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THE GENUS COELOSTEGIA*) Benth. (Bombac.)

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SUMMARY

1. The genus *Coelostegia* is confined to Western Malaysia: Malay Peninsula, Sumatra and Borneo.
2. Five species (three of which, *C. chartacea*, *C. kostermansii* and *C. neesiocarpa* are new to science) are described.
3. A key to the species is presented.

INTRODUCTION

This paper presents a survey of the species of *Coelostegia*, a genus allied to *Durio* and *Kostermansia*, which I revised formerly, whereas my colleague Mr. Soepadmo is working up the genus *Neesia* which is also allied to *Coelostegia*.

The alliance of these four genera is discussed. The genus *Coelostegia* is badly known for lack of material.

Recently Dr. Kostermans collected in Borneo two new species of *Coelostegia* (of the total of 5), which means that they are rare or not easy to collect.

Most *Coelostegia* species are very poorly represented in herbaria and definite conclusions about alliances have to be postponed.

I have to thank the Directors of the Herbaria of Kepong, Leyden, Bogor and Singapore for their kindness to supply me with material. Furthermore many notes were put at my disposal by Dr. A. J. G. H. Kostermans, who took the trouble to study material of *Coelostegia* in many herbaria during his recent world tour.

Dr. R. C. Bakhuizen van den Brink (Leiden) has kindly assisted me to compile the latin diagnoses.

Dr. Kostermans went through the MSS and gave valuable suggestions.

Messr. Sukirno and Damhuri prepared the drawings, for which I extend my thanks.

*) From the Greek: koilos = hole, stegē = roof; the flowers face downwards, the calyx suggests a roof with 5 cavities.

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..... COELOSTEGIA Benth. 1

Bentham *in* Benth. et Hook, f, Gen. PL 1: 199 & 213. 1862; Baillon, Hist. Pl. 4: 160. 1872; Diet. Bot. 2: 120. 1886; Masters *in* Hook, f, Fl. Br. Ind. 1: 352. 1874; *in* J. Linn. Soc. Bot. 14: 504. 1875; Beccari, Malesia 3: 269. 1889; Boerlage, Handl. Fl. Ned. Ind. 1: 119. 1890; King *in* J. As. Soc. Beng. 60 (2) : 56. 1891; K. Schumann *in* Engl. & Prantl., Nat. Pfl. Fam. 3 (6) : 66 & 68. 1895; Ridley, Fl. Mai. Pen. 1: 266. 1922; Bakhuizen v.d. Brink Sr. *in* Bull. Jard. bot. Buitenzorg 3, 6: 223 & 248; Lemeë, Diet, descr. Genres 2: 241. 1930; Corner, Wayside Trees Mai. 1: 436. 1940.

TYPE SPECIES. — *Coelostegia griffithii* Benth.

Large trees, usually buttressed, Branchlets lepidote or glabrescent. Wood mostly soft, light. Leaves alternate, simple, entire, penninerved, chartaceous to coriaceous, lower surface lepidote; petiole thickened at apex; stipules small, soon deciduous. Flowers small, 3—10 mm in diameter, in short lepidote panicles, axillary on young or older branches, peduncles usually much-branched, very rarely inconspicuous, pedicel short, filiform, bracts small, early caducous. Epicalyx a 3-lobed cup, chartaceous, persistent, outside lepidote, inside glabrous. Sepals 5, at base connate into a narrow, short tube, abruptly dilated into a 5-pouched cup (the lobes at this part being induplicate), apex free, tooth-like; outside lepidote, inside glabrous but for the papillose base of the pouches. Petals 5, triangular, somewhat fleshy, thickened at their middle, top acute, base truncate, with a very short, thin claw, inserted at or below the mouth of the (lower) calyx tube, soon deciduous. Stamens about 20, filaments short, fleshy, flattened, the ca 1/3 basal part connate into a tube, adnate to the calyx tube just below the insertion of the petals, upper part of filaments becoming free at different heights, each filament usually topped by 3 globose, 1-celled, agglutinate anthers, dehiscent, orbicular-elliptic, at first concave, later flat. Ovary globose or subobovoid, partly embedded in the calyx tube, 5-celled; each locule with few to several, subascending, biseriate ovules; outside densely lepidote; style filiform, pentangular, glabrous, protruding beyond the stamens; stigma conspicuous, peltate, discoid. Fruit capsular, globular, ellipsoid or ovoid, spiny or submuricate or more or less smooth, rather rough and glabrous inside, dehiscent on the tree for half of its length or more into 5, very hard, woody, erect valves. Seeds smooth, terete or compressed, elongate-obovoid, obtuse, base acute, carunculate, in two rows in each compartment. Cotyledones flat, thin, foliaceous, covered by 2 flat-convex endosperm lobes which are slightly connected at base; testa rather thin; radicle Short.

DISTRIBUTION. — Malaya, Sumatra, Borneo.

The genus *Coelostegia* was first described by Bentham in Benth. et Hook, f, Gen. Pl. 1: 213. July 1862. In March 1862 Bentham had discussed and published the name *Coelostegia* (*in* J. Linn. Soc. Bot. 6: 123); he stressed that the genus was close to *Boschia* Griff. (= *Durio* Adans.) and *Nesia* Bl.

Beccari in 1889 (I.e. 271—272) described two new species: *C. sumatrana* and *C. borneensis*. He was the first who described the fruit and seed of *Coelostegia*.

In 1875 Masters (*in* J. Linn. Soc. Bot. 14: 500) had included Beccari's type specimen of *C. borneensis* into his *Dw. no carinatus*.

Bakhuizen van den Brink Sr. revised the genus in 1924 (*in* Bull. Jard. bot. Buitenzorg 3, 6: 223). He incorporated *Coelostegia sumatrana* Becc. in *C. griffithii* Benth.

Since Bakhuizen's time our collections of *Coelostegia* have increased little. Among the new specimens collected in Borneo 3 new species are represented.

The most peculiar character of this genus is in the shape of the calyx and the subperigynous petals. The feeble attachment of the petals and the mucilaginous secretion causes the corolla to drop unopened.

Bentham stated in his original description that the stamens should be adnate to the petals, but according to me the petals and stamens are attached to the calyx at different heights.

King's contention that the fruit is hairy inside is certainly wrong, this character is typical for the related genus *Neesia*.

Kostermans (*in* Communication, For. Res. Inst. Bogor no. 62: 2. 1958 and *in* Reinwardtia 4 (3): 361. 1958) discussed the status of *Durio*, *Coelostegia* and *Neesia*; according to him the differences between the three genera are not on the generic level. He stressed the resemblance between *Coelostegia* and *Neesia* and he suggested to combine the latter two genera.

Kostermansia, *Coelostegia* and *Neesia* have similar embryos, consisting of two flat, foliaceous cotyledons, enclosed by 2 flat-convex lobes of endosperm. The seeds of *Coelostegia* and *Neesia* have a caruncula at their base; the seed of *Kostermansia* is devoid of an aril or caruncula. *Kostermansia* seems to be intermediate between *Durio* and *Coelostegia*.

Coelostegia can be best distinguished from *Neesia* by the absence of pruriant hairs in the fruit of the former. There are also differences in the flowers, which are small with a 5-sepaled calyx and subperigynous petals in *Coelostegia* and a large monophyllous calyx and hypogynous petals in *Neesia*. The leaves of *Neesia* are mostly larger than those of *Coelostegia*, with parallel secondary nerves which are perpendicular to the primary (lateral) nerves; these parallel secondary nerves are absent in *Coelostegia*.

Nothing is known of the cytology and pollen morphology of *Coelostegia* and *Neesia*.

In the present state of our knowledge of this group, it is not advisable to combine *Coelostegia* and *Neesia*, as suggested by Kostermans.

As to the endosperm of *Kostermansia*, *Coelostegia* and *Neesia*, which consists of two lobes, slightly connate at base, Kostermans (orally) suggested that they might represent the true cotyledons and the inner two lobes (which in this paper are considered the cotyledons) might be primordial leaves.

KEY TO THE SPECIES

- 1a. Fruit spiny. 2
 b. Fruit submuricate. 4. *C. kostermansii*
 c. Fruit more or less smooth. 5. *C. neesiocarpa*
 2a. Fruit spines conical. Upper leaf surface often lepidote 1. *C. borneensis*
 b. Fruit spines angular. Upper leaf surface always glabrous. 3
 3a. Fruit globular. Mature leaves up to 10 cm long, lateral nerves 6-10 pairs, on the lower surface prominent; petiole 1-2.5 cm long 3. *C. griffithii*
 b. Fruit ellipsoid. Mature leaves 10-23 cm long, lateral nerves 11-16 pairs, on the lower surface prominent; petiole 2.5-3 cm 2. *C. chartacea*

1. COELOSTEGIA BORNEENSIS Becc. — Fig. 1, 2.

Coelostegia borneensis Beccari, Malesia 3: 272, t. 29. 1889; Boerlage, Handl. Fl. Ned. Ind. 1: 120. 1890 (*nomen*); Merrill in J. Str. Br. Roy. As. Soc. Spec. Numb. 377. 1921; Bakhuizen van den Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 224 & 248. 1924. — Beccari P. B. 2688 (FI).

Durio carinatus Masters in J. Linn. Soc. Bot. 14: 500. 1875, p.p. (quoad specim. Beccari P. B. 2688).

Tree up to 45 m high, diameter up to 60 cm above the buttresses. Buttresses about 1 m high. Bark grey, pustular. Branchlets thick with distinct leaf-scars, glabrous, glabrescent or densely covered by loose, pale brown, toothed scales, towards apex sulcate. Leaves coriaceous, elliptic-oblong, 10-17 x 4-7 cm, apex acute or slightly acuminate, base rounded or acute; upper surface covered by a lax to rather dense layer of small, silvery brown, fimbriate scales, sometimes with numerous dots of minute holes in between the scales, sometimes glabrous, midrib prominent at base, gradually flattened and eventually channelled towards apex, lateral nerves 14-20 pairs, slightly prominent, arcuately anastomosing, the dense reticulation prominent; lower surface pale green (fresh), densely covered by adpressed, fimbriate scales of two kinds (small ones as those of the upper surface scattered in between the large scales which are about twice as large as the former), midrib strongly prominent, lateral nerves prominent, reticulation obscure; petiole 2.5-3 cm long, subterete, densely scaly, swollen towards apex, above grooved. Stipules lanceolate, soon deciduous, up to 1 cm long, 2 mm wide at base, tapering towards apex, scaly on both surfaces. Panicles on old branches, up to 9 cm long, many-flowered, lepidote; lateral branches short, often less than 1 cm. Flowerbuds depressed-conical, ca 3 x 2 mm, apiculate. Pedicel filiform, 3 mm long, scaly. Epicalyx a 3-lobed cup, 1.5 mm high, 2 mm in diameter, outside scaly, inside glabrous. Calyx tube 2 mm high, 2 mm in diameter at mouth, 5-pouched cup 6 mm in dia-

meter, 2.5 mm high, teeth erect, acute, 1.5 mm long; outside densely covered by dull brown, small, fimbriate scales; inside glabrous, but for base of each pouch with dark brown papillae. Petals fleshy, triangular, 3 x 1.5 mm, thickened at the middle, outside laxly scaly, inside glabrous; claw very short, thin, inserted at the calyx tube just below the mouth. Stamens about 20, ca 2 mm long; filaments-tube 0.75 mm, the upper free part of the filaments constricted at apex, each with 3—4 globose, agglutinate anthers, valves orbicular, first concave later flattened, patent. Ovary globose, obovoid, densely covered with large (about twice as large as those of the other parts of the flower), yellowish brown, fimbriate scales; style filiform, 5-sulcate, glabrous, 1.5 mm long, abruptly merging into the ovary; stigma often cone shaped, obscurely 5-lobed, glabrous above, with minute stellate hairs underneath. Fruit dark brown (dried), spherical, 14—15 cm in diameter, dehiscent for more than half of its length; spines conical, sharp, up to 1 cm; fruit stalk 7—8 cm, up to 1.4 cm thick. Seeds imperfectly known, carunculate, falling out while the fruit is still attached to the branches.

VERNAC. NAMES. — Durian antu (Kuching, Sarawak, antu = phantom); Duren enggang (Atjeh, enggang = hornbill); Apon (Dayak Sampit).

DISTRIBUTION. — Malaya, Sumatra, Borneo.

The description of fruit and seed is partly copied from Beccari.

According to Beccari the branchlets are glabrous; all specimens which I could examine, however, are either laxly or densely lepidote. The presence of scales on the upper leaf surface is not constant; the leaves of b.b. 2578 are either lepidote or glabrescent on their upper surfaces, while those of KEP. 53363 and BRUN 586 are completely glabrous.

Malaya, Trengganu, swamp, alt. 40 m, Oct., ster., *Abdullah bin Awang Kep*, 53363 (KEP). N. Sumatra, Atjeh, Langsa, on sandy soil, in primary forest, alt 50 m, Jan., ster., *b.b.* 2578 (BO, BZF, L). Borneo, Brunei, Andulau P. R., disturbed forest, on deep yellow sands overlying tertiary clays, low undulating hills, alt. ca 25 m, Sept., fr., *Ashton BRUN 586* (BO, BRUN, K, KEP, L). Sarawak, Kuching, Nov., fr., *Beccari P. B. 2688* (BO, FI, K), (type!). Indonesian S. Borneo, Sampit R. region, near Kuala Kuajan, on sandy soil, alt. 20 m, Aug., fl., *Kostermans 8070* (BO).

2. *Coelostegia chartacea* Soegeng, *spec. nov.* — Fig. 3, 4.

Arbor mediocris. Folia chartacea, oblonga, apice acuminata, basi in petiolulum contracta, supra glabra, subtus sparse lepidota. Inflorescentiae e ramulis ortae in posticis partibus foliorum, ramosae, multiflorae. Flores ab eis Coelostegia griffithii characteribus non differt, corolla externa lepidota. Fructus ellipticus, spinosus, valvis usque ad ca ¾ longitudinis fissis seminis non vidis.

Tree 18 m tall, bole 14 m, diameter 45 cm. Bark smooth, brown with white spots, 0.5 mm thick. Living bark dark orange yellow, 15 mm thick. Branchlets reddish brown, glabrous or glabrescent, sulcate towards apex. Leaves chartaceous, elliptic-oblong, 10—23 x 4.5—8.5 cm, acuminate (acumen up to 12 mm long, sharp), base contracted into petiole; upper surface glabrous, midrib flat, lateral nerves (11—16 pairs) prominulous, subsascent, near margin arcuately anastomosing, reticulation dense, prominulous; lower surface sparsely covered by small, silvery, fimbriate scales, midrib strongly prominent, lateral nerves prominent, the dense reticulation prominulous; petiole terete, 2—3 cm long, swollen towards apex, narrowly grooved above, lepidote (the scales are densest on the swollen part, towards the base glabrescent). Stipules subulate, 5—7 mm, lepidote, early caducous. Panicles 2.5—3 cm long, much branched, many-flowered, lepidote, fasciculate on the bare twigs. Flowers as in *C. griffithii*; the petals always lepidote outside. Fruit ellipsoid, 16 cm long, 12 cm in diameter, spines pyramidal, sharp, 1 cm long. Seed unknown.

TYPUS. — *Kostermans 5262* (BO).

DISTRIBUTION. — East Indonesian Borneo.

VERNAC. NAME. — Lalisung (Malay, Tidung).

The species is related to *C. borneensis* and *C. griffithii*; it differs from *C. borneensis* by its shorter inflorescences, chartaceous leaves with much laxer scaly layer underneath and in its ellipsoid fruit with angular spines. Its flowers are the same as those of *C. griffithii*, but the leaves are larger with prominent lateral nerves underneath, the petioles are longer.

East Indonesian Borneo, E. Kutei, Sangkulirang, Menubar R. region, ridge, loamsoil containing lime, alt. 50 m, June, fl., old fruit collected under the tree, *Kostermans 5262* (A, BO, K, L, LAE, P, PNH, SING); Tidung region, T. Paking alt. 25 m, July, ster., 6.6.17958 (A, BO, L).

3. COELOSTEGIA GRIFFITHII Benth. — Fig. 5, 6.

Coelostegia griffithii Benth. in Benth. & Hook, f, Gen. Pl. 1: 213. 1862; Baillofl, Hist. Pl. 4: 160. 1872; Diet. Bot. 2: 120. 1886; Masters in Hook, f, Fl. Br. Ind. 1: 353. 1874; in J. Linn. Soc. Bot. 14: 505, t. 16, fig. 43—50. 1875; Beccari, Malesia 3: 270. 1889; Boerlage, Handl. Fl. Ned. Ind. 1: 120. 1890 (nomen); King in J. As. Soc. Bengal 60 (2): 57. 1891; Ridley in J. Str. Br. Roy. As Soc. 33: 52. 1900; in Agric. Bull. Str. et F.M.S., N.S. 1 (2): 48. 1901; in Bull. Kolon. Mus. Haarlem 27: 13. 1903; Fl. Mai. Pen. 1: 266. 1922; de Clerq, Pl. Woordenboek Ned. Ind. 206. 1909; Foxworthy in Philipp. J. Sci. Bot. 4(4): 499. 1909; in Mai. For. Rec. 1: 120. 1921; 2: 174. 1922; 3: 152, fig. opposite pp. 152 & 153. 1927; Kent, Rep. Mech. Tests Mai. Timb. 6. 1920; Bakhuizen van den Brink Sr. in Bull. Jard. bot. Buitenzorg 3, 6: 224 & 248, t. 37. 1924; Thorenaar, Ond. naar bruikb. Kenmerk. Ident. Boomen naar hun Bast 200. 1926; Heyne, Nutt. Pl. Ned. Ind., ed. 2, 1: 1059. 1927; ed. 3, 1: 1059. 1950; Foxworthy & Woolley in Mai. For. Rec. 8: 28. 1930; Narayanaswami in J. & Proceed. As. Soc. Bengal, N.S. 27 (3): 345. 1931; Strugnell in Mai. For. 1: 72. 1931; Burkill, Diet.,

econ. Prod. Mai. Pen. 1: 618. 1935; Desch in Mai. For. Rec. 15: 58, t. 10, fig. 2. 1941; Corner, Wayside Trees Mai. 1: 436. 1940 (*C. griffithiana*); Wyatt-Smith in Mai. For. Rec. 17: 114. 1952 (nomen). — Griffith 547 (K).

Coelostegia sumatrana Beccari, Malesia 3: 271, t. 27 & 28. 1889; Boerlage, I.e. (nomen); Bakhuizen, I.e. 240 (as a *syn.* of *C. griffithii* Benth.); Thorenaar, I.e. 87; Platenatlas, fig. 6. — *Coelostegia griffithii, forma sumatrana* (Becc.) Bakhuizen van den Brink Sr., I.e. 248. — Beccari P. S. 738 (F1).

Tree up to 40 m tall, up to 110 cm in diameter; buttresses up to 3.5 m high, 2 m out. Bark dark brown or greyish brown, rough, shallowly, irregularly fissured. Living bark ca 1 cm thick, light brown to yellowish orange. Wood medium soft, dirty white to yellowish orange. Branchlets terete, dark, covered — denser towards apex — by loose, light brown or silvery, dark-centered, small, fimbriate scales, or glabrescent. Leaves chartaceous to coriaceous, elliptic-oblong, rarely ovate or lanceolate, (5—) 8—10 (—15) x (2—) 3—4 (—6) cm, base rounded or contracted into petiole, apex slenderly, bluntly acuminate, acumen 5—13 mm long; upper surface glabrous, midrib flat or slightly sunken, lateral nerves 6—10 pairs, prominulous, near margin arcuately anastomosing, reticulation dense, prominulous; lower surface with a lax to rather dense layer of silvery, more or less translucent, fimbriate scales, midrib strongly prominent, lateral nerves prominulous, usually with domatia at base and at the anastomosis, reticulation obscure. Petiole terete, 1—2.5 cm long, lepidote, slightly swollen towards apex, narrowly grooved above. Stipules soon caducous, linear to lanceolate, up to 6 mm long, acute, lepidote. Inflorescences densely lepidote, axillary or on bare branches, consisting sometimes of very short main peduncle with one to few flowers or more often of many-flowered, up to 7 cm long panicles; bracts and bracteoles ca 2 mm and 1 mm, early caducous; pedicel filiform, 7—15 mm long. Flowerbuds light greenish brown (fresh), ovoid or conical or depressed conical, up to 7 mm in diameter, acuminate or apiculate. Epicalyx cup 2 mm in diameter, 0.5 mm high, lobes 0.5 mm, outside scaly, inside glabrous. Calyx tube 2 mm high, 2 mm in diameter at mouth; pouched cup 6—10 mm in diameter, 2.5 mm high, teeth 2—2.5 mm long, folded lengthwise in their middle part, tip sharp, slightly incurved; inside pale yellow (fresh), glabrous, at the base of the pouches dark purple (fresh), papillose; outside brownish yellow, densely covered by overlapping, brown-yellowish, fimbriate scales. Petals fleshy, yellowish orange (fresh), becoming dark brown after anthesis, triangular, 3 mm long, 1.5 mm at the widest part, thickened at the middle, top acute, base truncate, claw 0.2 mm, narrow, thin, inserted at the mouth of the calyx tube, outside lepidote or glabrous, inside glabrous. Stamens about 20, fleshy, white, flattened, filament-tube ca 0.75 mm, the upper free part of filaments 1.25 mm, each usually with 3, white, globose, papillose anthers, valves eventually patent. Ovary globose-obovoid, ca 2 mm in diameter, densely covered by large (about twice as large as those of the other parts of the plant), pale yellowish, dark-centered, fimbriate scales; style white, filiform, 2 mm long, glabrous, inserted in a depression of the apex of the ovary; stigma discoid, ca 0.5 mm in diameter, 5-lobed, above glabrous, underneath minutely stellate-haired. Fruit globose, up to 7 cm in diameter

(including the pyramidal, sharp, 1—2 cm long spines), dark purplish-red or dark brown red, dehiscent for about 2/3; fruit stalk 2—4 cm. Seed terete, lanceolate, ca 2.5 cm long, 1 cm in diameter, caruncula 1 cm long, red, fleshy, not very juicy.

DISTRIBUTION. — Malay Peninsula, Sumatra, Bangka.

VERNAC. NAMES. — Punggai, Punggeh or Unggeh (Malay), Tembalun (Minangkabau), Regeum (Atjeh), Tongor (Batak-Toba), Durian hantu (hantu = phantom) or Durian Unggeh (Palembang), Durian hutan (Bangka), Mandarawan rangau (Indrapura).

HABITAT. — Lowland, swampy or well drained forest, from sea-level up to 550 m altitude.

USE. — The bark contains tannin which is used for tanning fish-nets; the timber is used for wooden clogs, boxes and also for house building.

The fact that the petals are sometimes lepidote on the outside has been usually overlooked (cf. King).

When Beccari published his *Coelostegia sumatrana*, he had not examined the type specimen of *C. griffithii*. He misinterpreted Masters's rather poor drawing of the epicalyx of *C. griffithii* as having 5 lobes; according to me there are 4 lobes. In his description, moreover, Masters stated that the epicalyx should be 3—4-lobed. All specimens which I examined have a 3-lobed epicalyx.

Bakhuizen van den Brink Sr. considered *C. sumatrana* conspecific with *C. griffithii*; later he described it as forma *sumatrana*.

I agree with Bakhuizen in incorporating *C. sumatrana* into *C. griffithii*, but not in treating it as a distinct forma. The solitary flowers (or 2 flowers together) in contrast with many-flowered inflorescences is not a constant character; the specimen Korthals s.n. (L) has both types of inflorescences.

A tree cultivated in the Bogor Economic Garden, flowers all the year round, but it very rarely produces fruit; the fruit moreover does not seed and is small (10 cm in diameter) with abnormally slender spines. This is perhaps attributable to the absence of a pollinating agent in Java or probably the plant is dioecious.

Malaya. Perak, loc. not. indicated, fl., *Scortechini* 1862, 1863 (SING); Dengong — Kampar Road, T. Anson, Sept., fr., *Haniff S.F.N. H31S* (SING); Kelantan, Ulu Kelantan, Temangan, alt. 30 m, June, ster., *Kep. 68766* (KEP); Selangor, Kuala Lumpur, Sungai Buloh For. Res., near river, Febr., fr., *Foxworthy F.M.S. 10213* (KEP, SING); *ibid.*, low lying land or swampy forest, May, fr., *Kiai F.M.S. 8S87* (KEP, SING); *ibid.*, Jan., fr., *F.M.S. 7068* (KEP, SING); *ibid.*, May, fr., *F.M.S. 1183* (KEP, SING); *ibid.*, low lying land, Oct., fr., *Symington F.M.S. 24445* (KEP, SING); *ibid.*, swamp, June, fl., *Strugnell F.M.S. 27880* (KEP, SING); Negri Sembilan, Pasir Pandjang Road, 14 th. mile, dry level, Febr., fl., *Yusup F.M.S. 4222* (KEP, SING);

Semawang For. Res., fl., *Yakim S.F.N. 0518* (KEP); Sendayan For. Res. April, fl., *Din bin Udjang S.F.N. 0536* (BO, SING); Malacca, anno 1845, fl., Herb. *Griffith 547* (A, K, L, P) (type!); Bukit China, Jan., fl., *Derry 95* (SING); Selander, March, fl., *Alvins s.n.* (SING); loc. not indicated, fl., *Derry 123* (SING); Johore, G. Banang For. Res., Batu Pahat, slope of a hill, alt. 150 m, Jan., ster., *Suleiman bin Manja, Kep. 70172* (KEP). Singapore. Mandai Road, swampy forest, July, young fr., *Kiah S.F.N. 37112* (A, BO, K, KEP, SING); *ibid.*, swampy forest, Sept., ster., *Comer s.n.* (SING); Garden Jungle, fl., *Ridley 3887* (K, P); Bukit Timah, fr., *Ridley 4738* (SING). Sumatra. N. Sumatra. Atjeh, Meulaboh, Alur Palombongan, Simpang Penet, alt. 50m, July, ster., *b.b.8873* (BO). W. Sumatra, Tapanuli, Sibolga, Barus, Pangkalan Tapus, alt. 0 m, Oct., ster., *66.29537* (A, BO, BZF, L); Melintang, mountain forest, *Korthals s.n.* (L); Air Mantjur, near Padang, alt. 360 m., Aug., fl., *Beccari P.S. 73S* (BO, Fl, K, L), type of *C. sumatrana* Becc.; *ibid.*, Aug. fl., *Beccari P.S. 620* (L); Between Bondjol-Lubuk Sikaping, alt. 550 m, Jan., ster., *Teijsmann s.n.* (BO); Pariaman, Village Tandjung, alt. 400 m, Apr., fl., *6.6.6736* (BO, L); Balai Selasa, Muaro Sakae, alt. 30 m, Oct., ster., *6.6.5969* (BO, L); Painan, Barung²-Balantai, June, fl. buds, Nov., fr., *S.W.K./I-32* (BO, BZF, L, WAG); Ophir, Lubuk Gadang, Parit, alt. 90m, Jan., ster., *6.6.1U81* (A, BO, BZF, L, SING); *ibid.*, Febr., ster., *6.6.19629* (BO, BZF, L). E. Sumatra. Badjalinggi, S. of Tebingtinggi, in primary forest, alt. 100 m, Oct. fr., *Lbrzing & Jochems 7397* (BO); Asahan, Bandar Pulau, ster., *Yates 2586* (A, BO, K); Bengkalis, Sungai Misigit, Panglong 31, alt. 4 m, Jan., fl., fr., *Beguïn 556* (BO, L); Indrapura, fl., *Volke 5* (BO, L). Riau, Indragiri Upperlands, Muara Serangege, alt. 75 m, Sept., ster., *b.b.30<X81* (A, BZF, L); Kuantan Districts, Muara Pantai, alt. 100 m, Febr., ster., *6.6.23859* (BO, L). S. Sumatra. Palembang, Banjuasin and Kubu regions, Bajung Lintjir, alt. 15 m, Jan., Apr., fl., fr., *85 E. 1 P. 754* (BO, BZF, K, L, PNH, U); *ibid.*, Sept., fl., fr., *1 P. T. 788* (BO, L); *ibid.*, Mar., fl., *Endert 276* (BO, L); *ibid.*, swampy forest, Nov., fl., *Grashoff 812* (BO, L); Rawas, alt. 150 m, Aug., fr., *Grashoff 1110* (BO, L). Bangka, Blinju, alt. 25 m, Oct., fl., fr., *Grashoff 18* (BO, L). Java, culta in Bogor Economic Garden, Bubulak, Sept., fl., *van Steenis 3105* (BO); *ibid.*, from the same tree, March, fl., fr., Aug., Sept., fl., *Garden Coll. s.n.* (A, BO, K, L, PNH, U).

4. *Coelostegia kostermansii* Soengeng, *sp. nov.* — Fig. 7, 8.

Arbor magna, basi cum rhizomate tabulari giganteo. Folia alterna subcoriacea elliptica ad oblonga, apice acuminata, basi acuta vel rotundata, supra glabra, subtus canescentia laxe lepidota. Inflorescentiae e ramulis ortae in positivis partibus foliorum, multiflorae, lepidotae, vix ramosae, plerumque glomerulis 3-vel pluri-floris terminatae. Flores ab eis Coelostegia griffithii characteribus non differt, sed paullum minores. Fructus subsymmetricus ovoideo-quinquangulatus, ca 16 x 11 cm, apice distincte mucronatus, e basi rotundata in tuberculam brevem abrupte contractus, extus irregulariter submuricatus, profunde 5-valvatus valvis usque ad ca ¾ longitudinis fissis.

Tree up to 50 m tall, bole 35 m, diameter above the buttresses 80 cm. Buttresses up to 6 m high, straight, out 2—3 m. Bark rough, fissured, strips

1 cm wide, 3 mm thick. Living bark 15 mm thick, light brown, with little orange sap. Wood pale brown, rather soft. Branchlets terete, covered (denser towards apex) by minute, brown fimbriate scales. Leaves subcoriaceous, elliptic-oblong, 6—10 (—17) cm long, 2.5—3.5 (—7.5) cm wide, apex acuminate, acumen up to 1 cm long, base acute or rounded; upper surface glabrous, usually with numerous dots of minute holes, midrib slightly prominent, reticulation dense, prominulous; lower surface grey (fresh), laxly covered by small, subtransparent, fimbriate, dark-centered scales (the scales visible as lighter spots when fresh), midrib strongly prominent, reticulation obscure; lateral nerves subsacendent, 7—13 pairs, curved, near margin arcuately anastomosing, on upper surface prominulous, on lower surface often less; petiole terete, 15—25 mm long, densely scaly, slightly channeled above. Stipules lanceolate, ca 4 mm long, soon caducous, obtuse, outside scaly, inside with a lax layer of minute stellate hairs or minute long-fimbriate scales. Panicles lepidote, fascicled on the bare twigs, many-flowered, up to 3 cm long, usually with short lateral branches, terminating in heads or clusters of 3 or more flower; bracts caducous; pedicels filiform, 5 mm long. Flower-buds small, conical, ca 3 mm long, 2.5 mm in diameter, acuminate. Epicalyx cup-shaped, 3-lobed, ca 1 x 1 mm, scaly outside, glabrous inside. Calyx tube ca 1 x 1 mm, pouched cup 3 mm in diameter, 3 mm high (including the 5 slender, acute, erect, ca 1 mm long teeth); outside densely covered by small, pale brown, ciliate scales; inside glabrous, pouches at base with dark papillae. Corolla soon deciduous, petals 5, triangular, convex, 2 mm long, 1 mm broad, fleshy, thickened at middle, top acute, base truncate, claw narrow, thin, very short, inserted just below the mouth of the calyx tube; outside covered by pale brown, fimbriate scales, glabrescent towards margin and base; inside glabrous. Stamens about 20, ca 1.5 mm long; filaments flattened, fleshy, connate at base forming a ca 0.5 mm long tube, each free filament topped by 3—4 subglobose, agglutinate anthers, after dehiscence forming orbicular valves. Ovary globose-ovoid, 1 mm in diameter, densely covered by light brown, fimbriate scales; style filiform, 1 mm long, pentangular or 5-sulcate, glabrous, abruptly emerging from the ovary; stigma discoid, faintly 5-lobed, with minute stellate hairs underneath, glabrous above. Fruit yellowish green (fresh), somewhat asymmetrical pentagonous-ovoid, ca 16 x 11 mm, apex distinctly mucronate, base rotundate, then abruptly contracted into a knob of 1 cm long, 2 cm in diameter, dehiscent for about $\frac{3}{4}$ of its length into 5 woody, hard, acute valves, inside whitish, rough. Seeds elongate obovoid, 3 cm long, 1.5 cm in diameter, glossy, very dark brown, top obtuse, base acute, subtended by a red, fleshy, not very juicy, triangular (beak-shaped), 7 mm long caruncula. Cotyledons white, filled with clear, sweet fluid when the seed is not mature. Fruit-stalk cylindrical, up to 3.5 cm long, swollen at apex, slightly so at base (2 cm in diameter at apex and 1.5 cm at middle), densely scaly.

TYPUS. — *Kostermans 12548* (BO).

DISTRIBUTION. — Borneo.

VERNACULAR NAMES. — Tabun (Dayak Kenya, Kutei); Tabut (W. Kutei).

HABITAT. — In primary forest, on sandy loam soil, at altitudes from 200—300 m.

The fruit of the specimens: Kostermans 10583, 10659 and Hallier 776 were picked from the ground and have somewhat deteriorated but still can be easily recognized. Kostermans 10659 has large leaves, up to 21 x 7 cm, with slender, 15 mm long acumen; it was collected from a young tree; the stipules are linear-lanceolate, up to 12 mm long, 2.5 mm wide, folded, outside scaly, inside stellate-haired.

Kostermans states that the seeds are eaten fresh and taste like ground-nuts.

East Indonesian Borneo, W. Kutei, Tudjung Plateau, Mt. Maranga, alt. 200 m, July, fl., *Kostermans 12548* (holotype in BO, isotypes in A, CANB, K, KEP, L, NY, P); C. Kutei, Belajan R., Mt. Kelopak near Tabang, on sandy yellow loam soil, alt. 250 m, Apr., fr., *Kostermans 10583* (BO, L); *ibid.*, alt. 200 m, Apr., fr., *Kostermans 10659* (BO, L). West Indon. Borneo, Sambas, Mt. Damus, fruit only, *Hallier 776* (BO).

5. *Coelostegia neesiocarpa* Soegeng, *sp. nov.* — Fig. 9, 10.

Arbor mediocris. Folia alterna coriacea elliptica raro ovata, apice mucronata vel acute basi rotundata, interdum in petiolum leviter contracta, supra glabra, subtus dense lepidota, nervis lateralibus numerosis densiusculis. Flores ignoti. Fructus ovoideus, 17 x 12 cm, apice obtusus, e basi rotundata in tuberculam brevem abrupte contractus, fere ad basin quinque valvatus, valvis equalibus, extus sublaevis inconspicue reticulatus reticulatione e figuris 4—6-angulatis composita, ca 1 cm diametens.

Tree 20 m tall, bole 18 m, diameter at 2 m 50 cm, below the first branch. 35 cm. Branchlets slender, terete, covered partly by loose, brown, toothed scales. Leaves coriaceous, elliptic or ovate, 7—11 x 3—6 cm, apex mucronate or acute, base usually rounded, sometimes slightly contracted into petiole; upper surface glabrous, midrib flat or very slightly prominent towards base, reticulation dense, prominulous; lower surface covered by a rather dense layer of loose, light brown, fimbriate scales, midrib strongly prominent, sharply ridged, reticulation obscure; lateral nerves many, rather close to each other, somewhat patent, slightly curved, near margin arcuately anastomosing, slightly prominent on both surfaces. Petiole terete, 2.5—3 cm long, irregularly covered by concave, fimbriate scales or glabrescent, grooved above. Stipules soon deciduous, ca 5 mm long, reflexed, acute or obtuse, densely scaly. Flowers unknown. Fruit ovoid, 17 x 12 cm, top obtuse, base rounded, then abruptly narrowed into a neck of 1 cm long, 2.5 cm in diameter, dehiscent almost up to its base into 3 equal valves; valves woody, hard, top curved, acute; outside dark, rather smooth, with a faint pattern of 4—6-angular, diamond-shaped figures, ca 1 cm in diameter; inside rough,

whitish brown, concave towards base; each locule with 2—3 seeds. Seeds very dark brown, subobovoid, somewhat flattened (the basal ones) or elongate obovoid, more or less terete (the upper seeds), 3 cm long, 1.5—2 cm in diameter at the broadest part, top obtuse, base acute, subtended by a broad triangular (beak-shaped), fleshy, 12 mm long, reddish caruncula. Fruit-stalk 5 cm long, cylindrical, 1.3 cm in diameter, at apex swollen, 2 cm in diameter.

TYPUS. — *b.b.* 11288 (BO).

DISTRIBUTION. — East Indonesian Borneo.

VERNAC. NAME. — Durut (Dayak-Bulungan); Uhu (Dayak-Upper Mahakam)•

Bakhuizen van den Brink had already recognized the type specimen as a new species, but never published it.

East Indonesian Borneo, Bulungan, S. Rumah, alt. 100m, Apr., fr., *van der Zwaan* 236 = *b.b.* 11288 (BO, BZF); Upper Mahakam, alt. 300 m, Febr. ster., *b.b.* 20696 (BO, BZF).



Fig. 1. — *Coelostegia borneensis* Becc; after Kostermans 8070 (BO); parts of flowers X 4.5; details of leaves x 9; inflorescence X 0.45.

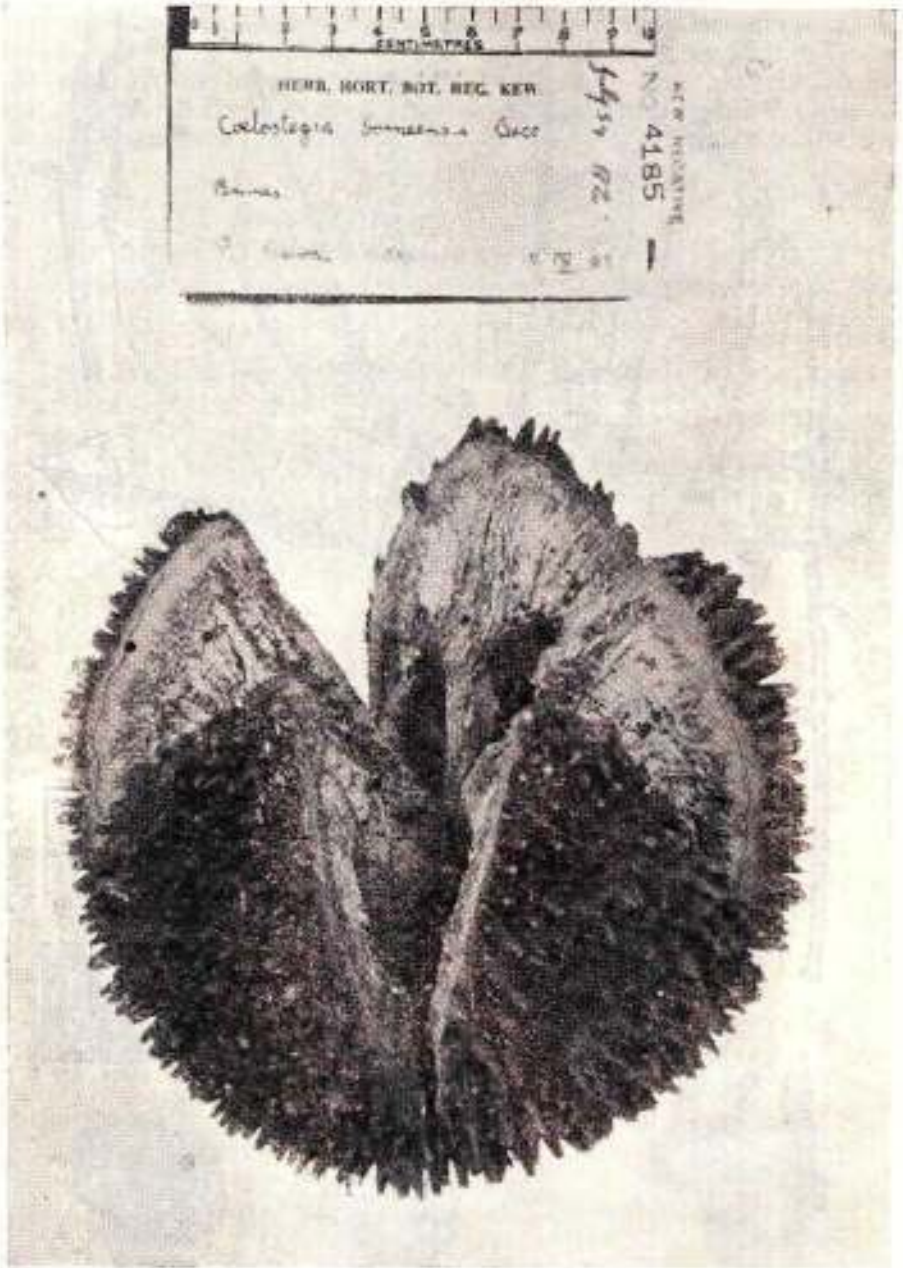


Fig. 2. — *Coelostegia borneensis* Becc.

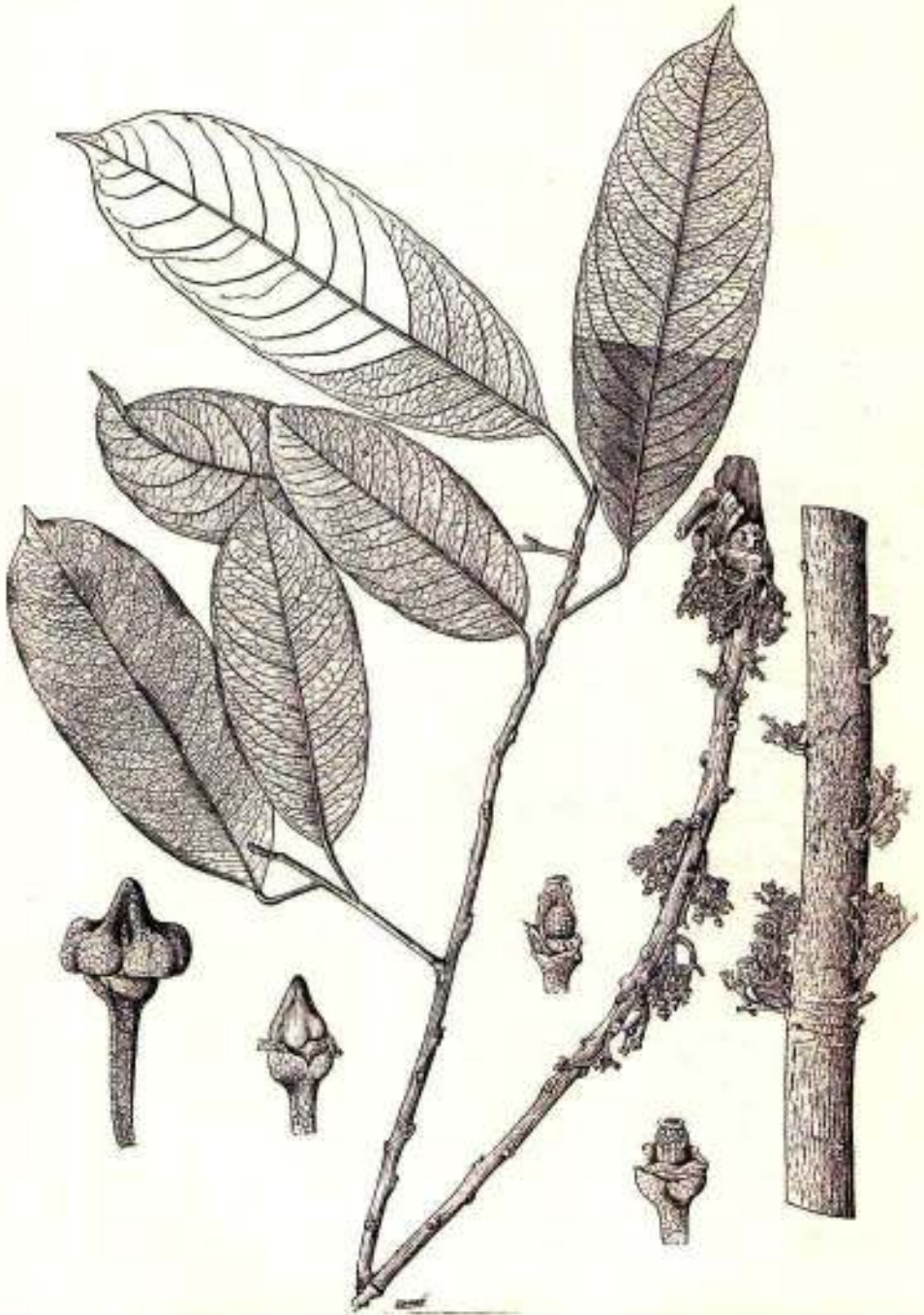


Fig. 3. — *Coelostegia chartaeea*, Soengeng; after Kostermans 5262 (BO); flowers and parts X 3.

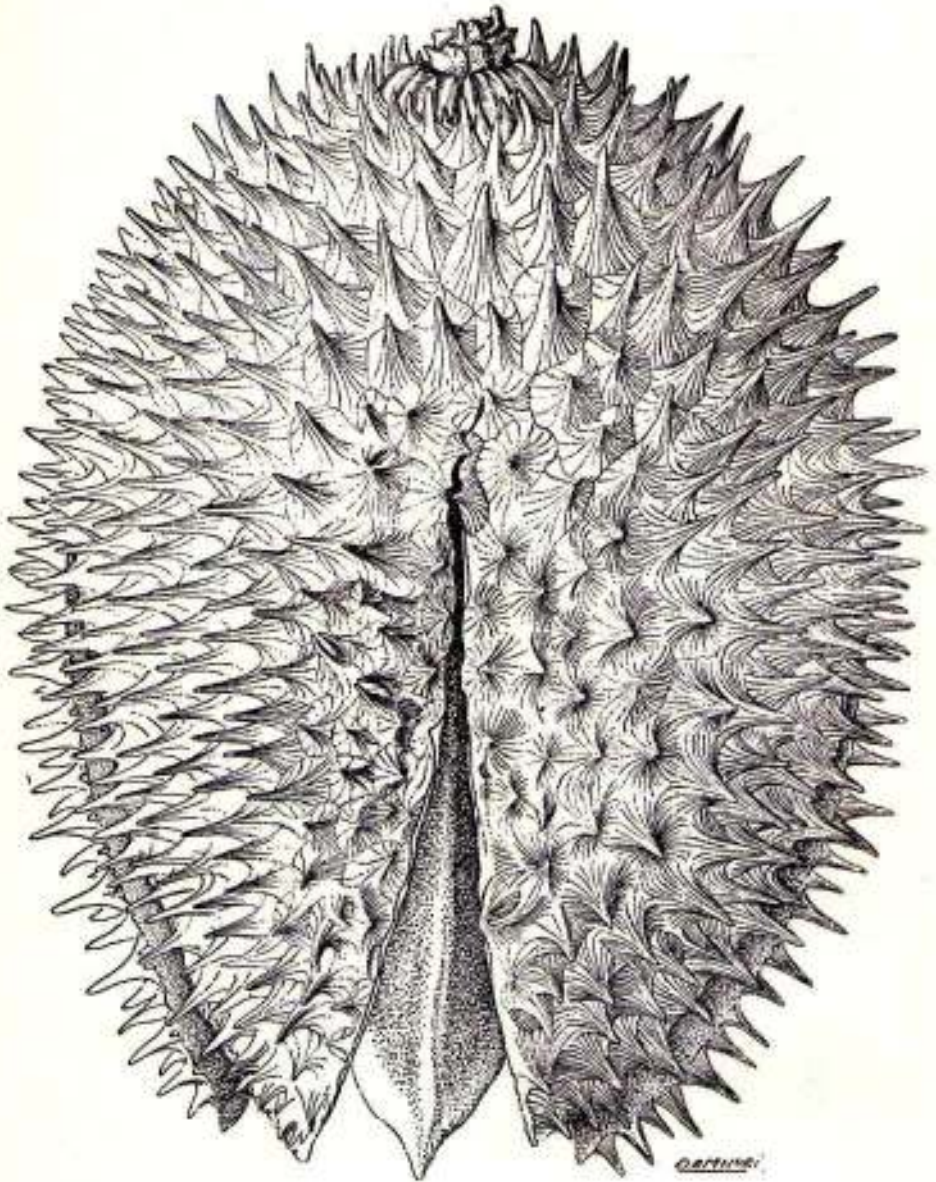


Fig. 4.— *Coelostegia chartacea* Soengeng; old fruit, after Kostermans 5262 (BO).



Fig. 5. — *Coelostegia griffithii* Benth.; after fresh material; flowers X 2; a. opened flower (X 3.3); branch (x 0.5).

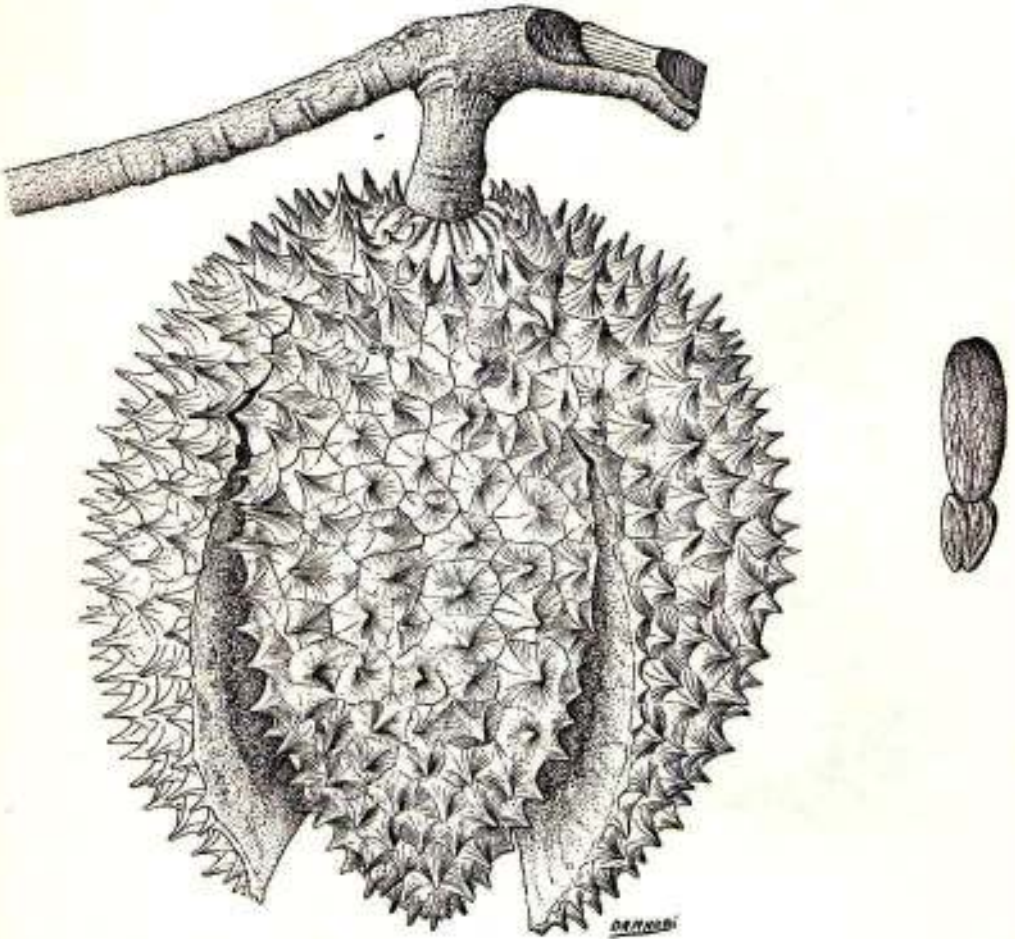


Fig. 6. — *Coelostegia griffithii* Benth.; after T. 788 (BO).

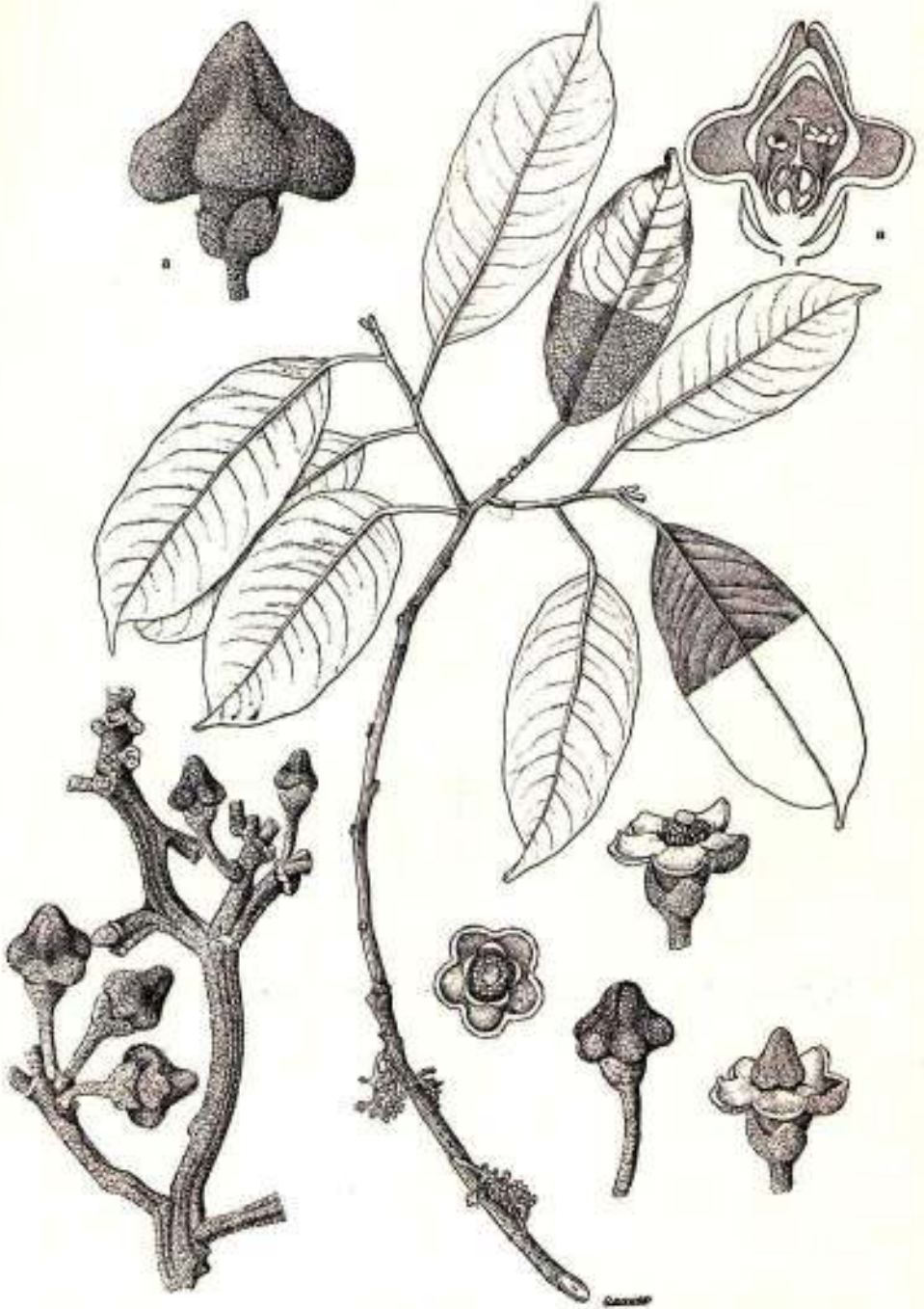


Fig. 7. — *Coelostegia kostermansii* Soeeng¹; after Kosterman 12548 (BO); in florescence and parts of flower X 54 (a = X 8).

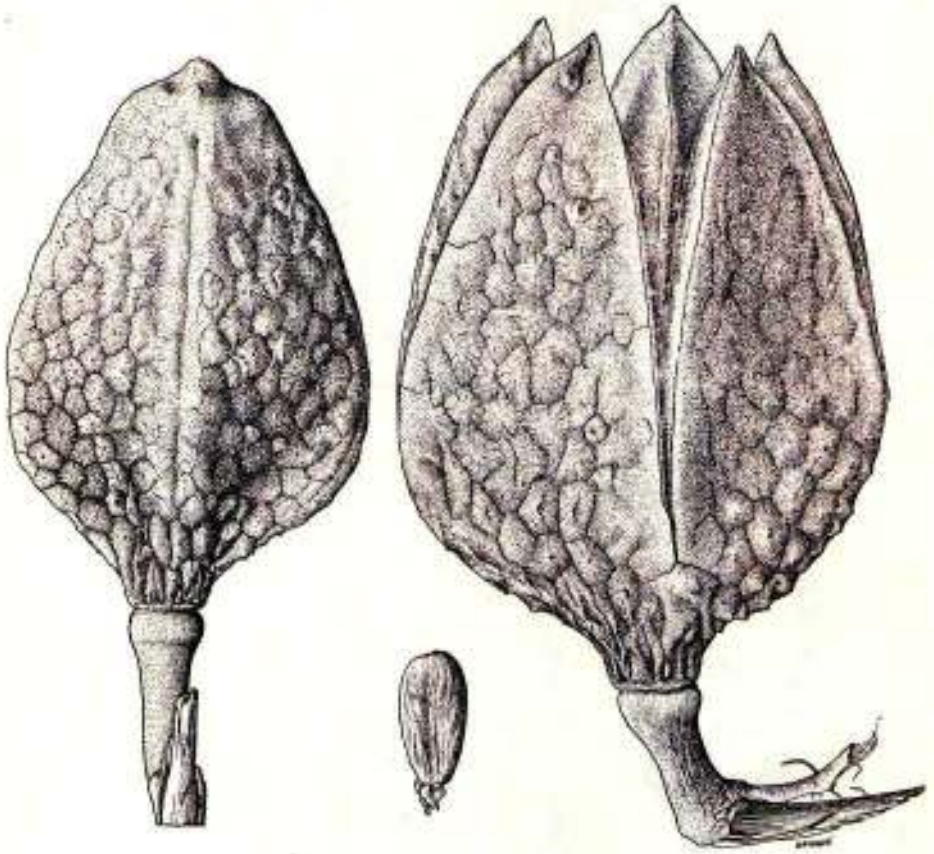


Fig. 8. — *Coelostegia kostermansii* Soengeng; after Kostermans 12548 (BO).

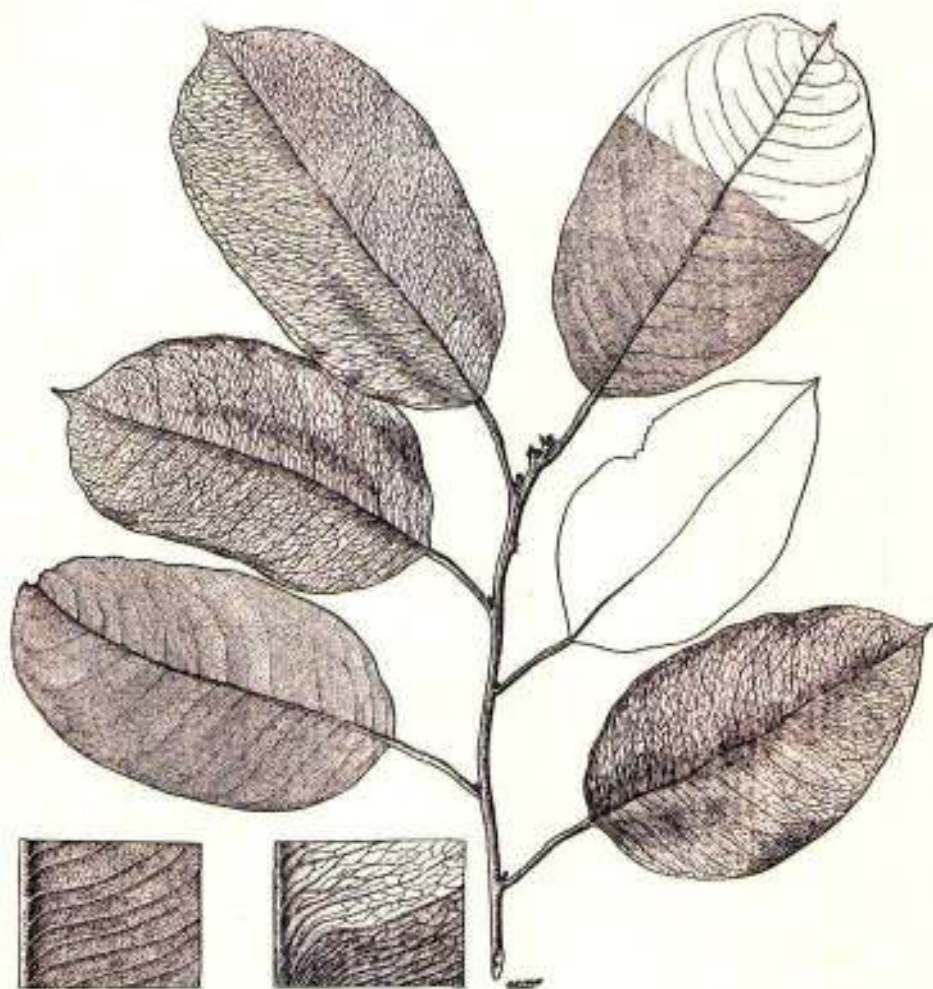


Fig. 9. — *Coelostegia neesiocarpa* Soeeng; after bb. 11288 (BO); lower and upper leaf surface X 3.

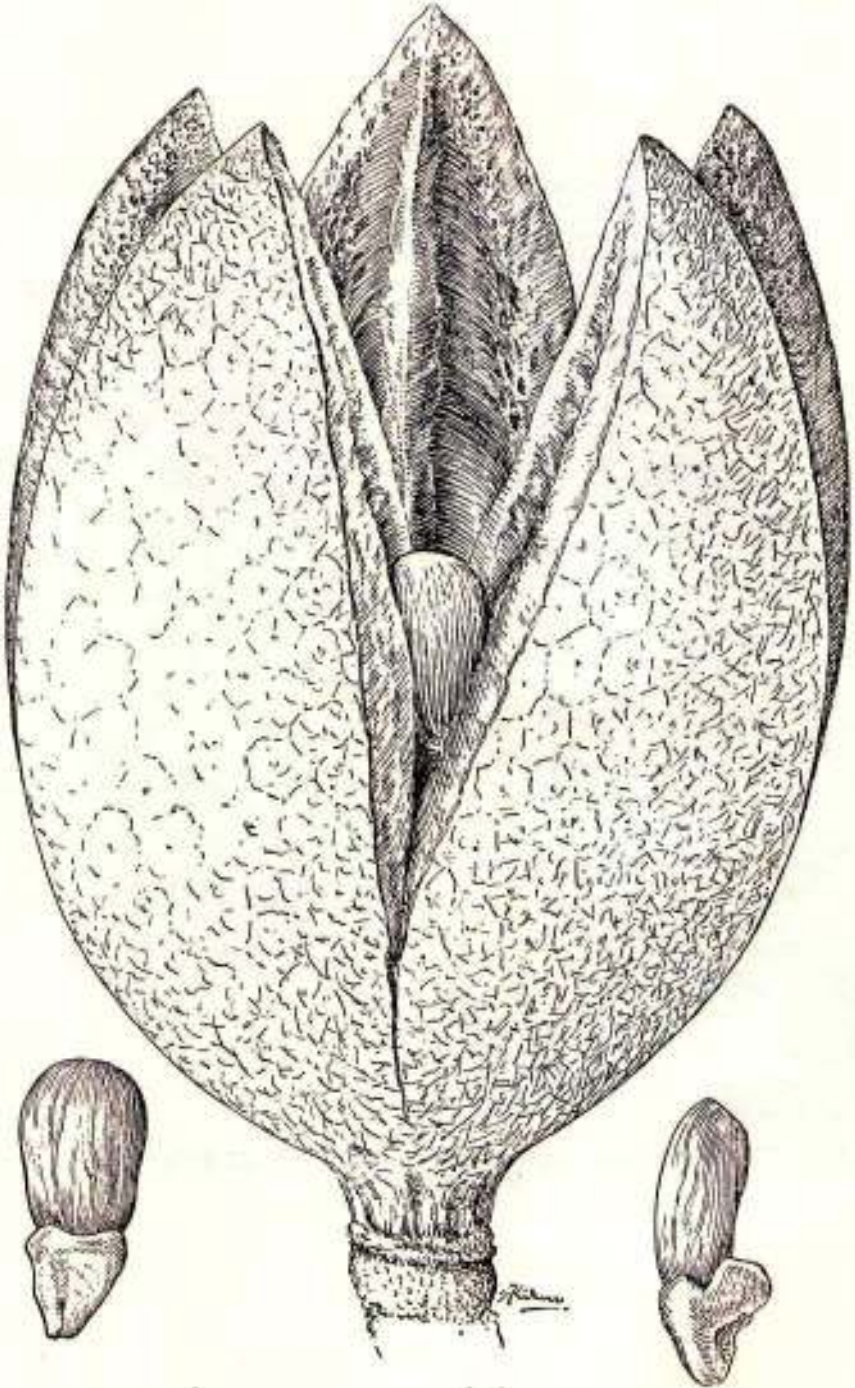
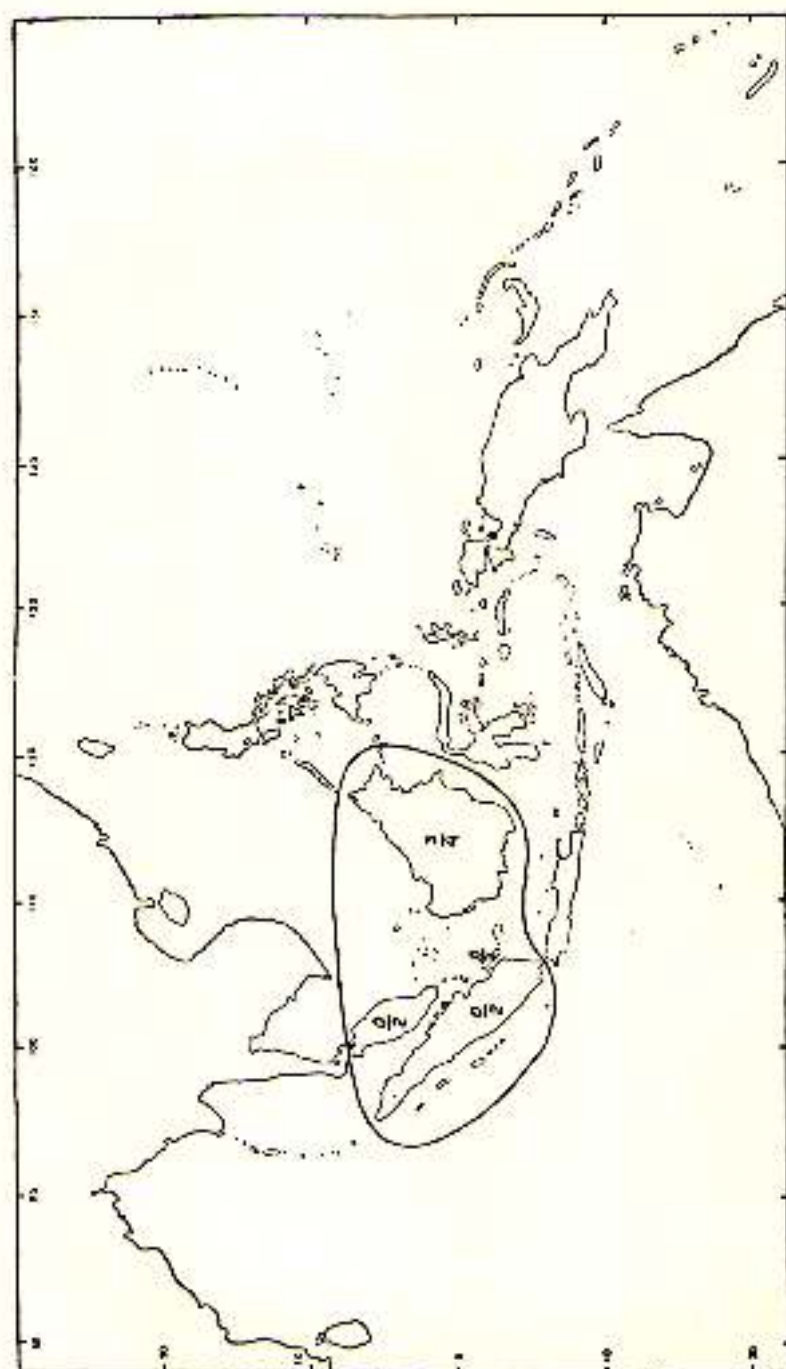


Fig. 10. — *Coelostegia neesiocarpa* Soegeng; after bb. 11288 (BO).

Distribution of *Coelostegia* Benth.