

THE GENERA *CYNANCHUM* AND *VINCETOXICUM* (APOCYNACEAE–ASCLEPIADOIDEAE) IN MALESIA

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SUMMARY

The genera *Cynanchum* and *Vincetoxicum* are revised for the Flora Malesiana area. For *Cynanchum*, nine species are recognized and one new subspecies is described. For *Vincetoxicum*, only one species, the widespread *V. carnosum*, occurs in the area. Five published species of *Cynanchum* have to remain obscure, because the types most likely got destroyed in Berlin.

Key words: *Cynanchum*, *Vincetoxicum*, Malesia.

INTRODUCTION

For a long time, the relationships of *Cynanchum* and *Vincetoxicum* were not resolved and the two genera were merged or split depending on the preference of the author. Lately, clear evidence has been produced that *Cynanchum* and *Vincetoxicum* are entirely unrelated (Liede, 1996). Both genera belong in the tribe Asclepiadeae; the large genus *Cynanchum* is the centre of the subtribe Metastelminae, while *Vincetoxicum* is most closely related to *Tylophora* R.Br. and a member of the Astephaninae, a subtribe characterized by the possession of clear latex and long, slender trichomes on the adaxial side of the corolla lobes (Liede, 1997). Liede (1994) recognized that *V. carnosum* was not a member of *Cynanchum*, but as the position of *Vincetoxicum* was by no means clear at this point, she placed the species in *Pentatropis*. This placement is supported by the contorted aestivation of *V. carnosum* and its preference for maritime habitats. However, the species lacks the defining character of *Pentatropis*, anther wings extending along the basal margin of the anther. Until further analyses will provide new insights, it seems therefore preferable to consider *V. carnosum* an aberrant species of *Vincetoxicum*.

The nine species of *Cynanchum* in the Flora Malesiana area all belong to sect. *Cynanchum*, characterized by strongly developed interstaminal corona parts (Ci). *Cynanchum ovalifolium* is widespread in the whole area and extends as far north as China (Li et al., 1995, as *C. formosanum*) and as far south as Australia. The other eight species are more restricted in distribution. It is not yet clear whether *C. muricatum* and *C. corymbosum* are conspecific, because flowering material of *C. muricatum* is restricted to a single bud on the type specimen. The distribution of *C. corymbosum* in Indochina and Peninsular Malaysia and of *C. muricatum* in Thailand and Java suggests this possibility.

The western border of *Cynanchum* is not yet established with certainty. At present, only *C. ovalifolium* has been found W of Timor, and *C. hoedimeerium* subsp. *timorense* establishes the western border of the Malesian species. However, as *C. neopommeranicum* from the Bismarck Archipelago belongs to the uncertain species, and there are several sterile collections from Flores which might well represent members of *Cynanchum*, this question has to remain unresolved until better material becomes available.

MATERIALS AND METHODS

Specimens were studied from the following herbaria: B, CAHUP, FI, G, K, L, P, PNH, S, TI, UPS-Thun, US.

The dimensions given in the descriptions are for dried material except for corona and gynostegium characters, that were measured after the flowers had been rehydrated.

'Stipules' designate leaflets in the position of true stipules, but constituting much reduced axillary short shoots according to Dr. W.D. Stevens (pers. comm.). 'Stipules' occur in many, but not all species of *Cynanchum* and constitute a valuable field character. Corona terminology according to Liede & Kunze (1993). The following abbreviations are used: Cs = staminal corona parts; Ci = interstaminal corona parts; C(is) = corona consisting of fused staminal and interstaminal corona parts.

SYSTEMATIC TREATMENT

CYNANCHUM

Cynanchum L., Sp. Pl. (1753) 212; R.Br., Mem. Wern. Soc. 1 (1810) 44; Blume, Bijdr. Fl. Ned. Ind. (1826) 1054–1055; Decne., Ann. Sci. Nat. Paris 2, 9 (1838) 257; in DC., Prodr. 8 (1844) 490; Miq., Fl. Ind. Bat. 2 (1860) 478–479; Boerl., Handl. Fl. Ned. Ind. 2 (1890) 436; Kuntze, Revis. Gen. Pl. 2 (1891) 422; K. Schum. in Engler & Prantl, Nat. Pflanzenfam. 4, 2 (1895) 189; Perkins, Fragm. Fl. Philipp. 1 (1904) 119–123. — Type species: *Cynanchum acutum* L., designated by E. Meyer (1837).

Cynoctonum E. Meyer, Comm. Pl. Afr. Austr. (1837) 215, nom. rej. — *Cyathella* Decne., Ann. Sci. Nat. Paris 2, 9 (1838) 332. — Type species: non designatus.

Plants scrambling or twining, leafy, glabrous or covered with multicellular trichomes, containing opaque, white to yellow latex. Stems usually green, often basally corky. *Leaves* petiolate, with 1–12 colleters, entire, ovate, obovate or elliptical, often basally cordate or reniform. *Inflorescences* extra-axillary, few- to multi-flowered, cymose to sciadioidal. *Floral buds* of various shapes; aestivation dextrorse, imbricate or contorted. *Flowers* 3–15 mm diam., frequently sweetly scented, nectariferous. *Corolla* rotate to tubular, white, yellow, green, or (reddish-)brown; adaxially glabrous or with short, verrucose trichomes. *Corona* gynostegial, white, rarely red, as high as or higher than the gynostegium, consisting of fused staminal (Cs) and interstaminal (Ci) parts; none of the Malesian species possesses an adaxial appendage (ligule). *Gynostegium* sessile or stipitate. *Anthers* with apical appendages and clearly differentiated lateral anther wings, the latter normally consisting of a proximal and a distal ridge; space between ridges mostly filled with upwardly oriented bristles; proximal ridge curved. *Pollinia* pendulous. *Stylar head* forming a protrusion at the upper end of the corpusculum;

part above this protrusion (upper part) flat, conical or umbonate. *Follicles* usually one per flower, thin-walled, winged or wingless, smooth or with protuberances, glabrous or with trichomes, often finely longitudinally striate. *Seeds* pyriform or ovate, brown, smooth, sculptured, papillate or with trichomes, winged or wingless, with coma. *Chromosome number* usually $2n = 22$.

Worldwide distributed genus of more than 300 species. Here, only literature and synonyms for Malesian species have been included into the references.

KEY TO THE MALESIAN SPECIES

- 1a. Gynostegium highly stipitate (stipe at least half as long as the gynostegium), inflorescences richly branched, many-flowered **3. *C. dimidiatum***
- b. Gynostegium sessile or stipe much shorter than gynostegium, inflorescences sparsely branched, few-flowered 2
- 2a. Leaves basally truncate, rounded or slightly heart-shaped 3
- b. Leaves basally reniform 5
- 3a. Corolla lobes adaxially densely pubescent, follicles globose, inflated **8. *C. physocarpum***
- b. Corolla lobes adaxially glabrous, leaves (sub)coriaceous 4
- 4a. Leaves at least twice as long as broad, corona not complexly folded, caudicles cylindrical (follicles unknown) **1. *C. celebicum***
- b. Leaves less than twice as long as broad, corona complexly folded, caudicles follicles ellipsoid, thick-walled **7. *C. ovalifolium***
- 5a. Follicles densely covered with long soft spines 6
- b. Follicles smooth or tuberculate, winged or wingless, but not with long soft spines 7
- 6a. Gynostegium sessile, follicles strongly beaked **2. *C. corymbosum***
- b. Gynostegium stipitate, follicles acute, but not beaked **6. *C. muricatum***
- 7a. Follicles tuberculate, but not winged **9. *C. tuberculatum***
- b. Follicles smooth, winged 8
- 8a. Corolla lobes abaxially conspicuously hispid **4a. *C. hoedimeerium* subsp. *hoedimeerium***
- b. Corolla lobes abaxially (almost) glabrous 9
- 9a. Seeds with patchily distributed trichomes **4b. *C. hoedimeerium* subsp. *timorense***
- b. Seeds smooth **5. *C. loheri***

1. *Cynanchum celebicum* Schltr. — Fig. 1

Cynanchum celebicum Schltr., Repert. Nov. Spec. 3 (1907) 305. — Type: *Warburg 16818* (holo B†), Indonesia, Celebes, Tjamba Manipi; neotype (here designated): *Kjellberg 2106* (S), Indonesia, Celebes, Karebbe, 15 Aug. 1929.

Plants ascending, twining. *Shoots* perennial, herbaceous, glabrescent, sparsely covered along a single line with appressed trichomes, 150–200 µm long. Internodes 15–20 cm long, 1.5 mm diam. ‘*Stipules*’ ovate; 8–10 mm long; 6–8 mm wide. *Leaves* with petiole 8–20 mm long, colleters absent; leaf blades coriaceous, discoloured, blades 60–80 mm long, 20–30 mm wide, oblong to ovate, basally rounded, blades adaxially and

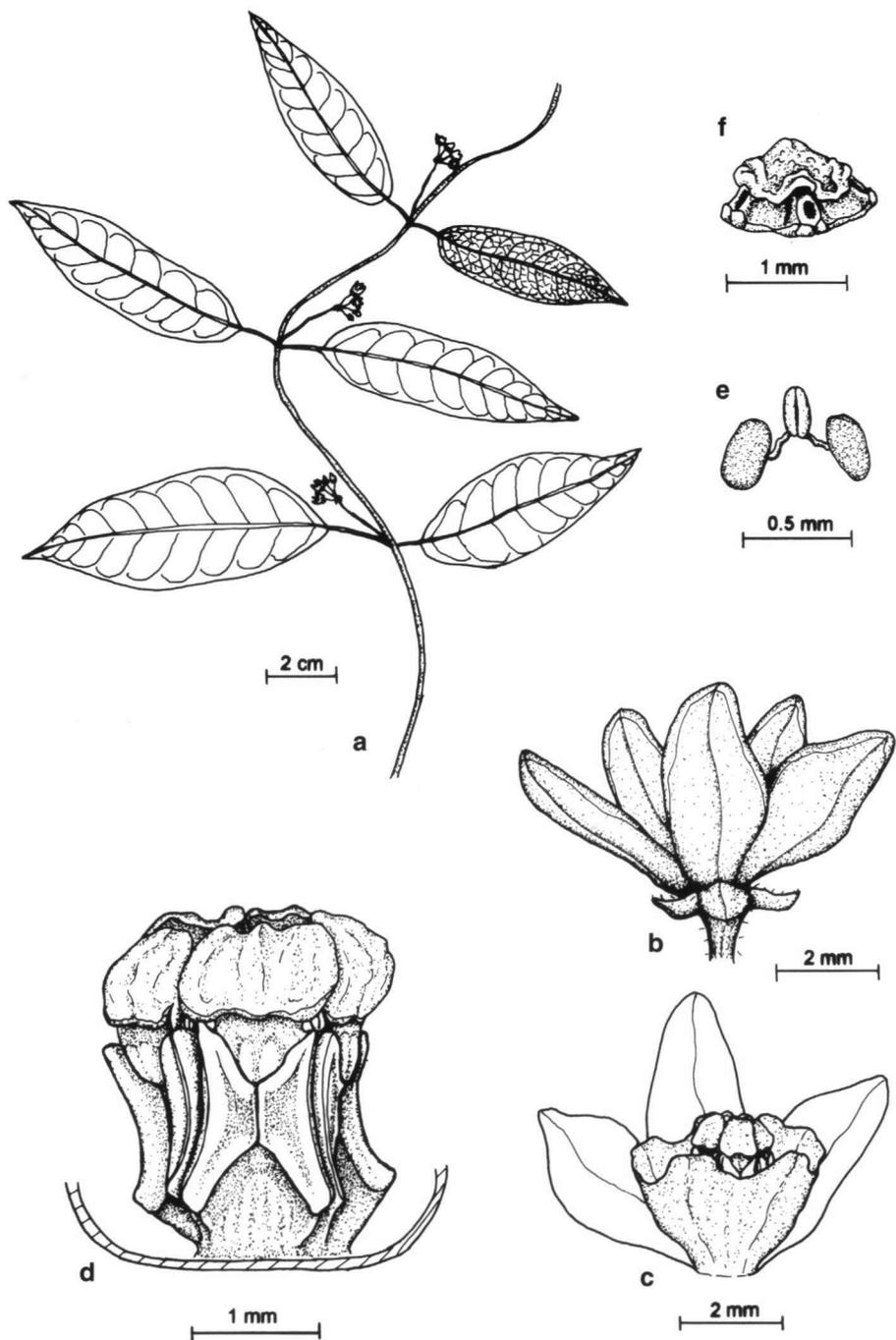


Fig. 1. *Cynanchum celebicum* Schltr. a. Branch with inflorescences; b. flower; c. corona; d. gynostegium; e. pollinarium; f. stylar head (from Kjellberg 2106). — Drawn by Ulrike Frensch.

abaxially glabrous. *Inflorescences* always one per node; extra-axillary; 3–6-flowered, 2–4 flowers open synchronously, sciadioid. *Peduncles* 20–30 mm long, sparsely covered along a single line with appressed trichomes 150–200 μm long. *Floral bracts* 0.7 mm long, 0.3 mm wide at the base, triangular, with trichomes; pedicels 4–6 mm long, sparsely covered along a single line with appressed trichomes, 150–200 μm long. *Floral buds* 3–4 mm long, 1.5–2 mm diam., ovoid. *Calyx* basally fused; rotate, abaxially glabrous, lobes c. 2.5 mm long, c. 2 mm wide, ovate, apically obtuse. *Corolla* 3.5–4 mm long, green to yellow, lobes almost entirely free, 1.2–1.5 mm wide, incurved, ovate, apically acute. *Gynostegial corona* *C(is)* white, 1.8–2 mm high, equalling the gynostegium in height, cyathiform, consisting of Cs and Ci fused for more than 3/4 of total corona length, only Cs differentiated; lobes of Cs laminar, ovate, apically erect, with denticulate margins. *Gynostegium* 2.2–2.5 mm high, sessile. *Stamens* with filament of 0.3–0.5 μm height, anthers higher than broad, hexagonal, abaxially biconvex, anther wings 1.3–1.5 μm long, extending along the whole length of the anther, consisting of distal and curved proximal ridge; adjacent anther wings parallel to each other, centrifugal; connective appendages 0.8–0.9 μm long, 1.2–1.3 μm wide; broadly ovate; broader than the stamen, slightly inflexed. *Pollinarium*: corpusculum c. 350 μm long, ovoid, margins of the corpuscular cleft centrally widened; caudicles 150 μm long, (sub)basally inserted at the corpusculum, cylindrical, straight, declinate; pollinia laterally attached to the caudicles, pendulous, c. 850 μm long, c. 250 μm wide, ovate in cross section, ovoid. *Stylar head* white, 1–1.2 mm diam., 0.7–0.8 mm high, upper part 0.4–0.5 mm high, equalling the lower part in height, depressed-conical.

Distribution — Malesia: Indonesia: Sulawesi.

Habitat & Ecology — In scrub. Flowering: August.

Note — Known only from the neotype collection. The original type (*Warburg 16816*, B) has been destroyed. The collection matches the description of *C. celebicum* perfectly and is therefore chosen as neotype for the species.

2. *Cynanchum corymbosum* Wight — Fig. 2

Cynanchum corymbosum Wight, Contr. (1834) 56. — *Cynoctonum corymbosum* (Wight) Decne. in DC., Prodr. 8 (1844) 528. — *Cyathella corymbosa* (Wight) C.Y. Wu & D.Z. Li, Acta Phytotax. Sin. 28 (1990) 465. — Type: *Wallich 81* (holo K).

Plants ascending, twining, richly branched. *Shoots* perennial, herbaceous, densely covered along a single line with recurved trichomes, 375–400 μm long; internodes 8–15 cm long. '*Stipules*' ovate, 37 mm long, 68 mm wide. *Leaves* with 30–70 mm long petioles, 8–12 colleters at the base of the leaves; leaf blades herbaceous, slightly discoloured, 40–90 mm long, 25–70 mm wide, ovate, basally lobate (lobes 8–12 mm long), apically acuminate (acumen 2–3 mm long), adaxially and abaxially glabrous. *Inflorescences* one, very rarely two per node, extra-axillary, 10–15-flowered, 4–6 flowers open synchronously, basally dichasial, apically bostrychoid. *Peduncles* 20–60 mm long, sparsely covered along a single line with recurved trichomes, 150–200 μm long; rachis 5–25 mm long. *Floral bracts* 1 mm long, 0.25 mm wide at the base, triangular, with trichomes; pedicels 6–10 mm long, densely covered over the whole surface with flexuous trichomes, 150–200 μm long. *Floral buds* 4 mm long, 2 mm diam., conical. *Calyx* basally fused, abaxially with trichomes; lobes 1.5 mm long,

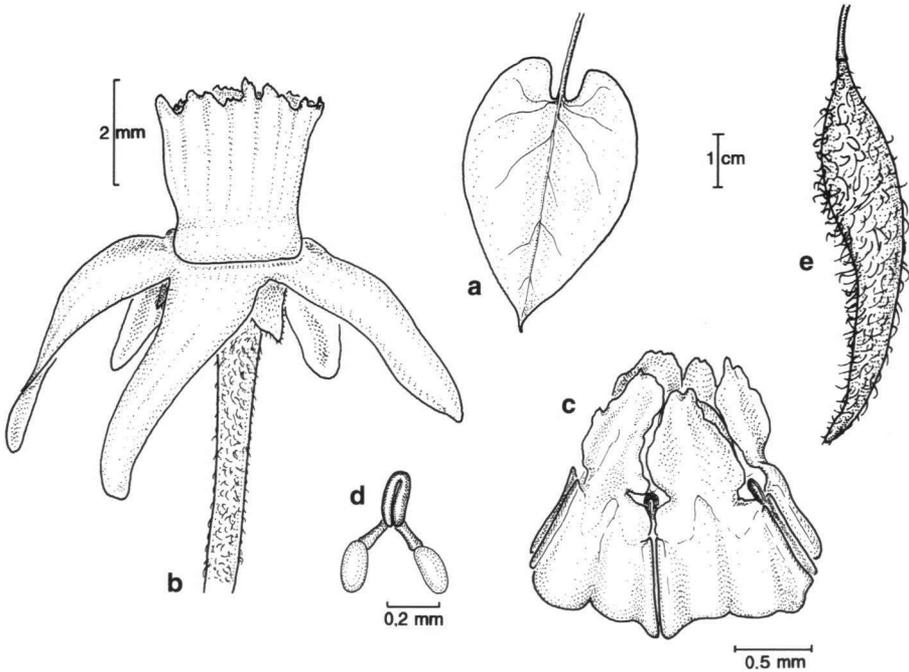


Fig. 2. *Cynanchum corymbosum* Wight. a. Leaf; b. flower; c. gynostegium; d. pollinarium; e. fruit (from Pételot 4922). — Drawn by Ulrich Meve.

1 mm wide, ovate, apically acute. *Corolla* c. 4 mm long, very dark when dry; lobes fused for about 1/4 of total corolla length, patent to declinate, oblong, apically obtuse. *Gynostegial corona* *C(is)* 2.5–3 mm high, tubular, exceeding the gynostegium, partly obscuring it, consisting of *Cs* and *Ci* fused for more than 3/4 of total corona length, *Cs* and *Ci* differentiated, lobes of *Cs* laminar, triangular, producing a pronounced convex fold along the upper 2/3 of corona height, sulcate, apically erect, with laterally involute margins; *Ci* a little shorter than *Cs*, lobes of *Ci* laminar, triangular, erect. *Gynostegium* 1.8 mm high, 2 mm diam., sessile. *Anthers* broader than high, pentagonal, abaxially planar, 0.75 mm long, parallel to each other, extending along the whole length of the anther; adjacent anther wings parallel to each other, in the same plane as the anther; connective appendages 0.75 mm long, 0.75 mm wide, equalling the stamen in width, erect. *Pollinarium*: corpusculum 250 μ m long; caudicles 125 μ m long, cylindrical, straight, declinate, thickened at the insertion of the pollinium; pollinia apically attached to the caudicles, 375 μ m long, 150 μ m wide, ovate in cross section, ovoid. *Stylar head* 0.5 mm diam., 0.37 mm high, upper part 0.175 μ m high, umbonate. *Follicles* one per flower, 7–9 mm long, 8–20 mm diam., obclavate, round in cross section, apically shortly to strongly beaked, densely covered with 5–10 mm long protuberances. *Seeds* 7–8 mm long, 5 mm wide, ovate, seta side smooth, a seta side sculptured with longitudinal ridges, with patchily arranged trichomes, 250 μ m long, marginally with 0.25 mm wide wing with entire, apically denticulate margin.

Distribution — Asia: Thailand, Vietnam; Malesia: Peninsular Malaysia, Singapore.

Habitat & Ecology — Altitude 50–600 m. Flowering: December–January.

Note — The insufficient flowering material of *C. muricatum* does not allow the decision whether it is identical with *C. corymbosum* or whether these two species form two geographically separated sister-species or subspecies. The species is illustrated in Tsiang & Li (1977: 138).

Collections studied: PENINSULAR MALAYSIA. *King 5301* (P), Larut, Perak, 100–160 m, Dec. 1883; *Kerr 13658* (P), Hatgai, ± 50 m, 26 Dec. 1927. — SINGAPORE. *Haniff & Nur 10111* (K), Kuala Krai, Kelantan, 22 Jan. 1923.

3. *Cynanchum dimidiatum* (Hassk.) Boerl. — Fig. 3

Cynanchum dimidiatum (Hassk.) Boerl., *Handl. Fl. Ned. Ind.* 2 (1890) 436. — *Cynoctonum dimidiatum* Hassk., *Flora* 40 (1857) 98 — Type: *Teijsmann s.n.* (BO, n.v.).

Plants ascending, twining, richly, irregularly branched. *Shoots* herbaceous, glabrescent, densely covered over the whole surface with flexuous trichomes, 200–300 µm long; internodes 10–20 cm long, 1–1.5 mm diam. '*Stipules*' ovate, 7–10 mm long, 5–7 mm wide. *Leaves* with petioles 30–40 mm long, 9 colleters at the base of the leaves; leaf blades herbaceous, 40–80 mm long, 30–65 mm wide, ovate, basally lobate (lobes 8–15 mm long), apically acuminate (acumen 3–5 mm long), adaxially isolatedly covered over the whole surface with flexuous trichomes, 200–300 µm long, abaxially finely papillose (resulting in a pale green colour), isolatedly covered mainly on veins and margins with flexuous trichomes, 200–250 µm long. *Inflorescences* frondulose, supported by bracts different from the vegetative leaves, 40–50-flowered, 20–25 flowers open synchronously, bostrychoid, partial inflorescences geminiflorous. *Peduncles* 30–40 mm long, sparsely covered along a single line with flexuous trichomes, 250–300 µm long; inflorescence bracts 10–20 mm long, 5–8 mm wide, ovate (small versions of normal leaves), papillose and with trichomes; rachis 30–80 mm long; straight. *Floral bracts* 0.3–0.5 mm long, 0.15–0.25 mm wide at the base, triangular, densely covered with trichomes; pedicels 3–6 mm long, densely covered over the whole surface with flexuous trichomes, 250–300 µm long. *Floral buds* 1.5 mm long, 1.5 mm diam., globose, with imbricate aestivation. *Calyx* basally fused, abaxially densely covered with trichomes; lobes 1–1.2 mm long, 0.6–0.7 mm wide, ovate, apically acute. *Corolla* subglobose, 2–2.5 mm long, abaxially yellow (fide *Iboet 274*); corolla lobes fused for about 1/3 of total corolla length, 1–1.2 mm wide, incurved, oblong, apically obtuse, with revolute margins. *Gynostegial corona C(is)* abaxially glabrous, equalling the gynostegium in height, cyathiform, consisting of Cs and Ci completely fused, annular, with straight, lacerate upper margin, Cs not connate to the filament, appressed to the back of the stamens. *Gynostegium* 0.6–0.7 mm high, 1.2–1.3 mm diam., atop a stipe of 0.35–0.45 mm length. *Stamens* without filament; anthers broader than high, rectangular, abaxially planar; anther wings 0.35–0.4 mm long, parallel to each other, not extending along the whole length of the anther; the anther forming a 'pseudostipe' of 0.25 mm length; adjacent anther wings parallel to each other, basally widened, in the same plane as the anther; connective appendages 0.4 mm long, 0.4 mm wide, obcordate, narrower than the stamen, strongly inflexed. *Pollinarium*: corpusculum 200 µm long,

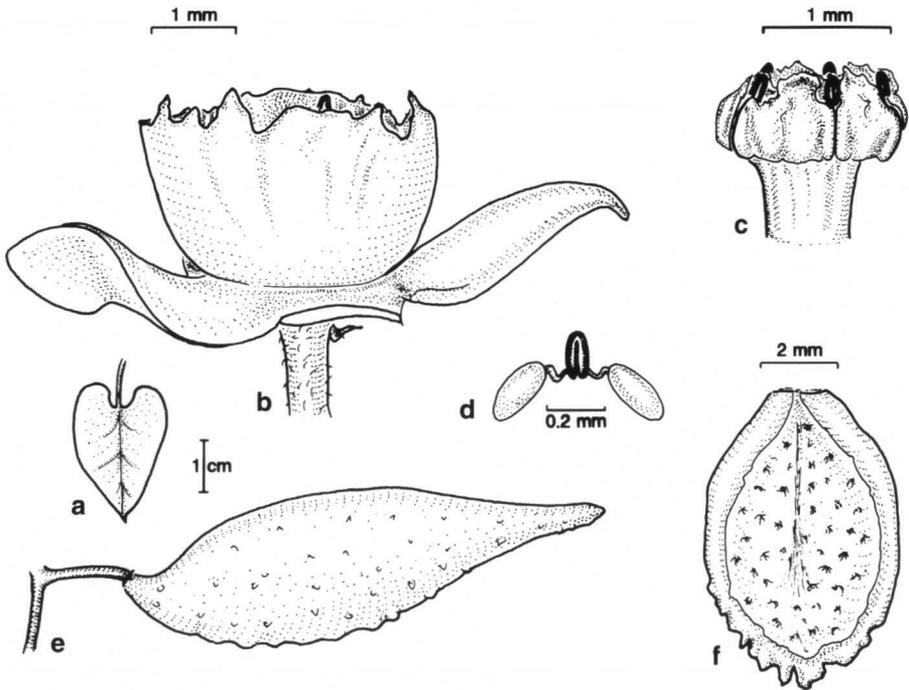


Fig. 3. *Cynanchum dimidiatum* (Hassk.) Boerl. a. Leaf; b. flower; c. gynostegium; d. pollinarium; e. fruit; f. seed (from Iboet 274). — Drawn by Ulrich Meve.

between 1.5 times and twice as long as broad, ovoid; caudicles 75–100 μm long, (sub)basally inserted at the corpusculum, cylindrical, s-shaped, convex-concave, not thickened at the insertion of the pollinium; pollinia laterally attached to the caudicles, 350 μm long, 150 μm wide, ovate in cross section, ovoid. *Stylar head* 0.75 mm diam., 0.2 mm high, upper part 0.05 mm high, umbonate. *Follicles* one per flower, 70 mm long, 20 mm diam., obclavate, obtusely deltate in cross section, apically shortly beaked, keeled, black, sparsely covered with 1–1.5 mm long protuberances, sparse indumentum of erect trichomes, 150 μm long. *Seeds* 7–8 mm long, 5–6 mm wide, ovate, dark brown, seta side sculptured with longitudinal ridges, seta side with regularly arranged papillae, with trichomes arranged in longitudinal ridges, 200–250 μm long, a seta side sculptured with longitudinal ridges, papillose with regularly arranged papillae, with patchily arranged trichomes, 200–250 μm long, marginally with 0.5–0.7 mm wide wing with denticulate margin; coma 7–10 mm long, brownish.

Distribution — Malesia: Indonesia: Java, Lesser Sunda Islands (Bali, Sumba, Flores), Sulawesi.

Habitat & Ecology — Lower altitudes. Flowering: April–August.

Collections studied: INDONESIA. Lesser Sunda Islands: *Verheijen* 3728 (L), 5 July 1974. Sumba: *Bloembergen* 3171 (L), 19 km S of Waikelo, nr Kp. Waimaengaesa, \pm 350 m, 21 Feb. 1939; *Iboet* 274 (B, L), Lologooh, 14 April 1925. Flores: *Verheijen* 2900, 5431 (L), So'a, 18 Oct. 1986. Sulawesi: *Smiles & Vane-Wright* s.n. (BM), Sulawesi Utara, Dumoga Bone National Park, 6 Aug. 1985.

4. *Cynanchum hoedimeerium* Bakh. f.

a. subsp. *hoedimeerium* — Fig. 4

Cynanchum hoedimeerium Bakh. f., Blumea 6 (1950) 369. — Type: *Den Hoed & Van der Meer* 488 (holo L), Java, Purmerend, 30 April 1940.

Plants ascending, twining. *Shoots* perennial, herbaceous, sparsely covered along two lines with recurved trichomes, 250 μ m long; internodes 8–15 cm long. '*Stipules*' ovate to obovate, 4–5 mm long, 5–6 mm wide. *Leaves* with petiole 15–25 mm long, 8–10 colleters at the base of the leaves; leaf blades herbaceous, slightly discolorous, 35–50 mm long, 20–35 mm wide, ovate, basally lobate (lobes 5–7 mm long), apically acuminate (acumen 1–3 mm long), adaxially sparsely covered over the whole surface with recurved trichomes, 500 μ m long, abaxially isolatedly to sparsely covered mainly on veins and margins with recurved trichomes, 400 μ m long. *Inflorescences* bostrychoid, 10–15-flowered, 8–10 flowers open synchronously. *Peduncles* 10–20 mm long, densely covered over the whole surface with recurved trichomes, 150 μ m long; rachis 2–3 mm long. *Floral bracts* 0.7–0.9 mm long, 0.2–0.4 mm wide at the base, triangular, with trichomes; pedicels 4–7 mm long, sparsely covered with recurved trichomes, 150–200 μ m long. *Floral buds* 2 mm long, 1.5 mm diam., ovoid. *Calyx* basally fused, abaxially with trichomes; lobes 1.5–2 mm long, 0.5–0.7 mm wide, ovate, apically mucronate. *Corolla* rotate, 2–2.5 mm long, abaxially hispidulous with trichomes, 200 μ m long (very characteristic!); lobes basally fused, 1–1.5 mm wide, declinate, oblong, apically obtuse. *Gynostegial corona C(is)* 2 mm high, equalling the gynostegium in height, urceolate, consisting of Cs and Ci completely fused, Cs and Ci differentiated, Ci as long as Cs, thinner than Cs. Cs appressed to the back of the stamens, solid, rectangular; lobes of Ci laminar, rectangular, producing a pronounced doublefold along the upper 2/3 of corona height (so that the central part is closer to the gynostegium than the lateral parts), erect, with emarginate margins. *Gynostegium* 1.5 mm high, 1.2 mm wide, atop a stipe of 0.5 mm length. *Anthers* higher than broad, rectangular, abaxially planar; anther wings 1 mm long, parallel to each other, not extending along the whole length of the anther, the anther forming a 'pseudostipe' of 0.3 mm length; adjacent anther wings parallel to each other, in the same plane as the anther; connective appendages 0.3 mm long, 0.4 mm wide, ovate, equalling the stamen in width, strongly inflexed. *Pollinarium*: corpusculum 200 μ m long, ovoid; caudicles 100 μ m long, flattened, straight, declinate, trapezoid; pollinia subapically attached to the caudicles, 260 μ m long, 160 μ m wide, ovate in cross section, ovoid. *Stylar head* 1 mm diam., 0.45 mm high; upper part 0.3 mm high, umbonate. *Follicles* one per flower, 50–60 mm long, 13 mm diam., obclavate, obtusely deltate in cross section, apically strongly beaked, winged (wings 0.5 mm wide), light brown, longitudinally grooved, with sparse indumentum. *Seeds* 65 mm long, 45 mm wide, ovate, medium brown, seta side sculptured with longitudinal ridges, with patchily arranged trichomes, 250 μ m long, aeta side sculptured with longitudinal ridges, with patchily arranged trichomes, 300 μ m long, marginally with 500 μ m wide wing with entire margin; coma 25 mm long.

Distribution — Indonesia: Java, Sulawesi, Wetar Island.

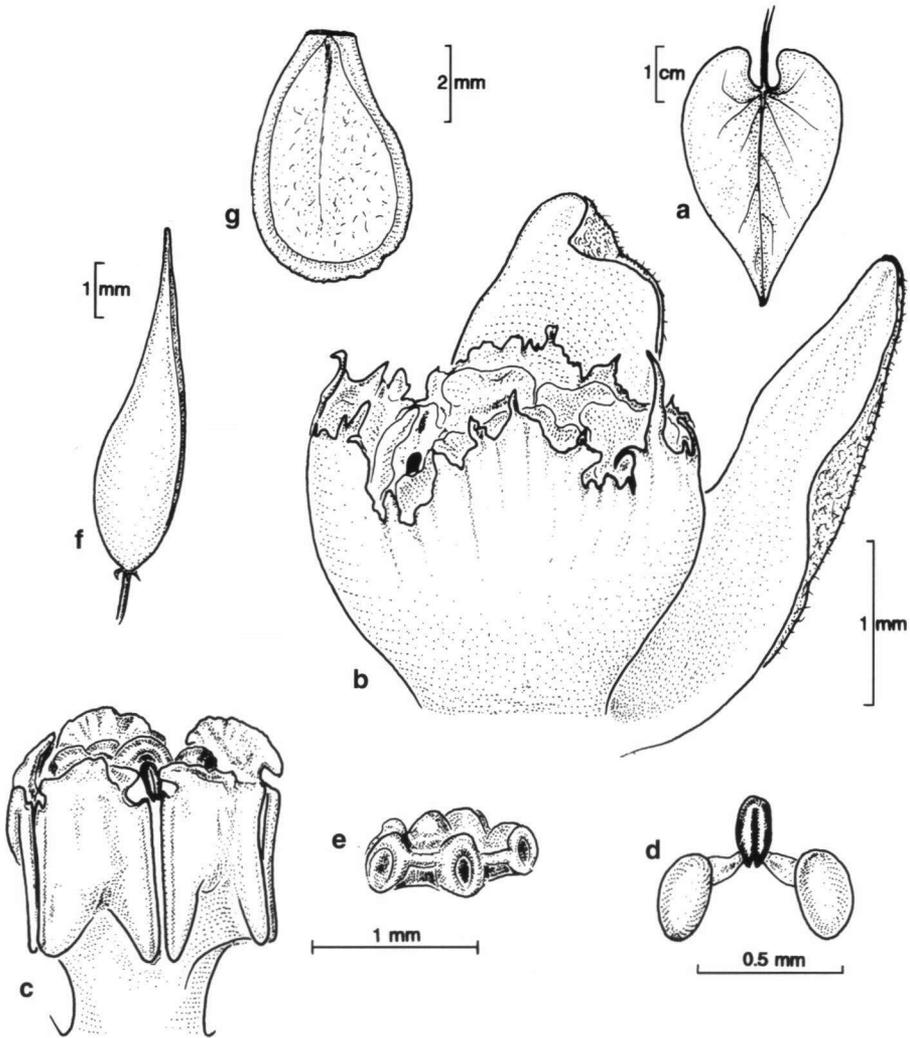


Fig. 4. *Cynanchum hoedimeerium* Bakh.f. subsp. *hoedimeerium*. a. Leaf; b. flower; c. gynostegium; d. pollinarium; e. stylar head; f. fruit; g. seed (from *Den Hoed 3107*). — Drawn by Ulrich Meve.

Habitat & Ecology — On volcanic slope in cleared area (fide *Dunlop & Leach 9669*). Flowering: April–May, August–September.

Note — *Cynanchum hoedimeerium* displays the most complex corona and seed structure of all South-East Asian taxa.

Collections studied: INDONESIA. Java: *Junghuhn s.n.* (L, L 898.166-402); *Den Hoed 3107* (L), P. Purmerend (central), 1 Aug. 1948; *Backer 8209* (L), Asam Bagoes, 1913; *Koorders 42517* (L), Tjabak E of Blora, Res. Rembang, Sept. 1915. Sulawesi: *Rachmat 323* (exp. Van Vuuren) (L), Mt Padang, 29 April 1913. Wetar Is.: *Dunlop & Leach 9669* (L), Kali Kuning River, S 07° 43', E 126° 16', 17 May 1993.

b. subsp. timorense Liede, *subsp. nov.*

Ad subspecies typica affinis, sed differt in lobis corollae glabris, lobis coronae staminibus minoribus. — Typus: *Walsh 136* (holo BM), Indonesia, Timor, Soë, South Central Timor, 830 m, 25 Feb. 1929.

Plants ascending, twining. *Shoots* perennial, herbaceous, densely covered over the whole surface with recurved trichomes, 300–400 µm long; internodes 6–10 cm long. *'Stipules'* ovate, 4–5 mm long, 4 mm wide. *Leaves* with petioles 5–20 mm long, 5 col-letters at the base of the leaves; leaf blades herbaceous, slightly discolorous, 25–45 mm long, 18–28 mm wide, ovate, basally lobate (lobes 3–6 mm long), apically truncate to obtuse, adaxially and abaxially sparsely covered with erect trichomes, 400 µm long. *Inflorescences* 8–12-flowered, 4–6 flowers open synchronously, bostrychoid. *Peduncles* 10–15 mm long, densely covered over the whole surface with erect trichomes, 300 µm long; rachis 3–5 mm long. *Floral bracts* 0.75 mm long, 0.2 mm wide at the base, oblong, with trichomes; pedicels 3–5 mm long, densely covered over the whole surface with erect trichomes, 300 µm long. *Floral buds* 3 mm long, 2 mm diam., ovoid. *Calyx* basally fused, abaxially with trichomes; lobes 1.5–2 mm long, 4 mm wide, apically acute. *Corolla* 3 mm long, with numerous tannin idioblasts; corolla lobes fused for about 1/3 of total corolla length, 1 mm wide, incurved, ovate, apically acute. *Gynostegial corona C(is)* 1.5 mm high, shorter than the gynostegium, cyathiform, consisting of Cs and Ci completely fused, Cs and Ci differentiated, Ci as long as Cs, thinner than Cs. Cs appressed to the back of the stamens, solid (but thinner than in typical subsp.), rectangular, apically erect; lobes of Ci laminar, ovate, producing a pronounced doublefold along the upper 2/3 of corona height (so that the central part is closer to the gynostegium than the lateral parts), erect, with straight margins. *Gynostegium* 1.5 mm high, 1.25 mm diam., atop a stipe of 0.5 mm length. *Anthers* higher than broad, rectangular, abaxially planar; anther wings 0.9 mm long, extending beyond the anther proper, forming a basal arch; adjacent anther wings parallel to each other, in the same plane as the anther; connective appendages 0.4 mm long, 0.6 mm wide, obcordate, narrower than the stamens, slightly inflexed. *Pollinarium*: corpusculum 225 µm long, ovoid, margins of the corpuscular cleft parallel, basally widened; caudicles 125 µm long, flattened, straight, declinate, trapezoid; pollinia subapically attached to the caudicles, 150 µm long, 125 µm wide, ovate in cross section, ovoid. *Stylar head* 0.75 mm diam., 0.4 mm high; upper part 0.15 mm high, umbonate. *Follicles* one per flower, 55–65 mm long, 8 mm diam., obclavate, obtusely deltate in cross section, apically strongly beaked, winged (wings 0.5 mm wide), light brown, isolatedly indumented. *Seeds* 60 mm long, 40 mm wide, ovate, medium brown, seta and a seta side sculptured with longitudinal ridges, with patchily arranged trichomes, 250–300 µm long, marginally with 500 µm wide wing, with entire margin; coma 25 mm long.

Distribution — Malesia: Indonesia: Timor.

Habitat & Ecology — Flowering: February.

Note — The most obvious distinction from the typical subspecies is the glabrous corolla. As it is found on Timor, where the typical subspecies does not occur, it seems warranted to describe it as new, as subspecies ought to be separated both geographically and by at least one qualitative character.

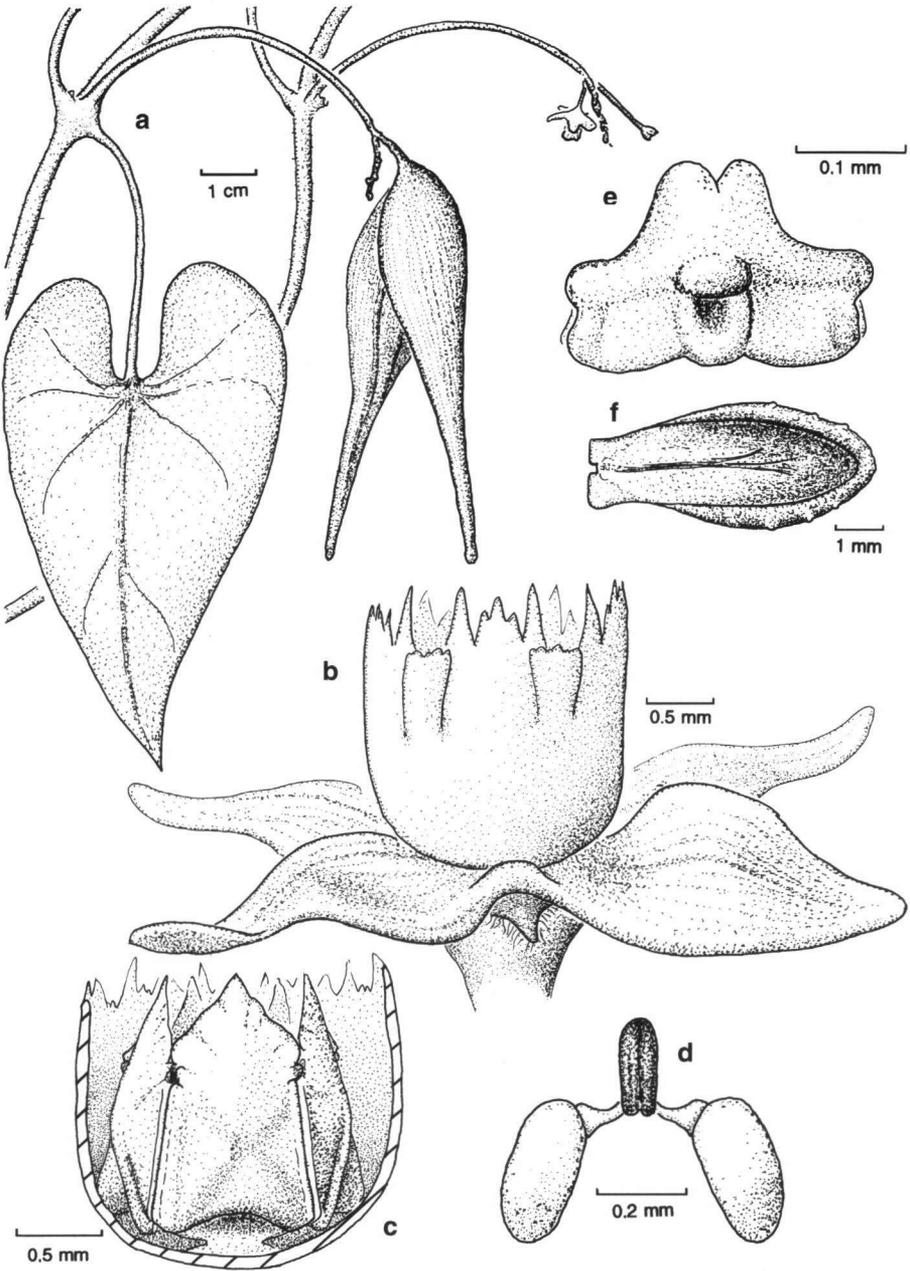


Fig. 5. *Cynanchum loheri* Schltr. a. Nodium with infructescence; b. flower; c. corona and gynostegium (frontal part of corona removed); d. pollinarium; e. stylar head; f. seed (from Merrill 532). — Drawn by Jim Conrad.

5. *Cynanchum loheri* Schltr. — Fig. 5

Cynanchum loheri Schltr. in Perkins, Fragm. Fl. Philipp. 1 (1904) 120. — Type: *Loher 4053* (lecto K; designated here), Philippines, Luzon, Luzon Channel.

Plants ascending, twining. *Shoots* perennial, herbaceous, sparsely covered along two lines with erect trichomes, 250–350 μm long; internodes 15–25 cm long, 1.5–2 mm diam. '*Stipules*' ovate. *Leaves* with petiole, 30–40 mm long, 9 colleters at the base of the leaves; leaf blades herbaceous, 80–110 by 50–65 mm, ovate, basally lobate (lobes 1.4–2 mm long), apically acute to acuminate (acumen 3–5 mm long), adaxially and abaxially sparsely to densely covered over the whole surface with erect to appressed trichomes, 250–400 μm long. *Inflorescences* 4- or 5-flowered, 1 or 2 flowers open synchronously, sciadioidal. *Peduncles* 30–40 mm long, densely covered along a single line with flexuous trichomes, 200–250 μm long. *Floral bracts* 1.5–2 mm long, 0.5 mm wide at the base, elongatedly triangular, with trichomes; pedicels 6 mm long, densely covered over the whole surface with flexuous trichomes, 350–400 μm long. *Floral buds* 2.5–3 mm long, 1.5–2 mm diam., globose to ovoid, with imbricate aestivation. *Calyx* basally fused, ciliate; lobes 1.2 mm long, 0.4–0.5 mm wide, ovate, apically acute. *Corolla* 3.5–4 mm long; corolla lobes basally fused, 1–1.5 mm wide, straight, horizontal to decurved, oblong, apically obtuse. *Gynostegial corona C(is)* white to ivory, cyathiform, 2–2.5 mm high, equalling to exceeding the gynostegium, but not obscuring it, consisting of Cs and Ci fused for more than 3/4 of total corona length, Cs and Ci differentiated; lobes of Cs trifid, apically erect, with lacerate upper margin; Ci shorter than Cs; lobes of Ci laminar, rectangular, producing a pronounced convex fold along the upper third of corona height, erect, emarginate. *Gynostegium* 1.2–1.5 mm high, 1.2–1.5 mm diam., sessile. *Stamens* without filament; anthers about as high as broad, trapezoidal, abaxially planar; anther wings 0.7–0.8 mm long, parallel to each other, extending along the whole length of the anther; adjacent anther wings parallel to each other, in the same plane as the anther; connective appendages 0.5 mm long, 0.7 mm wide, triangular, broader than the stamen, erect, emarginate. *Pollinarium*: corpusculum 220 μm long, ovoid; caudicles 80–100 μm long, cylindrical, straight, declinate, thickened at the insertion of the pollinium; pollinia subapically attached to the caudicles, 300–350 μm long, 150–170 μm wide, ovate in cross section, ovoid. *Stylar head* c. 1 mm diam., c. 0.5 mm high, upper part c. 0.3 mm high, conical. *Follicles* pendulous, 60–65 mm long, 0.7–1 mm diam., obclavate, obtusely deltate in cross section, apically strongly beaked, distinctly keeled, medium brown, smooth, with sparse to dense indumentum. *Seeds* 5.5–6 mm long, 3–4 mm wide, ovate, medium brown, seta side smooth, a seta side sculptured with longitudinal ridges, tuberculate, marginally with 250–300 μm wide wing with entire margin; coma yellowish, 25–30 mm long.

Distribution — Malesia: Borneo, Philippines.

Habitat & Ecology — Flowering: December.

Collections studied: MALAYSIA. Sabah: *Beaman 9150* (K), Tambunan Distr., Crocker Range, km 64 on Kota Kinabalu-Tambunan Rd, N 05° 46', E 116° 21', 1250 m, 1 April 1984. — PHILIPPINES. Basilan: *Hallier 4419* (L), 17 Jan. 1904. Luzon: *Loher 5060* (K), Luzon Central; *McGregor 12368* (K), Laguna, Calauan, Nov./Dec. 1910; *Ramos 22471* (BM, K), Rizal, March 1915; *Ramos & Edaño 47079* (K), Isabela, San Mariano, Feb./March 1926; *Vanoverbergh 976* (P), Bontoc, Dec. 1910; *Vidal 3311* (K), Tayabas, Dolores, March 1886. Calamian Is.: *Merrill 532* (K), Culion Is., Dec. 1902. Mindoro: *Sulit 4071* (L), *13787* (K, PNH), Occidental Mindoro, Abra de Ilog, Jan. 1951; *Loher 6524* (K), Puray.

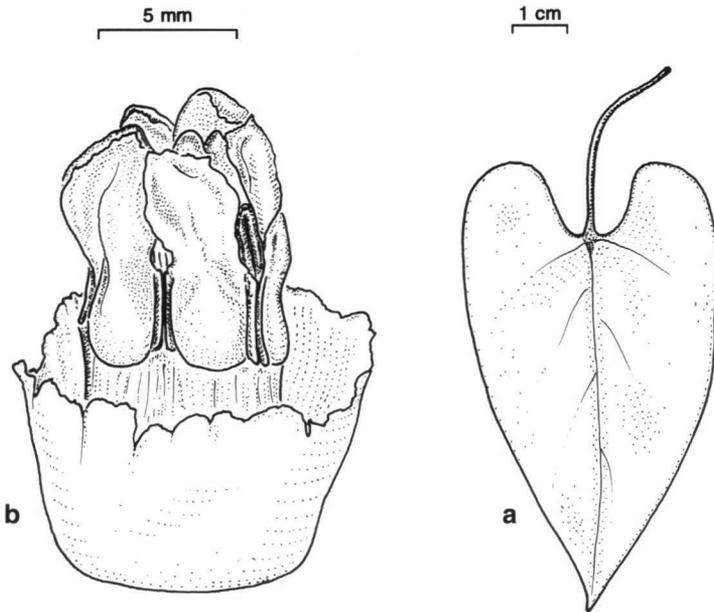


Fig. 6. *Cynanchum muricatum* (Blume) Boerl. a. Leaf; b. corona and gynostegium of almost mature bud (from *Blume s.n.*, P). — Drawn by Ulrich Meve.

6. *Cynanchum muricatum* (Blume) Boerl. — Fig. 6

Cynanchum muricatum (Blume) Boerl. in *Handl. Fl. Ned. Ind.* 2 (1890) 436. — *Holostemma muricatum* Blume, *Bijdr. Fl. Ned. Ind.* (1826) 1054. — *Cynoctonum muricatum* (Blume) Decne. in DC., *Prodr.* 8 (1844) 528. — Type: *Blume s.n.* (iso P), Java.

Plants ascending, twining. *Shoots* perennial, sparsely covered along a single line with erect trichomes, 250–400 μm long. '*Stipules*' ovate, 8–9 mm long, 7–8 mm wide. *Leaves* with 30–60 mm long petiole, 10–12 colleters at the base of the leaves; leaf blades herbaceous, discolorous, 50–80 mm long, 25–55 mm wide, ovate, basally lobate (lobes 8–15 mm long), apically acute, adaxially and abaxially almost glabrous. *Inflorescences* 6–10-flowered, bostrychoid. *Peduncles* 25–40 mm long, densely covered along two lines with flexuous trichomes, 150–300 μm long; rachis 2–3 mm long. *Floral bracts* 0.75 mm long, 0.2 mm wide at the base, triangular, glabrous; pedicels 6–8 mm long, densely covered along a single line with recurved trichomes, 250 μm long. *Floral buds* 3.5 mm long, 2 mm diam., conical. *Calyx* basally fused, abaxially glabrescent; lobes 1–1.2 mm long, 0.6 mm wide, ovate, apically acute. *Corolla* adaxially glabrous. *Gynostegial corona* *C(is)* cyathiform, 1.2 mm high, shorter than the gynostegium, consisting of Cs and Ci completely fused, annular, with crenulate upper margin. *Gynostegium* 1.4 mm high, 1.1 mm diam., atop a stipe of c. 1 mm length. Anthers about as high as broad, pentagonal, abaxially convex; anther wings 0.5 mm long, extending along the whole length of the anther; adjacent anther wings parallel to each other, in the same plane as the anther; connective appendages 0.75 mm long, 0.5 mm wide, ovate, equalling the stamen in width, erect. *Pollinarium*: corpusculum 350 μm long, more than twice as long as broad, elliptic. *Stylar head* 0.75 mm diam.,

0.9 mm high; upper part 0.4 mm high, shortly obinfundibuliform. *Follicles* always one per flower, 7–10 cm long, 12–20 mm diam., obclavate, round in cross section, apically acute, but not beaked, wingless, brown, densely covered with 5–10 mm long protuberances. *Seeds* 8 mm long, 6 mm wide, ovate, medium brown, seta side smooth, a seta side sculptured with longitudinal ridges, with patchily arranged trichomes along ridges, 350 µm long, marginally with 500 µm wide wing, with entire, but papillose margin; coma 10 mm long.

Distribution — Thailand: Utai Thani. Malesia: Indonesia: Sumatra, Java.

Habitat & Ecology — Altitude 0–500 m. Fruiting: December–May.

Notes — Well preserved flowering material of this species has not been found. Therefore it cannot be determined at present whether it is conspecific with *C. corymbosum*. The fruits of the Thailand collection are slightly broader than those of the Indonesian material.

Collections studied: THAILAND. *Van Beusekom & Santisuk 2838* (L), Utai Thani, Nong Chang, Khao Pla Ra, N 15° 25', E 99° 55', 150 m, 18 Feb. 1970. — INDONESIA. Sumatra: *Lörzing 7026* (K, L), Sibolangit, 500 m, 16 Dec. 1919; Lampung: *Mochtar 114A* (L), Way Kambas, 80 m, 10 Feb. 1972. Java: *s. coll. 694* (L), May 1849.

7. *Cynanchum ovalifolium* Wight — Fig. 7

Cynanchum ovalifolium Wight, Contr. (1834) 57. — *Cynoctonum ovalifolium* (Wight) Decne. in DC., Prodr. 8 (1844) 529. — Type: *Wight s. n.* [holo K-W(8226)], Malaysia, Penang, Aug. 1827.

Holostemma laeve Blume, Bijdr. (1826) 1055. — *Cynanchum laeve* (Blume) K. Schum. in Engler & Prantl, Nat. Pflanzenfam. 4, 2 (1897) 292, non Persoon, Syn. 1 (1805) 27. — *Cynoctonum blumei* Decne. in DC., Prodr. 8 (1844) 528. — Type: *Blume s. n.* (holo L, L 898.166-426), Java, Mt Salak.

Cynoctonum formosanum Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 23 (1877) 370, syn. nov. — *Cynanchum formosanum* (Maxim.) Hemsl., J. Linn. Soc., Bot. 26 (1889) 106. — *Vincetoxicum formosanum* (Maxim.) Kuntze, Revis. Gen. Pl. 2 (1891) 424. — *Cyathella formosana* (Maxim.) C. Y. Wu & D. Z. Li, Acta Phytotax. Sin. 28 (1990) 464. — Type: *Oldham 333* (iso P), Taiwan, Tamsury.

Vincetoxicum discolor Warb., Bot. Jahrb. Syst. 13 (1891) 469. — Type: 'Sigar am McCluersgolf, holl. Neu-Guinea' (B⁺), fide Forster, 1991.

Cynanchum celebicum Koord., Meded. Lands Plantentuin 19 (1898) 533, nom. nud. — Type: *Koorders 1097* (lecto L; designated here); annotated by Koorders as '*C. celebicum* sp. nov.'

Marsdenia javanicum Koord. in Koord.-Schum., Syst. Verz. 1 (1912) 8. — *Cynanchum javanicum* (Koord.) Bakh.f., Blumea 6 (1950) 369. — Type: *Koorders 32271* (lecto BO, isolecto L; designated here), Java, Res. Besoeki, Pantjoer Idjen, Nov. 1895.

Cynanchum luzonicum Schltr., Feddes Repert. 12 (1915) 538, syn. nov. — Type: *Merrill 7702* (BM, lecto designated here), Philippines, Luzon, Bontoc, May 1911.

Cynanchum crassifolium Hatus., Hokuriku J. Bot. 12 (1963) 9. — *Cynanchum hatusimai* P. T. Li, J. South China Agr. Univ. 12 (1991) 41. — Type: *Suzuki 9391* (Herb. Facult. Agric. Kagoshima Univ., n. v.), Taroko.

Cynanchum formosanum (Maxim.) Hemsl. var. *ovalifolium* Tsiang & P. T. Li, Acta Phytotax. Sin. 12 (1974) 109. — *Cyathella formosana* (Maxim.) C. Y. Wu & D. Z. Li var. *ovalifolia* (Tsiang & P. T. Li) C. Y. Wu & D. Z. Li, Acta Phytotax. Sin. 28 (1990) 465. — Type: *Suzuki 11935* (Herb. Bot. Inst. Kwangtung, n. v.), Taiwan, Mt Kwan-Non. 29 Oct. 1932.

Plants ascending, twining. *Shoots* perennial, herbaceous, glabrescent, densely covered along a single line with recurved trichomes, 400–500 µm long; internodes 12–20 cm long, 1.5–2 mm diam. '*Stipules*' ovate, 8–10 mm long, 7–9 mm wide. *Leaves* with

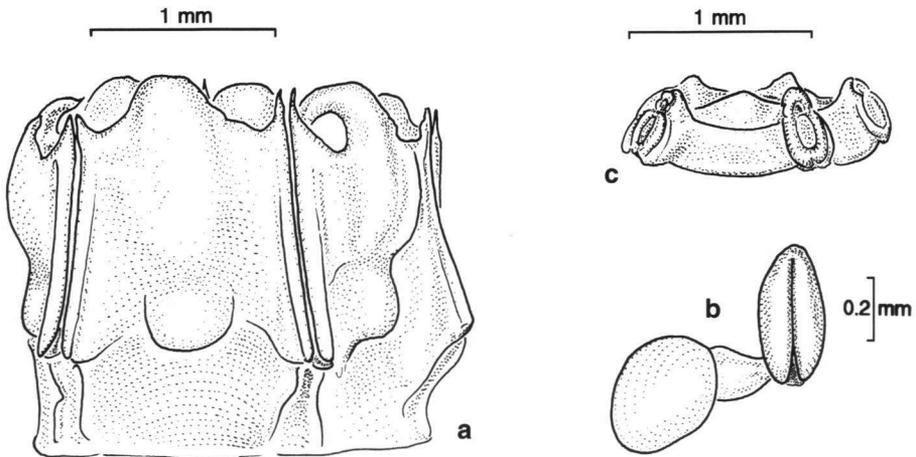


Fig. 7. *Cynanchum ovalifolium* Wight. a. Gynostegium; b. half of a pollinarium; c. stylar head (from Koorders 1097, type of *C. celebicum* Koord.). — Drawn by Ulrich Meve.

petioles 25–35 mm long, 2 or 3 colleters at the base of the leaves; leaf blades herbaceous, 55–120 mm long, 40–70 mm wide, ovate, basally cordate, apically acuminate (acumen 5–7 mm long), adaxially and abaxially almost glabrous. *Inflorescences* 6–9-flowered, 1 or 2 flowers open synchronously, bostrychoid, partial inflorescences geminiflorous. *Peduncles* 35–55 mm long, densely covered along a single line with recurved trichomes, 250–300 μm long; rachis 6–8 mm long. *Floral bracts* 1.5 mm long, 0.6 mm wide at the base, triangular, with trichomes; pedicels 5–6 mm long, densely covered over the whole surface with appressed trichomes, 250 μm long. *Floral buds* 1.5 mm long, 1.5 mm diam., globose. *Calyx* basally fused, ciliate and abaxially with trichomes; lobes 1.2–1.5 mm long, 1.2–1.5 mm wide, ovate, apically obtuse. *Corolla* rotate, 3.5–5.5 mm long; corolla lobes basally fused, 1–3 mm wide, abaxially cream, adaxially brown, yellow along the main nerves, horizontal, oblong, slightly dolabriform, apically obtuse. *Gynostegial corona* *C(is)* creamish white, 2.5–3 mm high, equalling the gynostegium in height, cyathiform, consisting of Cs and Ci fused for more than 3/4 of total corona length, Cs and Ci differentiated, Ci slightly shorter than Cs; Cs not connate to the filament, laminar, triangular, flat, apically erect with lacerate margins; lobes of Ci laminar, triangular, flat, erect, with lacerate margins. *Gynostegium* 2–2.5 mm high, 2–2.5 mm diam., atop a bulge of 0.4 mm length. *Anthers* higher than broad, rectangular, abaxially convex, basally normally with a pronounced hump; anther wings 1–1.5 mm long, extending along the whole length of the anther; adjacent anther wings parallel to each other, centrifugal, basally forming a distinct ‘mouth’ with the basal lateral margin of the anther; connective appendages 400–800 μm long, 400–800 μm wide, rectangular, narrower than the stamen, strongly inflexed. *Pollinarium*: corpusculum 300–400 μm long, ovoid; caudicles 180 μm long, flattened, straight, horizontal, trapezoid; pollinia laterally attached to the caudicles, 350–370 μm long, 250–300 μm wide, ovate in cross section, ovoid. *Stylar head* 1.5 mm diam., 0.5 mm high; upper part 0.15 mm high, umbonate. *Follicles* one per flower, 7–8.5 cm long, 30–35 mm wide, ellipsoid, ovate in cross section, apically beaked, smooth,

with comparatively thick pericarp. *Seeds* 6–7 mm long, 4 mm wide, ovate, medium brown, seta and aleta side vaguely sculptured with longitudinal ridges, marginally with 0.5 mm wide wing with entire margin; coma 2–2.5 mm long.

Distribution — Australia. Asia: China, Taiwan, Thailand. Malesia: Peninsular Malaysia, Borneo, Philippines (Luzon, Sulu). Indonesia: Sumatra, Java, Sulawesi, Moluccas (Halmahera, Ambon). New Guinea.

Habitat & Ecology — Margins of primary and secondary forests, thickets in grassland, weed in coconut plantations; sometimes on limestone rocks near the sea. Altitude 0–1700 m. Flowering all year.

Notes — *Cynanchum celebicum* Koord. differs from the 'typical' *C. ovalifolium* only in slightly more cordate leaf bases. *Cynanchum ovalifolium* represents the most frequent species of *Cynanchum* throughout the area.

The species is discussed and illustrated in Forster (1991: 458–460, f. 8).

Collections studied: MALAYSIA. *Curtis 871* (K), Penang, Penora Butnik, 300 m, May 1886; *King 8385* (P), Perak, 100 m, Jan. 1886. Borneo: *Creagh s.n.* (K), Mabul Is., 8 April 1895. — PHILIPPINES. *Vanoverbergh 3089* (P), Luzon, Bontoc, March 1913. — INDONESIA. Sumatra: *Meijer 195* (L), Mt Sago, nr Pajakumbuh, Timur Rjk. G. Kapur, Batu Barandjan djalan Halaban, 18 April 1956. Krakatau: *Van Borssum Waalkes 914* (L), P. Rakaxae, SE side, 8 m, 8 Oct. 1951. Java: *Koorders 20346* (L), Res. Besoeki, Pantjoer Idjen, 1600 m, 11 Dec. 1895. Sulawesi: *Van Balgooy 3480* (L), Danau Tambing, 1700 m, 24 May 1979; *Koorders 16232* (K), Minahassa, 6 Sept. 1897. Moluccas: Halmahera: *Nedi 210* (exp. De Haan) (L), Sosaepae, Kp. Taroeba, 50 m, 1 Oct. 1937. Ambon: *Kornassi 1111* (exp. Rutten) (L), Kampong Koeda Mati, ± 30 m, 8 April 1918. — NEW GUINEA. *Wiakabu & Yefle 70312* (K, L), East Sepik, Wewak, Cape Wom International Park, S 03° 35', E 143° 35', ± 0 m, 1 Nov. 1976.

8. *Cynanchum physocarpum* Schltr. — Fig. 8

Cynanchum physocarpum Schltr. in Perkins, *Fragm. Fl. Philipp.* 1 (1904) 121. — Type: *Warburg 13766*, not traced and probably destroyed in B.

Cynanchum schlechterianum Warb. in Perkins, *Fragm. Fl. Philipp.* 1 (1904) 121. — Type: *Warburg 13003*, Philippines, Luzon, Tayabas, Sampaloc; not traced and probably destroyed in B.

Cynanchum denigratum Elmer, *Leafl. Philipp. Bot.* 10 (1938) 3549, syn. nov. — Type: *Elmer 15636* (holo L; iso BM, FI, G, P), Philippines, Luzon, Mt Bulusan, April 1916.

Plants ascending, twining, richly irregularly branched. **Shoots** perennial, herbaceous; internodes 10–20 cm long, 1–1.5 mm diam. '**Stipules**' ovate, 5–7 mm long, 4–6 mm wide. **Leaves** with 16–27 mm long petiole, 2 or 3 colleters at the base of the leaves; leaf blades coriaceous, 65–80 mm long, 20–45 mm wide, ovate, basally rounded to indistinctly cordate, apically acuminate (acumen 3–5 mm long), adaxially and abaxially glabrous. **Inflorescences** always one per node, 10–17-flowered, 5–7 flowers open synchronously, bostrychoid. **Peduncles** 15–40 mm long, densely covered along a single line with recurved trichomes, 150–200 µm long; rachis 1–25 mm long, persistent. **Floral bracts** 0.8–1.1 mm long, 0.3–0.5 mm wide at the base, elongatedly triangular, ciliate; pedicels 3–5 mm long, densely covered along a single broad line with recurved trichomes, 150–200 µm long. **Floral buds** 1–1.2 mm long, 1.6–1.8 mm diam., ovoid, with imbricate aestivation. **Calyx** fused for more than 1/2 of its length, campanulate, ciliate; lobes 0.3–0.5 mm long, 0.5–0.6 mm wide, deltate, apically obtuse. **Corolla** cyathiform, 4–5 mm long, abaxially and adaxially white, adaxially with 200–250 µm long trichomes concentrated on the apical and lateral parts of the lobes; corolla lobes

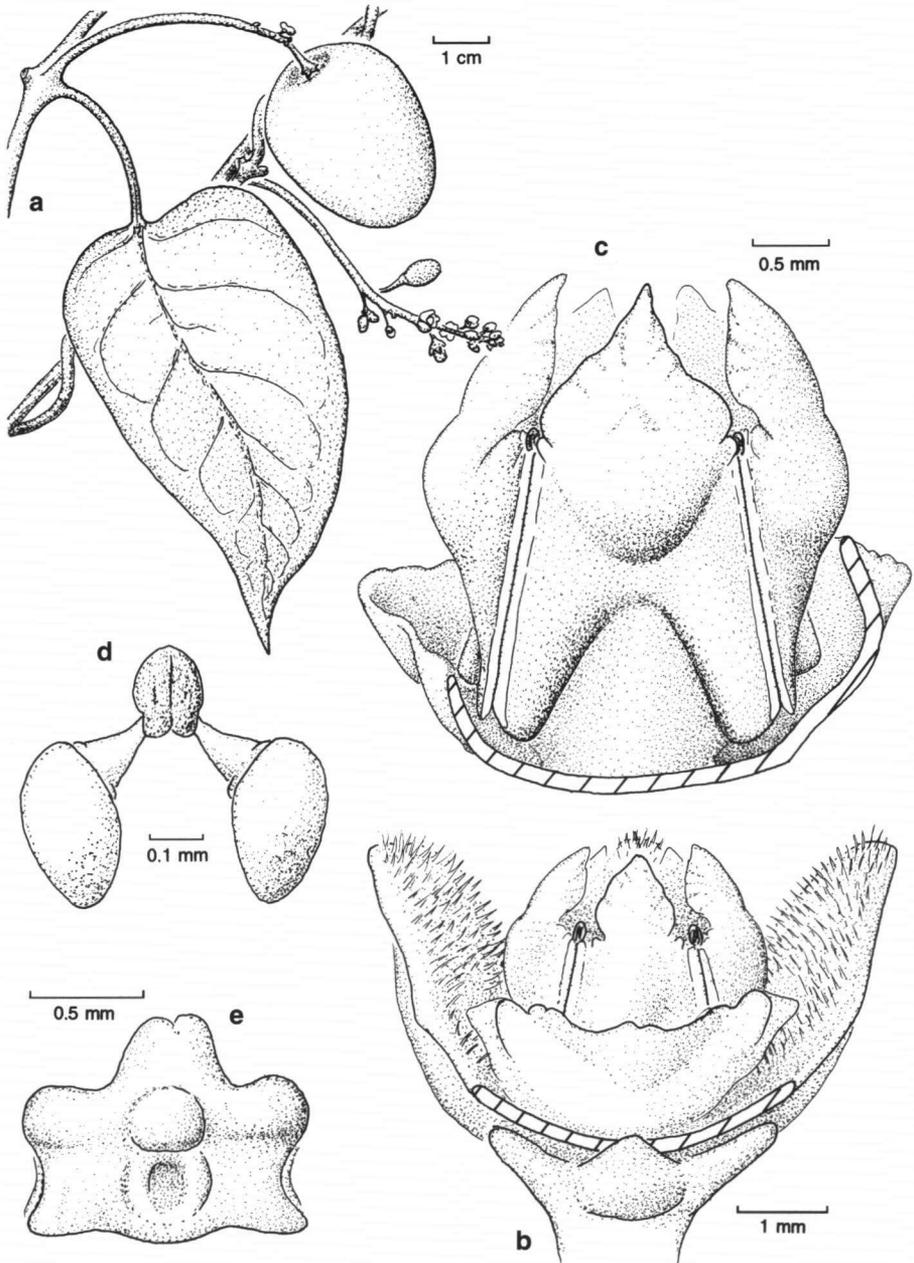


Fig. 8. *Cynanchum physocarpum* Schltr. a. Nodium with infructescence; b. young flower (frontal petal removed); c. gynostegium and corona (frontal part of corona removed); d. pollinarium; e. stylar head (from Ramos 30352). In most specimens, the corona is higher than in the flower drawn, which was rather young. — Drawn by Jim Conrad.

basally fused, 1.6–1.8 mm wide, patent, ovate, apically obtuse. *Gynostegial corona C(is)* white, cyathiform, 1.5–1.7 mm high, shorter than the gynostegium, consisting of Cs and Ci completely fused, annular, with straight, crenulate upper margin. *Gynostegium* 2–2.2 mm high, 1.8–2 mm diam., sessile. *Stamens* without filament; anthers higher than broad, trapezoidal; anther wings 1.3–1.4 mm long, parallel to each other, extending beyond the anther proper, forming a basal arch; adjacent anther wings parallel to each other, in the same plane as the anther; connective appendages 0.6–0.65 mm long, 1–1.1 mm wide, obcordate, broader than the stamen, erect. *Pollinarium*: corpusculum 250 µm long, caudicles 120–150 µm long, (sub)basally inserted at the corpusculum, flattened, straight, declinate, triangular; pollinia subapically attached to the caudicles, 300–350 µm long, 180–200 µm wide, ovate in cross section, ovoid. *Strylar head* 1.2–1.3 mm diam., 0.75–0.8 mm high; upper part 0.3–0.4 mm high, conical. *Follicles* one per flower, pendulous, 40–80 mm long, 35–50 mm diam., ovoid, round in cross section, apically obtuse, smooth, glabrous, inflated. *Seeds* unknown.

Distribution — Malesia: Philippines.

Habitat & Ecology — Degraded scrub. Altitude 0–1000 m. Flowering: September–July.

Notes — The fruits of the type (and only existing material) of *C. denigratum* are seemingly not physocarpous; however, fruits of *C. physocarpum* immaturely picked or parasitized look exactly like those of this widely distributed specimen.

Two specimens from Sabah, *Krispinus* 86689 (L) and *Nordin Abas* 86086 (L), both with fruits only, had been tentatively identified as *C. physocarpum*. However, no flowering material of *C. physocarpum* has ever been collected outside the Philippines and J. Schneidt (pers. comm.) associates the two specimens with the *Tylophora wallichii* Hook. f. group.

Collections studied: PHILIPPINES. Luzon: *Vidal* 3303 (K), Albay, Gubat, March 1886. Calamian Is.: *Ramos* 41280 (K, L, P), Bicawayan Is., Sept. 1922. Catanduanes: *Ramos* 30352 (K), Catanduanes, Nov./Dec. 1917.

9. *Cynanchum tuberculatum* (Blume) Boerl. — Fig. 9

Cynanchum tuberculatum (Blume) Boerl., Handl. Fl. Ned. Ind. 2 (1890) 436. — *Holostemma tuberculatum* Blume, Bijdr. Fl. Ned. Ind. (1826) 1055. — *Cynoctonum tuberculatum* (Blume) Blume ex Miq., Fl. Ind. Bat. 2 (1860) 478. — Type: *Blume s. n.* (holo L; iso P), Java.

Plants ascending, twining. *Shoots* perennial, herbaceous, glabrous; internodes 10–15 cm long. *Stipules* ovate, 8–10 mm long, 8–10 mm wide. *Leaves* with petiole, 35–45 mm long, 10–12 colleters at the base of the leaves; leaf blades herbaceous, 50–80 mm long, 30–55 mm wide, ovate, basally lobate (lobes 10–12 mm long), apically acute, adaxially and abaxially almost glabrous. *Inflorescences* 4–10-flowered, no mature inflorescences present, bostrychoid. *Peduncles* 30–40 mm long, sparsely covered along a single line with appressed trichomes, 250–300 µm long. *Floral bracts* 1 mm long, 0.75 mm wide at the base, ovate, with trichomes; pedicels 5–7 mm long, densely covered along a single line with recurved trichomes, 250 µm long. *Calyx* basally fused, abaxially with trichomes; lobes 1.5 mm long, 1 mm wide, ovate, apically acute. *Corolla* 4 mm long; lobes 1.5 mm wide, incurved, oblong, apically acute. *Gynostegial corona C(is)* 4 mm high, cyathiform, exceeding the gynostegium, partly obscuring it,

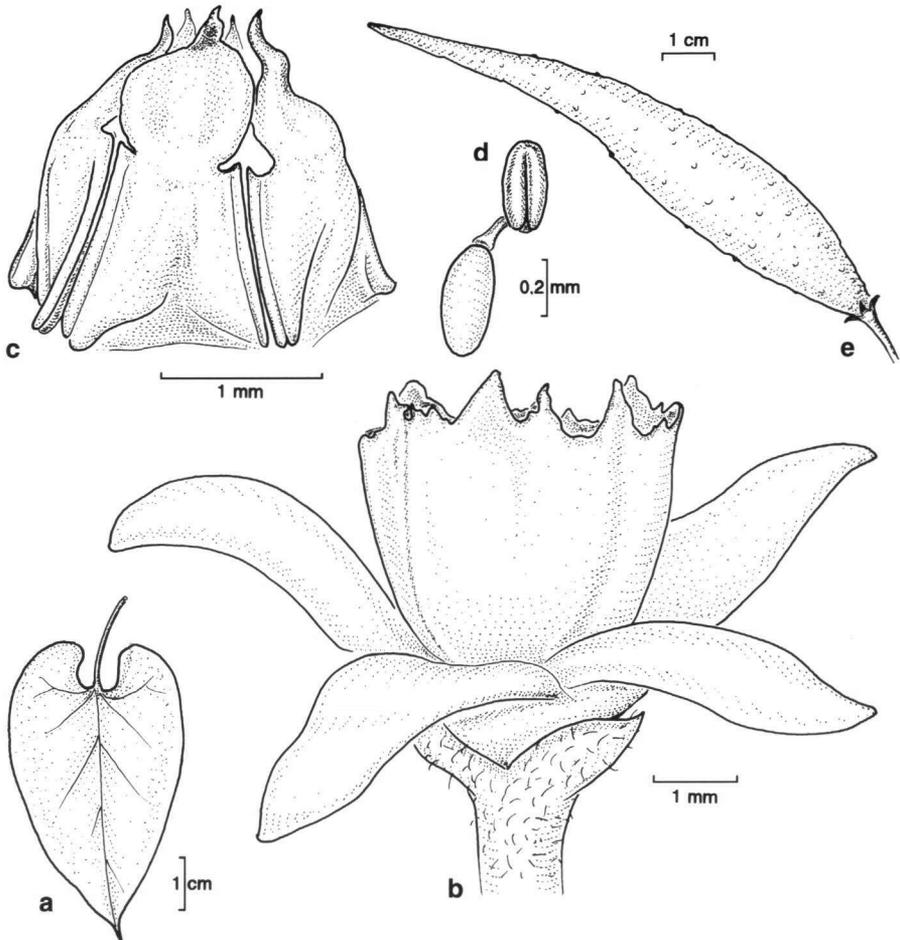


Fig. 9. *Cynanchum tuberculatum* (Blume) Boerl. a. Leaf; b. flower; c. gynostegium; d. half of a pollinarium; e. fruit (from *Blume s. n.*). — Drawn by Ulrich Meve.

consisting of Cs and Ci fused for more than $3/4$ of total corona length, Cs and Ci differentiated, Cs not connate to the filament, laminar; lobes of Cs triangular, apically erect, with lacerate margins; Ci shorter than Cs; lobes of Ci laminar, erect, with straight, emarginate margins. *Gynostegium* 2 mm high, 2 mm diam., sessile. *Anthers* about as high as broad, trapezoidal, abaxially convex; anther wings 1.3 mm long, convergent, extending along the whole length of the anther, forming a basal arch; adjacent anther wings parallel to each other, centrifugal; connective appendages 1 mm long, 0.75 mm wide, obcordate, broader than the stamen, slightly inflexed. *Pollinarium*: corpusculum 280 μm long, ovoid; caudicles 125 μm long, straight, declinate, thickened at the insertion of the pollinium; pollinia apically attached to the caudicles, 385 μm long, 175 μm wide, ovate in cross section, ovoid. *Stylar head* 1 mm diam., 0.5 mm high; upper part 0.2 mm high, umbonate. *Follicles* one per flower, 65–80 mm long, 5–7 mm diam., obclavate, round in cross section, apically strongly beaked, wingless, light brown,

minutely and isolatedly tuberculate, isolatedly covered with trichomes, 155 μm long. *Seeds* 5 mm long, 3 mm wide, ovate, brownish-yellow, marginally with 0.25 mm wide wing, with entire margin; coma 20 mm long.

Distribution — Malesia: Indonesia: Java.

Habitat & Ecology — Flowering: March.

Note — This species has not been collected for almost a century and might be endangered or extinct.

Collections studied: INDONESIA. Java: *s. coll., s. n.* (L, L 179.10-43/44); *s. coll., s. n.* (L, L 898.166-449); *Link 2207b* (L), Sullack, March.

INSUFFICIENTLY KNOWN TAXA

Quite a few species are still obscure because the types were destroyed in B or PNH and no isotypes or at least specimens identified by the author have been found in the course of this study.

1. *Cynanchum minahassae* Schltr., Beih. Bot. Centralbl. 34 (1916) 3. — Type: *Schlechter 20589*, Sulawesi, Tonsea (Minahassa), c. 600 m.
2. *Cynanchum neopommeranicum* Schltr., Bot. Jahrb. Syst. 1 (1913) 93. — Type: *L. Rechinger & K. Rechinger 3659*, Papua New Guinea, Bismarck Archipelago, Gazelle Peninsula, Kaja volcano.
3. *Cynanchum suluense* Schltr., Feddes Repert. 13 (1915) 539. — Type: *Merrill 5401*, Philippines, Sulu Is., Ubian Is., thickets near seashore.
4. *Cynanchum sumbawanum* Warb., Feddes Repert. 3 (1907) 306. — Type: *Warburg 17201*, Indonesia, Lesser Sunda Islands, Sumbawa, Bima.
5. *Cynanchum warburgii* Schltr., Feddes Repert. 3 (1907) 306. — Type: *Warburg 17502*, Indonesia, Moluccas, Amboina.

EXCLUDED SPECIES

1. *Cynanchum capillare* Thunb., Obs. in Cynanch. (1821) 8. — Type: *Thunberg s.n. (UPS-Thun 6291)*, Java = Convolvulaceae sp.
2. *Cynanchum cuspidatum* Thunb., Obs. in Cynanch. (1821) 6. — Type: *Thunberg s.n. (UPS-Thun 6296)*, Java = *Gymnema pergularioides* Wight & Gardner ex Thwaites.
3. *Cynanchum hirtum* Blanco, Fl. Filip. 1 (1837) 203 = *Telosma procumbens* (Blanco) Merr. See Merrill (1917).
4. *Cynanchum macrophyllum* Thunb., Obs. in Cynanch. (1821) 7. — Type: *Thunberg s.n. (UPS-Thun 6305)*, Java, Karak Nosi = Apocynaceae sp.
5. *Cynanchum seimundii* Ridl., J. Straits Br. Roy. As. Soc 86 (1922) 300. — Type: *Seimund s.n. (holo K)*, Malaysia, Pahang, Kwala Tahan = *Tylophora* sp.
6. *Cynanchum tenellum* Blanco, Fl. Filip. 1 (1837) 203 = *Tylophora perrottetiana* Decne. See Merrill (1917).

VINCETOXICUM

Vincetoxicum Wolf, Gen. Pl. (1776) 130. — *Alexitoxicon* St.-Lag., Ann. Soc. Bot. Lyon 7 (1880) 67, nom. illeg. — *Antitoxicum* Pobed., Fl. URSS 18 (1952) 674, nom. illeg. — Type species: *Vincetoxicum hirundinaria* Medik.

Pentabothra Hook.f., Fl. Brit. India 4 (1883) 18. — Type species: *Pentabothra nana* (Buch.-Ham. ex Wight) Hook.f. (= *Cynanchum nanum* Buch.-Ham. ex Wight).

Pycnostelma Bunge ex Decne. in DC., Prodr. 8 (1844) 512. — Type species: *Pycnostelma chinensis* Bunge ex Decne.

Plants mostly erect, rarely twining, leafy, glabrous or covered with multicellular trichomes, containing clear latex. *Roots* fleshy, fascicled. *Leaves* petiolate, with few colleters, entire, ovate, to triangular, basally slightly cordate to slightly decurrent. *Inflorescences* extra-axillary, few- to multi-flowered, usually sciadioidal. *Floral buds* mostly globose, aestivation dextrorse, imbricate or contorted. *Flowers* 3–10 mm diam., frequently sweetly scented, nectariferous. *Corolla* rotate, white, yellow, green, or (red-dish-)brown; adaxially glabrous or with long, smooth trichomes and short, verrucose trichomes. *Corona* gynostegial, white, green or red, about as high as the gynostegium, consisting either of staminal (Cs) parts or of fleshy staminal parts connected by much thinner interstaminal (Ci) parts. *Gynostegium* sessile. *Anthers* with apical appendages and clearly differentiated lateral anther wings. *Pollinia* pendulous; caudicles cylindrical. *Stylar head* forming a protrusion at the upper end of the corpusculum; part above this protrusion (upper part) flat, conical or umbonate. *Follicles* often two per flower, thin-walled, wingless, smooth or finely longitudinally striate. *Seeds* ovate, brown, smooth, with coma. *Chromosome number* usually $2n = 22$.

Eurasian genus of c. 70 species with its centre of diversity in China and the Caucasus. Only one seashore species, *V. carnosum*, extending through the Flora Malesiana area to Australia.

1. *Vincetoxicum carnosum* (R. Br.) Benth.

Vincetoxicum carnosum (R. Br.) Benth., Fl. Austral. 4 (1869) 331. — *Oxystelma carnosum* R. Br., Prodr. (1810) 462. — *Cynanchum carnosum* (R. Br.) Schltr. in Perkins, Fragm. Fl. Philipp. 1 (1904) 120. — *Ischnostemma carnosum* (R. Br.) Merr. & Rolfe, Philipp. J. Sci., Bot. 3 (1908) 121. — *Cynanchum carnosum* (R. Br.) Domin, Biblioth. Bot. 89 (1928) 531, nom. superfl. — Type: *Brown s.n.* (lecto BM, designated by Forster, 1988), Australia, Queensland, Cook District, Island A [= Sweer's Is., Gulf of Carpentaria], Nov. 1802.

Ischnostemma selangorica King & Gamble, J. Asiat. Soc. Bengal, Pt. 2 Nat. Hist. 74 (1907) 532. — Type: *Ridley 7564*, Selangor, at Kwala Selangor (n.v.).

Pentatropis novoguineensis Valetton, Bull. Dép. Agric. Ind. Néerl. 10 (1907) 49. — Type: *Atasrip 96* (n.v.).

Plants straggling or decumbent. *Shoots* herbaceous, glabrous; internodes to 9 cm long, to 2 mm diam. *Leaves* with petiole, to 10 mm long, colleters absent; leaf blades fleshy, to 65 mm long, 20–25 mm wide, elliptic to obovate, basally cuneate, apically acuminate, adaxially and abaxially glabrous. *Inflorescences* 1–5-flowered, sciadioidal. *Peduncles* 30–35 mm long, glabrous. *Floral bracts* 1.5 mm long, 0.8 mm wide at the base, lanceolate, glabrous; pedicels 5–15 mm long, glabrous. *Floral buds* conical, with contorted aestivation. *Calyx* basally fused, glabrous; lobes c. 2 mm long, 1 mm wide, ovate, apically acute. *Corolla* greenish-yellow, 7–10 mm long; lobes 1.5 mm

wide, horizontal, lanceolate, apically acute. *Gynostegial corona* greenish cream, 2.5–3 mm long, slightly exceeding the gynostegium, consisting of Cs only; lobes of Cs fleshy, basically rectangular, tapering to a subulate tip. *Gynostegium* 2–2.5 mm high, 2–2.5 mm diam., sessile. *Anthers* higher than broad; anther wings 1–1.3 mm long; connective appendages 0.75–1 mm long, 0.5–0.75 mm wide, triangular, narrower than the stamen, inflexed. *Pollinarium*: corpusculum 250 µm long, elliptic; caudicles 125 µm long, straight, declinate, thickened at the insertion of the pollinium; pollinia apically attached to the caudicles, 250–300 µm long, 100–125 µm wide, round in cross section, oblongoid. *Stylar head* umbonate. *Follicles* c. 75 mm long, 1.5 mm diam., fusiform, apically strongly beaked, wingless, glabrous. *Seeds* 4–5 mm long, 3 mm wide, ovate, winged; coma 15–20 mm long.

Distribution — Australia. Thailand. Malesia: Philippines, Indonesia (Timor), Papua New Guinea.

Habitat & Ecology — Near seashore, in mangrove and swamps. Altitude 0–300 m. Flowering: throughout the year.

Notes — The question whether the latex of this species is clear or milky has not been resolved satisfactorily. Forster (1991) stated it as white; on his specimens he stated it as clear. The possibilities of a seasonal colour change or infraspecific variability cannot be excluded at present.

The species is discussed in Forster 1988 and Forster 1991: 447, and illustrated in Forster 1991: 448, f. 1.

Collections studied: INDONESIA. Timor: *Van Steenis 18065* (K), betw. Baucau and Vermassi, 100–350 m, 17 Dec. 1953. — PHILIPPINES. Luzon: *Loher 4039, 4040* (K), Luzon Central, Playa, 30 Aug. 1896; *Williams 387* (K), Bataan, Lamoo, Mt Mariveles, 30 Dec. 1903. Sulu Prov.: *BS (Ramos & Edaña) 44077* (K), Tawitawi, July/Aug. 1924. — PAPUA NEW GUINEA. Central Prov.: *Frodin 5240* (K), Morupore, bootless inlet; NE corner of island, 0 m, 31 March 1979; *Rau 37* (K), Goloa (Aroma) Kupiano, 6 m, 27 June 1977.

ACKNOWLEDGEMENTS

I would like to thank the directors of the herbaria that provided material or hospitality during my visits. The continuous support of my work by Dr. U. Meve, Bayreuth, is gratefully acknowledged. Work on *Cynanchum* was sponsored by the Deutsche Forschungsgemeinschaft (SL, grants LI 496/1–4).

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Tsiang, Y. & P.T. Li (eds.). 1977. *Icones Cormophytorum Sinicorum*, vol. 63.

IDENTIFICATION LIST OF SPECIMENS

<i>Cynanchum</i>	6 = <i>muricatum</i>
1 = <i>celebicum</i>	7 = <i>ovalifolium</i>
2 = <i>corymbosum</i>	8 = <i>physocarpum</i>
3 = <i>dimidiatum</i>	9 = <i>tuberculatum</i>
4a = <i>hoedimeerium</i> subsp. <i>hoedimeerium</i>	
4b = <i>hoedimeerium</i> subsp. <i>timorensis</i>	<i>Vincetoxicum</i>
5 = <i>loheri</i>	V1 = <i>carnosum</i>

Backer 8209: 4a — Bakhuizen van den Brink 1654: 7; 7365: 7 — Beaman 9150: 5 — Bloembergen 3171: 3 — Blume s.n. (L 898.166-426): 7 — Brass 27423: 7; 27752: 7 — BS series: 44077 (Ramos & Edaño): V1.

Cajano 1658: 8 — Curtis 871: 7.

Den Hoed 3107: 4a — Den Hoed & Van der Meer 488: 4a — Dunlop & Leach 9669: 4a.

Edaño & Gutierrez 128 (PNH 37802, PNH): 8 — Elmer 15636: 8.

Frodin 933: 7; 5240: V1.

Hallier 4419: 5 — Haniff & Nur 10111: 2.

Iboet 274: 3.

Junghuhn s.n. (L 898.166-402): 4a.

Kerr 13658: 2 — King 5301: 2; 8385: 7 — Kjellberg 2106: 1 — Koorders 1097: 7; 16232: 7; 20346: 7; 32271: 7; 42517: 4a — Koorders & Koorders-Schumacher 43182: 7 — Kornassi (exp. Rutten) 1111: 7.

Liede 3279: 8; 3297: 7 — Link 2207b: 9 — Loher 4039: V1; 4040: V1; 4053: 5; 5060: 5; 6524: 5 — Lörzing 7026: 6.

McGregor 12368: 5 — Meijer 195: 7 — Merrill 532: 5; 7702: 7 — Millar 35341: 7 — Mochtar 114A: 6.

Nedi (exp. De Haan) 210: 7 — NGF series: 2936: 7.

Oldham 333: 7.

Pételot 4922: 2.

Rachmat (exp. Van Vuuren) 323: 4a — Ramos 22148: 8; 22471: 5; 30352: 8; 33075: 7; 41280: 8; 44173: 7 — Ramos & Edaño 29061: 8; 47079: 5; 48231: 8 — Rau 37: V1.

Soegandiredja 35: 7 — Stevens & Lelean 58501: 7 — Sulit 4071: 5; 13787: 5.

Van Balgooy 3480: 7 — Van Beusekom & Santisuk 2838: 6 — Van Borssum Waalkes 914: 7 — Van Hasselt 202: 7 — Van Royen & Sleumer 5438: 7; 6498: 7 — Van Steenis 18065: V1 — Vanoverbergh 976: 5; 3089: 7 — Verheijen 2900: 3; 3728: 3; 5431: 3 — Vidal 3281: 8; 3303: 8; 3311: 5.

Walsh 136: 4b — Wiakabu & Yefle 70312: 7 — Williams 387: V1.

INDEX OF SCIENTIFIC NAMES

Numbers refer to the species number under which each name can be found. For *Vincetoxicum* the prefix 'V' is used. Genus names (and their synonyms) have been referred to the page number. Other abbreviations used are: *insuf.* for 'insufficiently known taxa' and *excl.* for 'excluded species'. Accepted names are in roman type, new names or combinations are in bold type, and synonyms are in *italics*.

- Alexitoxicon* St.-Lag. [p. 492]
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 formosana (Maxim.) C. Y. Wu & D. Z. Li 7
 var. *ovalifolia* (Tsiang & P. T. Li) C. Y. Wu
 & D. Z. Li 7
Cynanchum L. [p. 472]
 capillare Thunb. *excl.* 1
 carosum (R. Br.) Domin V1
 carosum (R. Br.) Schltr. V1
 celebicum Koord. 7
 celebicum Schltr. 1
 corymbosum Wight 2
 crassifolium Hatus. 7
 cuspidatum Thunb. *excl.* 2
 denigratum Elmer 8
 dimidiatum (Hassk.) Boerl. 3
 formosanum (Maxim.) Hemsl. 7
 var. *ovalifolium* Tsiang & P. T. Li 7
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 hirtum Blanco *excl.* 3
 hoedimeerium Bakh. f. 4
 subsp. *hoedimeerium* 4a
 subsp. **timorense** Liede 4b
 javanicum (Koord.) Bakh. f. 7
 laeve (Blume) K. Schum. 7
 loheri Schltr. 5
 luzonicum Schltr. 7
 macrophyllum Thunb. *excl.* 4
 minahassae Schltr. *insuf.* 1
 muricatum (Blume) Boerl. 6
 neopommeranicum Schltr. *insuf.* 2
 ovalifolium Wight 7
 physocarpum Schltr. 8
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 tuberculatum (Blume) Blume ex Miq. 9
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 Thwaites *excl.* 2
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