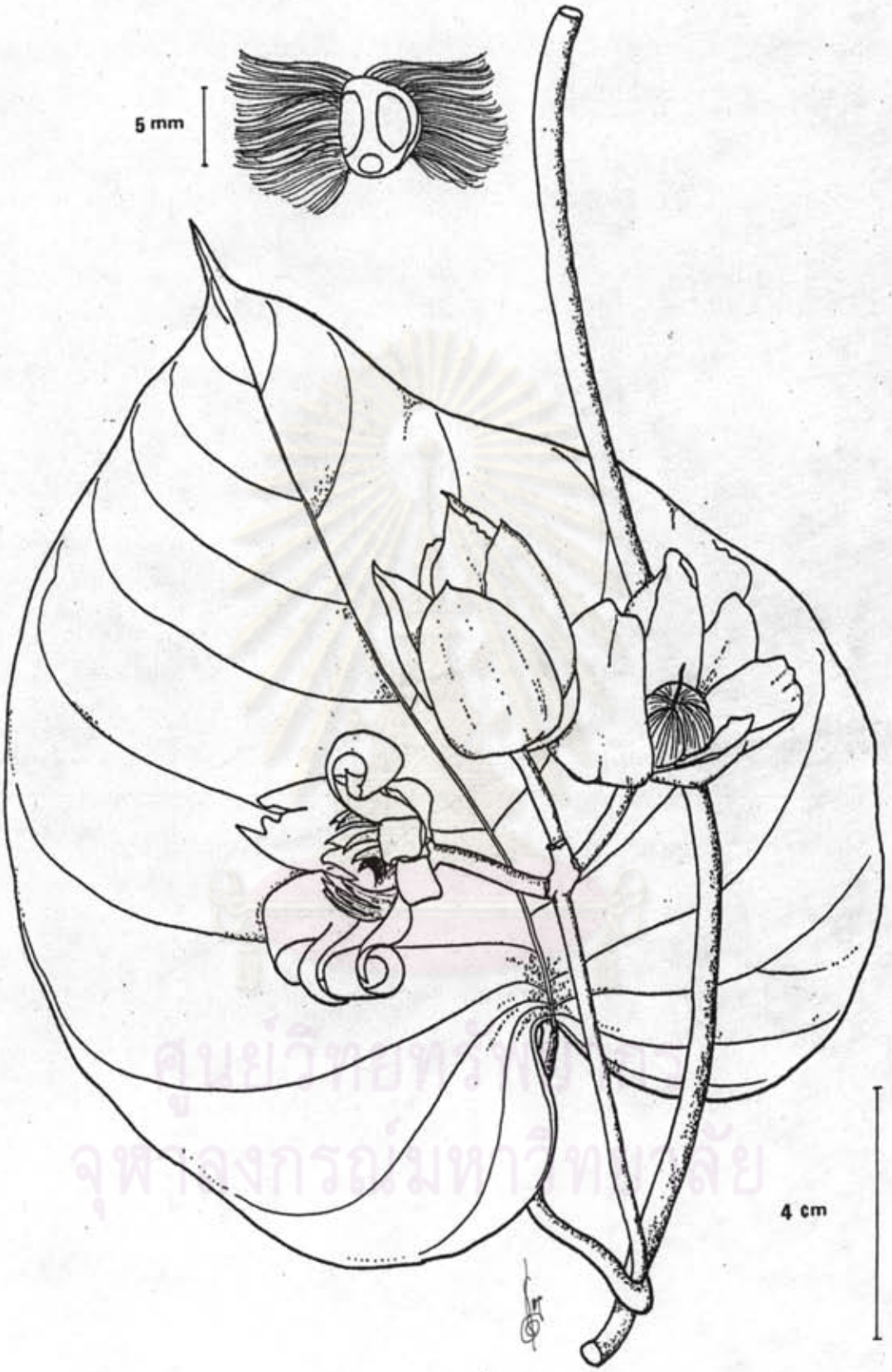



Figure 24. Merremia mammosa (Lour.) Hall.f. - a. fruiting branch b. seed.

7.9 Merremia peltata (Linn.) Merrill, Interpr.Rumph.Herb.Amb.:441.1917; id.in Enum.Philipp.Fl.Pl.3:362.1923; Van Ooststr.,Blumea 3:352.1939; id. in Fl.Mal.1, 4:452.1953; Kerr in Fl.Siam.En.3, 2:6.1954.- Convolvulus peltatus Linn.,Spec.Plant.:1194.1753.- Ipomoea nymphaefolia Bl.,Bijdr.: 719.1825.- Spiranthera peltata (Linn.) Boj., Hort.Maurit.:226.1837.- Operculina peltata (Linn.) Hall.f. in Engl., Bot.Jahrb.16:549.1893.- Merremia nymphaefolia (Bl.)Hall.f.in Versl.'s Lands Pl.t.1895:127.1896. -Fig.25; Plate 16.

A large woody twiner with milky juice, terete, striate, glabrous. Leaves peltate, ovate, broadly ovate or orbicular, broader than long 5.5-15 by 6-20 cm, apex acuminate, acute and mucronulate sometimes slightly emarginate, base rounded, the leaves of the inflorescense cordate at base, nerves 6-10 pairs; petioles glabrous, 2.5-11 cm long. Flowers corymbose; peduncles glabrous, large, terete, 5.5-20 cm long; bracts deciduous, oblong-elliptic, apex emarginate, margin scarious concave at the base, 2-2.5 mm long; pedicels glabrous or sparsely covered with short hairs, grooved, thickened and angular at the apex, 1.5-2.3 cm long. Sepals green, glabrous, green, equal in length or the outer ones slightly shorter, margin thinner than the blade, 2 outer sepals elliptic, apex obtuse sometimes slightly emarginate, 3 inner ones narrower, ovate, obtuse at the apex, glabrous, 2-2.3 by 1.2-1.8 cm. Corolla broadly funnel-formed, 7.5-10.7 cm long, 7-8.8 cm in diameter, yellow, glabrous. Base of each filament dilated and hairy, with thickened hairy semicircular scale. Anthers distinctly hairy at the connective tissue. Ovary conical, glabrous. Fruits capsule, 4-celled, 4-valved, valves longitudinally splitted into several segments.

Thailand.- PENINSULAR : Surat Thani, Phangnga, Nakhon Si Thammarat, Narathiwat.

Distribution.- Madagascar, Mascarine, Seychelles, Malay Peninsula, Philippines, New Guinea, North and South Australia, Polynesia (Van Ooststroom, 1939).

Ecology.- In evergreen forest, on shrubby tree along the road-side, in scrub. Altitude from sea level upto 1100 m. Flowering in December - May.

Vernacular.- En luen (เอ็นลื่น : Nakhon Si Thammarat), Yaan len (ย่านเหล็น : Phangnga), Yaan khee duen (ย่านขี้เดือน : Surat Thani).

Uses.- The tubers are reputed edible (but many cause purging). The Sudanese use an extract for stomach-ache. The juice of the stem is taken for cough, diarrhoea, and worms; and is used for sore eyes. The leaves are used for washing hair and are applied as poultice on sore breasts, ulcers, and wounds (Burkill, 1935).

Specimens examined.- BS, SP & BN 1034 (BKF); C. Khunwasi 43 (CU); C. Phusomsaeng 368 (BKF); Kerr 15681 (BK), 17112 (BK); Prayod 1240 (BK).

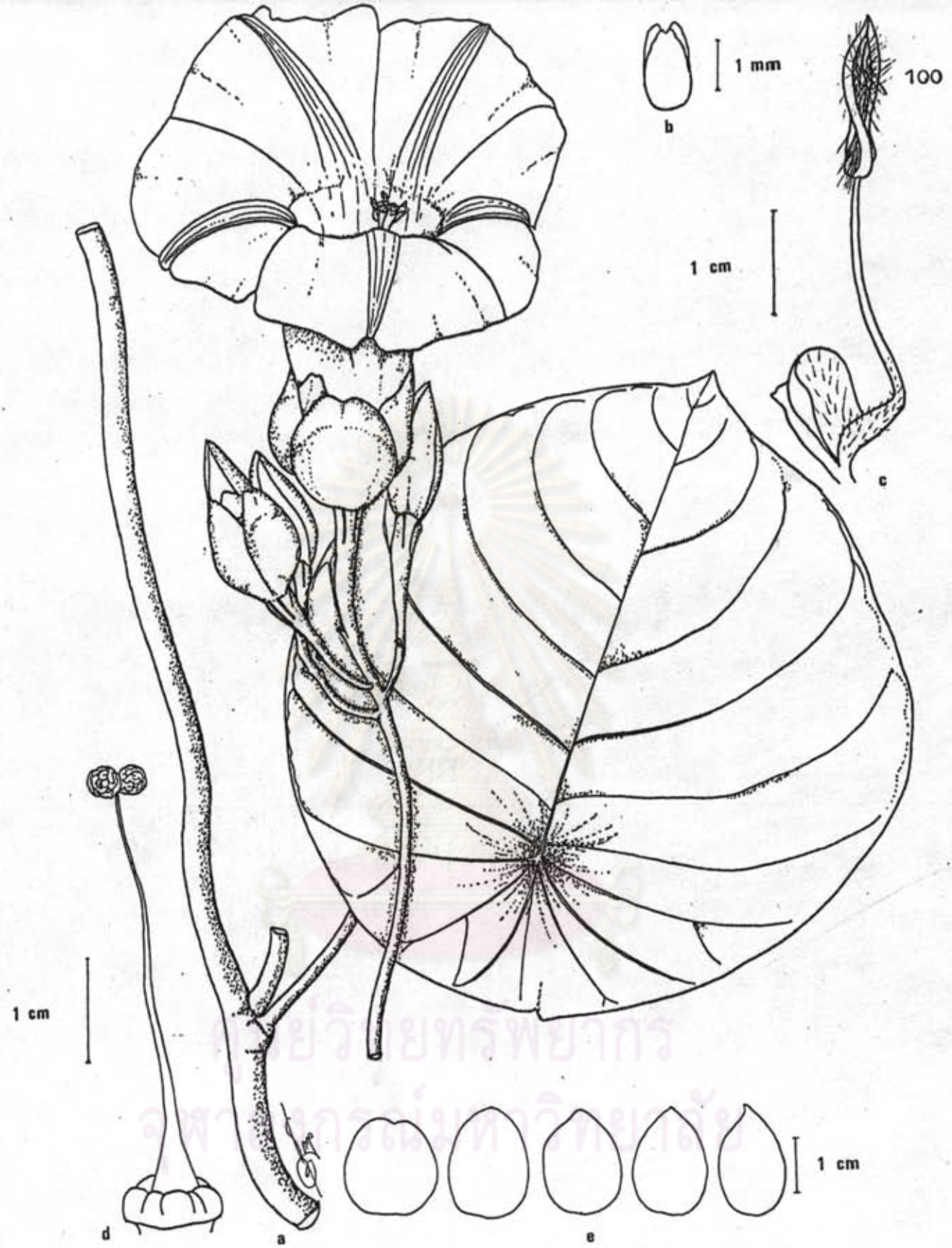



Figure 25. Merremia peltata (Linn.) Merrill - a. flowering branch, b. bract, c. stamen, d. pistil, e. sepals.

Plate 16. Merremia peltata (Linn.) Merrill

7.10 Merremia quinata (R.Br.) Van Ooststr.,Fl.Mal.1, 4:447.1953; Kerr, Fl.Siam.Enum.3, 2 :6.1954.- Ipomoea quinata R.Br.,Prodr.:486.1810; Bth.,Fl.Austr.4:415.1869; F.v.M., Descr.Notes Pap.Pl.3:44.1876; Warb., Bot.Jahrb.18:207.1894; Bailey, Queensl.Fl.4:1057.1901.; Schum.& Laut., Fl. Deut. Schutzgeb. : 517.1901; Gagnep. et Courch.in Lec.,Fl. I.-C.4: 258.1915; Van Ooststr.,Blumea 3:581.1940.- Ipomoea hirsuta R.Br.,I.c. 486.- Convolvulus quinatus Spreng.Syst.1:590.1825. -Fig.26-27.

A herbaceous twiner, slender, more or less patent hairs, or glabrous. Leaves palmately compound with 5 leaflets; leaflets linear-oblong, elongate-elliptic, elliptic-oblong, 2-6 by 0.2-1 cm, apex obtuse and mucronulate, base attenuate or narrowed towards the base, margin entire, glabrous, sometimes with short patent hairs on mid rib of the lower side, nerves 5-7 on pairs; petioles slender, 1-2.5 cm long, glabrous or with patent hairs. Flowers usually 1-flowered; peduncles 0.5-1 cm long, glabrous; bracts linear-lanceolate, 0.5-1.5 cm long; pedicels 0.5-0.7 cm long, glabrous. Sepals unequal, two outer sepals ovate to ovate-oblong, apex mucronulate, margin scarious, 5-7 by 2.5-3.5 mm, glabrous; three inner ones ovate, somewhat elliptic, apex obtuse and mucronulate, margin scarious, 7.5-14 by 3.7-4 mm. Corolla campanulate, 2.5-3 cm long, ca.3 cm in diameter, white, glabrous. Stamens included. Ovary glabrous. Fruits capsule, ovoid, acute, glabrous. Seeds 4, black, glabrous but short tomentose at edge above hilum.

Thailand.- NORTHERN : Chiang Mai, Lampang, Nakhon Sawan; NORTH-EASTERN : Loei, Sakon Nakhon; EASTERN : Buri Ram; SOUTH-WESTERN : Uthai Thani, Kanchanaburi, Ratchaburi.

Distribution.- North India to China and Formosa, Philippines, north Australia (Kerr, 1954), Queensland (Van Ooststroom, 1953).

Ecology.- In dry mixed deciduous and dry dipterocarp forest, along roadside, open field, dry dipterocarp forest, altitude 100-380 m. Flowering in October - November.

Vernacular.- Ching cho new naang (จิงจ้อน้ำนาง : author).

Uses. -

Specimens examined.- C. Phengkhlai 3426 (BKF); Staples & Wathaniyakom 291 (BKF); T. Smitinand 1218 (BKF).


Figure 26. Merremia quinata (R.Br.) Van Ooststr. - a. flowering branch, b. sepals, c. bract, d. pistil, e. stamen, f. fruit, g. seed.


Figure 27. M. quinata (R.Br.) Van Ooststr. - variation of leaves.

7.11 Merremia umbellata (Linn.) Hall.f.in Engl.,Bot.Jahrb.16:552.1893; Ridley, Fl. Mal. Pen. 2 :459.1923; Merrill, Enum. Philipp.Fl.Pl.3:362. 1923; Van Ooststr.,Blumea 3:333.1939; id.in Fl.Mal.1, 4:449.1953; Kerr, Fl.Siam.En.3, 2:6.1954; Austin in Dassanayake, Fl.Ceylon 1 :354. 1980; Khan,Fl.Bangladesh 30:45.1985.- Convolvulus umbellatus Linn.,Sp.Pl.:155. 1753.- Convolvulus cymosus Desr.in Lam.,Encycl.3:556.1791.- Convolvulus bifidus Vahl.,Symb.Bot.3:30.1794. -Ipomoea umbellata G.F.W.Mey.,Prim. Fl.Esseq.:99.1818. -Ipomea heynii R.et S.,Syst.4:237.1819. -Ipomea rothii R.et S.,Syst.4:237.1819. -Ipomoea cymosa (Desr.) R.et S.,Syst. 4;241.1819; Clarke, Fl.Brit.Ind.4:211.1885 -Ipomoea bifida (Vahl.) R.et S.,Syst.4:241.1819. -Convolvulus blandus Roxb.,Fl.Ind.2:70.1824. -Convolvulus pentagonus Roxb.,Fl.Ind.2:72.1824. -Convolvulus rothii (R.et S.) Spreng.,Syst.1:600.1825. -Ipomoea cymosa (Desr.) R.et S.var. pilosa Choisy in Mem.Soc.Phys.Geneve 6:462.1833. -Ipomoea cymosa (Desr.) R.et S. var.sagittato-angulata Choisy I.c.:463. -Ipomoea cymosa (Desr.) R.et S. var. sagitata Choisy in DC.,Prodr.9:371.1845. -Ipomoea modesta Choisy in Zoll.,Syst.Verz.2.Heft:129,131.1854. -Ipomoea cymosa (Desr.) R.et S. var. typica Prain in Journ.As.Soc.Bengal 63:108.1894. -Merremia umbellata (Linn.) Hall.f. var. orientalis Hall.f. in Versl.'s Lands Pl. t.1895:132.1896. -Merremia cymosa (Desr.) Baker & Rendle in This. -Dyer, Fl.Trop.Afr.4,2:106.1905. -Fig.29-30 Plate 17.

A prostate or twining herb, old part woody, mostly rooting at the nodes, terete, slightly striate, glabrous or sparsely pubescent. Leaves variable in shape and size, elliptic-oblong, ovate, ovate-oblong or triangular, 3-10.5 by 1-4.5 cm, apex more or less acuminate, acute and mucronulate, base cordate, rounded or truncate, occasionally auriculate, margin entire, lower surface sparsely to densely pubescent upper surface sparsely pubsecent, nerves 5-8 pairs; petioles pubescent, covered with short white hairs, 1-4 cm long. Flowers mostly dense-flowered in umbelliform cymes, sometimes 1, 2 to few - flowered; peduncles dense pubescent, 0.5-1.3 cm long; bracts small, ovate or lanceolate, pubescent, 1-1.5 mm long; pedicels glabrous, sometimes

sparsely pubescent, 0.5-1 cm long. Sepals slightly unequal, very concave, scarious at the margin, 3 outer ones sparsely pubescent, 2 inner ones glabrous, sometimes glabrescent, orbicular or broadly elliptic, somewhat ovate, short acute and mucronulate at the apex, 0.6-1 by 0.4-0.6 cm. Corolla funnel-formed, 2-3 cm long, 2.5-3.8 cm in diameter, yellow to yellowish orange, glabrous except the upper part of the midpetaline band. Base of filaments slightly dilated, sparsely hairy. Ovary conical, glabrous. Fruits capsule, conical, brown, 0.8 cm long. Seeds densely hairy with long soft patent hairs.

Thailand.- NORTHERN : Mae Hong Son, Chiang Mai, Chiang Rai, Lampang, Phrae, Phitsanulok; NORTH-EASTERN : Phetchabun, Loei, Khon Kaen; EASTERN : Si Sa Ket, Ubon Ratchathani; SOUTH-WESTERN : Kanchanaburi, Phetchaburi, Prachuap Khiri Khan; CENTRAL : Nakhon Nayok; SOUTH-EASTERN : Chon Buri, Chantaburi, Trat; PENINSULAR : Chumphon, Ranong, Surat Thani, Phangnga, Satun, Songkhla, Pattani, Yala, Narathiwat.

Distribution.- Tropical East Asia, British India, Ceylon, eastwards to China and Indo-China, Malay Peninsular, Philippines, New Guinea and Queensland (Van Ooststroom, 1939).

Ecology.- In evergreen and deciduous forest, a thicket next to the stream, along the roadside, open ground, disturbed area, moist shady location, grassland. Altitude from sea level upto 1300 m. Flowering in September - July.

Vernacular.-Ching cho Khaao (จิงจ้อขาว : Northern), Thao dok baan tuum (เถาดอกบานตูม : Trat), En (เอน : Surat Thani).

Uses.- The pounded leaves may be used as poultice for burns and scalds in Malay Peninsular and used as poultices in Moluccas for sores, the young leaves may be mixed with vegetables and eaten (Durkill, 1935).

Specimens examined.- A. Chantanamuck 76 (BK); B. Na Songkhla 581 (CU), 609 (CU); C. Chermsirivatana 344 (BK); C. Khunwasi 29 (CU), 33 (CU), 38 (CU); C. Hambananda 317 (BK), D.J. Collins 1641 (BK), 1653 (BK); E. Smith 317 (BK), 521 (BK); Garrett 270 (BKF); J. Sadakorn 218 (BK); Kerr 5166 (BK), 7829 (BK), 13569 (BK); Khanchai 777 (BK); M.C. Laksanakorn 323 (BK); Maxwell 71-70 (BK), 73-19 (BK), 85-1067 (BKF); P. Nitrasirirak 242 (BKF); Prayod 516 (BK), 760 (BK), 1223 (BK), 1647 (BK); Staples & Wathaniyakom 352 (BKF), Umpai s.n. (BK); Vacharapong 0124 (BK).

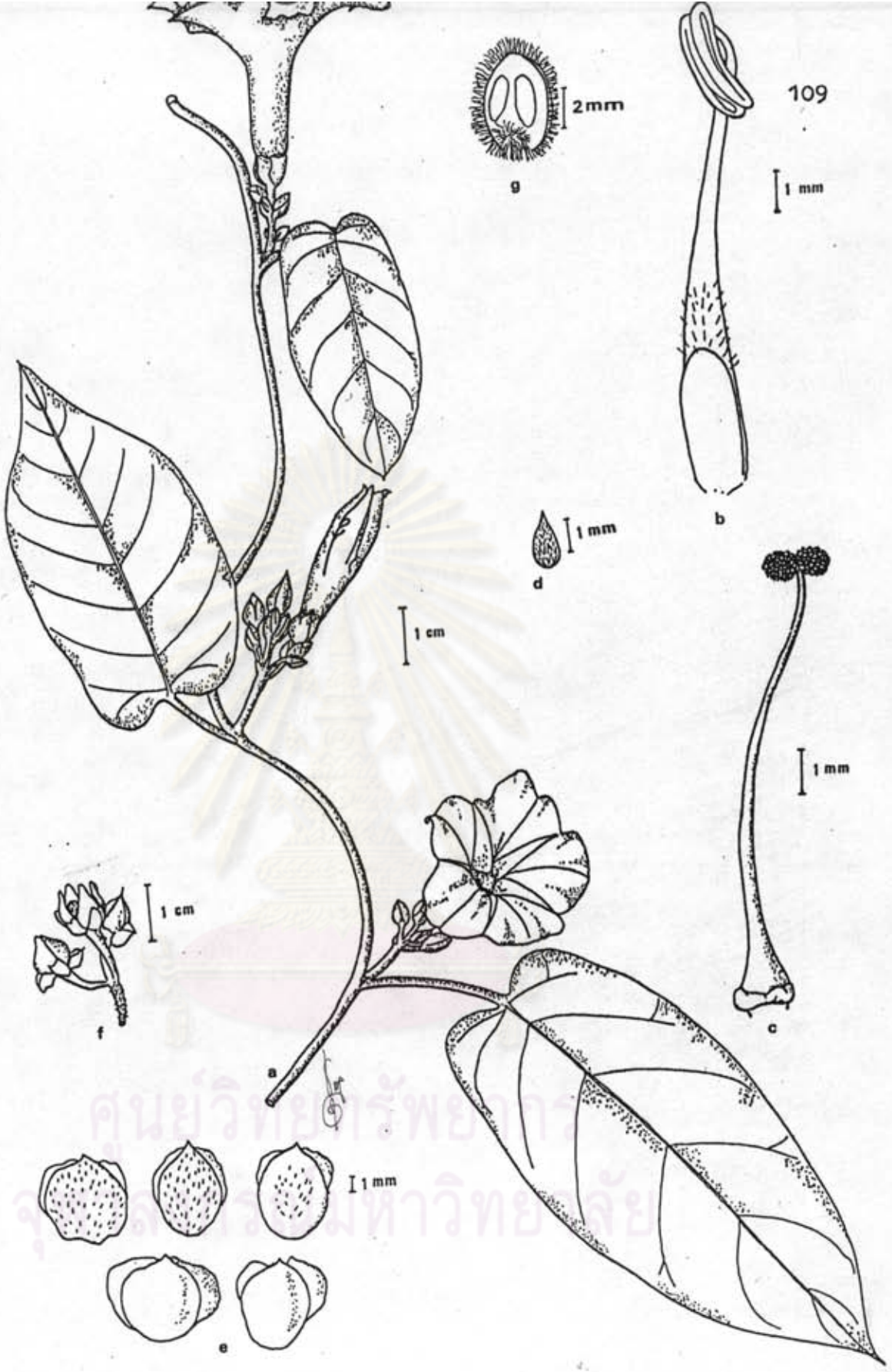



Figure 28. Merremia umbellata (Linn.) Hall.f. - a. flowering branch, b. stamen, c. pistil, d. bract, e. sepals, f. fruit. g. seed.

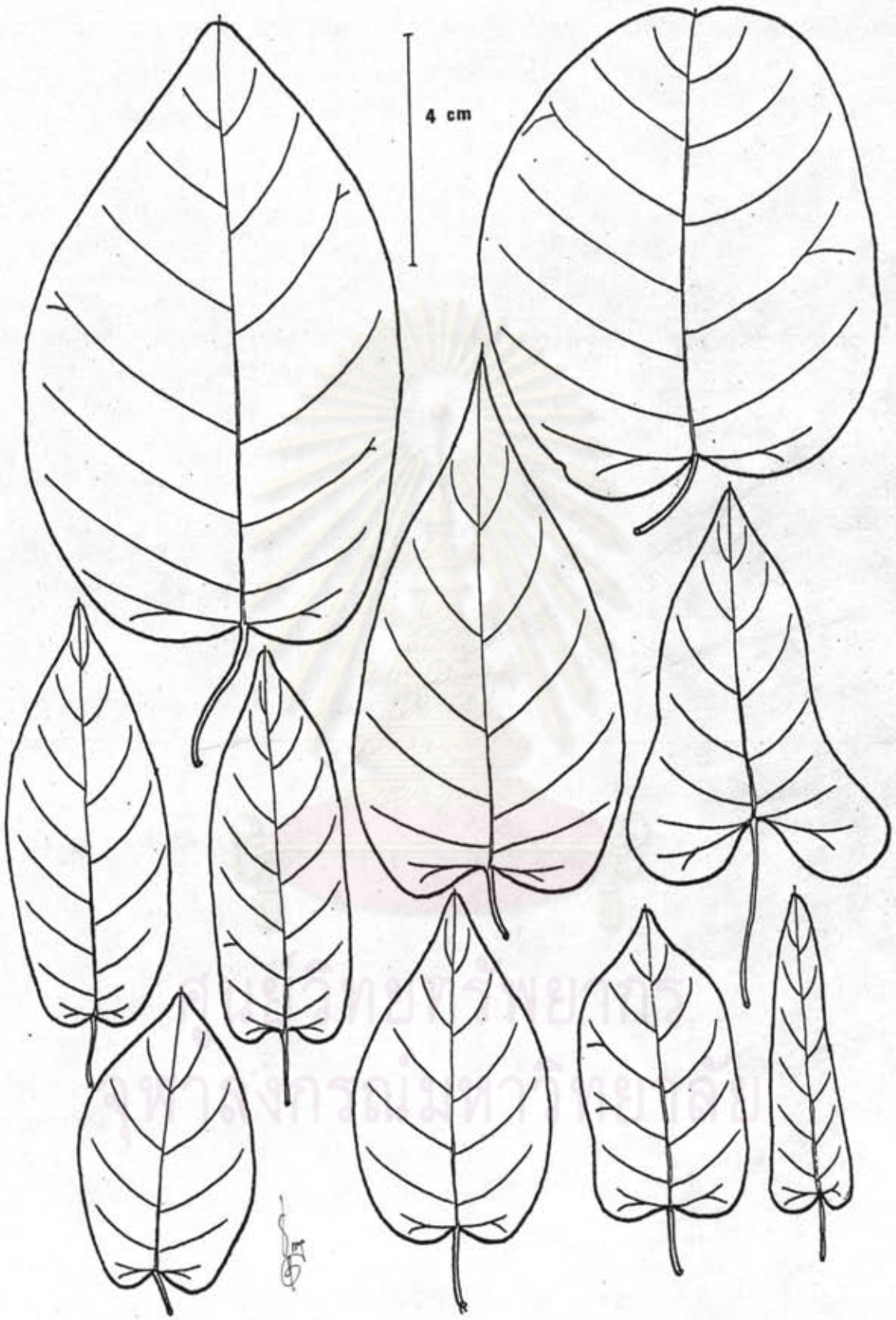



Figure 29. M. umbellata (Linn.) Hall.f. - variation of leaves.

Plate 17. Merremia umbellata (Linn.) Hall.f.

7.12 Merremia vitifolia (Linn.) Hall.f. in Engl.,Bot.Jahrb.16:552.1893; Gamble, Fl.Pres.Madras 5:928.1923; Ridley, Fl.Malay Penins. 2:457.1923; Merrill, Enum.Philipp.Fl.Pl.3:362.1923; Van Ooststr.,Blumea 3:329.1939; id.in Fl.Mal.1, 4:448.1953; Kerr, Fl.Siam.En.3, 2:7.1954; Backer & Bakhuizen, Fl.Java 2:489.1965; Austin in Dassanayake, Fl.Ceylon 1:355. 1980.- Convolvulus vitifolius Burm.f.,Fl.Ind.:45, t.18, Fig.1.1768; Roxb.,Fl.Ind.2:61.1824; Wall.,Cat.:n.1348.1828.- Convolvulus angularis Burm.f.,Fl.Ind.:46, t.19, Fig.2.1768.-Ipomoea vitifolia (Burm.f.) Blume, Bijdr.:709.1825; Choisy in Mem.Soc.Phys.Geneve 6:454.1833; id.in DC., Prodr.9:361.1845; Clarke in Hook., Fl.Brit.Ind.4:213.1883; Gagnep. et Courch.in Lec.,Fl. Indo-Chine 4:269.1915.- Convolvulus pilosus Noropnh., Verhandel. Batav. Gen.5 : 71. 1827, nomen nudum (ex Hassk.) -Ipomoea angularis (Burm.f.) Choisy in Mem.Soc.Phys.Geneve 6:454.1833.- Ipomoea vitifolia (Burm.f.) Blume var. angularis (Burm.f.) Choisy in DC.,Prodr.9:361.1845; Miq.,Fl.Ned.Ind.2:607.1857. **-Fig.31-32; Plate, 18.**

A prostate herb or twiner; stem green with reddish-purple tinged, slightly angular, covered with long patent hairs. Leaves orbicular in outline, palmately 5-7 triangular lobed, 5-7 by 4-5 cm, apex acute, acuminate or mucronulate, base cordate, margin entire or sometimes dentate, sparsely to densely hairy on both surfaces or more densely beneath, or glabrous above; petioles covered with long patent hairs, 2-7 cm long. Flowers in cymose, sometimes 1-flowered; peduncles pilose with long patent hairs, 3-21 cm long; bracts 2, minute, linear, 1-2 mm long; pedicels pilose, 1-1.5 cm long. Sepals ovate, ovate-oblong, 1.3-1.7 by 0.6-0.8 cm, more or less pilose, the 3 inner ones sometimes glabrous; Corolla funnel-shaped, 4-6 cm long, 3-3.5 cm in diameter, bright yellow, glabrous, midpetaline band distinctly 5-nerved. Base of filaments dilated, glabrous. Ovary glabrous, globose; Fruit capsule, depressed globose, thin pericarp, straw-yellow, slightly translucent. Seeds dull black, glabrous.

Thailand.- NORTHERN : Mae Hong Son, Chiang Mai, Chiang Rai, Phrae, Sukhothai; NORTH-EASTERN : Loei; EASTERN : Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN : Kanchanaburi, Ratchaburi, Prachuap Khiri Khan; CENTRAL : Saraburi, Bangkok; SOUTH-EASTERN : Chon Buri, Rayong, Chanthaburi; PENINSULAR : Chumphon.

Distribution.- India to Ceylon, Indo-China, eastward throughout Malaysia (Austin, 1980).

Ecology.- In mixed evergreen forest and deciduous forest, open ground near stream, waste ground, along the roadside, beside canal bank, forest margin. Altitude from sea level upto 500 m. Flowering October - March.

Vernacular.- Ching cho lueang (จิงจ้อเหลือง), Ching cho khon (จิงจ้อขน), Ching cho luang (จิงจ้อหลวง), Ching cho yai (จิงจ้อใหญ่ : Northern).

Uses. Used for poulticing and an infusion is drunk for high fever (Van Ooststroom, 1953).

Specimens examined.- Amphorn 68 (BKF); B. Na Songkhla 606 (CU); E. Smith 235 (BK); Kerr 13937 (BK); Maxwell 72-83 (BK), 74-32 (BK); Prayod 1224 (BK); Sakol 330 (BK); Staples & Wathaniyakom 144 (BKF); TBPS 1224 (BKF); T. Santisuk 6897 (BKF).

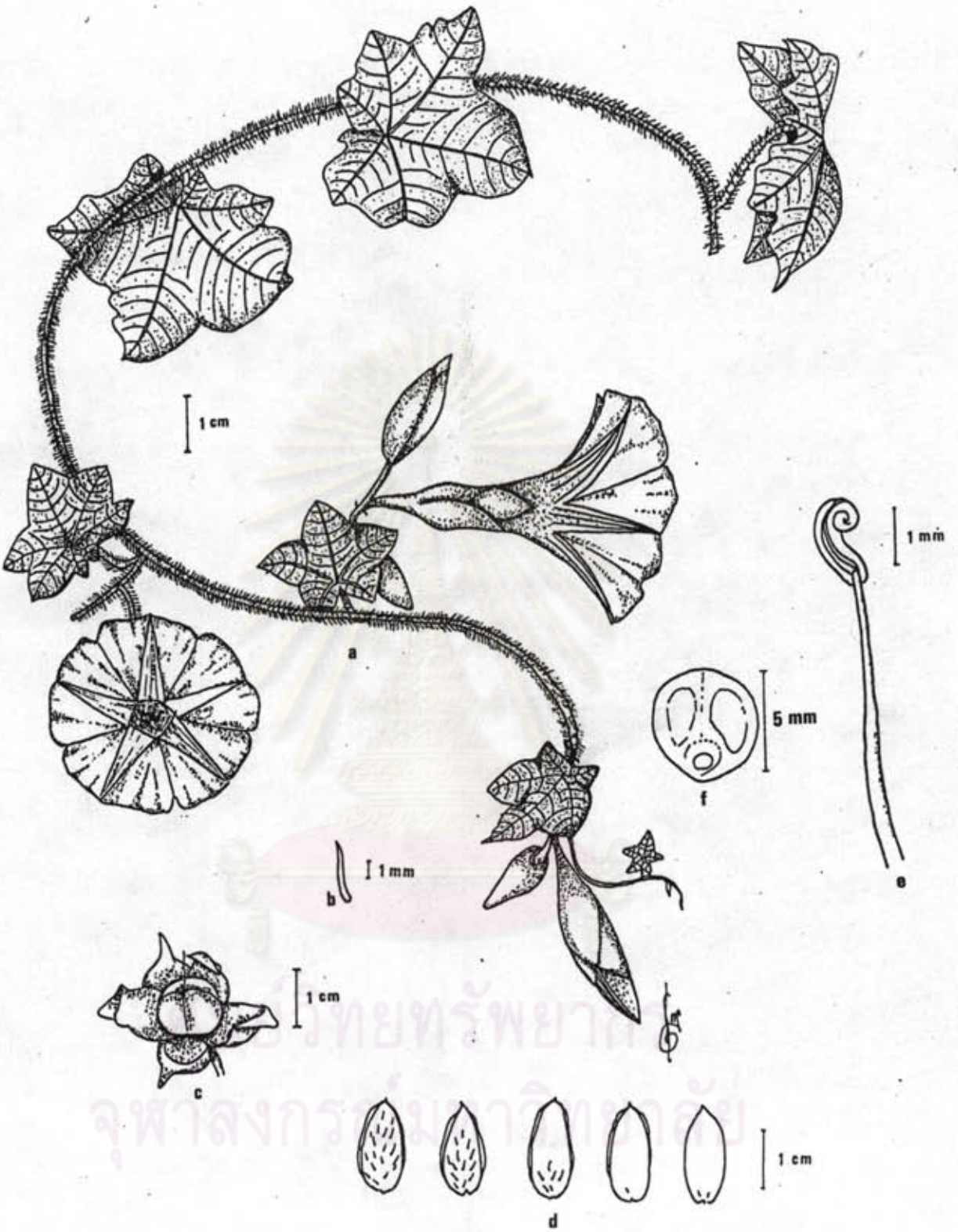



Figure 30. Merremia vitifolia (Linn.) Hall.f. - a. flowering branch, b. bract, c. fruit, d. sepals, e. stamen, f. seed.

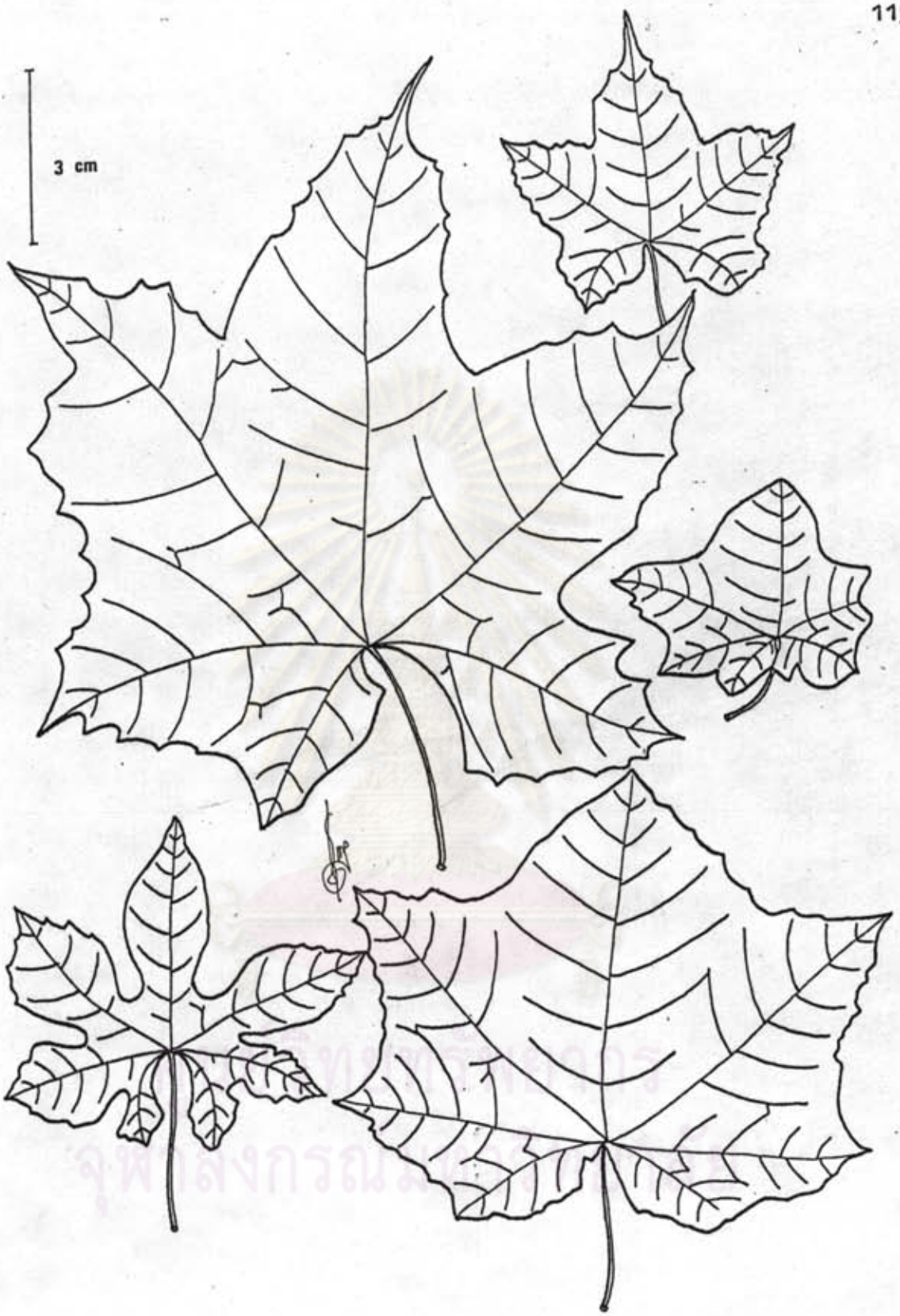



Figure 34. M. vitifolia (Linn.) Hall.f. - variation of leaves.

Plate 18. Merremia vitifolia (Linn.) Hall.f.

## 8. Neuropeltis

Wall. in Roxb.,Fl.Ind.2:43.1824; Choisy in Mem.Sovc.Phys.Geneve 6:491. 1833; Clarke in Hook.f.,Fl.Brit.Ind.4:224.1883; Peter in Engl.-Prantl. Nat.Pfl.fam.4, 3a:16.1891; Gagnep. et Courch. in Lec.,Fl.I.-C. 4:290. 1915; Ridley, Fl.Mal. Pen. 2:453.1923; Van Ooststr.,Blumea 3:81.1938; id.in Fl.Mal.1, 4:400.1953.

Large woody twiner. Leaves elliptic, ovate, oblong, chartaceous or coriaceous. Flowers axillary or subpaniculate towards the end of the branches, small in tomentose raceme; bracts small, adnate to the pedicel, enlarge in fruits, broadly elliptic or orbicular, scarious, distinctly reticulated nerved. Sepals 5, equal to subequal, orbicular. Corolla small, rotate to broadly campanulate, deeply 5-lobed, white or reddish. Stamens 5, exserted or included, glabrous or hairy at the base of filaments; pollen smooth, colpate. Ovary hairy, perfetly or imperfectly 2-celled, 4-ovuled; styles 2, stigmas 2, peltate, lobed or kidney-shaped. Fruits capsule, small, glabrous. Seed 1, black, smooth, opaque.

A small genus of about 11 species, about 7 species distributed in West tropical Africa and 4 species in tropical Asia and Southeast Asia (Van Ooststroom, 1953). Only one species found in Thailand.

8.1 Neuropeltis racemosa Wall. in Roxb.,Fl.Ind.2:44.1824; Choisy , Mem. Soc.Phys.Geneve 6:491.1833; id.in Dc.,Prodr.9:437.1845; Miq.,Fl.Ned.Ind. 2:626.1857; Clarke in Hook.f,Fl.Brit.Ind.4:225.1883; Gagnep. et Courch.in Lec.,Fl.I.-C. 4:290.1915; Ridley, Fl.Mal. Pen.2:453.1923; Van Ooststr., Blumea 3:81.1938; Kerr in Fl.Siam.En.3, 1:90.1951. Van Ooststr., Fl.Mal. 1, 4:400.1953. -Fig.32-33.

A large woody twiner. Young branches tomentose, soon glabrescent. Leaves broadly elliptic to narrowly elliptic, elliptic-oblong sometimes obovate or lanceolate, 5.5-15.5 by 3-8 cm, apex acute or short acuminate, base acute or obtuse, sometimes attenuate, margin entire, glabrous sometimes sparsely hairy, coriaceous, nerves 6-8 pairs. Inflorescences axillary, in brown tomentose raceme; bracts minute, immediately below the calyx, ovate to ovate lanceolate, pubescent, bracts in fruits enlarged, ovate, elliptic to orbicular, apex emarginate or slightly emarginate and mucronulate, 3-5 by 3-5 cm. Sepals minute, orbicular, sometimes scarious at the margin, slightly broader than long, 2-2.5 by 2-3.5 mm, covered with appressed brown hairs. Corolla small, campanulate, 4-5 mm long, 5 mm broad, pilose outside. Stamens exserted; filaments hairy at base. Disk present. Ovary hairy; styles free; stigmas peltate. Fruits conical, glabrous. Seeds 4, black, glabrous, opaque.

**Thailand.-** NORTHERN : Chiang Mai, Chiang Rai, Lampang, Phitsanulok; EASTERN : Nakhon Ratchasima, Buri Ram, SOUTH-WESTERN : Ratchaburi, Prachuap Khiri Khan; CENTRAL : Saraburi. SOUTH-EASTERN : Prachin Buri, Chon Buri, Rayong, Chanthaburi, Trat; PENINSULAR : Chumphon, Ranong, Phuket.

**Distribution.-** Hainan, South and West India, Tenasserim, Malaysia. (Van Ooststroom, 1954).

Ecology.- By stream, edge of evergreen forest, patch in old paddy field. Altitude from 20 to 200 m. Flowering in November-February.

Vernacular.-Kaaro (กาโร : Ranong), Non lap (นอนหลับ), Phayaa non lap (พญานอนหลับ : Nakhon Sawan), Man rue see (มันฤาษี : Central), Maat plaai rong (มาดพล้ายโรง : Nakhon Ratchasima), Maa thalaai rong (ม้าทลายโรง : Udon Thani, Nakhon Ratchasima, Prachin Buri).

Uses.- An alcoholic extract of stems are used as muscle relaxtant, tonic and to relieve toothache. (ก่องกานดา, 2528)

Specimens examined.- C Phengkhlai et al 3260 (BKF); Sakol 204 (BK), 2875 (BK); T. Smitinand 4159 (BKF).

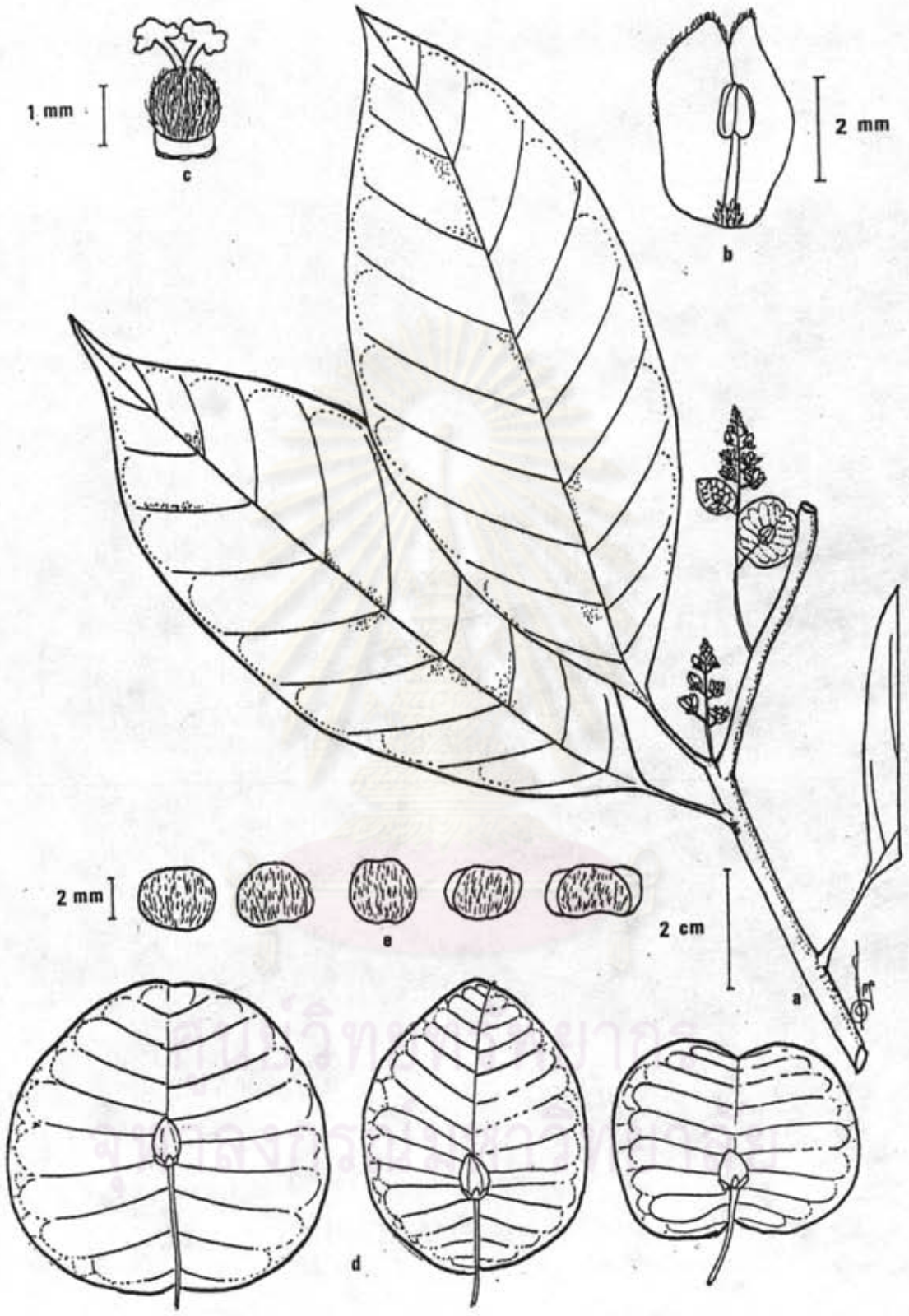



Figure 32. Neuropeltis racemosa Wall. - a. flowering branch, b. stamen with some part of corolla, c. pistil, d. variation of fruit with enlarged bract, e. sepals.

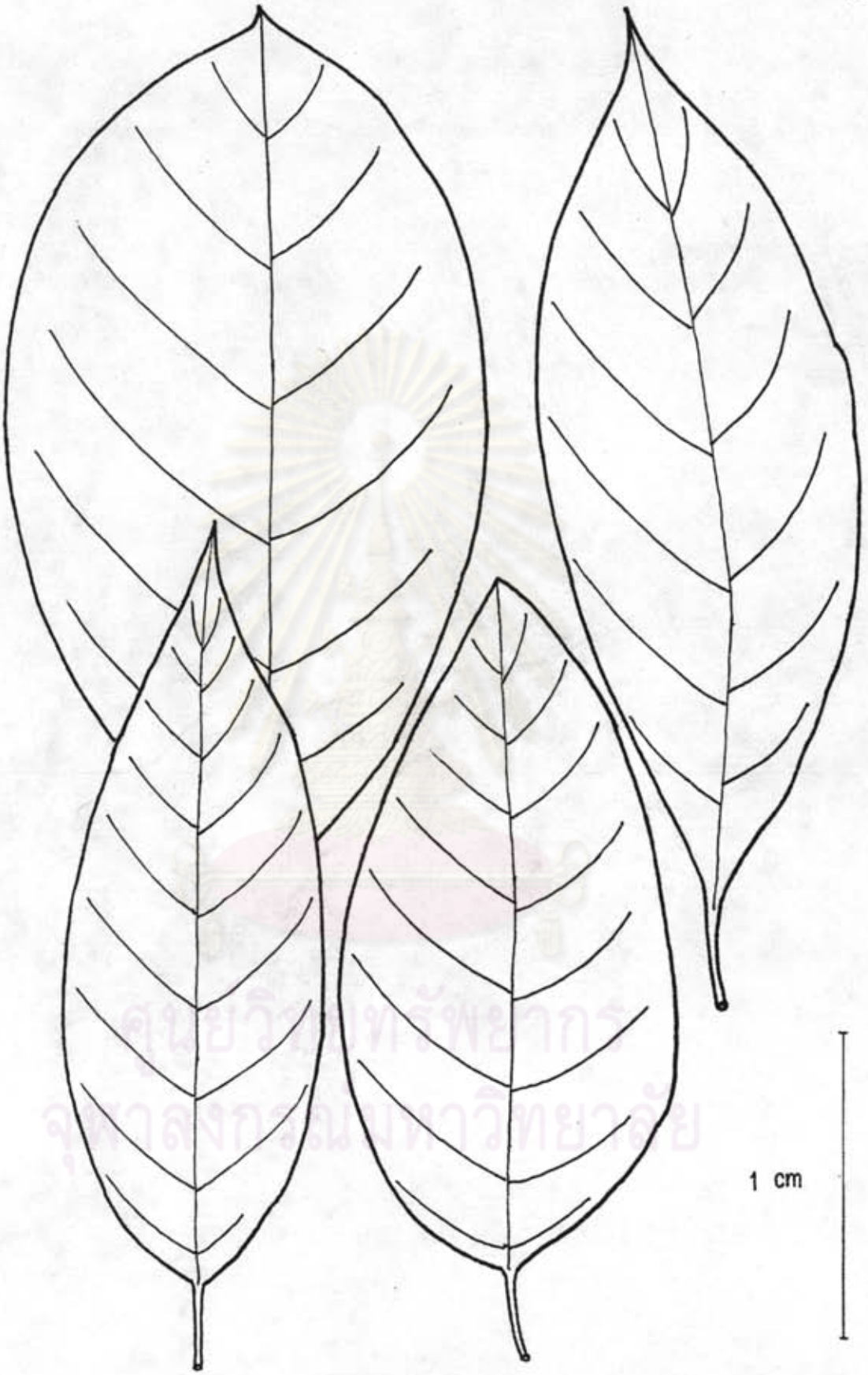



Figure 33. N. racemosa Wall. - variation of leaves.

## 9 OPERCULINA

S. Manso, Enum.Subst.Bras.:16.1836; Van Ooststr.,Blumea 3:361.1939; id. in Fl.Mal.1, 4:454.1953. Back. & Bakh., Fl.Java 2:490.1965; Austin & Ghazanfar, Fl.W.Pakistan 126:57.1979; AustinG in Dassanayake, Fl.Ceylon 1:356.1980; Khan, Fl.Bangladesh 30:48.1985.- Spiranthera Boj.,Hort. Maurit.:226.1837.- Piptostegia Reichb.,Nom.:113.1841.

Large herbaceous twiner. Stem, peduncles, petioles often winged. Leaves entire to undulate, angular or digitate, cordate, subcordate or rounded at the base. Flowers large, axillary, solitary to few-flowered cymes; bracts deciduous, small to large size. Sepals 5, large, membranous or scarious at the margin, mostly glabrous, often enlarged in fruit. Corolla funnel-formed or campanulate, 5 lobed, white, pale yellow to yellow, glabrous or hairy on the outside of midpetaline band. Stamens and stigma included. Stamens 5, inserted on the corolla tube, base of filaments dilated and covered with hairs, anthers twisted, sometimes with glands, pollen smooth, 3-colpate. Disk annular. Ovary glabrous, 2-locules, each locule with 2 ovules; style 1, stigmas 2-globular. Fruits capsule, the upper part of pericarp (operculum) seperated from the endocarp. Seeds 4 or fewer, black, glabrous or pilose along the edge.

A genus of about 20 species in tropics of both hemispheres. Three species found in Thailand.



### Key to species

1. Midpetaline band hairy outside; stem terete, not winged.
   2. Sepals elliptic, bract 0.5 cm long; fruit globular, top of the fruit acute, operculum thin and papery.

.....9.1 O. petaloidea

2. Sepal orbicular, bracts 1-2 cm long; fruit depressed globose, operculum thick and leathery.

.....9.2 O. riedeliana

1. Midpetaline band glabrous; stem usually winged.

.....9.3 O. turpethum

9.1 Operculina petaloidea (Choisy) Van Ooststr. in Blumea 3:369.1939; Kerr in Fl.Siam.En.3, 2:8.1951.- Convolvulus crispatulus Wall.,Cat.n. 1403.1828, nomen nudum.- Ipomoea petaloidea Choisy in Mem.Soc.Phys. Geneve 6:451.1833; id.in Fl.Brit.Ind.4:212.1883; id.in Ind.Trees :488.-; id. in Fl. I.-C. 4 :257.1915.- Ipomoea xanthantha Kurz.,For.Fl.Burma 2:219.1877.- Merremia petaloidea (Choisy) Boerl.,Handl.Fl.Ned.Ind.2: 509.1899, quoad nomen tantum.- Merremia crispatula (Wall.) Prain, Bengal Pl.2:730. -Fig.34-35; Plate 19.

A twining herb. Stem striate, glabrous. Leaves vary in shapes, linear-oblong to broadly ovate; 9-18 by 2-9 cm; apex obtuse and mucronulate; base rounded or subcordate at the base; margin entire; the young leaves densely pubescent on the lower surface, glabrous or sparsely pubescent above; nerves 6-12 pairs; petioles 1.5-3 cm long. Flowers one to several; peduncles 3 cm long; pedicels 1.5-2 cm long; bracts elliptic, glabrous, 0.5 mm long. Sepals elliptic, concave, green with red tinged, glabrous, membranous at the margin, 1.4-1.5 cm by 1-1.2 cm. Corolla funnel-formed, pale yellow, densely brown pilose at the midpetaline bands, 3.5-4 cm long, 4-5 cm in diameter. Anthers with glands. Ovary globose, Fruits capsular, 1.3-1.5 cm in diameter, operculum thin. Seeds 4, dull black, hairy at the edge.

**Thailand.**- NORTHERN : Mae Hong Son, Chiang Mai, Chiang Rai; EASTERN : Nakhon Ratchasima; SOUTH-WESTERN : Kanchanaburi.

**Distribution.**- India, Burma, Indo-China (Kerr, 1951).

**Ecology.**- At edge of scrub and deciduous forest. Altitude 180-450 m. Flowering in February - March.

**Vernacular.** -

**Uses.** -

Specimens examined.- C. Khunwasi 31 (CU); Kerr 5118 (BK); Staples & Wathaniyakom 289 (BKF).

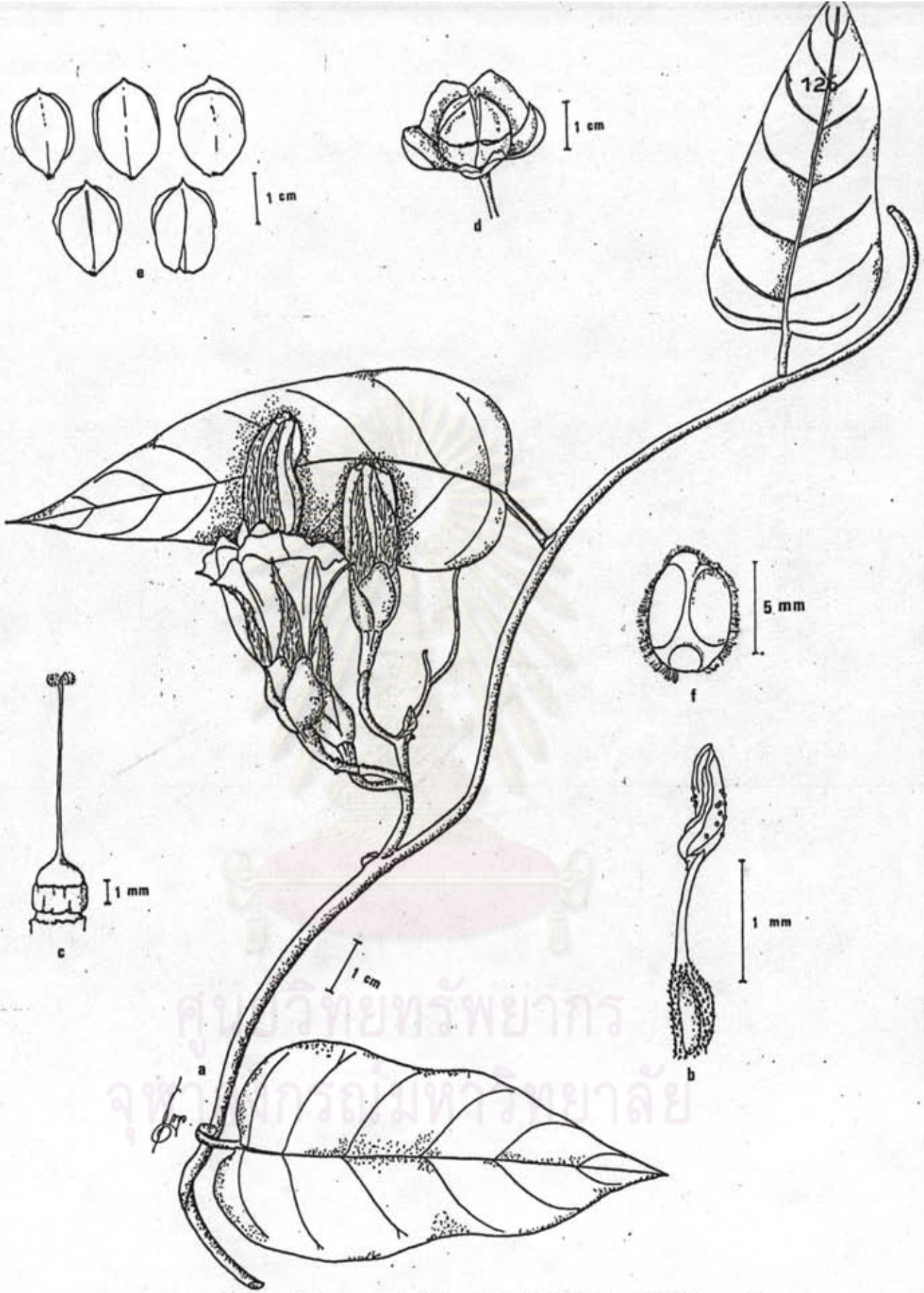



Figure 34. Operculina petaloidea (Choisy) Van Ooststr. - a. flowering branch, b. stamen, c. pistil, d. fruit, e. sepals, f. seed.

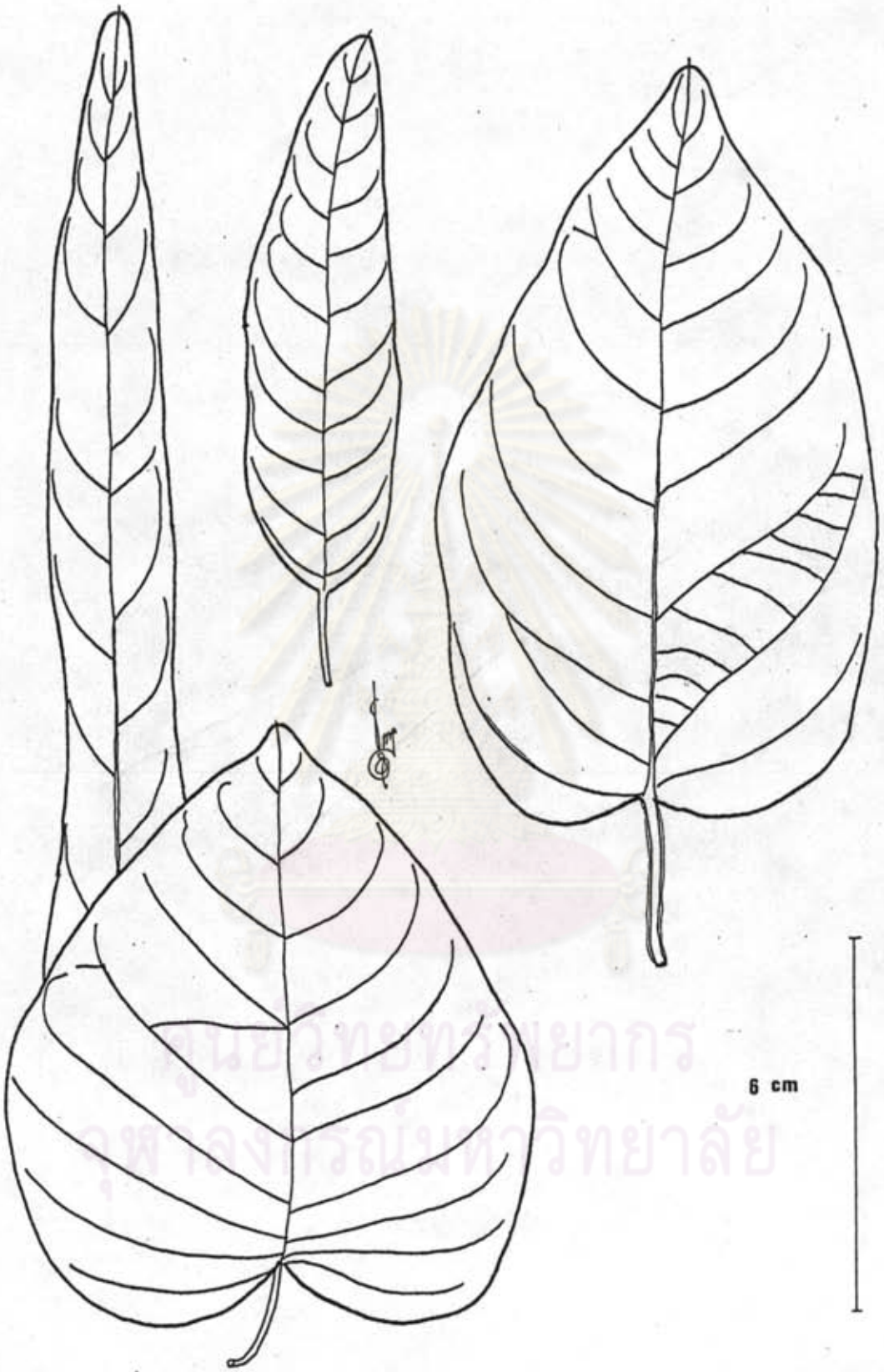



Figure 35. O. petaloidea (Choisy) Van Ooststr. - variation of leaves.

Plate 19. Operculina petaloidea (Choisy) Ooststr.

9.2 Operculina riedeliana (Oliv.) Van Ooststr.,Blumea 3:366.1939, id. in Fl.Mal.1, 4:457.1953.- ? Convolvulus bufalinus Lour.,Fl.Cochinch. 1:109.1790.- ? Ipomoea bulfalina (Lour.) Choisy in Mem.Soc.Phys.Geneve 6:452.1833.- Convolvulus platypeltis Zipp.ex Spanoghe in Linnaea 15:383. 1841.- Ipomoea riedeliana Oliv.in Hook.,Ic.Ser.3, 5, 1, t.1424.1883.- Merremia riedeliana (Oliv.) Hall.f. in Engl.,Bot.Jahrb.16:552.1893.- Ipomoea petaloidea Choisy var.andamanica (Prain) Prain in Journ.As.Soc. Dengal 63:110.1894.- Merremia platypeltis (Zipp.ex Spanoghe) Prain Ic. :307.- Operculina bulfalina (Lour.) Hall.f.in Meded.Rijksherb.Leiden 1: 26.1910, quoad specim. tantum. -Fig.36; Plate 20.

A prostrate or twiner. Stem woody in older parts glabrous, terete. Leaves ovate, broadly ovate to orbicular, 7-11.5 by 6.5-8.5 cm, apex acuminate with sharp point, base cordate to truncate, margin slightly undulate, glabrous on both surfaces; petioles glabrous, slender, 2-6 cm long. Flowers one to few-flowered, peduncles glabrous, terete, 4-10 cm long; pedicels glabrous clavate above, thickened in fruit, 1.5-2 cm long; bracts deciduous, oblong, acute, glabrous, 1-2 cm long. Sepals concave, glabrous, equal in length, scarious at the margin, orbicular, two outer sepals emarginate and mucronulate at the apex, three inner ones rounded and mucronulate at the apex, 1.3-1.5 by 1.1-1.3 cm, in fruit upto 2 cm long and enclosing the capsule. Corolla broadly funnel-formed, 4.5-6 cm long, 3.5-5.5 cm in diameter, creamy white, densely pilose at the midpetaline bands. Anthers glandular. Ovary glabrous. Fruits capsule, depress globose with leathery operculum, about 2 cm in diameter. Seeds 4, black, pilose along edges.

**Thailand.**- PENINSULAR : Phangnga.

**Distribution.**- Indo-China (?), Malaysia, Philippines, West and East New Guinea, West Java, South Celebes, Lesser Sunda Islands (Van Ooststroom, 1953).

Ecology.- On the disturbed and open sunny places along the roadside. Altitude ca.120 m. Flowering in January-February.

Vernacular.- Ching cho ta lab (จิงจ้อตลับ ; author).

Uses.- -

Specimens examined.- C.Khunwasi 44 (CU).

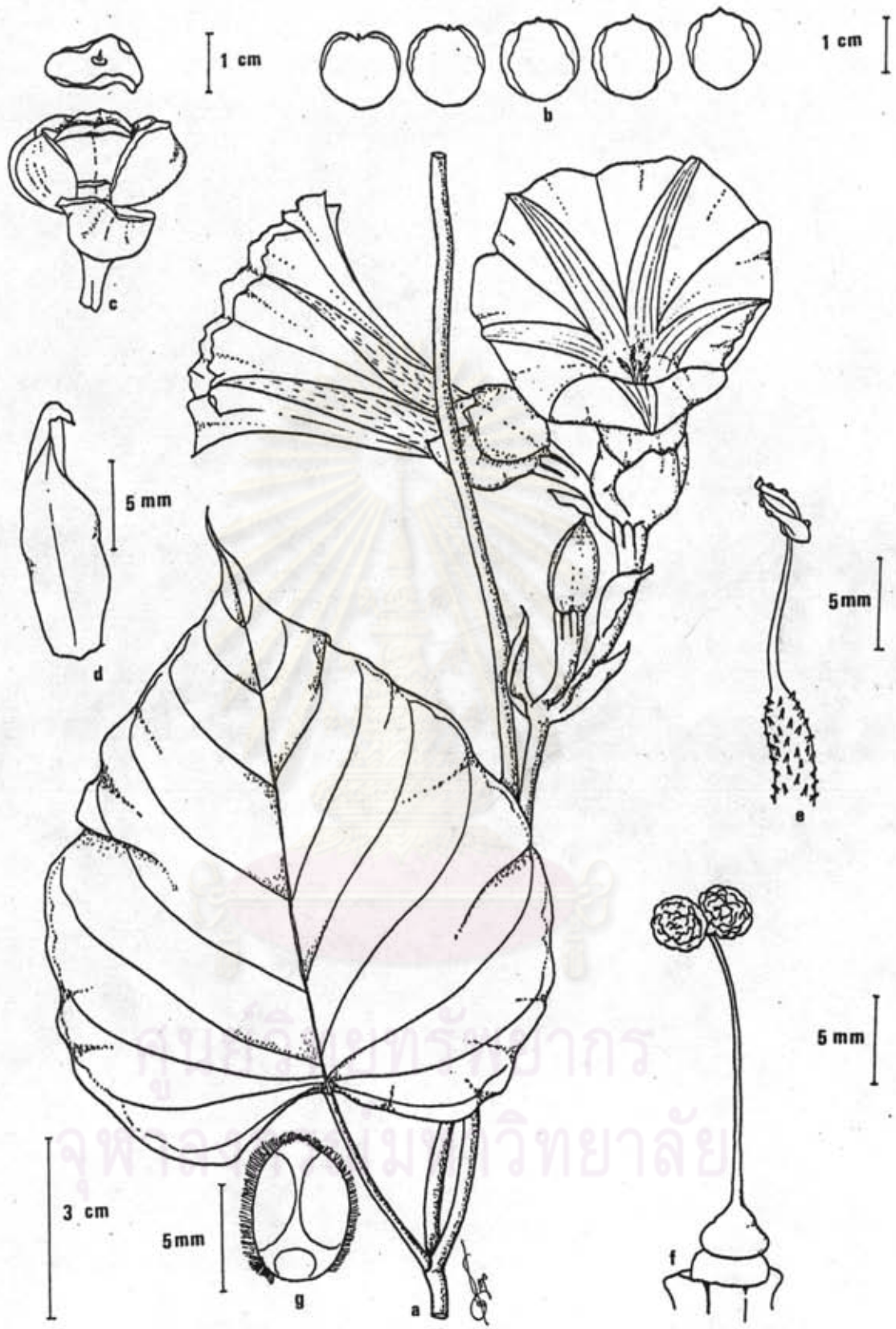



Figure 36. Operculina riedeliana (Oliv.) Van Ooststr. - a. flowering branch, b. sepals, c. fruit, d. bract, e. stamen, f. pistil, g. seed.

Plate 20. Operculina riedeliana (Oliv.) Van Ooststr.

9.3 Operculina turpethum (L.) S.Manso, Enum.Subst.Bras.:16.1836; Hall.f.in Engl.,Bot.Jahrb.18:120.1894,; Gamble, Fl.Pres.Madras 5:929. 1923; Ridley, Fl.Mal. Pen. 2:463.1923; Merrill, Enum. Philipp.Fl.Pl.3: 363.1923; Van Ooststr., Blumea 3:361.1939; id.in Fl.Mal.1, 4:454.1953; Kerr in Fl.Siam.En.3, 2:8.1954; Austin in Dassanayake, Fl. Ceylon 1:356. 1980.- Convolvulus turpethum Linn., Spec.Plant.:155.1753; Bot Mag. t.2093.1819; Hassk., Pl.Jav.Rar.:518.1848.- Convolvulus anceps Linn., Mant.1:43.1767; Vahl.,Symb.3:31.1794.- Convolvulus triqueter Vahl., l.c.:30.- Ipomoea turpethum (L.) R.Br. Prodr.Fl.Nov.Holl.ed.1:485. 1810; Benth.,Fl.Austr.4:418.1869; Clarke in Hook.f., Fl.Brit.Ind.4:212. 1883; Watt, Dict.Econ.Prod.Ind.4:493.1890; Gagnep.et Courch.in Lec.,Fl. I.-C. 4:263.1915.- Spiranthera turpethum (L.) Boj.,Hort.Maurit. :226.1837.- Ipomoea reptans Blanos, Fragm. Pl. Filip. : 55.1851.- Ipomoea ventricosa Llanos, l.c.:56; F.-Vill.and Naves, l.c.:40, non G.Don (according to Merrill).- Argyreia alulata Miq.,Fl.Ned.Ind.2:587. 1857.- Ipomoea turpethum (L.) R.Br. var. anceps Miq.,Fl.Ned.Ind.2:607. 1857.- Argyreia alata Montr.in Mem.Acad.Lyon 10:236.1860.- Operculina turpethum (L.) Peter in Engl.-Prantl, Nat. Pfl. fam.4, 3a :32.1891.- Ipomoea diplocalyx Baker in Kew Bull.:71.1894.- Operculina turpethum (L.) S.Manso var. heterophylla Hall.f. in Versl.'s lands Plantent.1895: 127.1896.- Merremia turpethum (L.) Rendle in This.-Dyer, Fl.Trop. Afr.4,2:102.1905. -Fig.37; Plate 21.

A prostrate or twining herb. Stem triangular, narrowly winged, green when young and turned to reddish purple or brown in the older parts. Leaves vary in shapes, ovate-lanceolate, broadly ovate or ovate; 3.5-10 by 2-8 cm, apex acute or acuminate, base cordate, subcordate or obtuse somewhat hastate, margin entire; upper surface glabrous or appressed pilose, lower surface pubescent; petioles covered with short hairs, sometimes winged, 1-5 cm long. Flowers one to few; peduncles pubescent, 1-1.5 cm long; bracts elliptic-oblong, concave, reddish-green, pubescent, 1-1.5 cm long. Sepals concave, two outer sepals reddish-green, broadly ovate, pubescent outside, 2 by 1.1 cm, three

inner ones green, ovate, pubescent, 1.3 by 1 cm. Corolla funnel-formed, white, glabrous, 4-4.5 cm long, 3.5-4.5 cm in diameter. Filaments sparsely hairy sometimes with glandular hairs at base. Ovary conical. Fruits capsule, depressed globose, operculum thin, when falling showed translucent endocarp. Seeds 4 or less, dull black, glabrous.

**Thailand.**- NORTHERN : Chiang Mai, Chiang Rai; Lampang, Phrae; SOUTH-WESTERN : Kanchanaburi, Ratchaburi; CENTRAL : Angthong, Ayutthaya, Saraburi, Bangkok; PENINSULAR : Surat Thani.

**Distribution.**- Tropical Africa, Mascarene Island, India, China, Japan (Kerr, 1954), South and Southeast Asia, tropical Australia and Polynesia (Van Ooststroom, 1953).

**Ecology.**- On sandy soil, along the roadside, riverside, open waste ground, in sunny places, in dry deciduous forest. Altitude from 25 to 200 m. Flowering in October - April.

**Vernacular.**- Chingcho liam (จิงจ้อเหลี่ยม : Northern), Chingcho daeng (จิงจ้อแดง : Angthong).

**Uses.**- The bark of the root is used as a purgative; the stems are used for tying purpose (Van Ooststroom, 1953). The latex in the root has been used as a laxative (Austin, 1980).

**Specimens examined.**- B. Na Songkhla 607 (CU), Bunchai 61 (BKF), C. Khunwasi 24 (CU), E. Smith 359 (BK), Maxwell 75-146 (BK), Prayod 1151 (BK), Put 2412 (BK), Sakol 377 (BK).

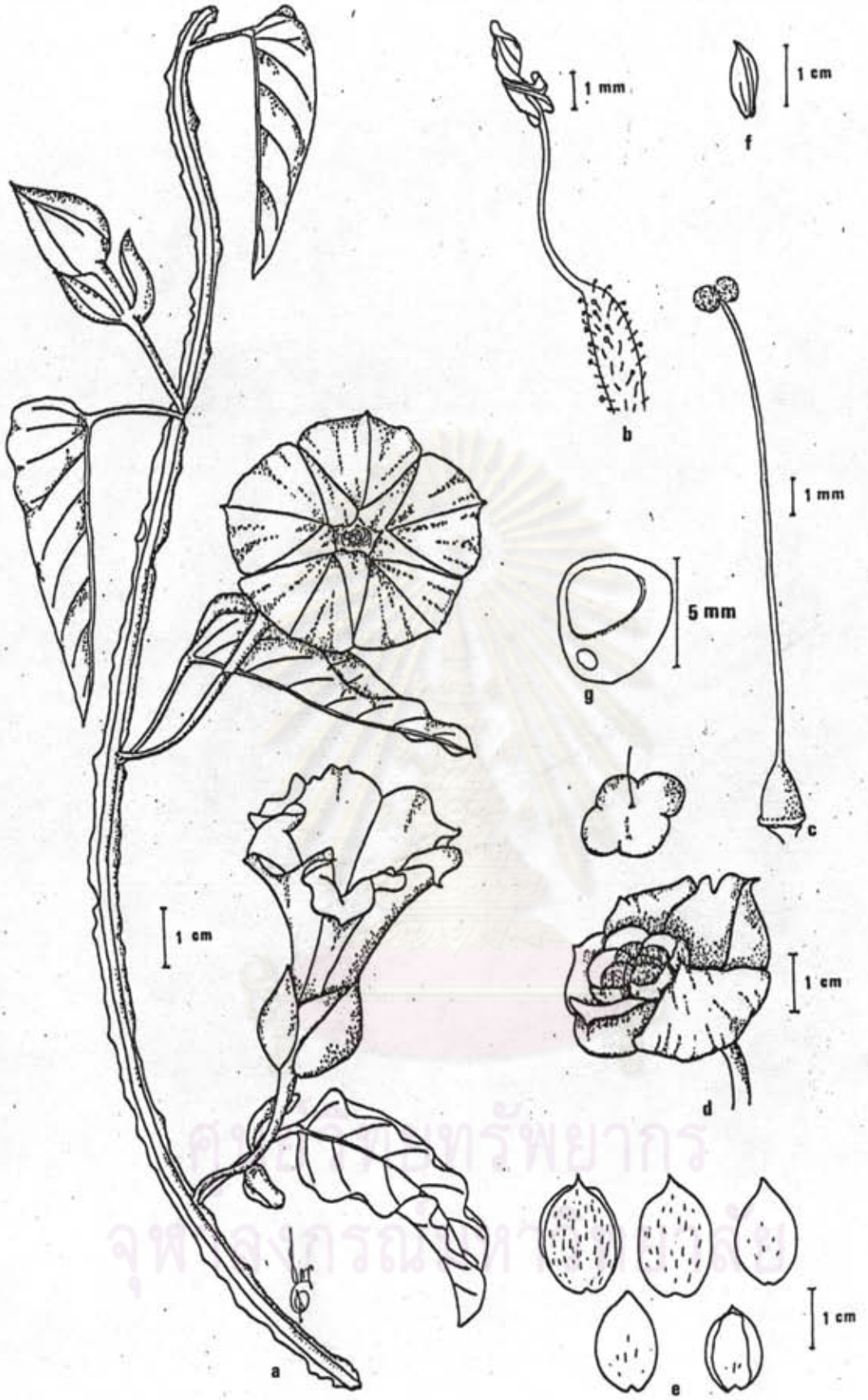



Figure 37. Operculina turpethum (Linn.) S. Manso - a. flowering branch, b. stamen, c. pistil, d. fruit, e. sepals, f. bract, g. seed.

Plate 21. Operculina turpethum (Linn.) S. Manso

## 10. Xenostegia

Austin & Staples, Brittonia 32(4) : 533.1980.

A herbaceous twiner, sometimes prostrate. Leaves linear, oblong-linear, long elliptic to oblanceolate or spathulate, apex acute, obtuse, truncate to emarginate or mucronulate and tridentate, base sagittate to truncate or hastate, margin entire, lobe at the base dentate; petioles 0.5-3 mm long. Flowers 1-2-flowered in cyme. Sepals 5, subequal, or two outer ones larger than the inner ones, oblong to oblong-ovate, acute to obtuse, rarely sagittate at base, the inner sepals generally narrowly lanceolate to lanceolate-acuminate. Corolla funnel-formed to campanulate, 5-lobed, pale yellow to white. Stamens included and inserted on the corolla tube; anthers straight when dehisced. Pollen smooth, pantoporate. Ovary glabrous; style 1; stigma 2-globular, not undulate. Fruits globose, ovate, 4 valves, glabrous to pubescent. Seeds 4 or fewer.

A small new genus of 2 species, seperated from Merremia in 1980. (Austin & Staples, 1980) Only one species found in Thailand.

10.1 Xenostegia tridentata (Linn.) Austin & Staples in Brittonia 32(4) :533.1980.- Convolvulus tridentatus Linn.,Sp.Pl.:157.1753.- Evolvulus tridentatus (Linn.) Linn.,Sp.Pl.ed.2:392.1762.- Ipomoea tridentata (Linn.) Roth. in Roemer, Arch.Bot. 1, 2:38.1798; Clarke, Fl.Brit.Ind.4: 203.1883.- Merremia tridentata (Linn.) H.Hall.,Bot.Jahrb.Syst.16:552. 1893; Austin in Dassanayake, Fl.Ceylon 1:351.1980.- Merremia hastata (Desr.) Hall.f.,Bot.Jahrb.Syst.16:552.1893; Kerr, Fl.Siam.En.3, 2:3.1954; Austin in Dassanayake, Fl.Ceylon 1:351.1980.- Merremia tridentata (Linn.) Hall.f. ssp. hastata (Desr.) Van Ooststr.,Blumea 3:317.1939; id. in Fl.Mal.1, 4:445.1953; Kerr, Fl.Siam.En.3, 2:3.1954; Austin in Dassanayake, Fl.Ceylon 1:351.1980.- Merremia tridentata ssp. genuina Van Ooststr.,Blumea 3:315.1939; Austin in Dassanayake, Fl. Ceylon 1 : 351. 1980. -Fig.38-39; Plate 22.

A herbaceous twiner, sometimes prostrate, glabrous. Leaves linear -oblong, lanceolate-oblong, 3-5 by 0.4-0.7 cm, attenuate towards the acute apex, base hastate contracted above the base, with more or less stem clasping, margin entire or slightly undulate, the margin at the hastate base dentate, nerves 9-13 pairs; petioles glabrous, very short or nearly sessile, 1-2 cm long. Flowers axillary, solitary or 2-3-flowered cymes; peduncles thin, glabrous, 1-5 cm long; bracts linear, minute, 1 mm long or less; pedicels glabrous, 0.7-0.8 cm long. Sepals oval-lanceolate, lanceolate, attenuate or acute at the apex, glabrous, 4-6 by 1-2 mm. Corolla funnel-formed, 1.5-1.7 cm long, 1-1.5 cm in diameter, white or creamy white, often with brown or reddish purple center, glabrous. Base of filaments slightly dilated, sparsely covered with short hairs. Disk thin. Fruits capsule, globose, wall papery, glabrous. Seeds 4, glabrous, brown or black.

Thailand.- NORTHERN : Chiang Mai; NORTH-EASTERN : Kalasin, Khon Kaen; EASTERN : Surin; SOUTH-WESTERN : Kanchanaburi, Prachuap Khiri Khan; SOUTH-EASTERN : Chon Buri, Rayong; PENINSULAR : Chumphon, Surat Thani, Phangnga, Phuket, Nakhon Si Thammarat, Trang, Satun, Songkhla, Pattani,

Yala.

Distribution.- Tropical East Africa, tropical Asia from the Khasia Hills and Bengal southwards to Ceylon, eastwards and southwards to China, the Malay Peninsula, the Malay Archipelago, and tropical Australia (Van Ooststroom, 1939).

Ecology.- On sandy soil, along the roadside, riverside, open waste ground, sunny places, dry deciduous forest. Altitude from sea level upto 500 m. Flowering in August - May.

Vernacular.- Thao tot maa (เถาตดหมา : Kanchanaburi).

Uses.- The leaf-poultices made from it may be applied to the head for fever.

Specimens examined.- C. Chermsirivatana 119 (BK), C. Khunwasi 25 (CU), Kasin 166 (BK), Kerr 1132 (BK), P. Suwanakoset 1735 (BKK), Put 8 (BK), R. Gusink et P. Hiepko - (BK), S. Bloembergen 30 (BKF), Staples & Wathaniyakom 351 (BKF), Umpai 279 (BK).

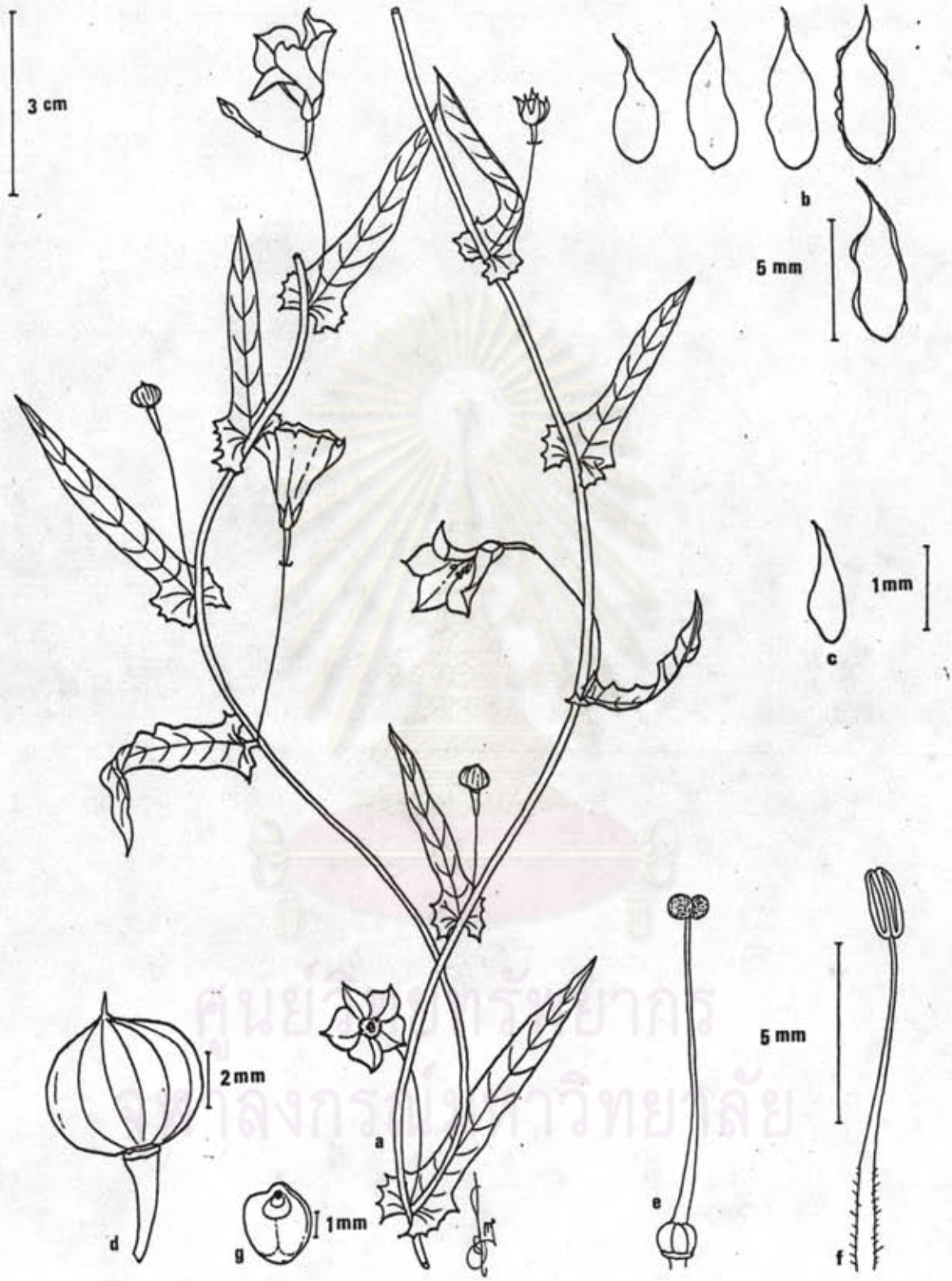



Figure 38. Xenostegia tridentata (Linn.) Austin & Staples - a. flowering branch, b. sepals, c. bract, d. fruit, e. pistil, f. stamen, g. seed.


Figure 39. X. tridentata (Linn.) Austin & Staples - variation of leaves.

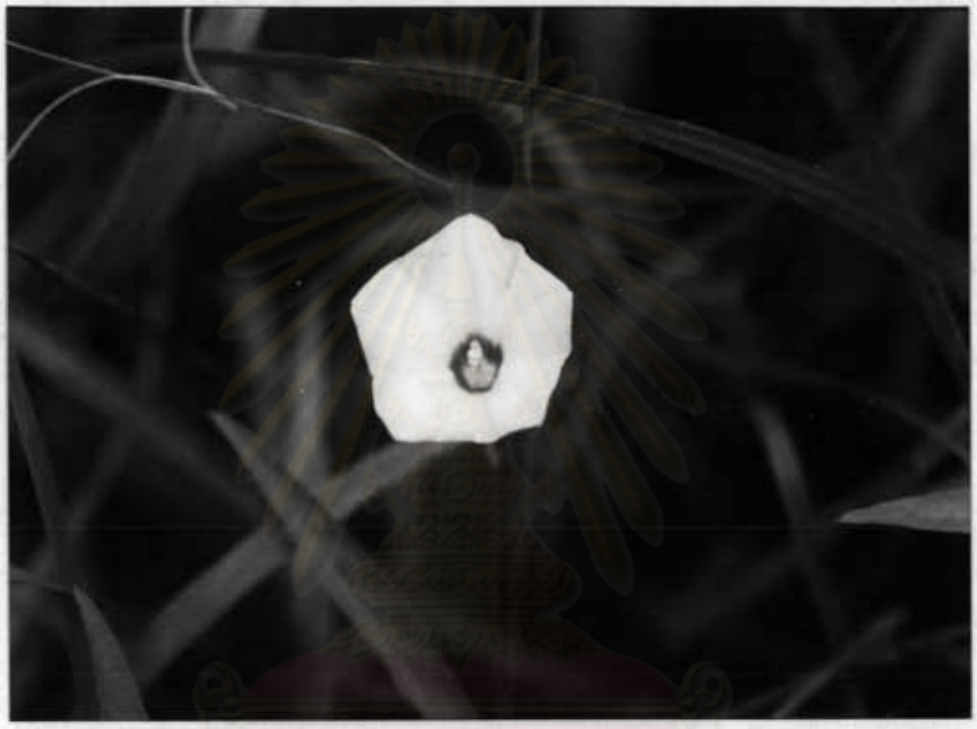


Plate 22. Xenostegia tridentata (Linn.) Austin & Staples

Table 1 Floristic regions, altitude and flowering periods of 26 species and 1 variety.

| SPECIES | FLORISTIC REGIONS | | | | | | | ALTITUDE DISTRIBUTION | FLOWERING PERIODS |
|---|---|---|---|---|---|---|---|---|---|
| | N | NE | E | SW | C | SE | P | | |
| A. martinicensis | | | * | * | * | * | * | 0 - 25 m | Oct.-May |
| B. semidigyna | | | | | * | * | * | 0 -100 m | Oct.-Feb. |
| C. chinensis | * | * | | | * | | | 0 -340 m | Aug.-Apr. |
| C. reflexa | * | | | | | | | 1400-1900m | Dec. |
| E. alsinoides var. alsinoides | * | * | * | * | | | * | 0 -400 m | Sep.-Apr. |
| E. alsinoides var. hirsutus | | | | | | | * | sea level | Jul.-Mar. |
| E. nummularius | * | | | * | | | | 200-300m | Oct.-Feb. |
| H. scandens | * | | | * | * | * | * | 0 -990 m | Sep.-Apr. |
| J. paniculata | * | * | * | * | * | * | * | 0 -600 m | Oct.-Mar. |
| J. pentantha | Cultivated | | | | | | | | Oct.-Mar. |
| M. bambusetorum | | | * | | | * | | 400-750m | Nov.-Feb. |
| M. collina | * | * | | | | | | 800 m | Nov.-Dec. |
| M. emarginata | | | | * | * | | | 0 -800 m | Aug.-Mar. |
| M. gemella | * | * | | * | * | * | | 0 -100 m | Oct.-Jan. |
| M. hederacea | * | * | * | * | * | * | * | 0 -375 m | Sep.-Mar. |
| M. hirta | * | * | * | | * | * | * | 0-1000 m | Oct.-Mar. |
| M. kingii | * | | * | * | | | | 500-900m | Jan.-mar. |
| M. mammosa | | | | * | | | | 320 m | Nov.-Jan. |
| M. peltata | | | | | | | * | 0-1100 m | Dec.-May |
| M. quinata | * | * | * | | | * | | 100-380m | Oct.-Nov. |
| M. umbellata | * | * | * | * | * | * | * | 0-1300 m | Sep.-Jul. |
| M. vitifolia | * | * | * | * | * | * | * | 0 -500 m | Oct.-Mar. |
| N. racemosa | * | | * | * | * | * | * | 20-100 m | Nov.-Feb. |

Table 1 (Continued)

| SPECIES | FLORISTIC REGIONS | | | | | | | ALTITUDE DISTRIBUTION | FLOWERING PERIODS |
|---|---|---|---|---|---|---|---|---|---|
| | N | NE | E | SW | C | SE | P | | |
| O. petaloidea | * | | | * | * | | | 180-450 m | Feb.-Mar. |
| O. riedeliana | | | | | | | * | 120 m | Jan.-Feb. |
| O. turpethum | * | | | * | * | | * | 25-200 m | Oct.-Apr. |
| X. tridentata | * | * | * | * | | * | * | 0 -500 m | Aug.-May |

## Palynological result

Pollen morphology of twenty three species of ten genera of Convolvulaceae have been studied by using light microscope and scanning electron microscope. Only two species, Donamia semidigyna (Roxb.) Hall.f., Evolvulus nummularius (Linn.) have been studied only by scanning electron microscope, because only the small amount of the pollen can be collected. Unfortunately, in this study, the pollen of E. alsinoides (Linn.) Linn. var. hirsutus and Merremia mammosa (Lour.) Hall.f. have not been observed, according to the poor herbarium specimens and the unavailable fresh materials.

Note.- The size classes of pollen in this study, based on the longest axis, have been suggested (Erdtman, 1952) :-

| | |
|---|---|
| very small | 10 microns |
| small | 10 - 25 microns |
| medium | 25 - 50 microns |
| large | 50 - 100 microns |
| very large | 100 - 200 microns |
| gigantic | 200 microns |

1. Aniseia

1.1 Aniseia martinicensis (Jacq.) Choisy

Grains large, 49.4-78 microns, polyrugate (12-15 rugate, rarely 18 rugate), apolar, spheroidal to slightly subsphereoidal. Sculpturing - perforate with scattered supratectal graules. (Plate 23-24, Table 2).

2. Donamia

2.1 Donamia semidigyna (Roxb.) Hall.f.

Grains medium, 40.0-43.2 microns, 3-colpate, isopolar, oblate, polar field index about 10 microns . Sculpturing - perforate with supratectal granules. (Plate 25).

3. Cuscuta

3.1 Cuscuta chinensis Lamk.

Grains small, 23.4 - 28.6 microns, 3-colpate, isopolar, oblate spheroidal, polar field index about 9.75 micronss in average. Sculpturing - rugulate. (Plate 26-27, Table 3).

3.2 Cuscuta reflexa Roxb.

Grains medium, 28.4-39.0 microns, 5-colpate, isopolar, prolate spheroidal, polar field index about 19.37 micronss in average. Sculpturing - reticulate with pila on the muri. (Plate 28-29, Table 4).

4. Evolvulus

4.1 Evolvulus alsinoides (Linn.) Linn. var. alsinoides

Grains small, 20.8 - 28.6 microns, 12-rugate, apolar, spheroidal to slightly subspheroidal. Sculpturing - finely perforate with supratectal granules. (Plate 30, Table 5).

4.2 Evolvulus nummularius (Linn.) Linn.

Grain small (nearly to small size), about 22.7 microns, 12 rugate, apolar, spheroidal, Sculpturing - finely perforate with supratectal granules. (Plate 31).

5. Hewittia

5.1 Hewittia scandens (Milne) Mabberley

Grains large, 52.0 - 70.2 microns, usually 12-rugate (very rarely 15-rugate) constructed in 6 equal squares, apolar, spheroidal to slightly subspheroidal. Sculpturing - perforate with supratectal granules always have a few large global projections. (Plate 32-33, Table 6).

6.Jacquemontia

6.1 Jacquemontia paniculata (Burm.f.) Hall.f.

Grains large, 49.4 - 67.6 microns (nearly to medium size), 15-rugate, sometimes 12-rugate, apolar, spheroidal to slightly subspheroidal. Sculpturing - perforate with coarse supratectal granules. (Plate 34-35, Table 7).

6.2 Jacquemontia pentantha (Jacq.) G.Don

Grains large, 41.6 - 57.2 microns (nearly to medium size), 15-rugate, apolar, spheroidal to slightly subspheroidal. Sculpturing - perforate with coarse supratectal granules. (Plate 36-37, Table 8).

7. Merremia

7.1 Merremia bambusetorum Kerr

Grains very large, 52.0-91.0 microns, 6-colpate, heteropolar; evaginate on one pole, prolate spheroidal, polar field index about 28.08 microns in average. Sculpturing - perforate with supratectal

granules. (Plate 38-39; Table 9).

7.2 Merremia collina S.Y.Liou

Grains medium size, 36.4 - 49.4 microns, 3-colpate, isopolar, suboblate to oblate spheroidal, polar field index about 8.71 microns in average. Sculpturing - finely perforate with supratectal granules. (Plate 40-41; Table 10).

7.3 Merremia emarginata (Burm.f.) Hall.f.

Grains large, 52.0-65.0 microns, 3-colpate, isopolar, prolate spheroidal, polar field index about 17.03 microns in average. Sculpturing - perforate with supra tectal granules. (Plate 42-43, Table 11).

7.4 Merremia gemella (Burm.f.) Hall.f.

Grains large, 45.0 - 60.0 microns, 3-colpate, isopolar, prolate spheroidal, polar field index about 13.88 microns in average. Sculpturing - perforate with supratectal granules. (Plate 44-45, Table 12).

7.5 Merremia hederacea (Burm.f.) Hall.f.

Grains medium, 40.0 - 50.0 microns, 3-colpate, isopolar, prolate spheroidal, polar field index about 16.12 microns in average. Sculpturing - perforate with supratectal granules. (Plate 46-47, Table 13).

7.6 Merremia hirta (Linn.) Merr.

Grains medium or slightly large, 41.6 - 57.2 microns, 3-colpate, isopolar, oblate spheroidal, polar field index about 9.1 microns in average. Sculpturing - supratectal granules. (Plate 48-49, Table 14).

7.7 Merremia kingii (Prain) Kerr

Grains large, 54.6 - 67.6 microns, 6-colpate, isopolar, oblate spheroidal, polar field index about 19.11 microns in average. Sculpturing - perforate with supratectal granules. (Plate 50-51, Table 15).

7.8 Merremia mammosa (Lour.) Hall.f.

Grains large, 74.0 - 88.0 microns, 3-colpate, spheroidal, Sculpturing - perforate with supratectal granules (Ferguson et al, 1977).

7.9 Merremia peltata (Linn.) Merrill

Grains large, 62.4 - 88.4 microns, 3-colpate, isopolar, prolate spheroidal, polar field index about 23.14 microns in average. Sculpturing - coarse perforate with supratectal granules. (Plate 52-53, Table 16).

7.10 Merremia quinata (R.Br.) Ooststr.

Grains large, 57.2 - 93.6 microns, (6)-7-8-9-colpate, isopolar, suboblate, polar field index about 31.59 microns in average. Sculpturing - coarse perforate with coarse supratectal granules. (Plate 54-55, Table 17).

7.11 Merremia umbellata (Linn.) Hall.f.

Grains large, 46.8 - 70.2 microns, 6-colpate, isopolar, prolate spheroidal, polar field index about 23.01 microns in average. Sculpturing - perforate with supratectal granules. (Plate 56-57, Table 18).

7.12 Merremia vitifolia (Durm.f.) Hall.f.

Grains large, 52.0 - 75.4 microns, 5-colpate, very rarely 4-colpate, isopolar, prolate spheroidal, polar field index about 27.17 microns in average. Sculpturing - finely perforate with supratectal granules. (Plate 58-59, Table 19).

8. Neuropeltis

8.1 Neuropeltis racemosa Wall.

Grains small, 20.8 - 28.6 microns, 3-colpate, isopolar, prolate spheroidal, polar field index about 9.1 microns in average. Sculpturing - coarse perforate with small amount of supratectal granules. (Plate 60, Table 20).

9. Operculina

9.1 Operculina petaloidea (Choisy) van Ooststr.

Grains large, 52.0 - 67.6 microns, 3-colpate, isopolar, prolate spheroidal, polar field index about 14.69 microns in average. Sculpturing - finely perforate with supratectal granules. (Plate 61-62, Table 21).

9.2 Operculina riedeliana (Oliv.) van Ooststr.

Grains large, 41.6 - 59.8 microns, 3-colpate, isopolar, prolate spheroidal, polar field index about 18.33 microns in average. Sculpturing - sparsely perforate with finely supratectal granules. (Plate 63-64, Table 22).

9.3 Operculina turpethum (Linn.) S. Manso

Grains large, 46.8 - 62.4 microns, 3-colpate, isopolar, prolate spheroidal, polar field index about 15.6 microns in average. Sculpturing - perforate with supratctal granules. (Plate 65-66, Table 23).

10.Xenostegia

10.1 Xenostegia tridentata Austin & Staples

Grains large, 56.07 - 66.75 microns, pantoporate, apolar, spheroidal to subspheroidal. Sculpturing - perforate with supratectal granules.(Plate 67-68, Table 24).

Table 2 Dimensions of pollen grains of Aniseia martinicensis (Jacq.) Choisy, stated in micron.

| DIAMETER OF GRAINS | |
|---|---|
| 57.2 | 54.6 |
| 78.0 | 72.8 |
| 62.4 | 59.8 |
| 57.2 | 57.2 |
| 72.8 | 72.8 |
| 67.6 | 70.2 |
| 62.4 | 57.2 |
| 54.6 | 54.6 |
| 70.2 | 72.8 |
| 52.0 | 59.8 |
| 52.0 | 54.6 |
| 57.2 | 54.6 |
| 54.6 | 57.2 |
| 57.2 | 57.2 |
| 52.0 | 54.6 |
| 70.2 | 70.2 |
| 52.0 | 52.0 |
| 59.8 | 57.2 |
| 49.4 | 52.0 |
| 54.6 | 57.2 |

| | DIAMETER OF GRAIN |
|---|---|
| maximum value | 78.00 |
| average value | 59.80 |
| minimum value | 49.40 |

Table 3 Dimension of pollen grains of Cuscuta chinensis Lamk. , stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 26.0 | 26.0 | 5.2 , 5.2 |
| 26.0 | 28.6 | 5.2 , 7.8 |
| 23.4 | 28.6 | 10.4 , 7.8 |
| 24.7 | 23.4 | 7.8 , 10.4 |
| 26.0 | 22.1 | 10.4 , 10.4 |
| 23.4 | 26.0 | 10.4 , 7.8 |
| 26.0 | 26.0 | 7.8 , 7.8 |
| 23.4 | 26.0 | 7.8 , 7.8 |
| 23.4 | 26.0 | 7.8 , 10.4 |
| 23.4 | 28.6 | 7.8 , 7.8 |
| 28.6 | 23.4 | |
| 26.0 | 23.4 | |
| 26.0 | 26.0 | |
| 26.0 | 28.6 | |
| 23.4 | 26.0 | |
| 23.4 | 26.0 | |
| 26.0 | 23.4 | |
| 23.4 | 23.4 | |
| 23.4 | 26.0 | |
| 28.6 | 28.6 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 28.60 | 28.60 |
| average valued | 25.03 | 25.81 |
| minimum valued | 23.40 | 23.40 |

Table 4 Dimension of pollen grains of Cuscuta reflexa Roxb., stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 28.4 | 31.2 | 26.0 , 23.4 |
| 33.8 | 36.4 | 20.8 , 20.8 |
| 39.0 | 39.0 | 15.6 , 13.0 |
| 36.4 | 39.0 | 20.8 , 18.2 |
| 36.4 | 39.0 | 20.8 , 20.8 |
| 39.0 | 36.4 | 13.0 , 15.6 |
| 33.8 | 39.0 | 13.0 , 18.2 |
| 33.8 | 33.8 | 20.8 , 23.4 |
| 39.0 | 39.0 | 18.2 , 20.8 |
| 33.8 | 39.0 | 20.8 , 23.4 |
| 33.8 | 41.6 | |
| 33.8 | 33.8 | |
| 36.4 | 39.0 | |
| 33.8 | 39.0 | |
| 33.8 | 36.4 | |
| 33.8 | 33.8 | |
| 31.2 | 39.0 | |
| 33.8 | 36.4 | |
| 36.4 | 39.0 | |
| 33.8 | 39.0 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 39.00 | 39.00 |
| average valued | 34.70 | 37.44 |
| minimum valued | 28.40 | 31.20 |

Table 5 Dimensions of pollen grains of Evolvulus alsinoides (Linn.) Linn. var. alsinoides.,stated in micron.

| DIAMETER OF GRAINS | |
|---|---|
| 26.0 | 26.0 |
| 28.6 | 28.6 |
| 28.6 | 28.6 |
| 28.6 | 28.6 |
| 28.6 | 28.6 |
| 28.6 | 26.0 |
| 26.0 | 26.0 |
| 20.8 | 26.0 |
| 26.0 | 26.0 |
| 28.6 | 28.6 |

| | DIAMETER OF GRAIN |
|---|---|
| maximum value | 28.60 |
| average value | 27.17 |
| minimum value | 20.80 |

Table 6 Dimensions of pollen grains of Ilewittia sublobata (Linn.f.) O.K., stated in micron.

| DIAMETER OF GRAINS | |
|---|---|
| 62.4 | 67.6 |
| 65.0 | 65.0 |
| 65.0 | 65.0 |
| 72.8 | 65.0 |
| 59.8 | 62.4 |
| 65.0 | 65.0 |
| 65.0 | 62.4 |
| 62.4 | 70.2 |
| 62.4 | 65.0 |
| 65.0 | 70.2 |
| 54.6 | 54.6 |
| 57.2 | 52.0 |
| 54.6 | 54.6 |
| 54.6 | 57.2 |
| 54.6 | 57.2 |
| 54.6 | 52.0 |
| 52.0 | 52.0 |
| 54.6 | 57.2 |
| 52.0 | 52.0 |
| 54.6 | 57.2 |

| | DIAMETER OF GRAIN |
|---|---|
| maximum value | 70.20 |
| average value | 59.80 |
| minimum value | 52.00 |

Table 7 Dimension of pollen grains of Jacquemontia paniculata (Burm.f.) Hall.f., stated in microns.

| DIAMETER OF GRAINS | |
|---|---|
| 59.8 | 67.6 |
| 57.2 | 57.2 |
| 52.0 | 54.6 |
| 54.6 | 57.2 |
| 49.4 | 54.6 |
| 49.4 | 54.6 |
| 52.0 | 54.6 |
| 54.6 | 54.6 |
| 52.0 | 54.6 |
| 49.4 | 52.0 |
| 57.2 | 56.2 |
| 57.2 | 57.2 |
| 57.2 | 57.2 |
| 52.0 | 54.6 |
| 49.4 | 57.2 |
| 57.2 | 54.6 |
| 57.2 | 62.4 |
| 52.0 | 52.0 |
| 52.0 | 54.6 |
| 57.2 | 52.0 |

| | DIAMETER OF GRAIN |
|---|---|
| maximum valued | 67.60 |
| average valued | 54.97 |
| minimum valued | 49.40 |

Table 8 Dimension of pollen grains of Jacquemontia pentantha (Jacq.) G.Don, stated in microns.

| DIAMETER OF GRAINS | |
|---|---|
| 54.6 | 57.2 |
| 52.0 | 52.0 |
| 54.6 | 54.6 |
| 54.6 | 52.0 |
| 57.2 | 54.6 |
| 52.0 | 57.2 |
| 54.6 | 57.2 |
| 46.8 | 46.8 |
| 46.8 | 46.8 |
| 57.2 | 54.6 |
| 41.6 | 44.2 |
| 57.2 | 57.2 |
| 46.8 | 49.4 |
| 46.8 | 46.8 |
| 54.6 | 57.2 |
| 54.6 | 57.26 |
| 46.8 | 44.2 |
| 52.0 | 52.0 |
| 54.6 | 57.2 |
| 54.6 | 54.6 |

| | DIAMETER OF GRAIN |
|---|---|
| maximum valued | 57.20 |
| average valued | 52.33 |
| minimum valued | 41.60 |

Table 9 Dimension of pollen grains of Merremia bambusetorum Kerr, stated in micron.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 70.2 | 80.6 | 26.0 , 26.0 |
| 72.8 | 52.0 | 31.2 , 23.4 |
| 65.0 | 67.6 | 26.0 , 26.0 |
| 67.6 | 75.4 | 26.0 , 33.8 |
| 70.2 | 78.0 | 33.8 , 33.8 |
| 65.0 | 59.8 | 20.8 , 23.4 |
| 67.6 | 91.0 | 18.2 , 28.6 |
| 67.6 | 65.0 | 31.2 , 36.4 |
| 65.0 | 57.2 | 28.6 , 31.2 |
| 67.6 | 54.6 | 26.0 , 31.2 |
| 65.0 | 88.4 | |
| 72.8 | 59.8 | |
| 75.4 | 59.8 | |
| 67.6 | 75.4 | |
| 54.6 | 57.2 | |
| 72.8 | 59.8 | |
| 72.8 | 59.8 | |
| 70.2 | 83.2 | |
| 72.8 | 65.0 | |
| 80.6 | 67.6 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 80.60 | 91.00 |
| average valued | 69.16 | 67.86 |
| minimum valued | 54.60 | 52.00 |

Table 10 Dimension of pollen grains of Merremia collina S.Y. Liou, stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (X) | POLAR FIELD INDEX |
|---|---|---|
| 41.6 | 49.4 | 7.8 , 7.8 |
| 41.6 | 44.2 | 10.4 ,10.4 |
| 39.0 | 46.8 | 10.4 , 7.8 |
| 39.0 | 44.2 | 5.2 , 7.8 |
| 41.6 | 49.4 | 7.8 , 5.2 |
| 41.6 | 49.4 | 10.4 ,10.4 |
| 36.4 | 44.2 | 10.4 ,10.4 |
| 41.6 | 46.8 | 7.8 , 7.8 |
| 41.6 | 44.2 | 10.4 , 7.8 |
| 41.6 | 46.8 | 10.4 , 7.8 |
| 39.0 | 41.6 | |
| 39.0 | 44.2 | |
| 39.0 | 44.2 | |
| 40.3 | 44.2 | |
| 39.0 | 46.8 | |
| 36.4 | 49.8 | |
| 39.0 | 46.8 | |
| 39.0 | 46.8 | |
| 36.4 | 49.8 | |
| 39.0 | 46.8 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 41.60 | 49.40 |
| average valued | 39.59 | 46.28 |
| minimum valued | 36.40 | 41.60 |

Table 11 Dimension of pollen grains of Merremia emarginata (Burm.f.) Hall.f., stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 57.2 | 49.4 | 18.2 , 13.0 |
| 57.2 | 49.4 | 15.6 , 18.2 |
| 59.8 | 44.2 | 18.2 , 18.2 |
| 59.8 | 52.0 | 15.6 , 15.6 |
| 57.2 | 57.2 | 13.0 , 15.6 |
| 57.2 | 52.0 | 15.6 , 18.2 |
| 62.4 | 52.0 | 20.8 , 18.2 |
| 57.2 | 65.0 | 15.6 , 15.6 |
| 59.8 | 65.0 | 18.2 , 18.2 |
| 54.6 | 52.0 | 20.8 , 18.2 |
| 62.4 | 52.0 | |
| 57.2 | 59.8 | |
| 62.4 | 54.6 | |
| 57.2 | 49.4 | |
| 57.2 | 52.0 | |
| 54.6 | 49.4 | |
| 65.0 | 62.4 | |
| 57.2 | 46.8 | |
| 54.6 | 54.6 | |
| 52.0 | 49.4 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 65.00 | 65.00 |
| average valued | 58.11 | 53.43 |
| minimum valued | 52.00 | 44.20 |

Table 12 Dimension of pollen grains of Merremia gemella (Burm.f.) Hall.f., stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 55.0 | 55.0 | 15.0 , 15.0 |
| 60.0 | 60.0 | 10.0 , 15.0 |
| 60.0 | 55.0 | 15.0 , 12.5 |
| 55.0 | 45.0 | 15.0 , 17.5 |
| 55.0 | 52.5 | 10.0 , 10.0 |
| 50.0 | 55.0 | 10.0 , 15.0 |
| 57.5 | 55.0 | 12.5 , 15.0 |
| 60.0 | 47.5 | 20.0 , 15.0 |
| 60.0 | 45.0 | 15.0 , 15.0 |
| 55.0 | 45.0 | 20.0 , 15.0 |
| 50.0 | 50.0 | 15.0 , 15.0 |
| 52.5 | 60.0 | |
| 55.0 | 55.0 | |
| 52.5 | 55.0 | |
| 60.0 | 52.5 | |
| 60.0 | 60.0 | |
| 60.0 | 45.0 | |
| 60.0 | 50.0 | |
| 55.0 | 55.0 | |
| 60.0 | 45.0 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 60.00 | 60.00 |
| average valued | 56.63 | 52.13 |
| minimum valued | 52.50 | 45.00 |

Table 13 Dimension of pollen grains of Merremia hederacea (Burm.f.) Hall.f., stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 47.5 | 40.0 | 15.6 , 13.0 |
| 45.0 | 40.0 | 15.6 , 15.6 |
| 45.0 | 45.0 | 23.4 , 26.0 |
| 42.5 | 42.5 | 15.6 , 15.6 |
| 50.0 | 42.5 | 18.2 , 20.8 |
| 45.0 | 45.0 | 13.0 , 18.2 |
| 42.5 | 42.5 | 15.6 , 18.2 |
| 47.5 | 45.0 | 15.6 , 13.0 |
| 50.0 | 40.0 | 13.0 , 15.6 |
| 45.0 | 45.0 | 10.4 , 10.4 |
| 47.5 | 45.0 | |
| 45.0 | 45.0 | |
| 42.5 | 40.0 | |
| 47.5 | 40.0 | |
| 50.0 | 45.0 | |
| 47.5 | 40.0 | |
| 45.0 | 40.0 | |
| 45.0 | 45.0 | |
| 45.0 | 40.0 | |
| 45.0 | 45.0 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 50.00 | 45.00 |
| average valued | 46.00 | 42.63 |
| minimum valued | 42.50 | 40.00 |

Table 14 Dimensions of pollen grains of Merremia hirta (Linn.) Merr., stated in micron.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 49.4 | 46.8 | 7.8 ,10.4 |
| 52.0 | 46.8 | 7.8 , 5.2 |
| 57.2 | 44.2 | 10.4 ,10.4 |
| 54.6 | 44.2 | 13.0 ,13.0 |
| 49.4 | 44.2 | 5.2 , 7.8 |
| 52.0 | 46.8 | 10.4 , 7.8 |
| 44.2 | 41.6 | 10.4 ,10.4 |
| 52.0 | 49.4 | 7.8 , 7.8 |
| 52.0 | 52.0 | 7.8 , 7.8 |
| 52.0 | 49.4 | 10.4 ,10.4 |
| 52.0 | 41.6 | |
| 54.6 | 46.8 | |
| 57.2 | 44.2 | |
| 52.0 | 49.4 | |
| 49.4 | 41.6 | |
| 49.4 | 46.8 | |
| 54.6 | 44.2 | |
| 49.4 | 44.2 | |
| 52.0 | 44.2 | |
| 49.4 | 41.6 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 57.20 | 52.00 |
| average valued | 51.74 | 45.50 |
| minimum valued | 44.20 | 41.60 |

Table 15 Dimension of pollen grains of M. kingii (Prain) Kerr, stated in micron.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 59.8 | 62.4 | 13.0 , 10.4 |
| 57.2 | 65.0 | 15.6 , 20.8 |
| 59.8 | 59.8 | 20.8 , 18.2 |
| 59.8 | 59.8 | 18.2 , 23.4 |
| 59.8 | 59.8 | 13.0 , 20.8 |
| 54.6 | 62.4 | 23.4 , 20.8 |
| 59.8 | 57.2 | 20.8 , 15.6 |
| 57.2 | 65.0 | 18.2 , 20.8 |
| 59.8 | 59.8 | 26.0 , 18.2 |
| 57.2 | 65.0 | 20.8 , 23.4 |
| 57.2 | 59.8 | |
| 62.4 | 62.4 | |
| 58.5 | 62.4 | |
| 67.6 | 62.4 | |
| 62.4 | 59.8 | |
| 59.8 | 65.0 | |
| 57.2 | 57.2 | |
| 62.4 | 59.8 | |
| 54.6 | 54.6 | |
| 54.6 | 57.2 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 67.60 | 65.00 |
| average valued | 59.09 | 60.84 |
| minimum valued | 54.60 | 54.60 |

Table 16 Dimension of pollen grains of Merremia peltata (Linn.) Merrill, stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 78.0 | 88.4 | 23.4 , 23.4 |
| 72.8 | 67.6 | 26.0 , 23.4 |
| 78.0 | 70.2 | 20.8 , 23.4 |
| 80.6 | 72.8 | 23.4 , 20.8 |
| 78.0 | 83.2 | 23.4 , 23.4 |
| 75.4 | 78.0 | 26.0 , 28.6 |
| 78.0 | 83.2 | 18.2 , 20.8 |
| 72.8 | 65.0 | 23.4 , 23.4 |
| 78.0 | 67.6 | 20.8 , 20.8 |
| 78.0 | 65.0 | 23.4 , 26.0 |
| 75.4 | 62.4 | |
| 78.0 | 70.2 | |
| 72.8 | 78.0 | |
| 75.4 | 85.8 | |
| 75.4 | 70.2 | |
| 78.0 | 67.6 | |
| 75.4 | 80.6 | |
| 72.8 | 72.8 | |
| 78.0 | 85.8 | |
| 75.4 | 72.8 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 80.60 | 88.40 |
| average valued | 76.31 | 74.36 |
| minimum valued | 72.80 | 62.40 |

Table 17 Dimensions of pollen grains of Merremia quinata (R.Br.) Ooststr., stated in micron.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 85.8 | 70.2 | 46.8 , 18.2 |
| 78.0 | 65.0 | 31.2 , 36.4 |
| 78.0 | 62.4 | 36.4 , 39.0 |
| 80.6 | 65.0 | 33.8 , 39.0 |
| 93.6 | 65.0 | 26.0 , 28.6 |
| 75.4 | 72.8 | 31.2 , 31.2 |
| 78.0 | 67.6 | 26.0 , 28.6 |
| 65.0 | 59.8 | 23.4 , 31.2 |
| 83.2 | 67.6 | 20.8 , 33.8 |
| 78.0 | 62.4 | 31.2 , 39.0 |
| 75.4 | 57.2 | |
| 78.0 | 59.8 | |
| 78.0 | 59.8 | |
| 72.8 | 57.2 | |
| 80.6 | 59.8 | |
| 78.0 | 65.0 | |
| 83.2 | 62.4 | |
| 78.0 | 65.0 | |
| 78.0 | 65.0 | |
| 78.0 | 59.8 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 93.60 | 72.80 |
| average valued | 78.78 | 63.44 |
| minimum valued | 72.80 | 57.20 |

Table 18 Dimension of pollen grains of Merremia umbellata (Linn.) Hall.f., stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 59.8 | 52.0 | 20.8 , 20.8 |
| 62.4 | 46.8 | 23.4 , 23.4 |
| 59.8 | 57.2 | 23.4 , 20.8 |
| 62.4 | 57.2 | 26.0 , 23.4 |
| 59.8 | 54.6 | 15.6 , 28.6 |
| 59.8 | 54.6 | 23.4 , 26.0 |
| 54.6 | 54.6 | 20.8 , 20.8 |
| 62.4 | 57.2 | 18.2 , 18.2 |
| 62.4 | 54.6 | 26.0 , 26.0 |
| 65.0 | 52.0 | 26.0 , 28.6 |
| 57.2 | 57.2 | |
| 59.8 | 57.2 | |
| 59.8 | 70.2 | |
| 57.2 | 57.2 | |
| 59.8 | 59.8 | |
| 57.2 | 57.2 | |
| 62.4 | 57.2 | |
| 57.2 | 59.8 | |
| 57.2 | 59.8 | |
| 62.4 | 59.8 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 65.00 | 70.20 |
| average valued | 59.93 | 56.81 |
| minimum valued | 54.60 | 46.80 |

Table 19 Dimension of pollen grains of Merremia vitifolia (Burm.f.) Hall.f., stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 62.4 | 54.6 | 20.8 , 28.6 |
| 65.0 | 67.6 | 26.0 , 28.6 |
| 62.4 | 70.2 | 28.6 , 28.6 |
| 67.6 | 65.0 | 26.0 , 26.0 |
| 65.0 | 57.2 | 23.4 , 31.2 |
| 70.2 | 62.4 | 26.0 , 31.2 |
| 65.0 | 65.0 | 26.0 , 26.0 |
| 65.0 | 54.6 | 28.6 , 31.2 |
| 65.0 | 59.8 | 23.4 , 26.0 |
| 59.8 | 57.2 | 26.0 , 31.2 |
| 65.0 | 62.4 | |
| 65.0 | 57.2 | |
| 70.2 | 59.8 | |
| 62.4 | 62.4 | |
| 65.0 | 59.8 | |
| 72.8 | 54.6 | |
| 70.2 | 75.4 | |
| 67.6 | 52.0 | |
| 67.6 | 62.4 | |
| 67.6 | 59.8 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 72.80 | 75.40 |
| average valued | 66.04 | 60.97 |
| minimum valued | 59.80 | 52.00 |

Table 20 Dimension of pollen grains of Neuropeltis racemosa Wall., stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 23.4 | 23.4 | 10.4 , 7.8 |
| 23.4 | 26.0 | |
| 26.0 | 26.0 | |
| 20.8 | 23.4 | |
| 20.8 | 23.4 | |
| 26.0 | 20.8 | |
| 23.4 | 28.6 | |
| 23.4 | 20.8 | |
| 23.4 | | |
| 23.4 | | |
| 20.8 | | |
| 23.4 | | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 26.00 | 28.60 |
| average valued | 23.18 | 24.05 |
| minimum valued | 20.80 | 20.80 |

Table 21 Dimension of pollen grains of Operculina petaloidea (Choisy) van Ooststr., stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 54.6 | 57.2 | 15.6 , 15.6 |
| 62.4 | 54.6 | 13.0 , 13.0 |
| 57.2 | 59.8 | 13.0 , 15.6 |
| 67.6 | 57.2 | 15.6 , 18.2 |
| 57.2 | 59.8 | 15.6 , 15.6 |
| 59.8 | 57.2 | 13.0 , 13.0 |
| 62.4 | 57.2 | 10.4 , 13.0 |
| 54.6 | 54.6 | 10.4 , 18.2 |
| 59.8 | 59.8 | 15.6 , 18.2 |
| 65.0 | 57.2 | 15.6 , 15.6 |
| 59.8 | 54.6 | |
| 57.2 | 54.6 | |
| 54.6 | 59.8 | |
| 65.0 | 57.2 | |
| 59.8 | 59.8 | |
| 59.8 | 57.2 | |
| 57.2 | 65.0 | |
| 62.4 | 52.0 | |
| 59.8 | 52.0 | |
| 65.0 | 54.6 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 67.60 | 65.00 |
| average valued | 60.06 | 57.07 |
| minimum valued | 54.60 | 52.00 |

Table 22 Dimension of pollen grains of Operculina riedeliana (Oliv.) van Ooststr., stated in microns.

| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 57.2 | 52.0 | 20.8 , 20.8 |
| 57.2 | 52.0 | 20.8 , 18.2 |
| 59.8 | 49.4 | 13.0 , 15.6 |
| 57.2 | 49.4 | 13.0 , 23.4 |
| 52.0 | 46.8 | 13.0 , 15.6 |
| 52.0 | 52.0 | 18.2 , 20.8 |
| 54.6 | 48.1 | 20.8 , 20.8 |
| 59.8 | 52.0 | 18.2 , 15.6 |
| 54.6 | 49.4 | 20.8 , 18.2 |
| 46.8 | 49.4 | 23.4 , 15.6 |
| 52.0 | 41.6 | |
| 52.0 | 54.6 | |
| 52.0 | 54.6 | |
| 55.9 | 49.4 | |
| 54.6 | 46.8 | |
| 52.0 | 49.4 | |
| 49.4 | 46.8 | |
| 49.4 | 52.0 | |
| 57.2 | 49.4 | |
| 59.8 | 54.6 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 59.80 | 54.60 |
| average valued | 54.28 | 49.99 |
| minimum valued | 46.80 | 41.60 |

Table 23 Dimension of pollen grains of Operculina turpethum (Linn.) S. Manso , stated in microns.

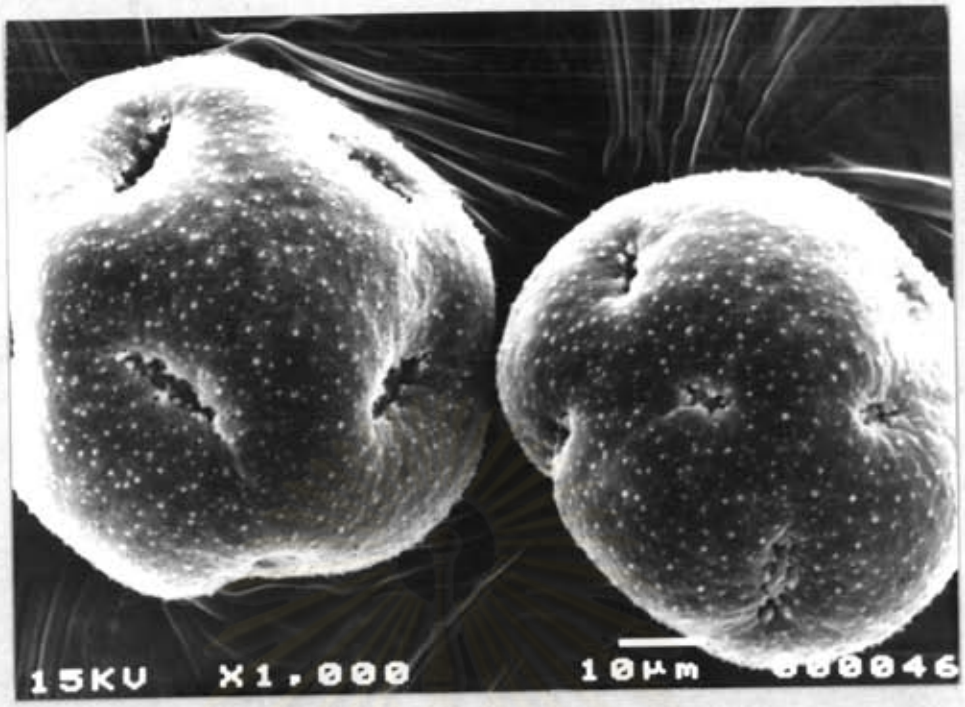
| POLAR AXIS (P) | EQUATORIAL AXIS (E) | POLAR FIELD INDEX |
|---|---|---|
| 57.2 | 52.0 | 18.2 , 20.8 |
| 57.2 | 52.0 | 15.6 , 10.4 |
| 59.8 | 62.4 | 18.2 , 18.2 |
| 57.2 | 59.8 | 15.6 , 18.2 |
| 52.0 | 52.0 | 18.2 , 20.8 |
| 57.2 | 57.2 | 13.0 , 13.0 |
| 57.2 | 46.8 | 13.0 , 13.0 |
| 52.0 | 46.8 | 13.0 , 15.6 |
| 52.0 | 57.2 | 13.0 , 10.4 |
| 54.6 | 57.2 | 15.6 , 18.2 |
| 52.0 | 49.4 | |
| 57.2 | 49.4 | |
| 57.2 | 46.8 | |
| 54.6 | 49.4 | |
| 54.6 | 46.8 | |
| 57.2 | 49.4 | |
| 49.4 | 52.0 | |
| 52.0 | 49.4 | |
| 57.2 | 49.4 | |
| 49.4 | 49.4 | |

| | POLAR AXIS | EQUATORIAL AXIS |
|---|---|---|
| maximum valued | 59.80 | 62.40 |
| average valued | 54.86 | 51.74 |
| minimum valued | 49.40 | 46.80 |

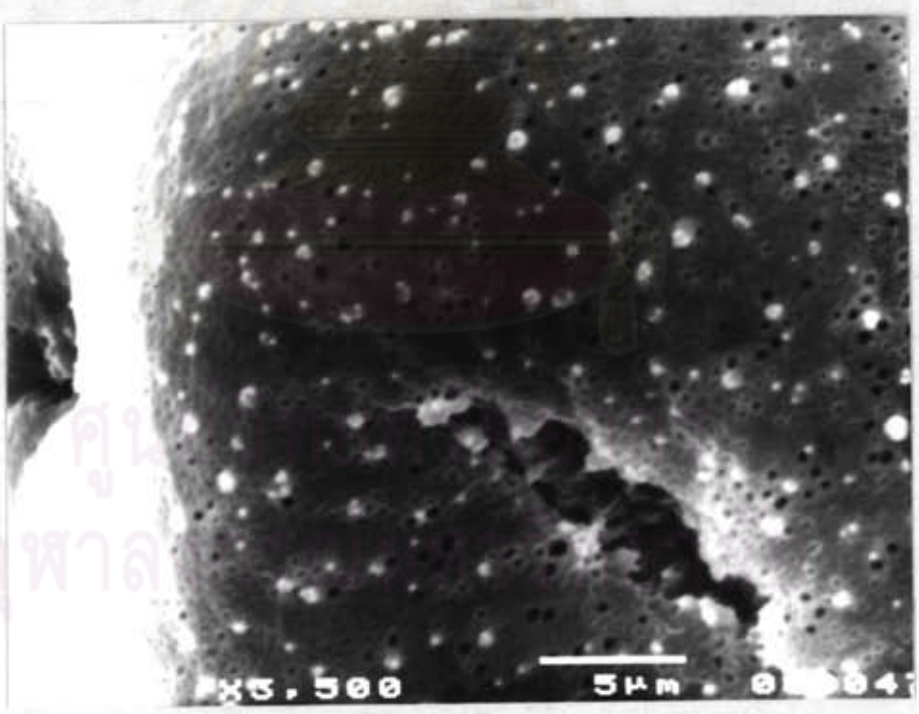
Table 24 Dimension of pollen grains of Xenostegia tridentata Austin & Staples, stated in microns.

| DIAMETER OF GRAIN | |
|---|---|
| 61.14 | 61.14 |
| 64.08 | 61.14 |
| 61.14 | 61.14 |
| 64.08 | 64.08 |
| 61.14 | 64.08 |
| 64.08 | 58.74 |
| 61.14 | 61.14 |
| 56.07 | 61.14 |
| 64.08 | 64.08 |
| 64.08 | 61.14 |
| 64.08 | 66.75 |

| | DIAMETER OF GRAIN |
|---|---|
| maximum valued | 66.75 |
| average valued | 62.26 |
| minimum valued | 56.07 |




A.




B.

Plate 23 Aniseia martinicensis (Jacq.) Choisy

A. Grains and apertures.

B. Sculpturing.

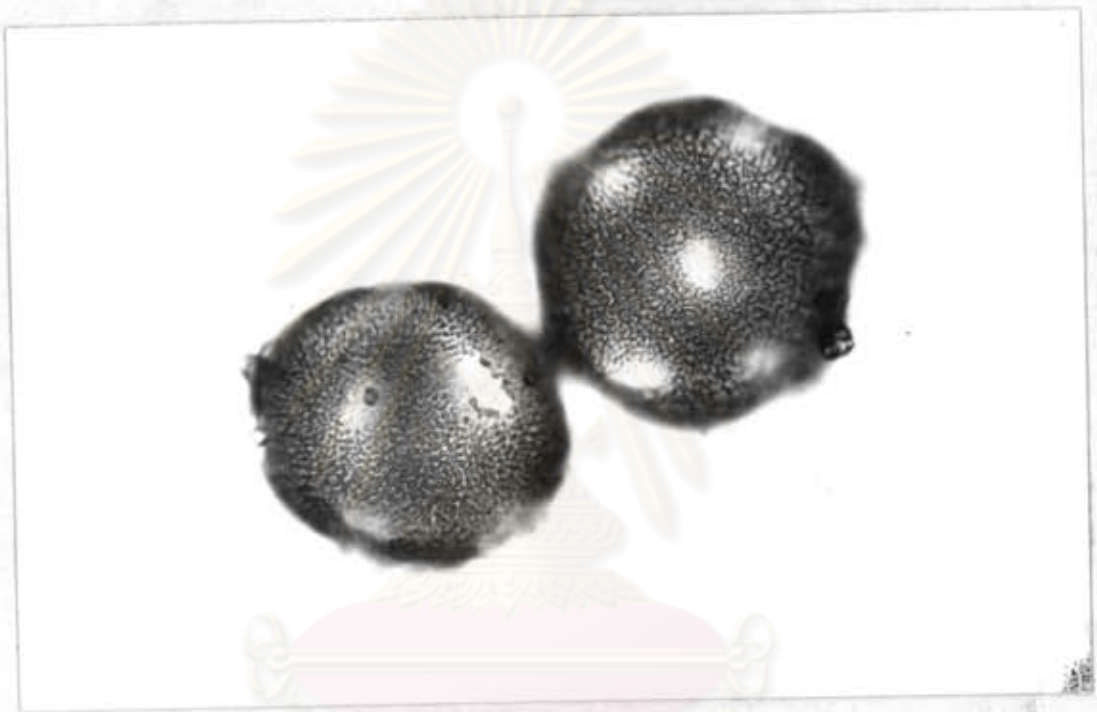
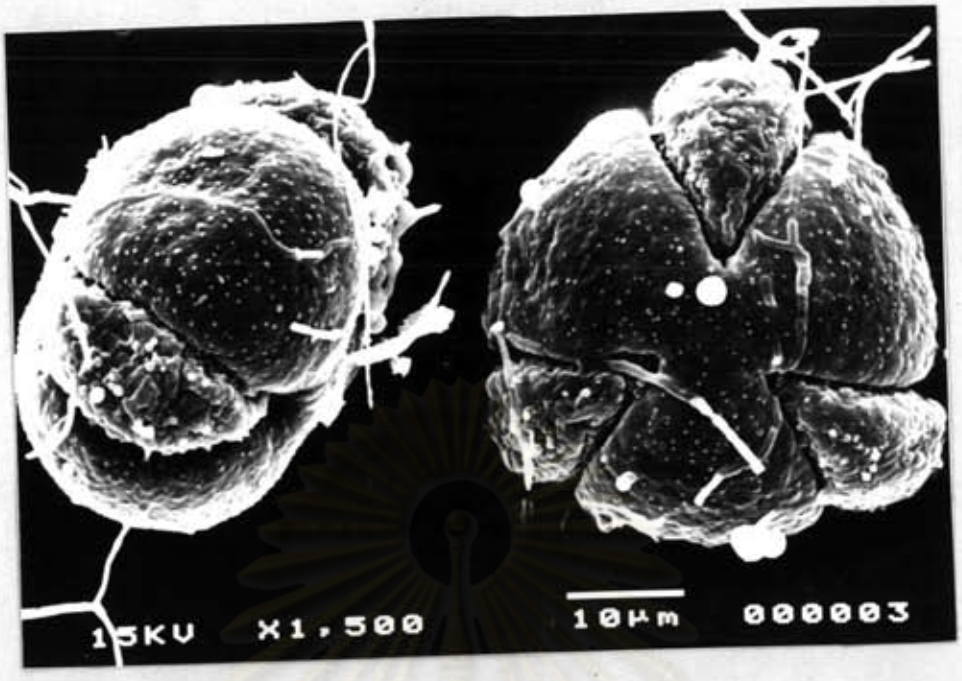
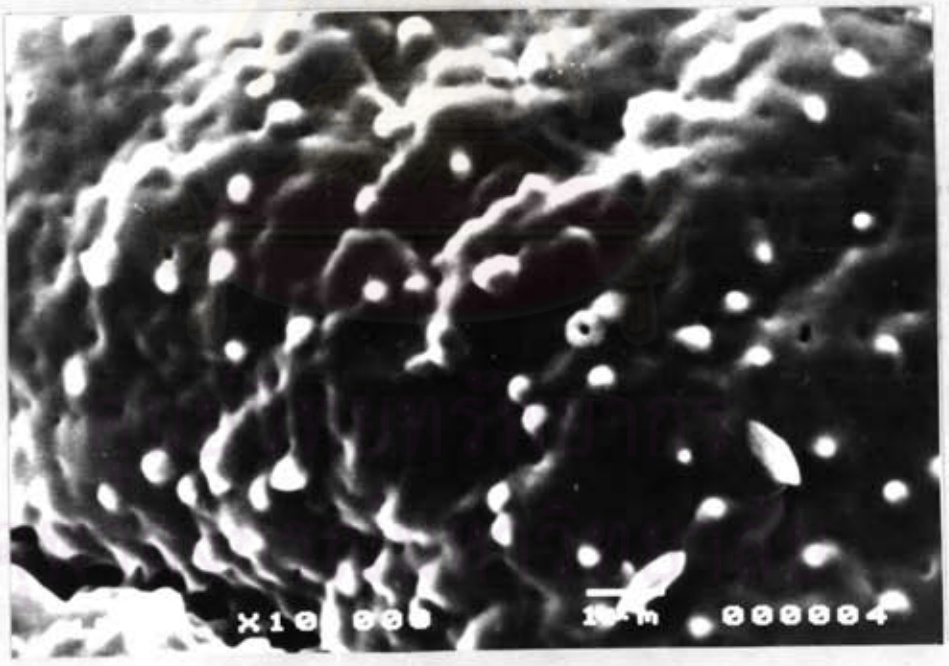


Plate 24 Aniseia martinicensis (Jacq.) Choisy
(× 750)




A.

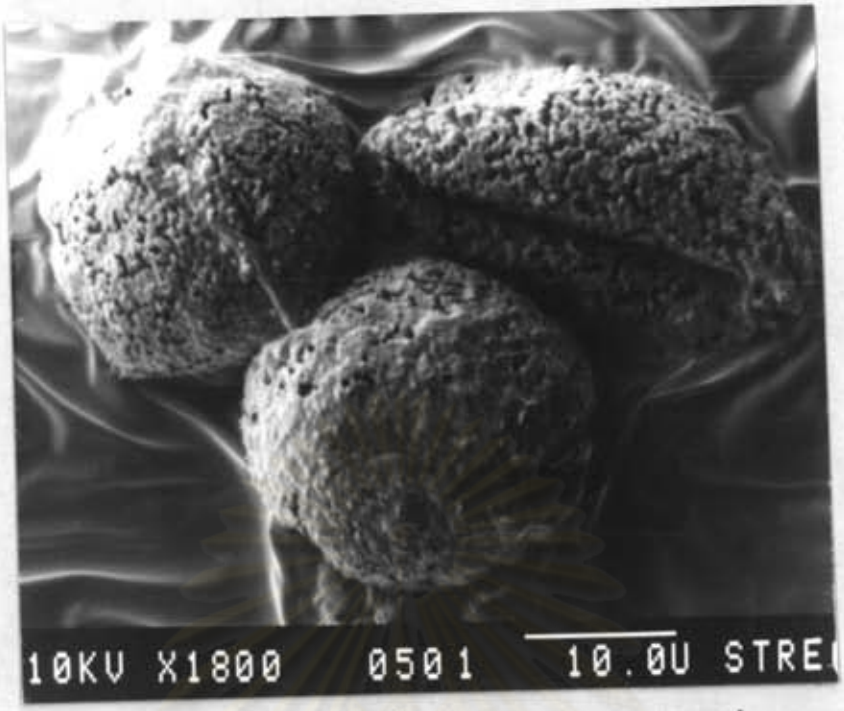



B.

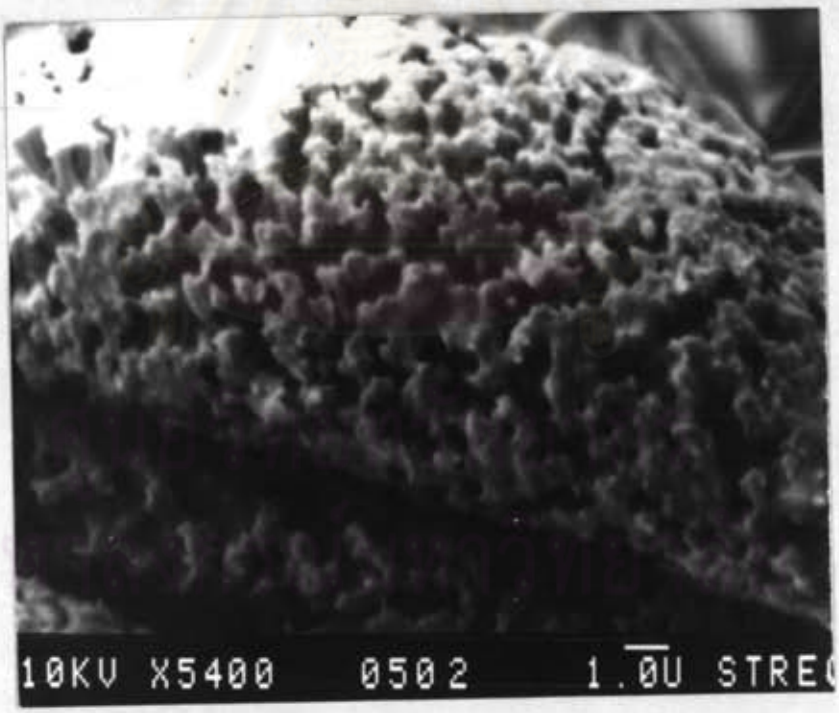
Plate 25 Bonamia semidigyna (Roxb.) Hall.f.

A. Grain in equatorial view (left), polar view (right).

B. Sculpturing.




A.

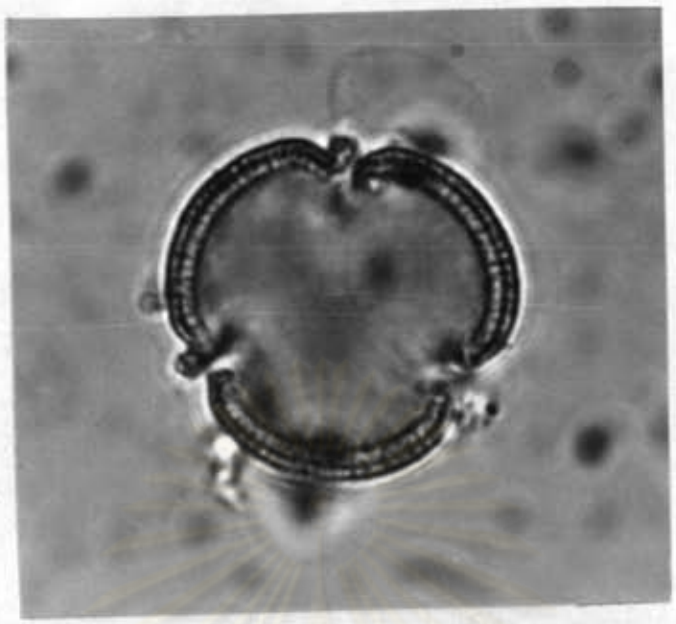



B.

Plate 26 Cuscuta chinensis Lamk.

A. Grains in polar view and equatorial view.

B. Sculpturing.



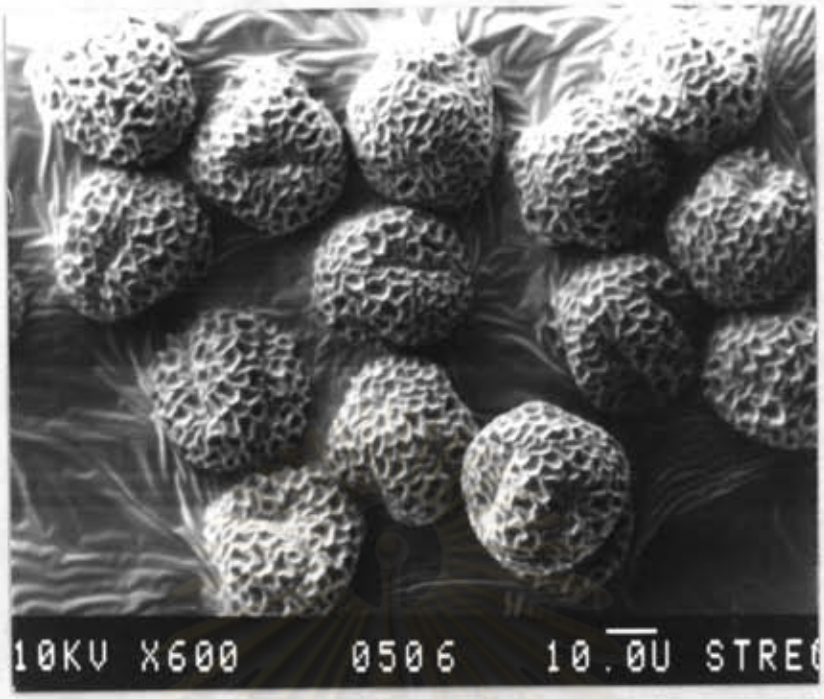
A.

B.

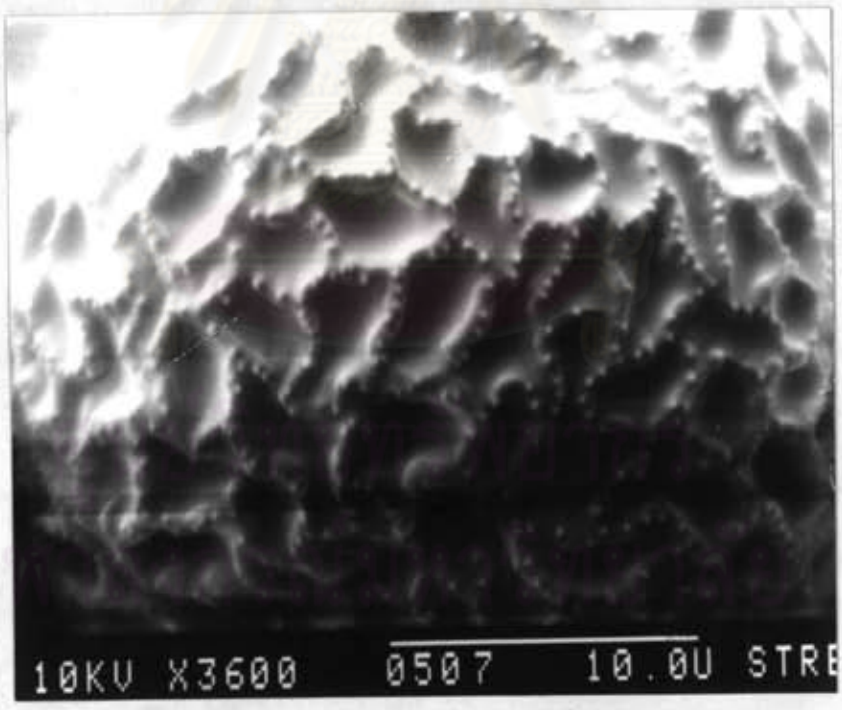
Plate 27 Cuscuta chinensis Lamk.

A. Polar view. (× 2200)

B. Equatorial view. (× 2000)




A.

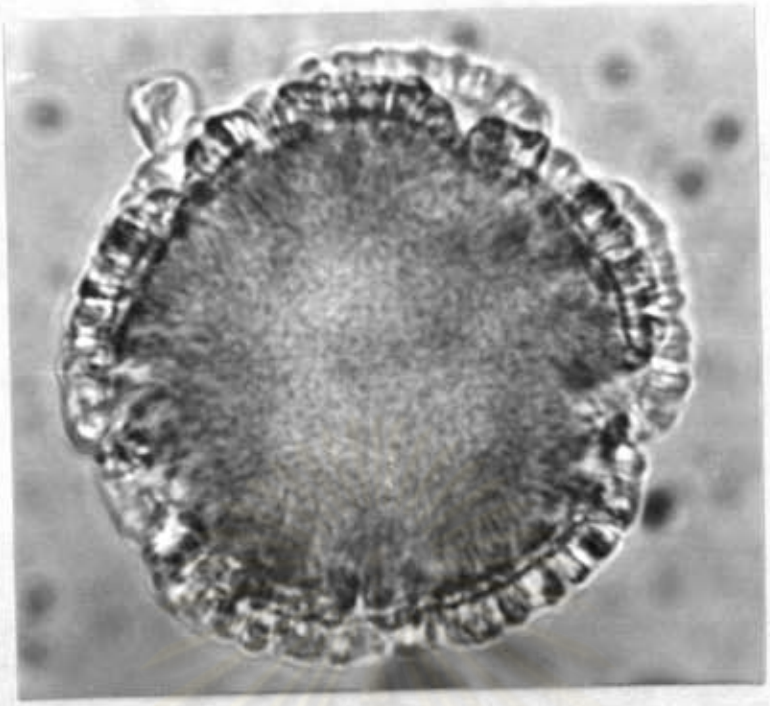



B.

Plate 28 Cuscuta reflexa Roxb.

A. Grains in polar and equatorial view.

B. Sculpturing.



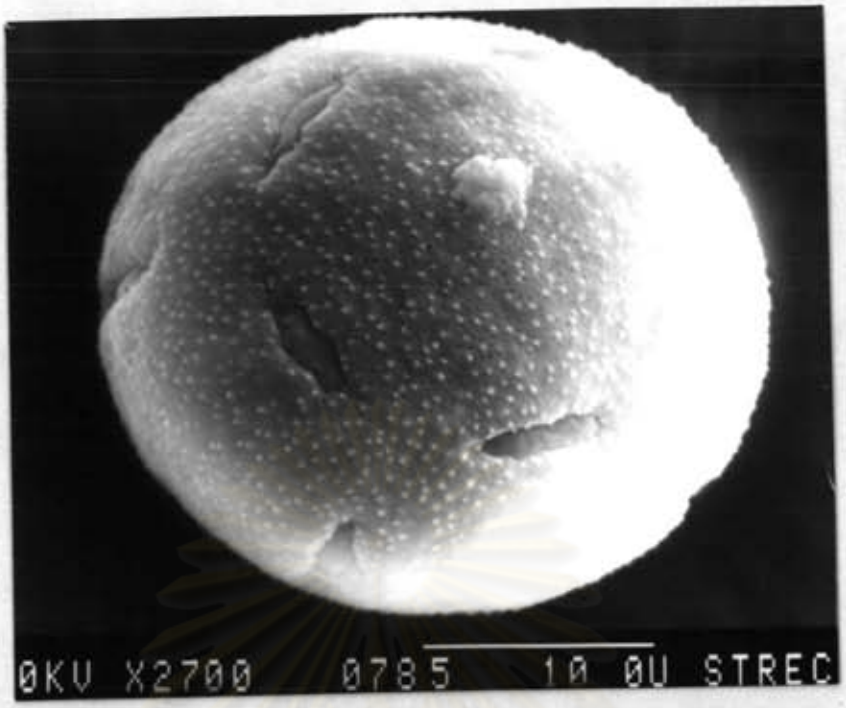
A.

B.

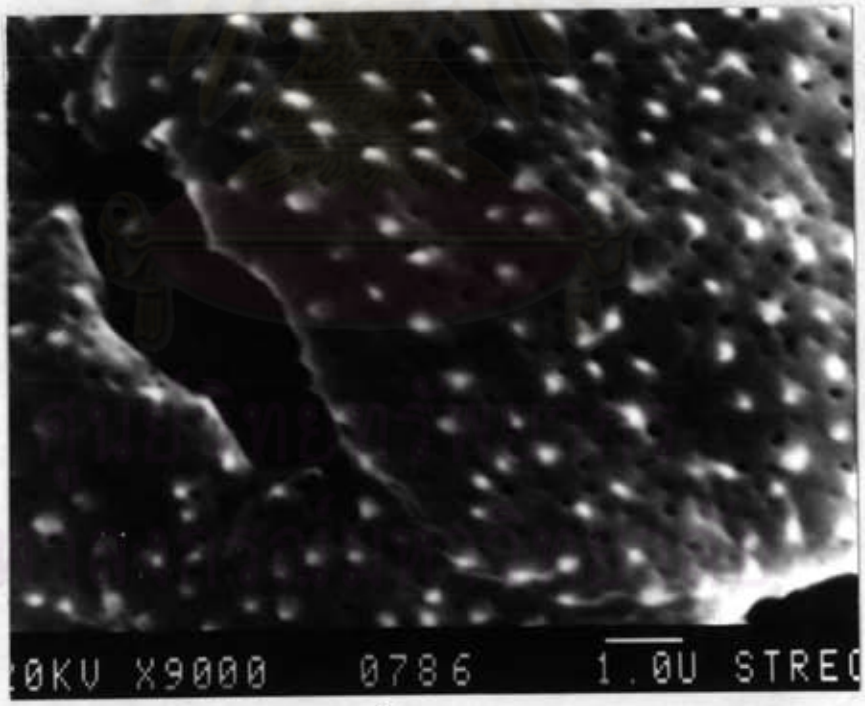
Plate 29 Cuscuta reflexa Roxb.

A. Polar view. (X 2500)

B. Equatorial view. (X 2000)




A.

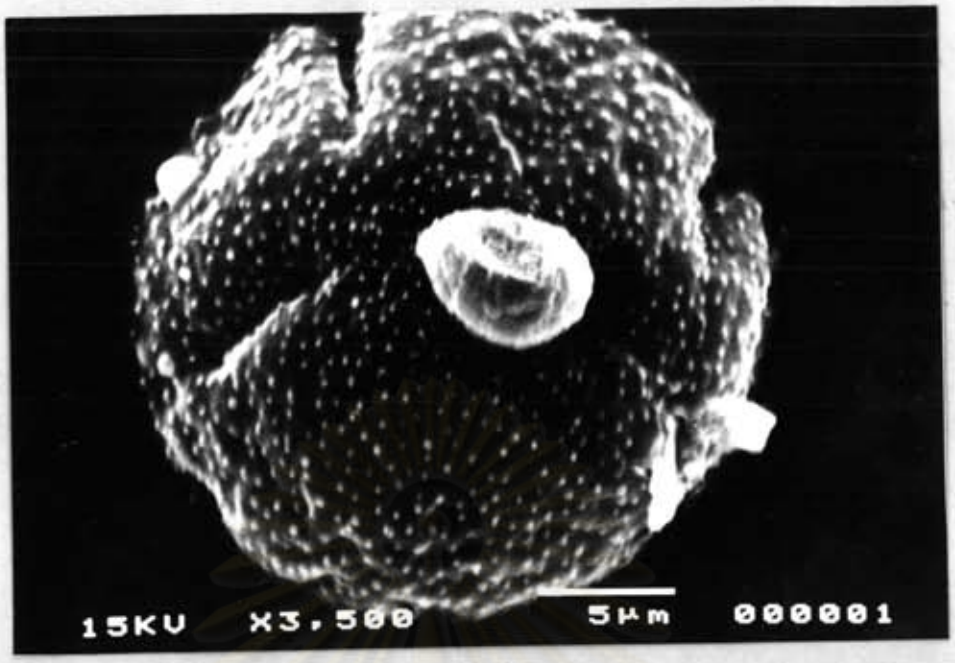



B.

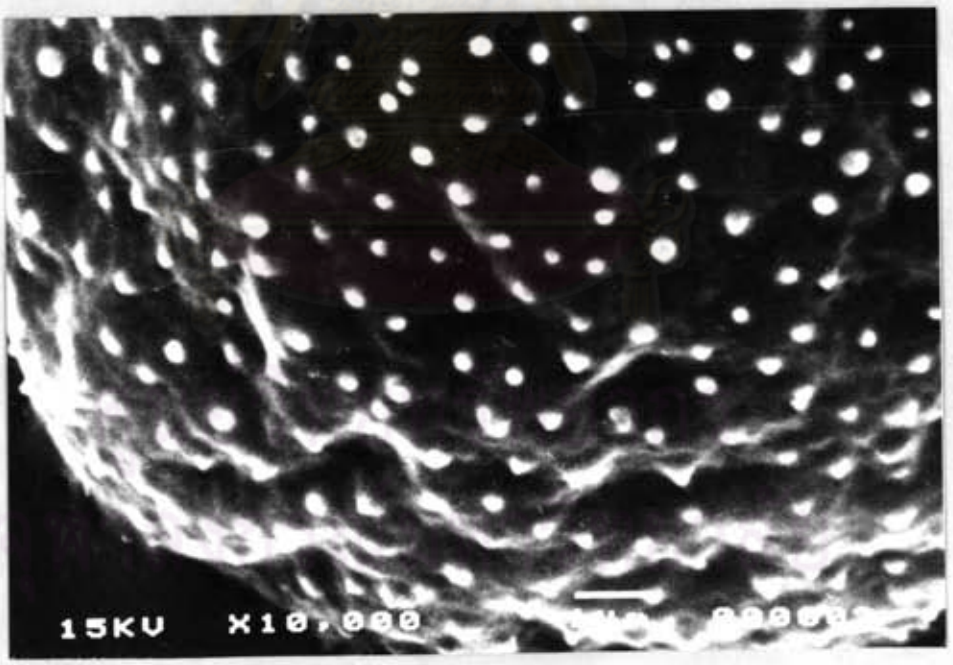
Plate 30 Evolvulus alsinoides (Linn.) Linn. var. alsinoides.

A. Grain and apertures.

B. Sculpturing.




A.



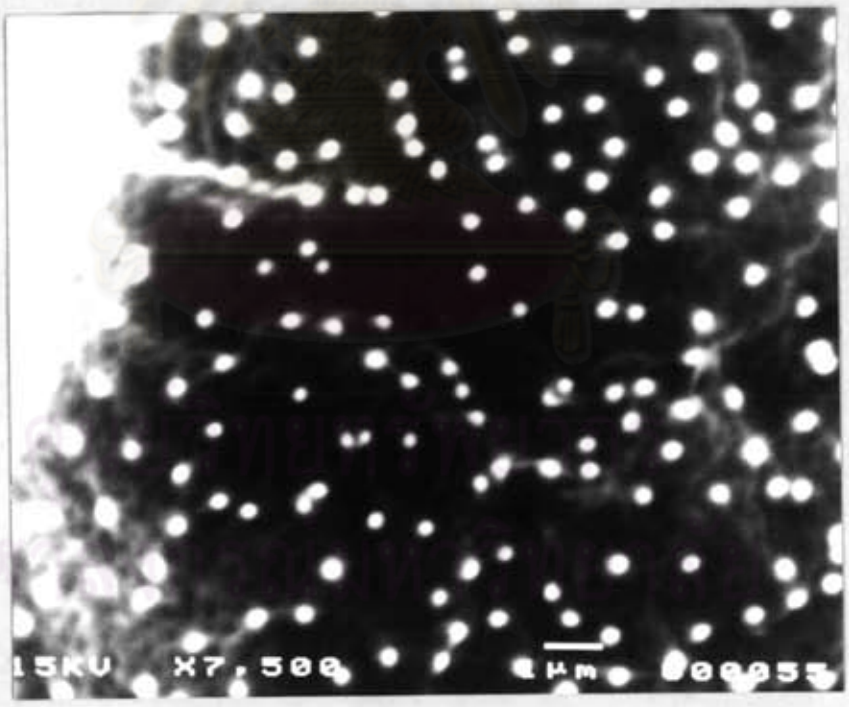

B.

Plate 31 Evolvulus nummularius (Linn.) Linn.

A. Grain and apertures.

B. Sculpturing.


A.




B.

Plate 32 Hewittia scandens (Milne) Mabberley

A. Grain and apertures.

B. Sculpturing.

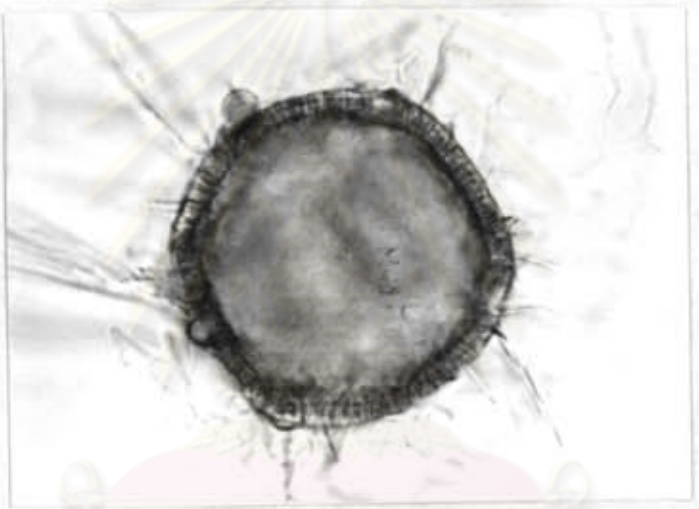
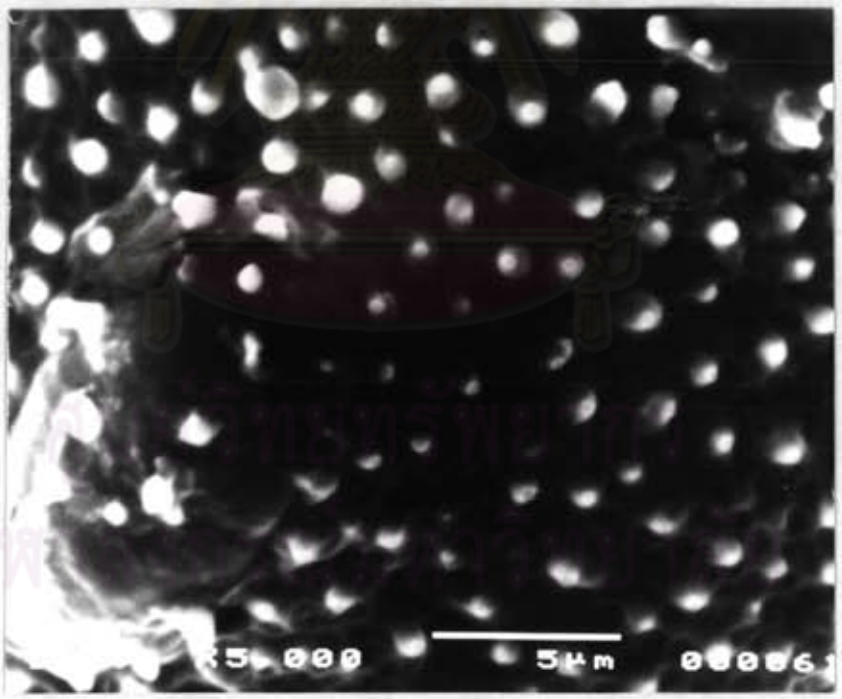


PLate 33 Hewittia scandens (Milne) Mabberley
(× 450)


A.




B.

Plate 34 Jacquemontia paniculata (Burm.f.) Hall.f.

A. Grain and apertures.

B. Sculpturing.

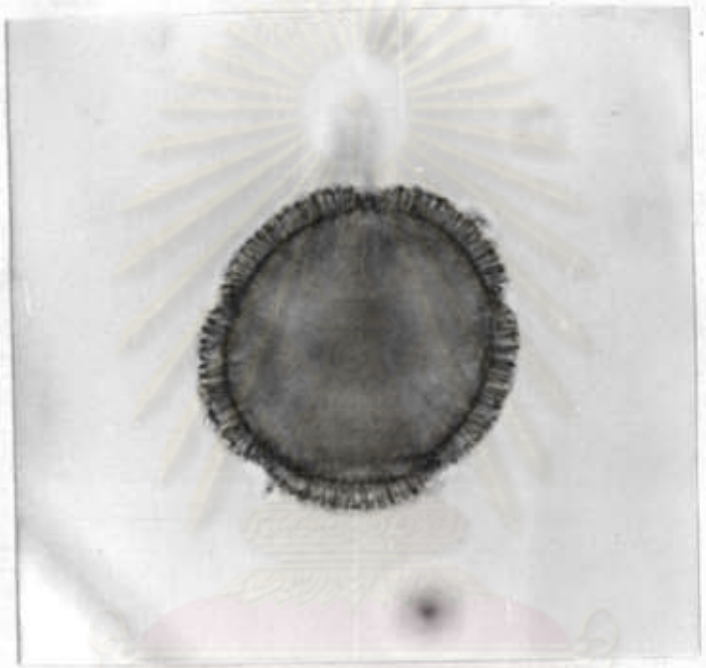
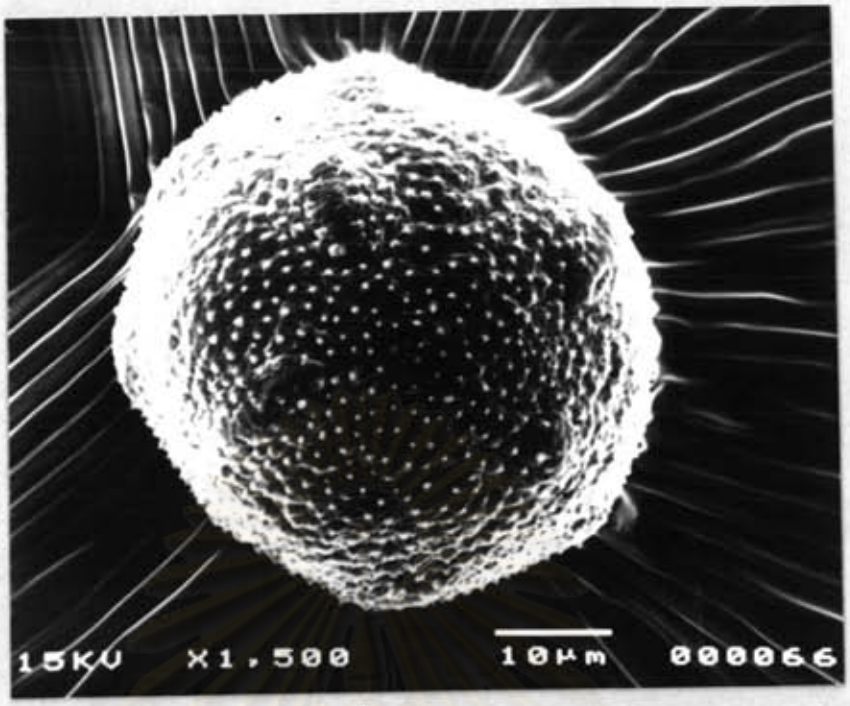
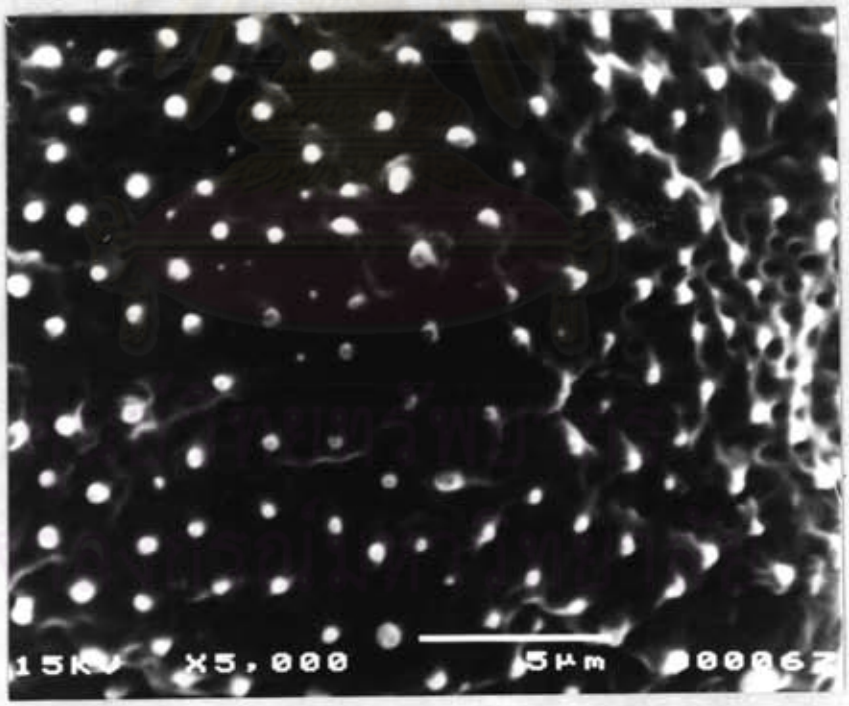


Plate 35 Jacquemontia paniculata (Burm.f.) Hall.f.
(X 450)




A.




B.

Plate 36 Jacquemontia pentantha (Jacq.) G.Don

A. Grain and apertures.

B. Sculpturing.

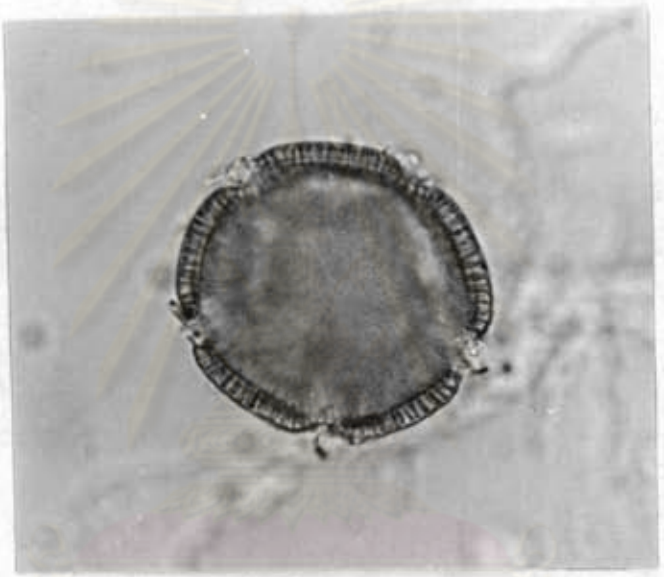
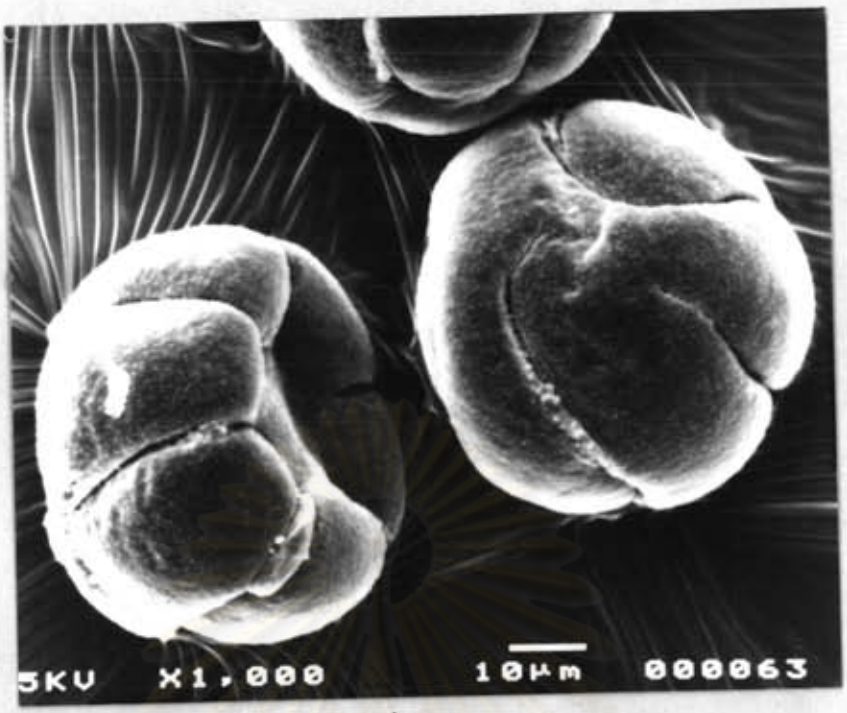
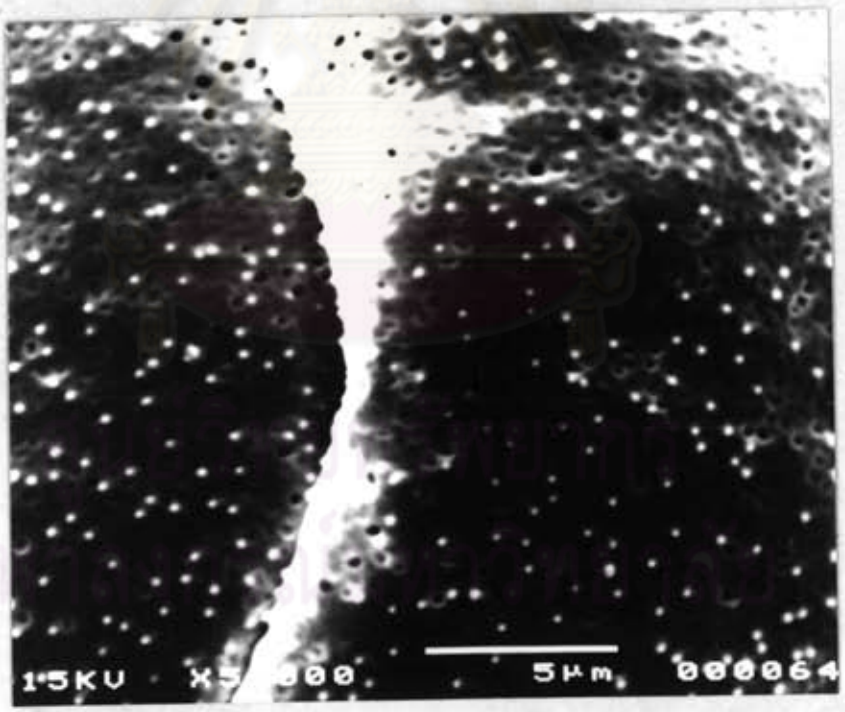


Plate 37 Jacquemontia pentantha (Jacq.) G.Don
(× 450)




A.

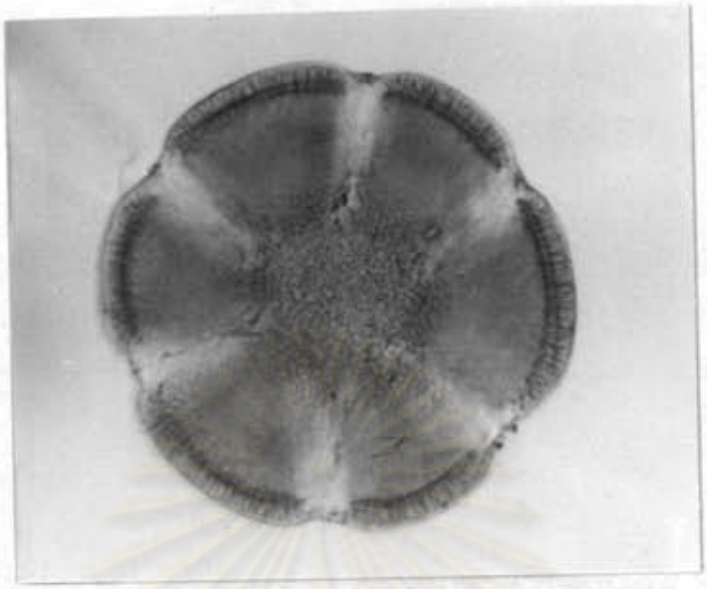



B.

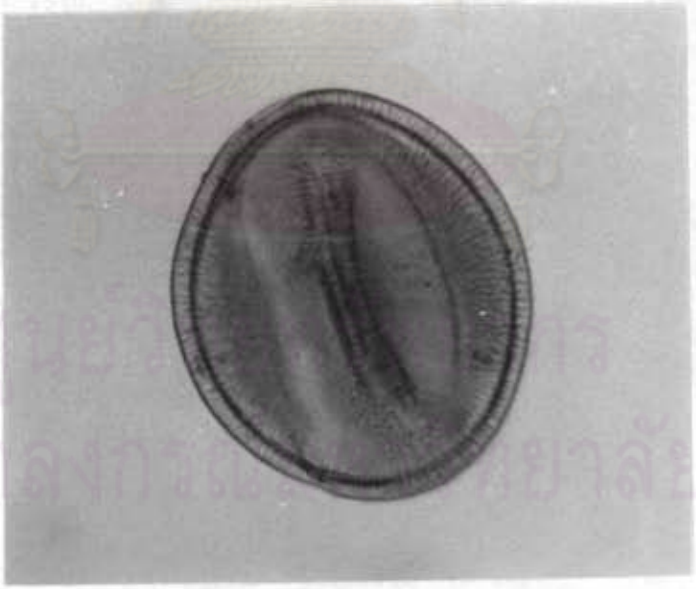
Plate 38 Merremia bambusetorum Kerr

A. Grains, heteropolar.

B. Sculpturing.



A.

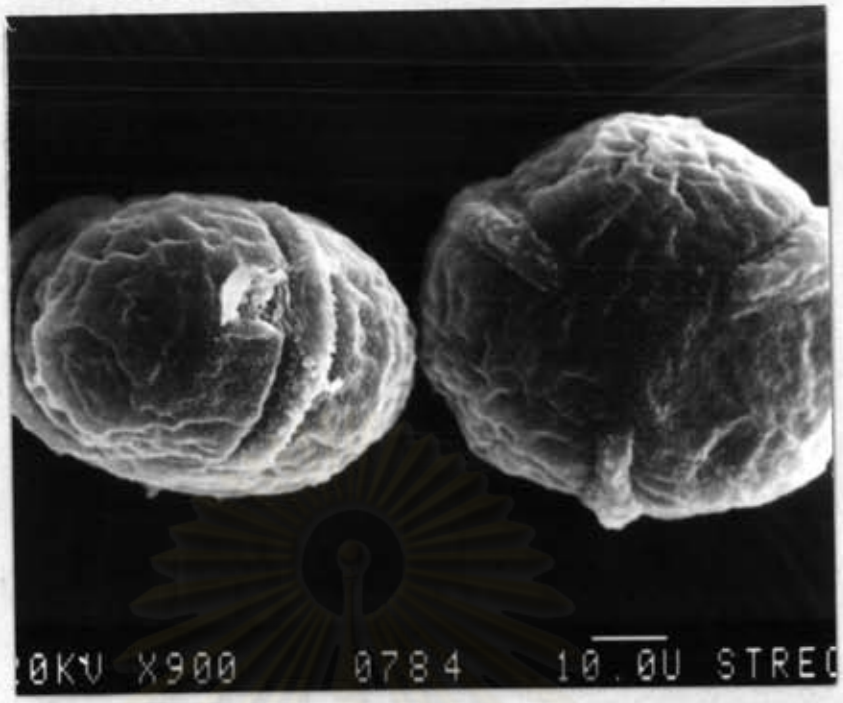


B.

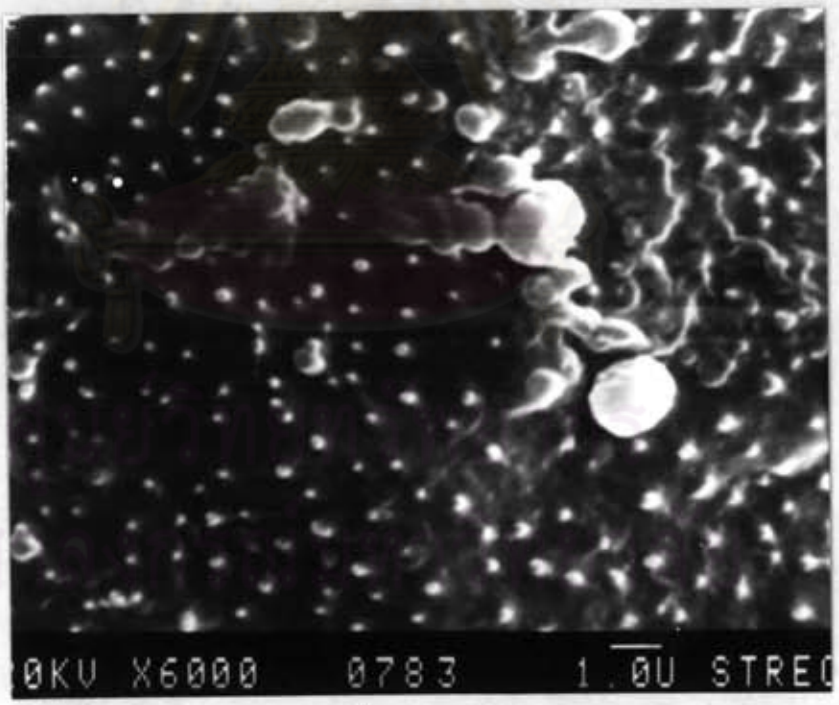
Plate 39 Merremia bambusetorum Kerr

A. polar view. ( x 1000)

B. equatorial view. ( x 400)




A.

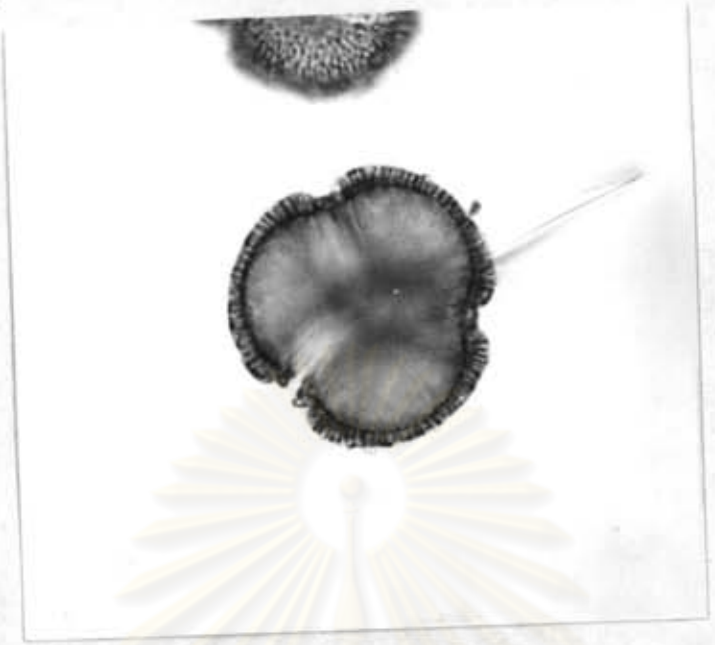



B.

Plate 40 Merremia collina S.Y. Liou

A. Grain in equatorial view (left), polar view (right).

B. Sculpturing.



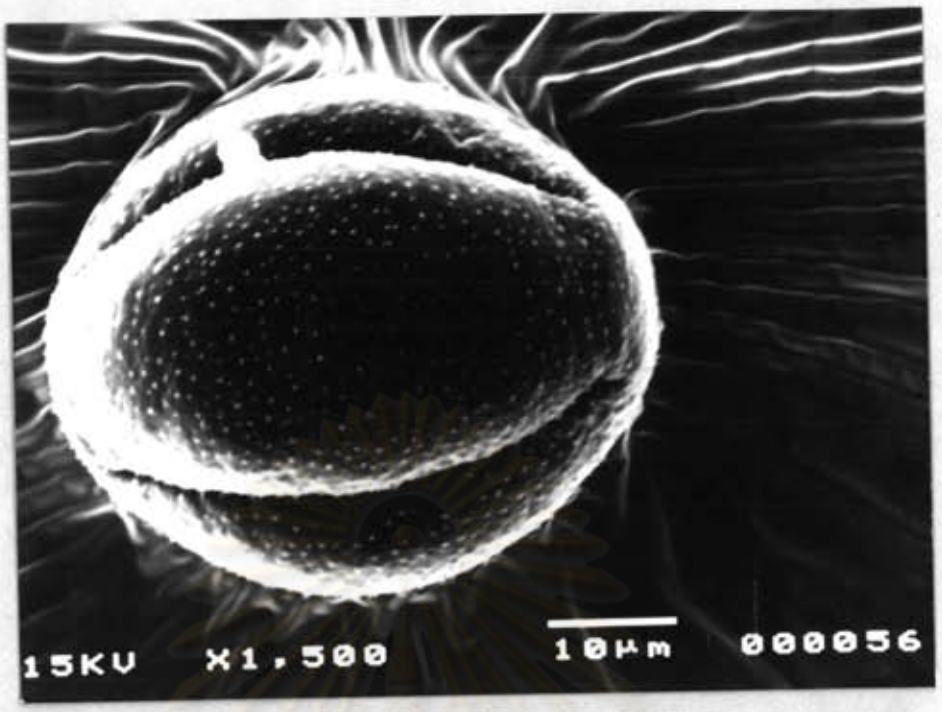
A.

B.

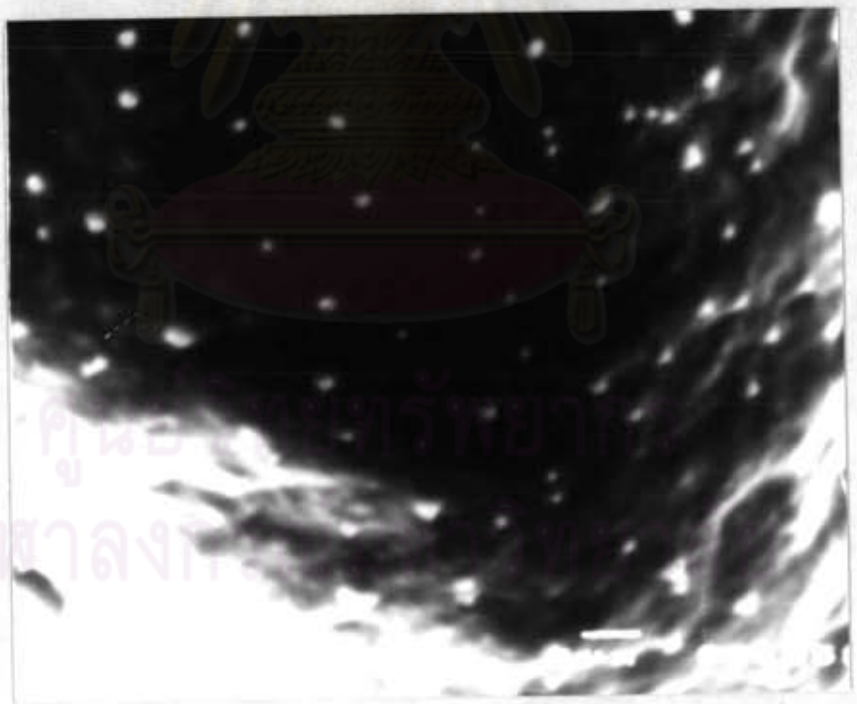
Plate 41 Merremia collina S.Y. Liou

A. Polar view. ( x 900)

B. Equatorial view. (x 800)




A.

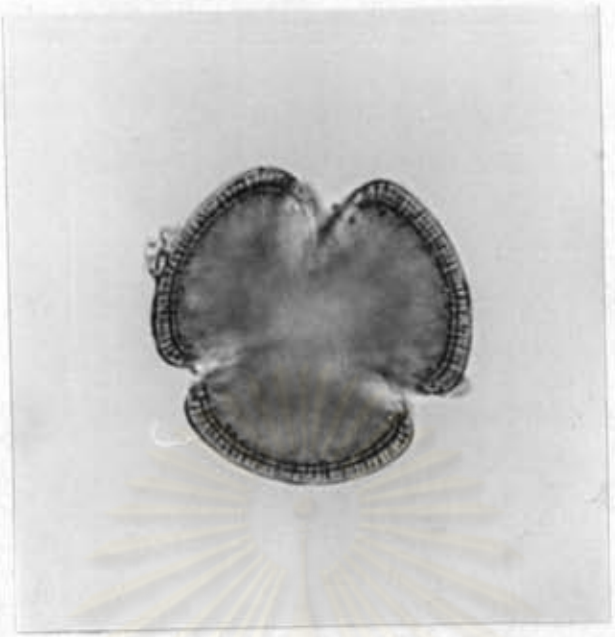


B.

Plate 42 Merremia emarginata (Burm.f.) Hall.f.

A. Grain in equatorial view.

B. Sculpturing.



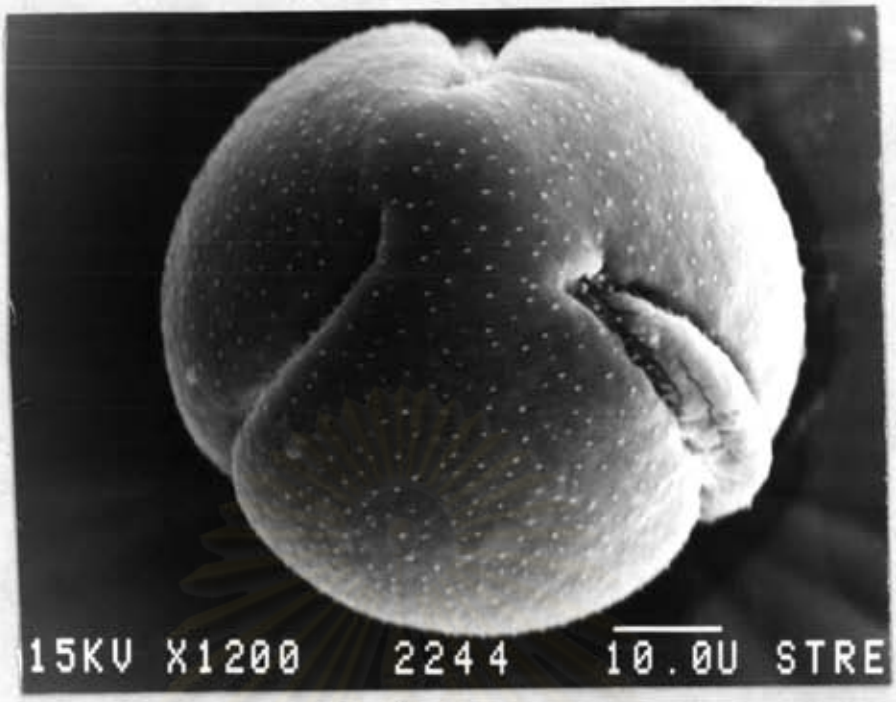
A.

B.

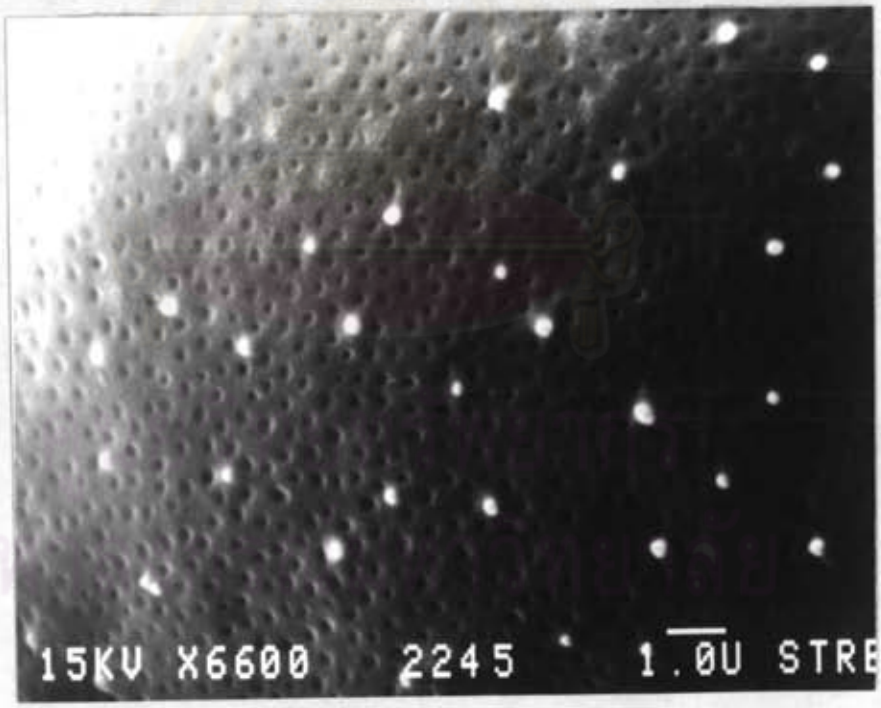
Plate 43 Merremia emarginata (Burm.f.) Hall.f.

A. Polar view. (X 750)

B. Equatorial view. (X 700)




A.

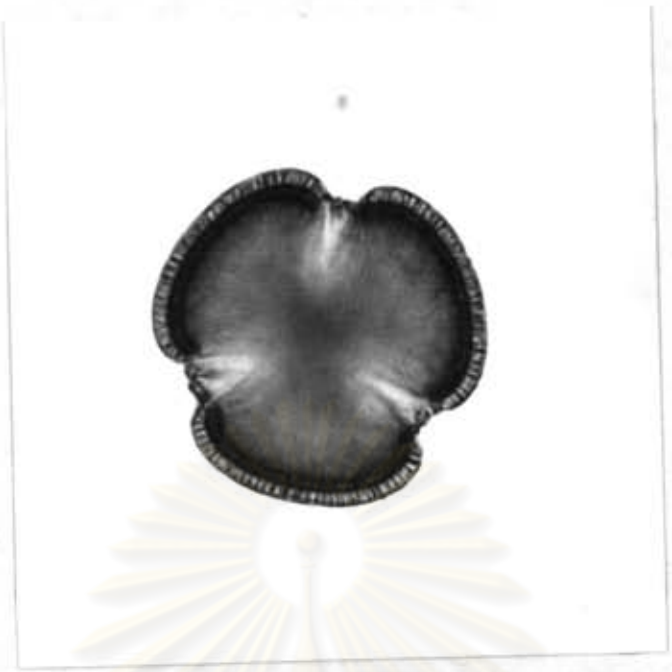



B.

Plate 44 Merremia gemella (Burm.f.) Hall.f.

A. Grain in polar view.

B. Sculpturing.



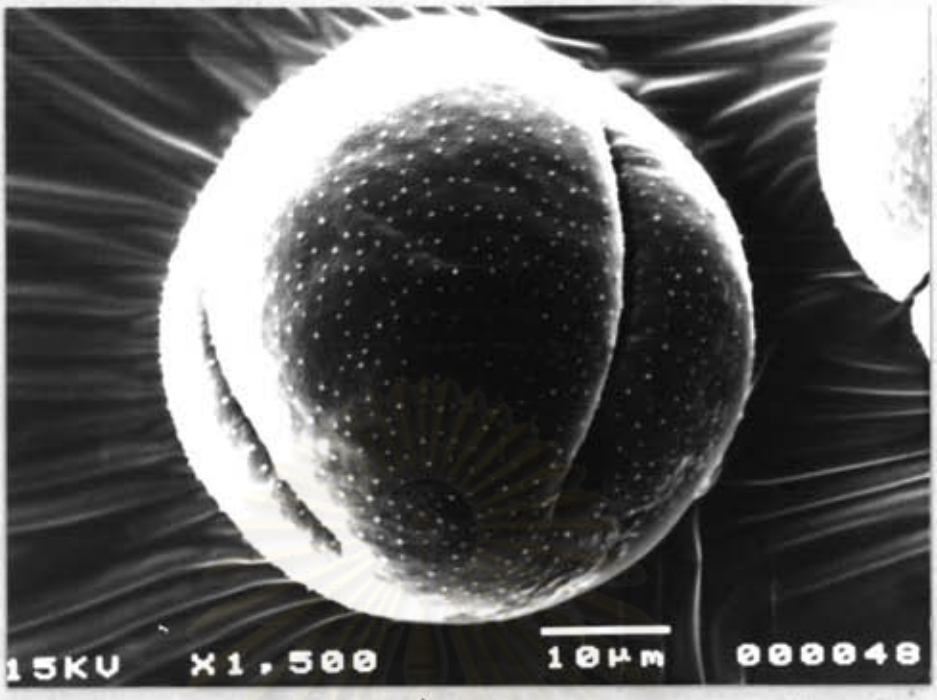
A.

B.

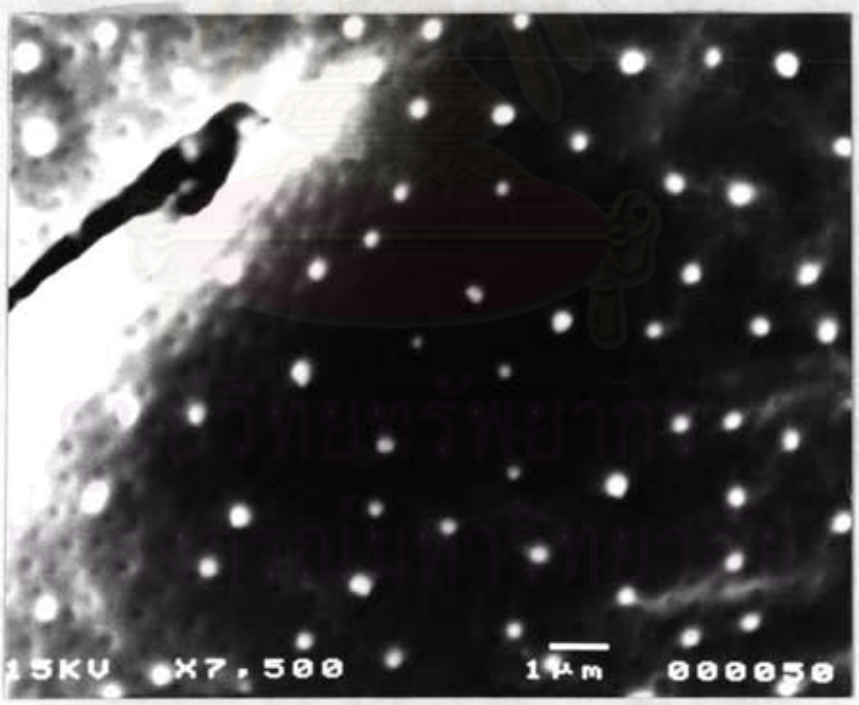
Plate 45 Merremia gemella (Burm.f.) Hall.f.

A. Polar view. (× 800)

B. Equatorial view. (× 700)




A.

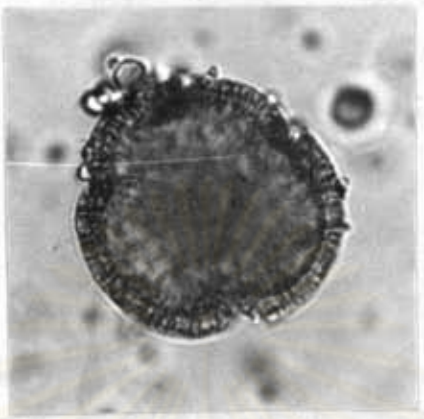



B.

Plate 46 Merremia hederacea (Burm.f.) Hall.f.

A. Grain in equatorial view.

B. Sculpturing.



A.

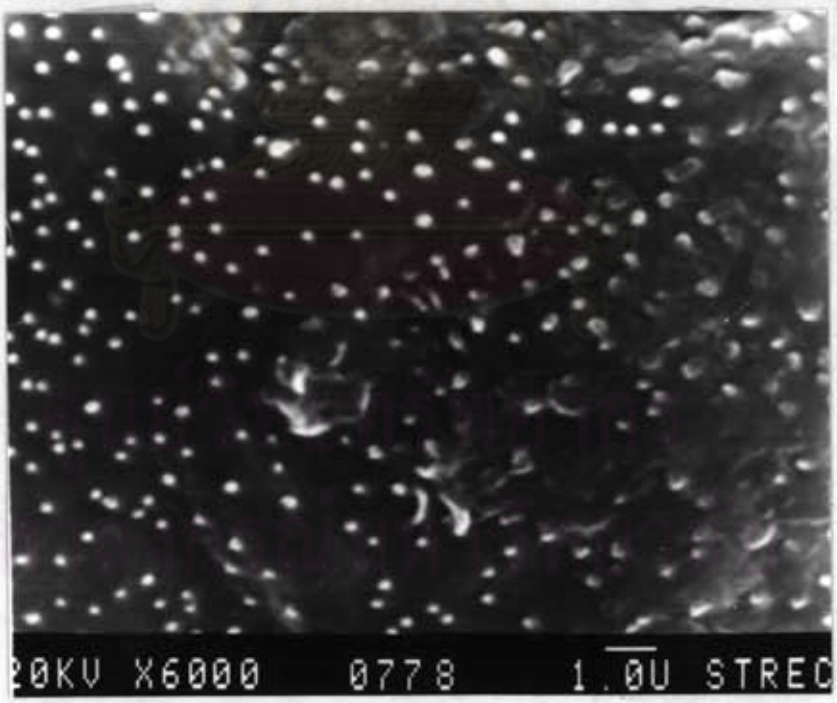
B.

Plate 47 Merremia hederacea (Burm.f.) Hall.f.

A. Polar view. ( X 760)

B. Equatorial view. ( X 800)


A.

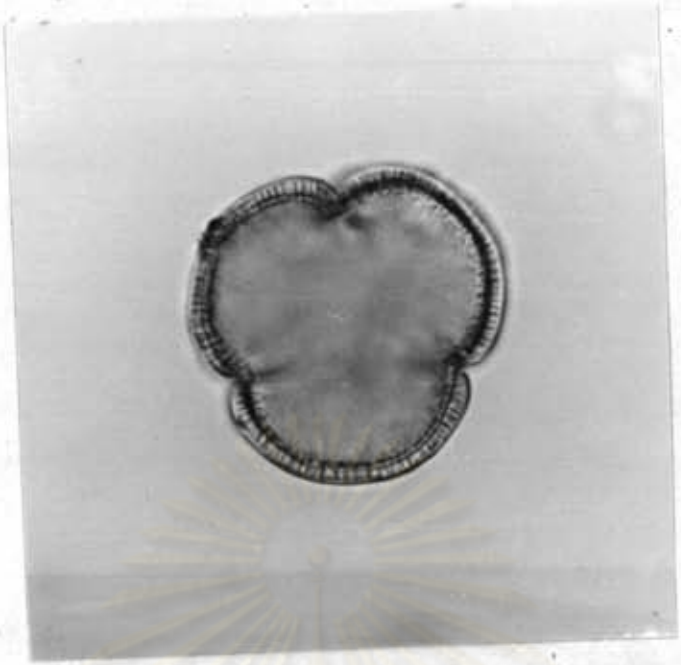



B.

Plate 48 Merremia hirta (Linn.) Merrill

A. Grain in polar view.

B. Sculpturing.



A.

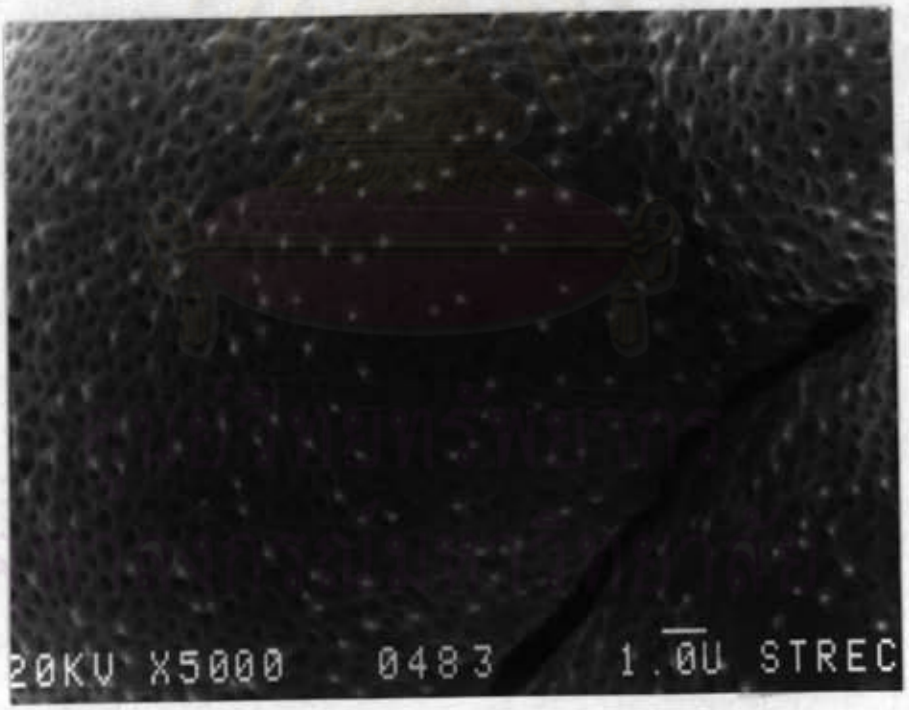
B.

Plate 49 Merremia hirta (Linn.) Merrill

A. Polar view. ( × 800)

B. Equatorial view. (× 1000)


A.

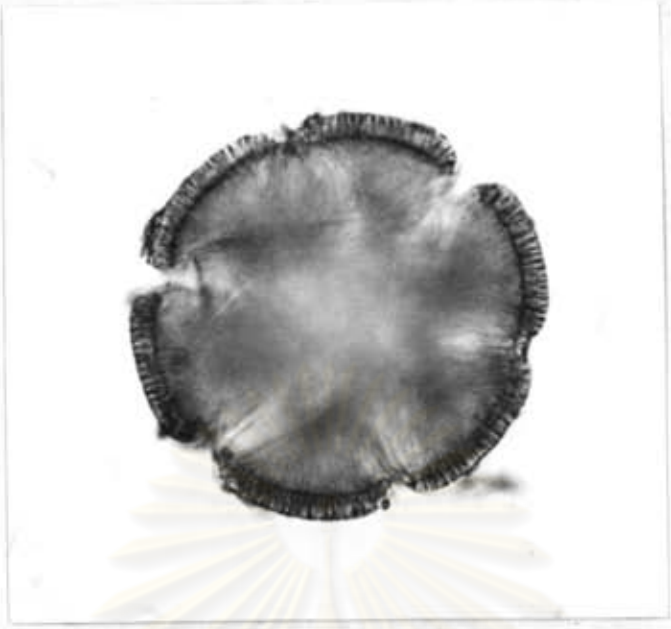



B.

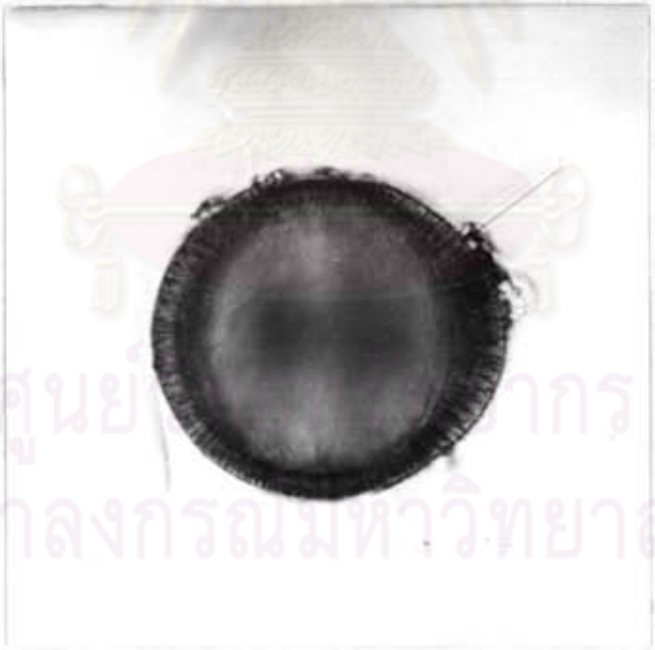
Plate 50 Merremia kingii (Prain) Kerr

A. Grain in polar view (left), equatorial view (right).

B. Sculpturing.



A.



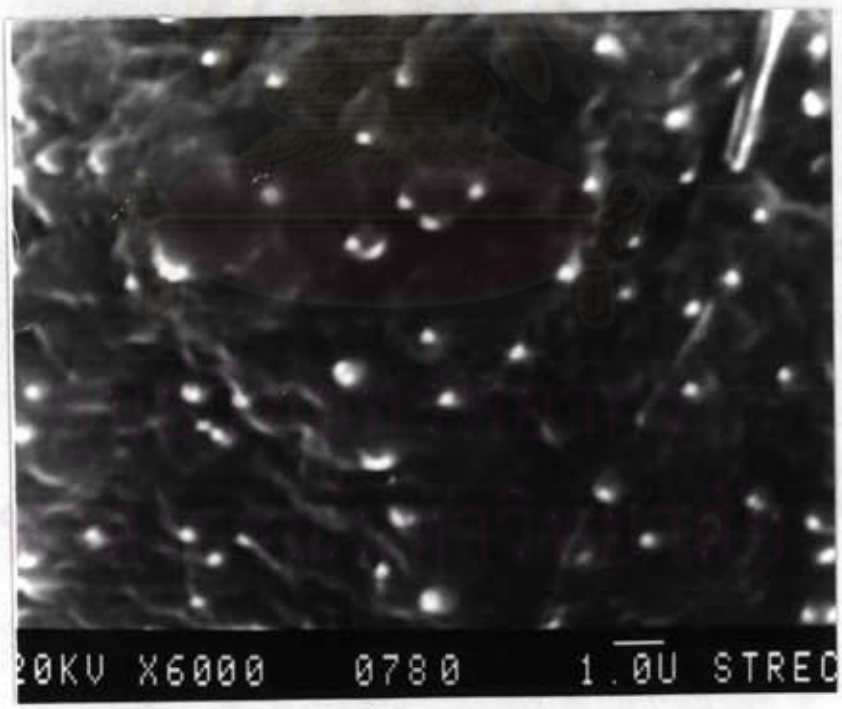
B.

Plate 51 Merremia kingii (Prain) Kerr

A. Polar view. ( X 1000)

B. Equatorial view. (X 750)


A.

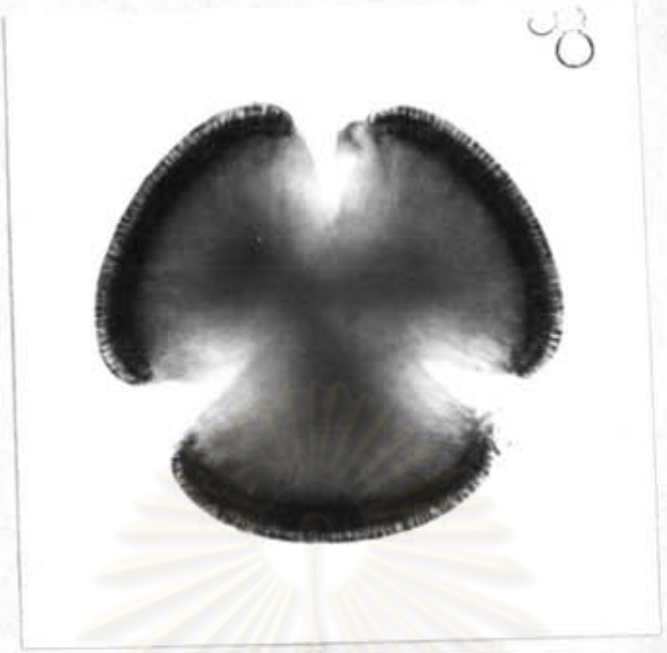



B.

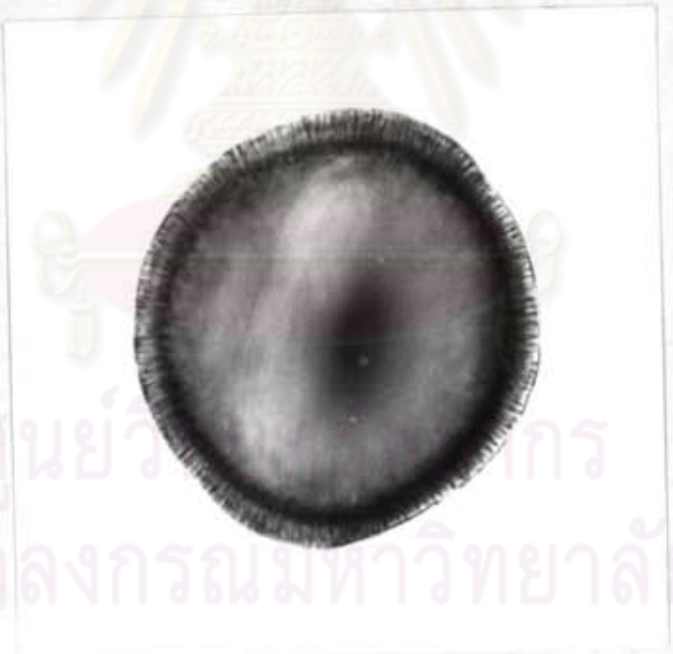
Plate 52 Merremia peltata (Linn.) Merrill

A. Grain in polar view.

B. Sculpturing.



A.



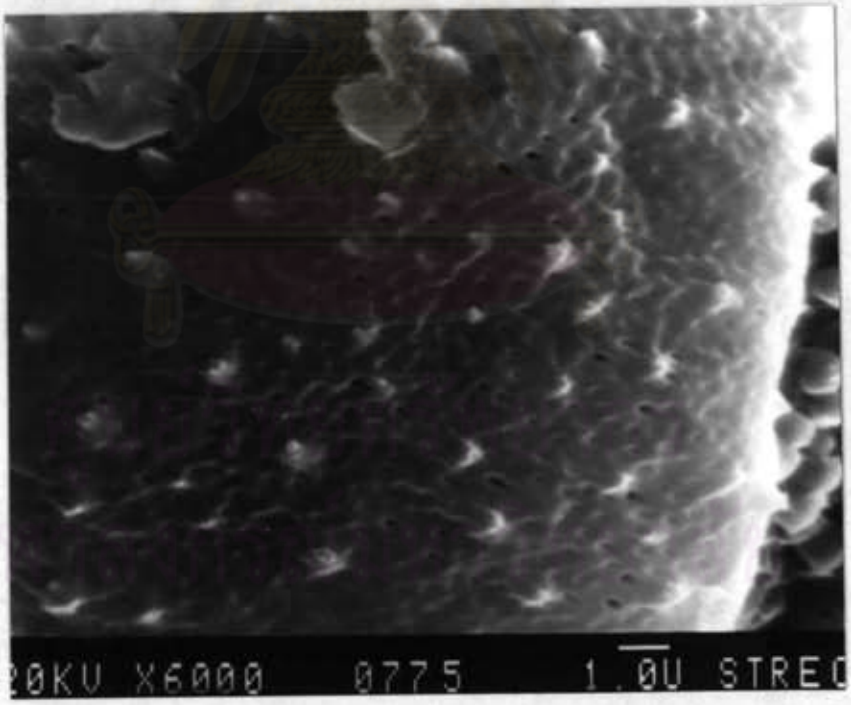
B.

Plate 53 Merremia peltata (Linn.) Merrill

A. polar view. (X 850)

B. Equatorial view. (X 450)


A.

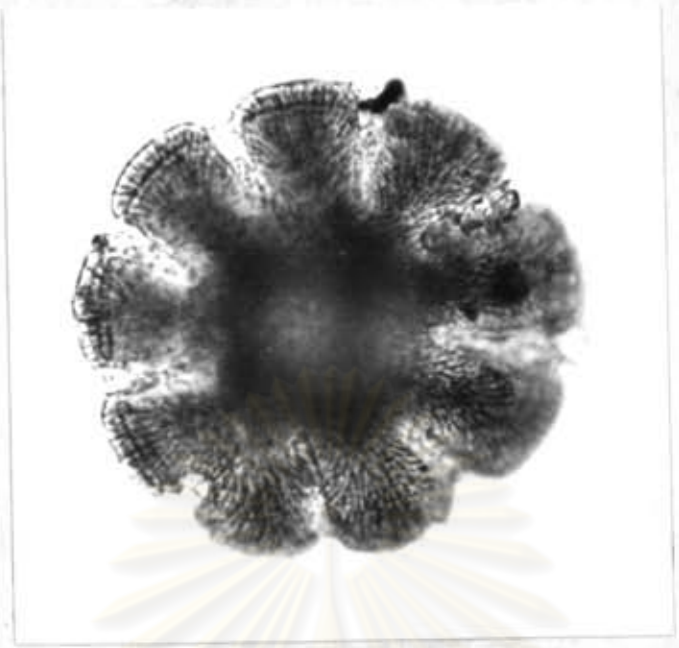



B.

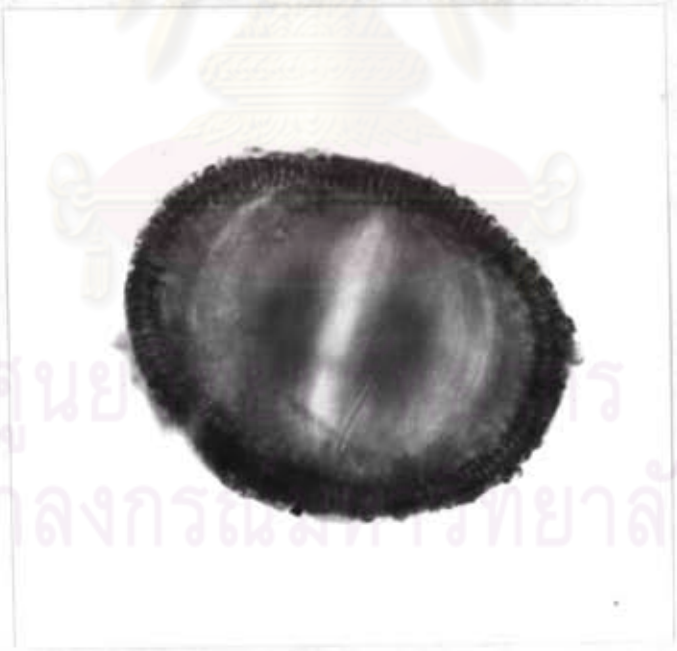
Plate 54 Merremia quinata (R.Br.) Van Ooststr.

A. Grains in polar and equatorial view.

B. Sculpturing.



A.

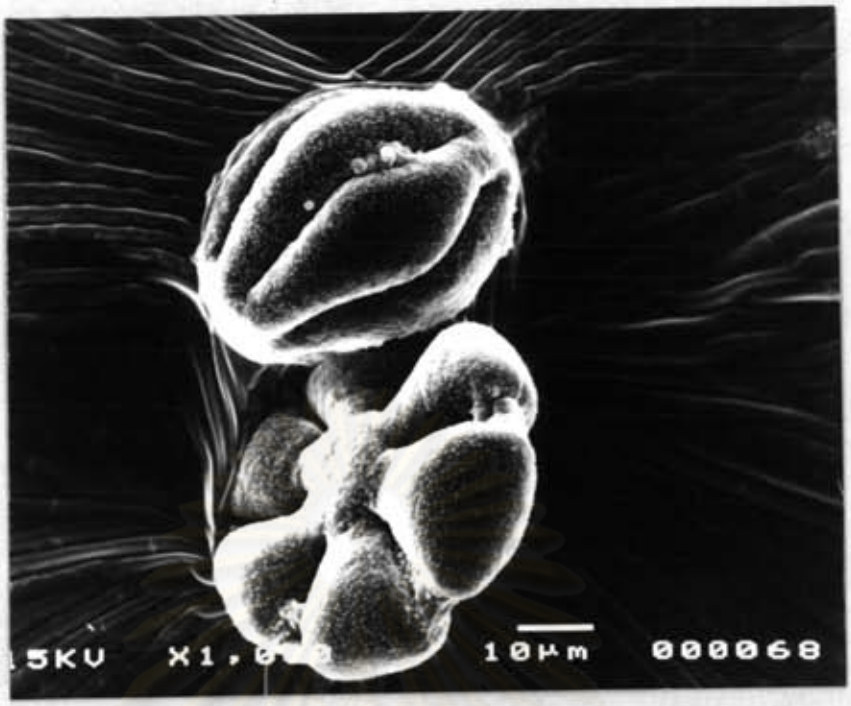


B.

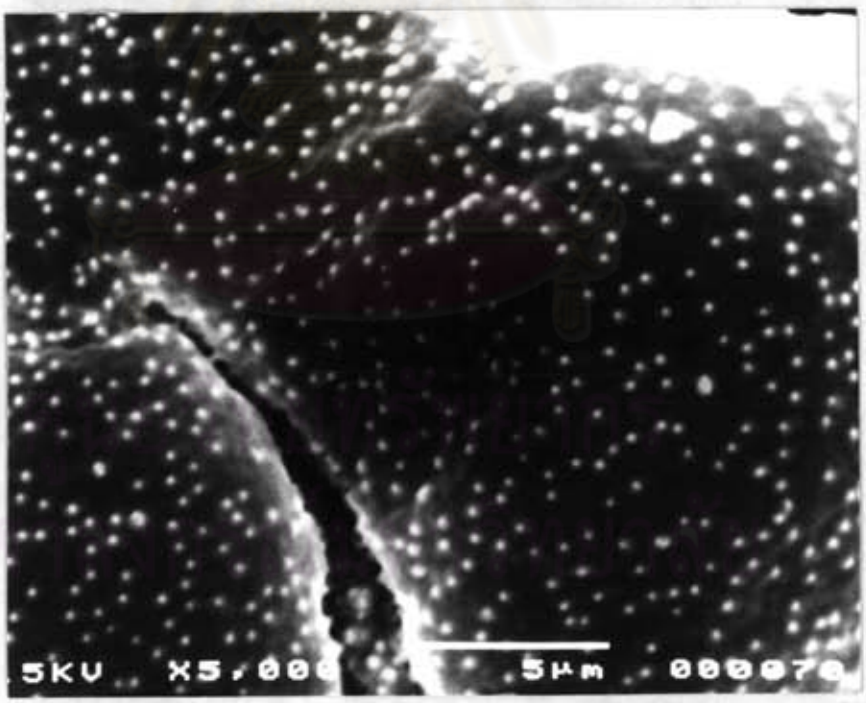
Plate 55 Merremia quinata (R.Br.) Van Ooststr.

A. Polar view. (× 850)

B. Sculpturing. (× 1000)




A.

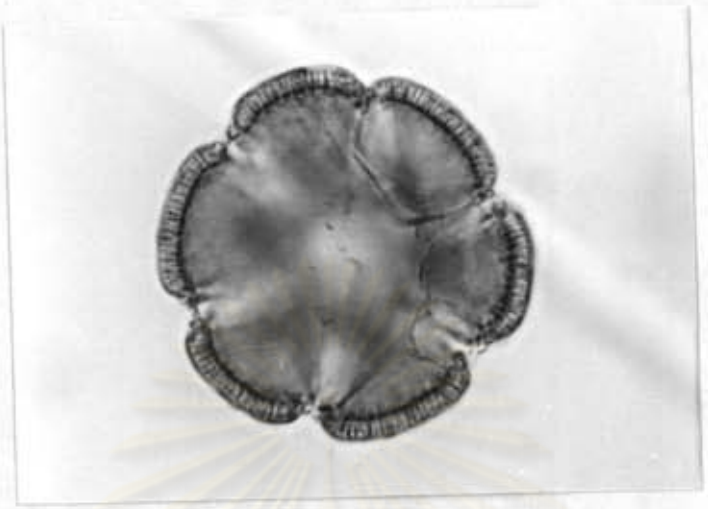



B.

Plate 56 Merremia umbellata (Linn.) Hall.f.

A. Grains in equatorial view (above), polar view (below).

B. Sculpturing.



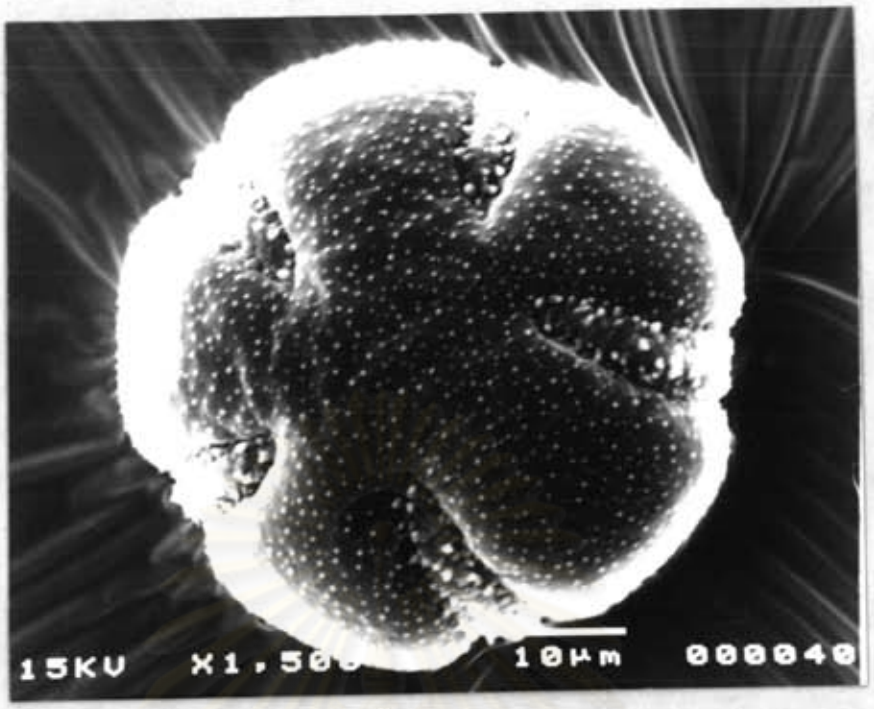
A.

B.

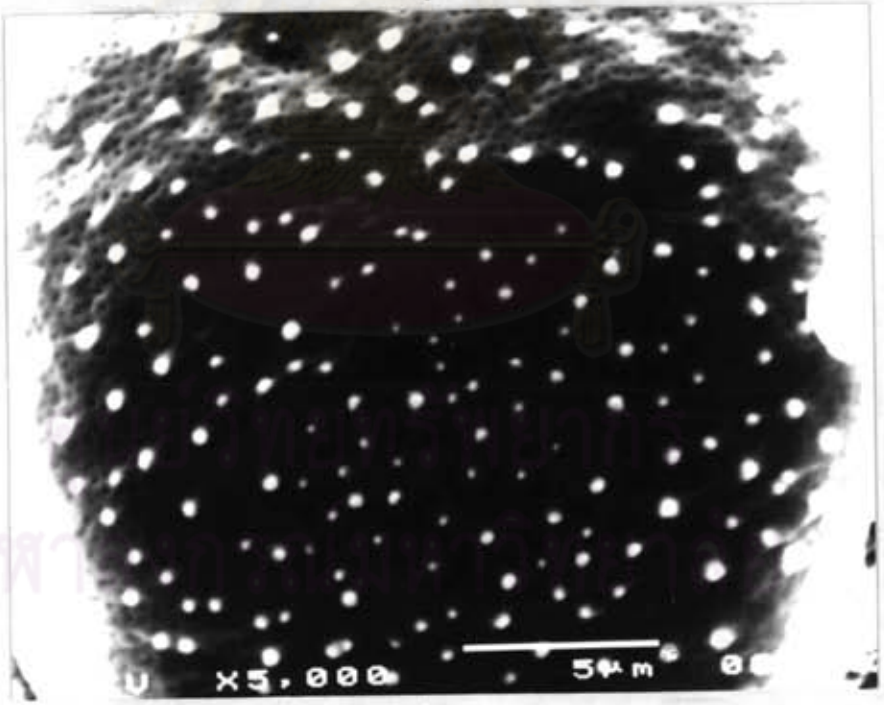
Plate 57 Merremia umbellata (Linn.) Hall.f.

A. polar view. (×850)

B. Equtorial view. (×800)




A.

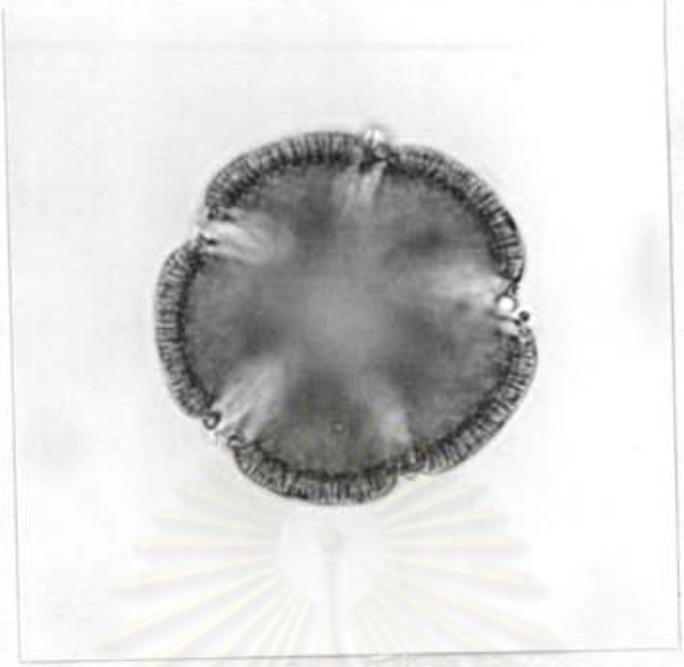



B.

Plate 58 Merremia vitifolia (Burm.f.) Hall.f.

A. Grain in polar view.

B. Sculpturing.



A.

B.

Plate 59 Merremia vitifolia (Burm.f.) Hall.f.

A. Polar view. (× 800)

B. Equatorial view. (× 450)

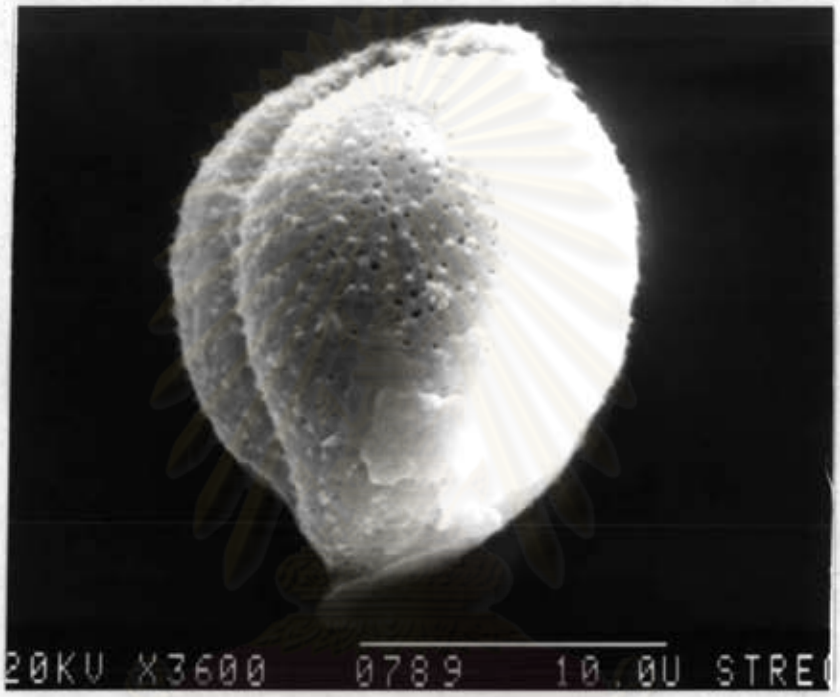
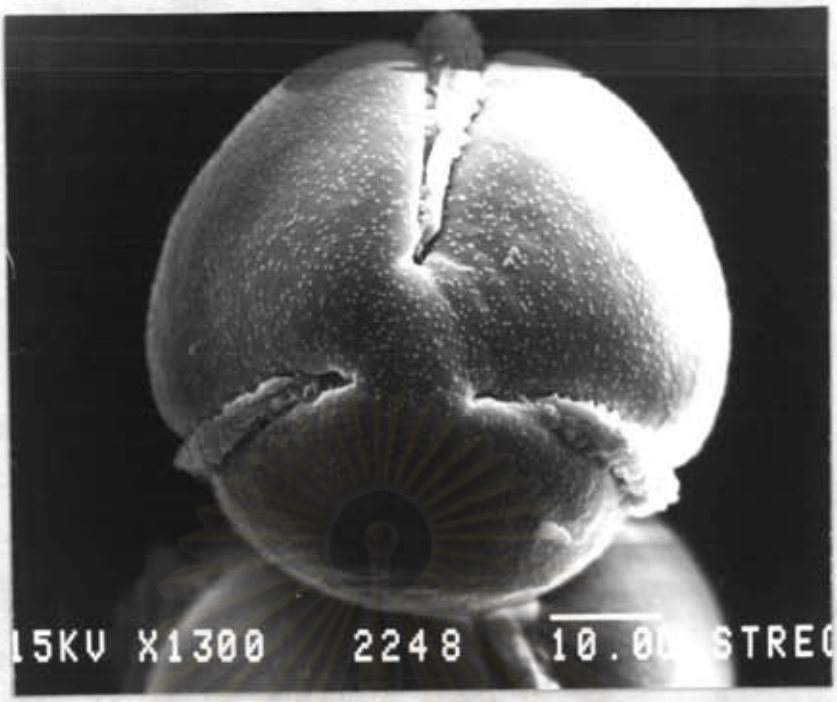
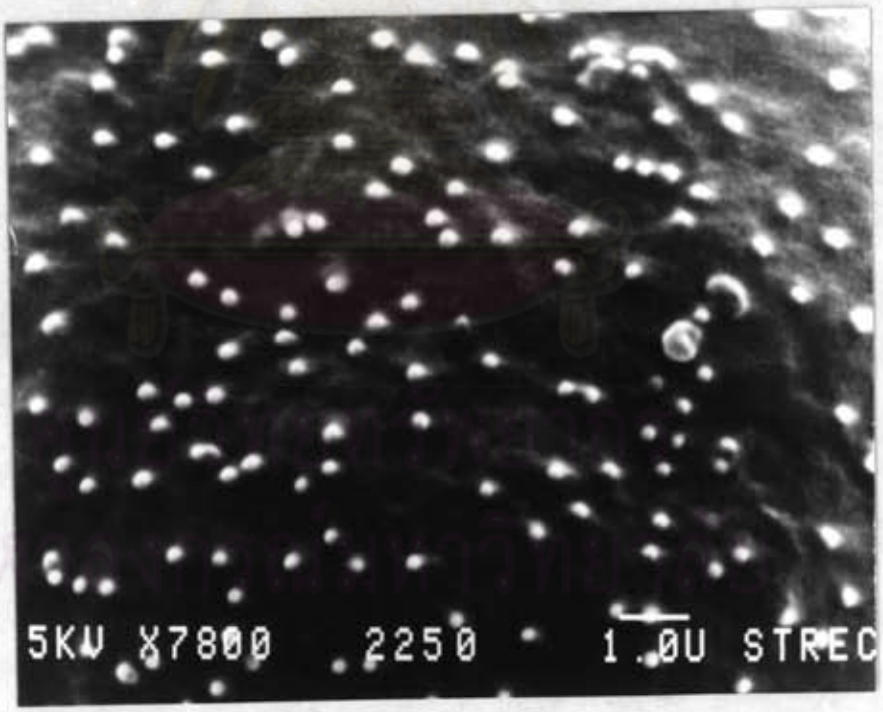



Plate 60 Neuropeltis racemosa Wall.




A.

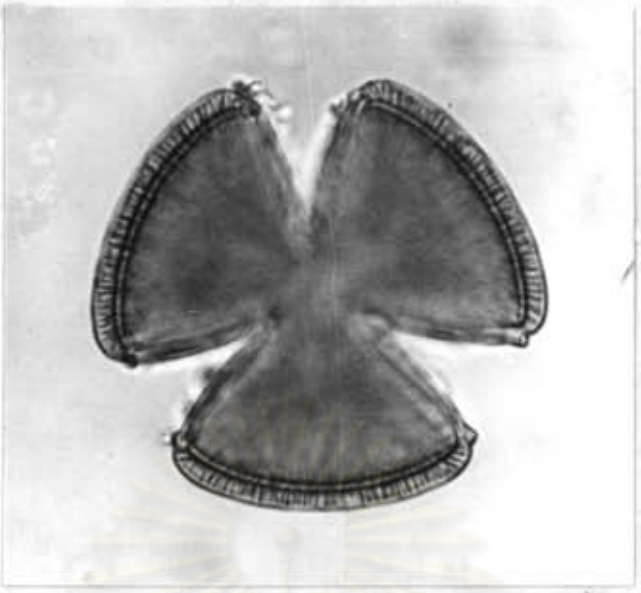



B.

Plate 61 Operculina petaloidea (Choisy) Van Ooststr.

A. Grain in polar view.

B. Sculpturing.

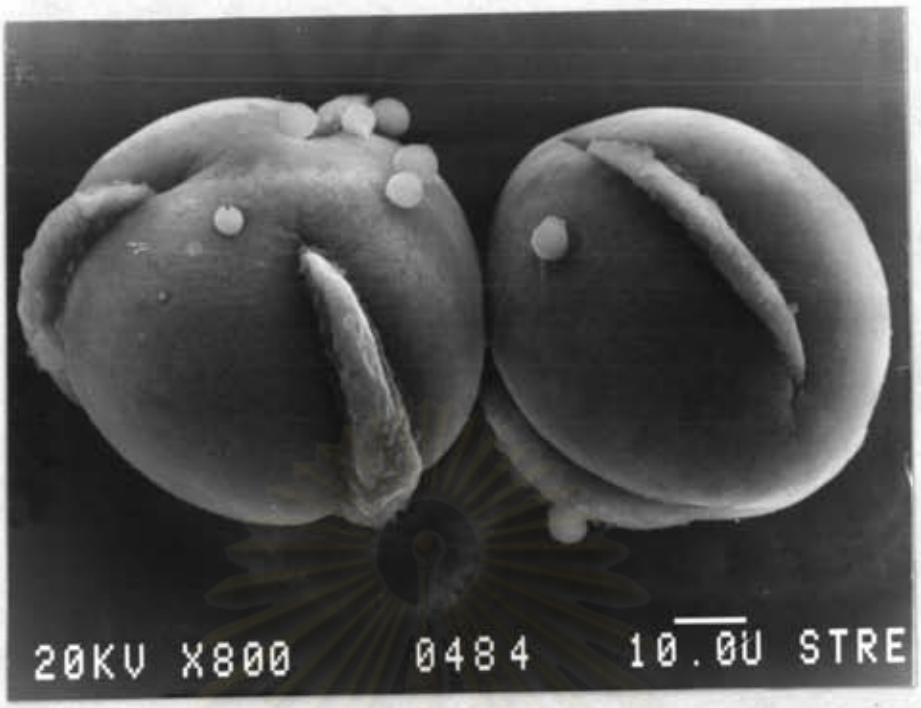


B.

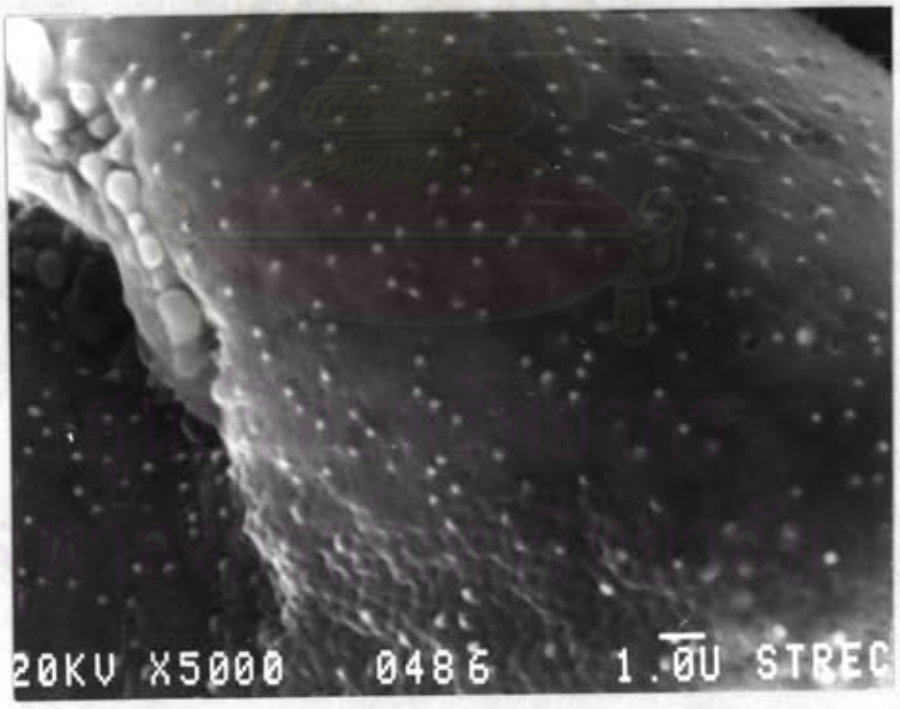
Plate 62 Operculina petaloidea (Choisy) Van ooststr.

A. Polar view. ( X 1000)

B. Equatorial view. (X 900)




A.




B.

Plate 63 Operculina riedeliana (Oliv.) Van Ooststr.

A. Grains in polar view (left), equatorial view (right).

B. Sculpturing.

A.

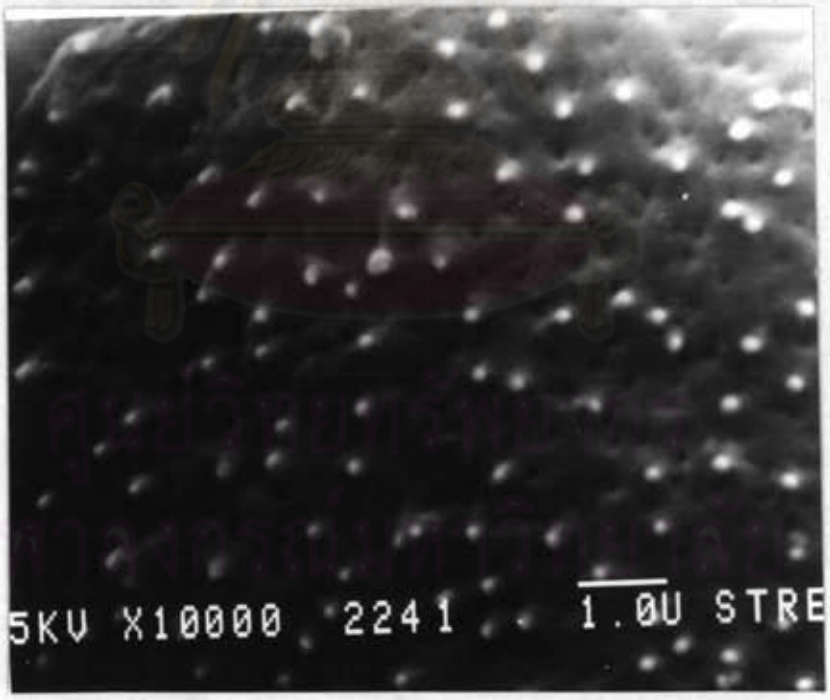
B.

Plate 64 Operculina riedeliana (Oliv.) Van Ooststr.

A. Polar view. ( X 400)

B. Equatorial view. (X 450)


A.

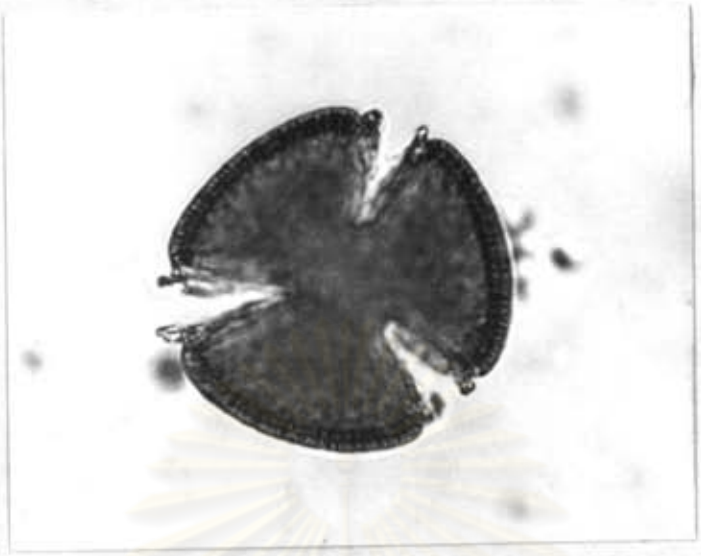



B.

Plate 65 Operculina turpethum (Linn.) S. Manso

A. Grain in polar view.

B. Sculpturing.



A.

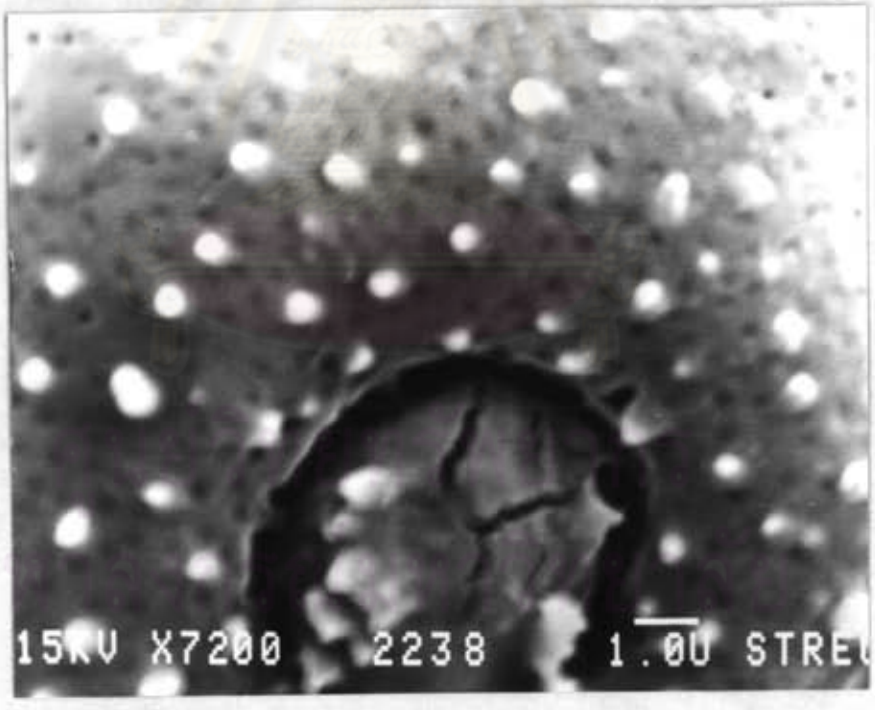
B.

Plate 66 Operculina turpethum (Linn.) S. Manso

A. Polar view. (x 850)

B. Equatorial view. (x 400)


A.




B.

Plate 67 Xenostegia tridentata (Linn.) Austin & Staples

A. Grain and apertures.

B. Sculpturing.

PLate 68 Xenostegia tridentata (Linn.) Austin & Staples
(x 800)