

Fig. 1. a-e. *Gnetum costatum* K. SCH., f. *G. leptostachyum* BL., g. *G. latifolium* BL. var. *laxifrutescens* (ELM.) MGF, h. *G. latifolium* BL. var. *latifolium* f. *latifolium*, i. *G. macrostachyum* HOOK. f., j. *G. tenuifolium* RIDL. (a. ♂ flowering twig, b. ♂ flower, × 10, c. sterile ♀ flower, × 10, d. ♀ inflorescence, e. fruit, f. section of ♂ inflorescence, × 8, g-h. fruit, i-j. infructescences).

GNETACEAE (F. Markgraf, München)

GNETUM

LINNÉ, Mant. ed. 1 (1767) 18; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 407, map 1-8, t. 1-14; Pflanzenareale 3 (1932) map 31-40.

Glabrous trees, shrubs or, for the greater part, vines. *Leaves* decussate, simple, entire, penninerved, exstipulate, mostly provided with fine, pellucid lines (spicular cells) parallel to the secondary nerves and then bearded on fracture. *Spikes* ramified or simple, axillary or often cauline, dioecious, each one with 2 opposite basal scales and several collars containing moniliform hairs and sessile flowers, either numerous spirally arranged male ones below a ring of some sterile female ones, or a ring of few fertile female ones. ♂ *Flower*: a claw-shaped, transversely splitting perianth and a central stamen with 2 (in *G. gnemonoides* one) apical, yellow microsporangia that open by an apical median split. ♀ *Flower*: a fleshy outer envelop ('perianth') and 2 thin inner ones ('integuments'), the innermost with a long, slender, apical tube, and an orthotropous ovule; sterile ♀ flower without the middle envelop. *Fruit* pink (in *G. neglectum* and *G. oxycarpum* yellow), consisting of the fleshy outer envelop, which in some *spp.* is narrowed into a stalk, the hardened, ribbed middle envelop, the thin, silky, inner envelop, and a large, horny seed with small embryo.

Distr. About 30 species, of which 7 in northern S. America, 2 in western tropical Africa, the remainder in tropical Asia from Bombay to Fu-Kien, through *Malaysia* to Fiji, neither in Formosa nor in Australia or New Caledonia. Centre of present development: eastern *Malaysia*. The distributional areas of several species present some marked lines within the archipelago.

Ecol. All species inhabit the tropical rainforest below 1500 m altitude, except *G. microcarpum* which has been reported from Mt Tahan (Pahang, Mal. Pen.) at ca 2000 m. Large-leaved and -fruited taxa are produced in the moist air of mountain gorges. Small-leaved taxa occur both in the rain forest (*G. diminutum* and *G. microcarpum* f. *silvestre*) and in drier localities; examples of the first are represented by *G. montanum* f. *parvifolium* in E. China and *G. microcarpum* f. *campestre* in the Malay Peninsula, examples of the latter are *G. latifolium* var. *minus* and *G. leptostachyum* var. *abbreviatum*, all growing near the lower limit of the cloudy forest.

Most *Malaysian* species are tall lianas, but *G. costatum* and *G. gnemon* are arboreous, though the latter species is sometimes climbing as has repeatedly been reported from New Guinea.

According to RIDLEY (Disp. p. 240, 352) the pink fruits of *Gnetum* are dispersed by birds, but some are probably disseminated by water, e.g. *G. gnemonoides* with large corky fruits $7\frac{1}{2}$ by $3\frac{3}{4}$ cm. *Gnetum* seeds are sometimes found in excreta of civet-cats (*Viverridae*). HEMSLEY reported *Gnetum* seeds from the beach (Rep. Chall. 297).

Uses. The inner bark of several species, *G. gnemon*, *G. latifolium*, and others, is highly praised for its fibre, and is used all over *Malaysia* for twisting thread, string and cordage. The fibre is strong and durable in seawater and is mostly used for fishing nets and lines; in Papua carrying nets are made from it. If the fibre could be purified it would do exceedingly well for paper. *G. gnemon* is principally cultivated as a fruit tree, the embryo being pounded and eaten roasted, but also cooked in soup. Seeds of some other species are also used. The flush and inflorescences of *G. gnemon* are cooked in soup or eaten as vegetable which in the raw state causes a little itching in the mouth. Trees are sometimes coppiced for rapid production of flush. The only species really cultivated is *G. gnemon* var. *gnemon*; it is a straight tree, leafy from the base; it is sometimes planted in small orchards, but mostly in mixed gardens. It is found outside Java, not rarely in old clearings and secondary forest (HEYNE, Nutt. Pl. 1927, p. 121-125).

Wood anat. DEN BERGER, Determinatietabel Houtsoorten van Malesië, Wageningen (1949) 35 (hand lens). LA RIVIÈRE, Ann. Jard. Bot. Buitenzorg 30 (1916) 23 (also bark anat.); fig. 10, pl. V and fig. 8, pl. VI are most probably representing rd. and tg. faces of disjunctive elements (in Dutch: conjugatiebuisjes). Wood especially of interest as it presents some angiospermous characters, cf. MACDUFFIE, Bot. Gaz. 71 (1921) 438, THOMPSON, Bot. Gaz. 65 (1918) 83.—C.A.R.—G.

Vern. *Méindju*, *méningo*, *génémo*, *tangkil*, *kliat* (all reported several times). See also under the separate species.

Notes. The family represents a peculiar climax of gymnosperms holding some characters of dicotyledons as well. The floral organs are interpreted in very different ways. The most recent review is given by FAGERLIND (Ark. för Bot. 33 A, 1946, no 8), who assumes the ♀ envelops to be composed of several leaves according to development comparable to that of the whole strobilus.

In collecting *Gnetum*, one should try to get both sexes in each locality and take care of the brittle inflorescences.

Some remarkable teratological foliar deviations have been described by COSTERUS & SMITH (Ann. Jard. Bot. Btzg 33, 1923, 99-102), e.g. 4-whorled leaves and reduction of leaves to scales or thorns resembling those in *Ephedra*. Adventitious leaf-borne shoots have been studied by J. VAN BEUSEKOM (Thesis, Utrecht, 1907, pp. 141, t. 1-3); their origin is ascribed to the sting of a coccide. They were later reported from Java by VAN STEENIS (Trop. Natuur 28, 1939, 69, fig.). Sometimes the inflorescence collars are transformed into a continuous spiral band (THOMPSON, Amer. J. Bot. 3, 1916, 139-140).

KEY TO THE SPECIES (♂ plants)

1. Trees or shrubs, only occasionally and partly climbing. Leaves thin, yellowish when dried. Inflorescence yellowish; collars flat, almost always conspicuously distant from each other.
 2. Trees. Sterile ♀ flowers ovate, long-beaked; beak finely velvety, whitish 2. *G. costatum*
 2. Trees or shrubs. Sterile ♀ flowers globose, tipped (only in *var. griffithii* beaked), the tip neither velvety nor whitish 1. *G. gnemon*
 3. Shrub. Inflorescences simple, tender, its axis scarcely 1/2 mm thick, flower clusters up to 2 mm in diam. *var. tenerum*
 3. Trees or shrubs. Inflorescences simple or branched, thick, its axis 1 mm thick, flower clusters up to 5 mm in diam.
 4. Trees. Inflorescences almost always branched, all collars distant *var. gnemon*
 4. Shrubs. Inflorescences always simple, often only the lowermost collars distant (inflorescence unknown in *var. gracile*).
 5. All collars distant. Sterile ♀ flowers beaked (oblong, glabrous) *var. griffithii*
 5. Collars at least partly contiguous. Sterile ♀ flowers shortly acuminate.
 6. Only the uppermost collars contiguous. Sterile ♀ flowers globose with short tip *var. brunonianum*
 6. All collars contiguous or only the two lowermost distant. Sterile ♀ flowers tapering gradually. *var. ovalifolium*
1. Lianas. Leaves brown or black when dry, coriaceous (thin only in *G. neglectum* and *G. tenuifolium*). Inflorescence not yellowish, its collars always fairly approaching each other (the axis never visible between them), their edges bent upward *Sect. Cylandrostachys* MGF
7. Collars of inflorescence dish-like, the flowers coming out freely.
 8. Leaves with numerous spicular cells parallel to the secondary nerves, therefore silky above when dry. Stamen with one microsporangium only 11. *G. gnemonoides*
 8. Leaves with few or no spicular cells. Stamen with two microsporangia.
 9. Leaves thin, green when dry, large, elliptic. Inflorescence simple (rarely once branched), slender (3 mm broad), spike itself 2 cm long 3. *G. tenuifolium*
 9. Leaves coriaceous. Inflorescence always branched.
 10. Leaves small, obovate and tailed, distinctly reticulate, black when dry, striate above by spicular cells. Inflorescence once branched, slender (3 mm broad), spike itself 1-1 1/2 cm long. 5. *G. arboreum*
 10. Leaves often large and broad, not striate, mostly black when dry and inconspicuously reticulate. Inflorescence branched several times, thicker (4 mm broad), spike itself up to 4 cm long. 4. *G. latifolium*
 11. Leaves elliptic, brown when dry, distinctly reticulate, secondary nerves distinctly joined. *var. funiculare*
 11. Dry leaves nigrescent, inconspicuously reticulate, secondary nerves ending open.
 12. Leaves almost orbicular *var. laxifrutescens*
 12. Leaves elliptic.
 13. Leaves small, up to 9 cm. Spike short, 1 1/2 cm long *var. minus*
 13. Leaves large, up to 20 cm. Spike 2-4 cm long *var. latifolium*
 7. Collars of inflorescence cylindric, keeping the flowers enclosed.
 14. Inflorescence branched, mostly large (unknown in 9. *G. ridleyi* from Pahang, but ♀ ones of this type), with often very long stalks (in *var. abbreviatum* short) 16. *G. leptostachyum*
 14. Inflorescence unbranched, often cauline.
 15. Leaves thin, tapering at both ends (inflorescence unknown, but the ♀ one is simple and slender). 6. *G. neglectum*
 15. Leaves coriaceous. Inflorescence thick (4-5 mm).
 16. Inflorescence 6 cm long, drooping (unknown in 8. *G. klossii* from Borneo, but its rough ♀ one is of this type). Flowers numerous, embedded in many hairs 7. *G. cuspidatum*
 16. Inflorescence short (2-3 cm), mostly erect.
 17. Inflorescence very thick (7 mm). Leaves large.
 18. Leaves oblong-obovate, somewhat silky above by spicular cells. Flowers immersed into few hairs 10. *G. loeringii*
 18. Leaves elliptic, not silky. Flowers immersed into numerous long hairs 13. *G. macrostachyum*

17. Inflorescence moderately thick (4 mm), shortly stalked, mostly upright. Leaves small, up to 15 cm long.
19. Leaves firm (not fleshy), with distinct nervation, not glaucous, not cuneate. Inflorescence 3 cm long 12. *G. diminutum*
19. Leaves fleshy, with indistinct nervation, more or less glaucous. Inflorescence 1½–2 cm long.
20. Leaf base mostly acute, leaves often lanceolate. Collars of inflorescence with angular lower edge 14. *G. microcarpum*
20. Leaf base mostly rounded. Collars of inflorescence with vaulted lower edge. 15. *G. oxycarpum*

KEY TO THE SPECIES (♂ plants)

1. Trees and shrubs, only occasionally or partly climbing. Leaves thin, yellowish when dry. Inflorescence yellowish, collars flat. Fruit almost velvety.
2. Tree. Flowers ovate, long-beaked; beak finely velvety, whitish 2. *G. costatum*
2. Tree or shrub. Flowers globose, shortly tipped (only in *var. griffithii* beaked), the tip not velvety nor whitish 1. *G. gnemon*
3. Collars of inflorescence remote.
4. Flowers globose. Fruit ovate, obtuse.
5. Tree. Inflorescence mostly branched, all its internodes long (1½–1 cm). Fruit large (2 cm long). *var. gnemon*
5. Shrub. Inflorescence simple, at least its two lowermost internodes long, all others short and hidden. Fruit small (1 cm long), inserted on a thickened rhachis *var. brunonianum*
4. Flowers oblong, beaked (unknown in *var. gracile*). Fruit acute.
6. Fruit oblong. Axis of inflorescence thick (1 mm); internodes ½ cm long *var. gracile*
6. Fruit ovate. Axis of inflorescence slender (½ mm); internodes 1½ cm long *var. tenerum*
3. Collars of inflorescence contiguous. Inflorescence short. Flowers acute.
7. Flowers globose, beaked. Fruit globose *var. griffithii*
7. Flowers ovate, acuminate. Fruit ovate, long-acute *var. ovalifolium*
1. Lianas. Leaves coriaceous, brown or black when dry (thin only in *G. neglectum* and *G. tenuifolium*). Inflorescence not yellowish. Collars dish-like. Fruit smooth or warty, not velvety. *Sect. Cylindrostachys*
8. Inflorescence branched (unknown in 5. *G. arboreum*, but the male one branched, small).
9. Leaves obovate-cuneate, tailed, small, distinctly nerved below, densely striate by spicular cells above. Fruit long-stalked 5. *G. arboreum*
9. Leaves broadest in or below the middle, mostly large, not densely striate above.
10. Leaves brown when dry, secondary nerves distinctly joining.
11. Nerves all remote, arcuate. Inflorescence rich and spreading, often 30 cm long, in *var. abbreviatum* much shorter. Flowers globose, shortly tipped, embedded in dense hairs. Fruit sessile 16. *G. leptostachyum*
11. Secondary nerves at the leaf base approaching each other, all with a straight lower part. Inflorescence not so rich, 15 cm long. Flowers obliquely beaked, conical, embedded in few hairs. Fruit stalked 4. *G. latifolium var. funiculare*
10. Leaves black when dry, secondary nerves indistinctly joining.
12. Leaves with conspicuous spicular cells, though not striate. Flowers embedded in numerous hairs. Fruit very large (6 cm), obtusely turbinate, sessile 9. *G. ridleyi*
12. Leaves without conspicuous spicular cells. Flowers not embedded in numerous hairs. Fruit elliptic, up to 2½ cm long, stalked 4. *G. latifolium*
13. Leaves almost or quite orbicular. Fruit oblong-obovate, rather long-stalked. *var. laxifrutescens*
13. Leaves elliptic. Fruit stalk thick.
14. Leaves small (not longer than 9 cm). Fruit ovate, small (1½ cm long) *var. minus*
14. Leaves large. Fruit large, 2–2½ cm, broadly ovate, long- or short-stalked *var. latifolium*
8. Inflorescence simple (exceptionally once branched in *G. neglectum*).
15. Leaves thin, tapering at both ends. Secondary nerves straight and broken.
16. Secondary nerves remote but not extremely so. Spike short (4 cm). Collars contiguous. Fruit 2 cm long, longitudinally furrowed, acute, with a long, slender stalk 3. *G. tenuifolium*
16. Secondary nerves extremely remote (up to 3 cm). Spike long, 8 cm. Collars not contiguous. Fruit small, brownish yellow, sessile, smooth, obtuse, 1½ cm long 6. *G. neglectum*
15. Leaves coriaceous, secondary nerves bent, not broken.
17. Leaves silky above by numerous parallel spicular cells. Flowers obtuse. Fruit obtuse, large, warty. 11. *G. gnemonoides*
17. Leaves not silky by spicular cells. Flowers acuminate. Most inflorescences cauline.
18. Leaves fleshy, with indistinct nervation, more or less glaucous.
19. Flowers ovate. Fruit more or less obtuse, yellow, 2 cm long 14. *G. microcarpum*
19. Flowers oblong-conical. Fruit long-acuminate, 2½ cm long, pink 15. *G. oxycarpum*
18. Leaves firm, not fleshy, not glaucous, with distinct nervation.

20. Leaves obovate-cuneate, striate above by spicular cells. Flowers obtuse, not embedded in thick hair masses. Fruit obtuse, 4 cm long 10. *G. loerzingii*
 20. Leaves elliptic, not striate above. Flowers embedded in thick hair masses.
 21. Leaves broad-elliptic. Fruit large, acute, rough 8. *G. klossii*
 21. Leaves twice as long as broad. Fruit not rough.
 22. Collars contiguous, their hair tufts enormous. Fruit small, up to 2 cm long, almost globose. 13. *G. macrostachyum*
 22. Collars remote, hair tufts large, but not enormous.
 23. Leaves large. Inflorescence elongate. Fruit shining, large, broad-ovate, 2½ cm long, 1½ cm broad 7. *G. cuspidatum*
 23. Leaves small. Inflorescence short. Fruit small, elliptic, 1½ cm long, 8 mm broad. 12. *G. diminutum*

Section *Gnemonomorphi*

MGF in E. & P. ed. 2, 13 (1926) 440; Bull. Jard. Bot. Btzig III, 10 (1930) 435.

Male inflorescences with visible internodes between the collars (though very short in the shrubby *G. gnemon* var. *griffithii* & var. *ovalifolium*).

Subsection *Eugnemones*

MGF *l.c.*

Leaves thin. Trees and shrubs, only exceptionally climbing. Dried leaves and inflorescences yellowish. Fruits finely velvety (except in *G. gnemon* var. *tenerum*).

1. *Gnetum gnemon* LINNÉ, Mant. 1 (1767) 125; MARKGRAF, Bull. Jard. Bot. Btzig III, 10 (1930) 436; BURK. Dict. (1935) 1091; CORNER, Wayside Trees (1940) 726, pl. 227–228.—*G. acutatum* MIQ. Fl. Ind. Bat. Suppl. (1860) 251, 588.—*G. vinosum* ELM. Leaf. Philip. Bot. 7 (1915) 2673.

Tree or shrub, up to 22 m tall, 40 cm diam., without buttresses, exceptionally a climbing shrub. Crown monopodial, narrow, cylindrical; trunk grey, marked with conspicuous or faint rings. Leaves thin, yellow when dry, tapering at both ends, but varying in shape and size, 7½–20 by 2½–10 cm; secondary nerves bent, joining; petiole 6–18 mm. ♂ Inflorescences solitary, axillary, simple or once branched, yellowish, 3–6 cm long, collars 3 mm broad. ♂ Flowers with broad sporophyll, twice as long as the perianth (3 mm). Sterile ♀ flowers globose, tipped or beaked, 2 mm thick, 10–15 in a ring. ♀ Inflorescences similar. ♀ Flowers 5–8 at each node, globose, tipped or beaked, 3–4 mm long, inner tube exerted by 1 mm. Fruit ripening yellow, then orange-yellow or pink, sessile (exceptionally stalked), ellipsoid, shortly apiculate, 1–3½ cm long, almost velvety; middle envelop ribbed.

Distr. From Assam throughout *Malaysia* to Fiji, but not native in the Andaman Islands, Sumatra, and Java.

Ecol. In rainforest at lower altitudes, but shrubby varieties ascending up to 1500 m in India.

Uses. Young leaves and inflorescences are eaten as vegetable, fruits are also edible.

Vern. *Génémo*, *rukiti* (Moluccas), *mēlindju*, *malinju*, *M*, *garintul*, *J*, *sabé*, *tankil*, *S*, *mēninjau*, *bēlinjau*, *songkok* (Mal. Pen.). New Guinea: *tu-a* (Suku), *suffitz* (Yalu), *genda* (Buna), *doro* (Vailala).

var. *gnemon*.—var. *laurinum* BL. Rumphia 4 (1848) p. 3, t. 176, var. *lucidum* BL., var. *majusculum*

BL.; MIQ. Fl. Ind. Bat. 2 (1856) 1067.—*Gnemon domestica* RUMPH. Herb. Amb. 1 (1741) 181, t. 71, 72.—var. *domesticum* MGF, *l.c.* 437, t. 1, fig. 7 *incl. f. vo ubile & stipitatum* MGF; CORNER, Gard. Bull. S.S. 10 (1929) 247.—*Gnetum vinosum* ELM. Leaf. Philip. Bot. 7 (1915) 2673.

Tree. Collars remote, axis often once branched. ♀ Flowers shortly tipped. Fruit large, 2–2½ cm long.

Distr. Fiji and Solomon Islands to *Malaysia*: from Sumba and Celebes through the Philippines to New Guinea, the Malay Peninsula, and possibly elsewhere, often planted and frequently naturalized in secondary forests, even in W. *Malaysia*. Fig. 2.

Ecol. High tree in rainforest at lower altitudes, below 1000 m, not rare.

Use. Fruit eaten, young leaves eaten as a vegetable.

Vern. *Génémo* (Alf.), *saédé* (Talaud), *rukiti* (Morotai), *kaikai* (Celebes), *andēpi* (S. New Guinea).

var. *brunonianum* (GRIFF.) MGF, *l.c.* 440, t. 1, f. 6b; CORNER, Wayside Trees (1940) 726.—*G. brunonianum* GRIFF. Not. Pl. As. 4 (1854) 30–31.

Shrub, 0.6–3 m. Collars remote, only the uppermost ones contiguous, axis unbranched; ♀ flowers shortly tipped; fruit small, 1 cm long.

Distr. Assam, Burma, Tenasserim and *W. Malaysia*: Malay Peninsula, Anambas Islands, Karimata Islands, NW. Borneo. Fig. 2.

Ecol. Ascends into the mountain rainforest, often to 1200 m, in Perak up to 1500 m.

Vern. *Chépérai* (Johore), *mēliling* (Raub).

var. *griffithii* (PARL.) MGF, *l.c.* 442, t. 1, f. 5, 6–6b.—*G. griffithii* PARL. in DC. Prod. 16, 2 (1868) 349.

Shrub. Collars all remote, though often not far. ♀ Flowers beaked, oblong. Fruit small, globose. Leaf margins often parallel.

Distr. Assam, Burma, Lushai, Annam and Tenasserim to *Malaysia*: Malay Peninsula. Fig. 2.

Ecol. Ascends into the mountain rainforest as well (Assam 1500 m).

var. ovalifolium (POIR.) BL. Ann. Sc. Nat. II, 2 (1834) 105.—*Gnemon silvestris* RUMPH. Herb. Amb. 1 (1741) 183, t. 73.—*Gnemon ovalifolium* POIR. in LAMK, Encycl. Suppl. 2 (1811) 810.—*G. silvestris* BRONGN. in DUPERREY, Voy. Coquille (1829) 12.—*G. gnemon var. silvestris* PARL. in DC. Prod. 16, 2 (1868) 349; MGF, l.c. 443, f. 1, 2–2a.

Collars all contiguous or only the 2 lowermost remote, axis unbranched.

Distr. From the Fiji Islands to *E. Malaysia*: westwards to Celebes, rare. Fig. 2.

Uses. Fibres used for nets and ropes.

Vern. *Mariwa* (Solomons), *saédé* (Talaud), *mulai* (New Ireland).

var. tenerum MGF, l.c. 444, t. 1, f. 3–4.

Shrub or small tree, 3 m tall. Inflorescence very slender, collars remote. ♀ Flowers gradually tapering. Fruit small, 1½ cm long, ovate, acute.

Distr. *Malaysia*: Malay Peninsula (from Pahang southward), Borneo. Fig. 2.

var. gracile MGF, l.c. 444, t. 1, f. 1a.

Shrub. Leaves small, not longer than 9 cm.

Inflorescence slender, collars few, remote. Fruit small, oblong.

Distr. SW. & Central Celebes (Makassar, Malili). Fig. 2.

2. *Gnetum costatum* K. SCH. in K. SCH. & HOLLR. Fl. Kais. Wilh. Land (1889) 13; MARKGRAF, Bot. Jahrb. 60 (1925) 147; WHITE, J. Arn. Arb. 10 (1929) 201; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 445, t. 1, f. 7–12.—Fig. 1a–e.

Tree, ca 20 m high. Leaves thin, but slightly thicker than in *G. gnemon*, yellowish when dry, tapering at both ends, large (15–18 cm long), petiole short (½ cm), secondary nerves bent, joining. ♂ *Inflorescences* solitary, axillary, simple, yellowish, 6–7 cm long, collars remote, 3 mm broad; ♂ flowers with tender, long-exserted sporophyll; sterile ♀ flowers ovate, beaked, finely whitish-pubescent, up to 10 in a ring. ♀ *Inflorescences* similar, their flowers immersed in dense whitish hairs. ♀ Flowers long-acuminate, finely whitish-pubescent. Fruit red or pink, obliquely fusiform, 4 cm long, 1 cm thick, conspicuously tapering at the base, sharply acuminate at the top, its outer envelop fleshy but thin, the longitudinal ribs of the hard middle one visible therefore in the dry state already from the outside. Seed fusiform, furrowed.

Distr. Solomon Islands (Bougainville, Malaita, only ♂♂), in *Malaysia*: E. New Guinea. Fig. 2.

Ecol. In rainforest, at low altitudes up to 1350 m, not in swamps.

Vern. *Böiwa* (Waria region), *kem, roro, haboi*.

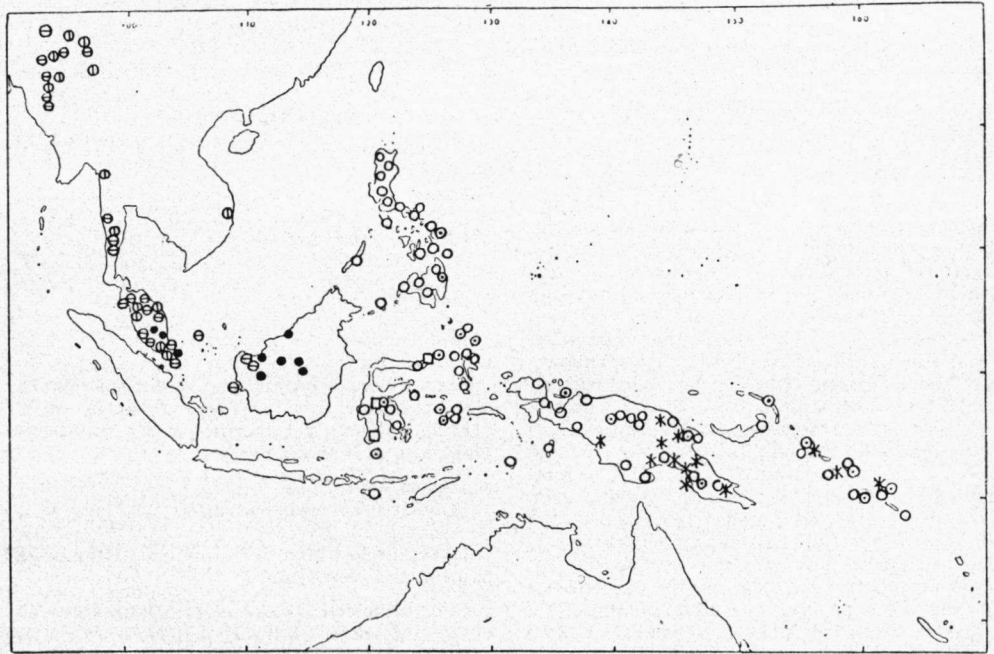


Fig. 2. Distribution of * *Gnetum costatum* K. SCH. and different varieties of *G. gnemon* L. viz ○ *var. brunonianum* (GRIFF.) MGF, ⊙ *var. griffithii* (PARL.) MGF, ● *var. tenerum* MGF, □ *var. gracile* MGF, ⊙ *var. ovalifolium* (POIR.) BL., ○ *var. gnemon*.

Section *Cylindrostachys*

MGF in E. & P. ed. 2, 13 (1926) 440; Bull. Jard. Bot. Btzig III, 10 (1930) 455.

Male inflorescences without visible internodes between the collars. Dried leaves never yellowish. Fruits never velvety. Lianas.

Subsection *Stipitati*

MGF, Bull. Jard. Bot. Btzig III, 10 (1930) 455.

Male collars flat, their margins bent outward, allowing the flowers to come out freely in anthesis and distinctly visible before anthesis. Fruits stalked.

3. *Gnetum tenuifolium* RIDL. J. Str. Br. R. As. Soc. 59 (1911) 188; *ibid.* 60 (1911) 66; Fl. Mal. Pen. 5 (1925) 277; MARKGRAF, Bull. Jard. Bot. Btzig III, 10 (1930) 456, t. 6, f. 5-10.—Fig. 1j.

Leaves thin, green when dry, tapering at both ends, large, up to 24 cm; secondary nerves bent, joining. ♂ Inflorescences erect, simple or once branched, slender; spike 2 cm long. ♂ Flowers short, 1½ mm. Sterile ♀ flowers 6-10 in each collar, ovate, low. ♀ Inflorescences erect, simple; spike 4 cm long; collars very close to each other. ♀ Flowers 6-10, fusiform, 2 mm long, tube of innermost envelop 2 mm exerted. Fruits in a dense spike, 2 cm long, elliptic, acute, furrowed lengthwise, their outer envelop comparatively thin, fibrous, middle one ribbed, hard but also thin. Seed apiculate.

Distr. *Malaysia*: Malay Peninsula, Sumatra. Fig. 3.

Ecol. Rainforests at low altitudes.

4. *Gnetum latifolium* BL. Tijd. Nat. Geschied. & Phys. 1 (1834) 160; Ann. Sc. Nat. II, 2 (1834) 105; Rumphia 4 (1848) 5, 7, t. 174; MARKGRAF, Bull. Jard. Bot. Btzig III, 10 (1930) 458.—*G. indicum* (LOUR.) MERR. Interpr. Rumph. Herb. Amq. (1917) 77, partly!—*G. philippinense* (non WARB.) FOXW. Philip. J. Sc. 6 (1911) 175.—Fig. 1g-h.

Large liana. Leaves dark green, black when dry, leathery, of variable shape; secondary nerves bent, running out inconspicuously, not joining, the 2-3 lowermost approximate, tertiary venation indistinct (distinct only in the brown-drying *var. funicularae*). ♂ Inflorescences lax, branched, most so if cauliflorous, up to 12 cm long; spikes 4 cm long, 4 mm broad, their collars open. ♂ Flowers numerous (about 50), sporophyll 3 mm long, half exerted, the 2 sporangia narrow. Sterile ♀ flowers 6-8 in each collar, broadly conical. ♀ Inflorescences similar, up to 15 cm long, their spikes 8 cm long, their collars 3 mm spaced. ♀ Flowers 6-9, acuminate and bent upward, 4 mm long, inner envelop rather deeply split. Fruit pink, ellipsoidal, 1½-2½ by 1-1½ cm, distinctly stalked (axis of inflorescence elongated up to 30 cm); outer envelop shining, fleshy, fibrous, 2 mm in diam., middle one hard but thin, inner one papery. Seed broad-oblong.

Distr. From the Andamans, peninsular Siam and Tonkin throughout *Malaysia* to New Ireland, not yet found in the Lesser Sunda Islands.

Ecol. Rainforest, ascending to 1800 m in Borneo, not rare.

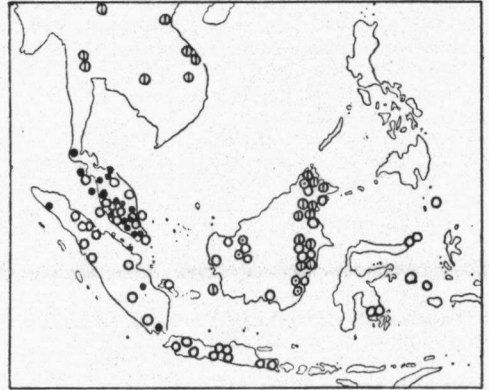


Fig. 3. Distribution of ● *G. tenuifolium* RIDL., ○ *G. cuspidatum* BL., ◻ *G. diminutum* MGF, ◻ *G. leptostachyum* BL.

Use. Bark fibre is used for making ropes and nets.

Vern. *Akar leia* (Bunguran).

var. latifolium.—*var. blumei* MGF, Bull. J.B.B. III, 10 (1930) 459, t. 7, f. 1.

Leaves elliptic, black when dry, nerves not joining. Spike 2-4 cm long. Fruit stalk thick, almost never longer than half as long as the fruit.

Distr. Cochinchina and throughout *Malaysia*.

Vern. *Tangkal*, *trangkil* (Java), *akar tutubo*, *akar suburus* (Mal. Pen).

f. latifolium.—*var. brachypodum* MGF, *l.c.*, t. 1, f. 6.—Fig. 1h.

Fruit of the broadest type, sometimes almost globose, obtuse, four times as long as its stalk.

Distr. *Malaysia*: rather frequent in the Philippines, also in New Guinea.

f. longipes MGF, *l.c.*, t. 7, f. 7.

Fruit large, somewhat attenuate, not longer than its stalk.

Distr. Indo-China and *Malaysia*: Philippines (Luzon) and New Guinea.

var. laxifrutescens (ELM.) MGF, Bot. Jahrb. 60 (1925) 148; Bull. J.B.B. III, 10 (1930) 463, t. 7, f. 8-10.—*G. laxifrutescens* ELM. Leaf. Philip. Bot. 4 (1912) 1478.—*G. latifolium var. peekelii* MGF, Bot. Jahrb. 60 (1925) 148.—Fig. 1g.

Leaves broad-elliptic, almost orbicular, black

when dry. Fruit claw-shaped, twice as long as broad, tapering into the stalk.

Distr. Melanesia (New Ireland, New Britain), in *Malaysia*: Philippines & Moluccas (Kei & Tanimber Isl.).

var. minus (Foxw.) MGF, Bull. J.B.B. III, 10 (1930) 463.—*G. minus* Foxw. Philip. J. Sc. 6 (1911) 176, t. 33.

Leaves small, not longer than 9 cm, elliptic. ♂ Spikes only 1½ cm long. Fruit small, 1½ cm long, four times as long as its stalk.

Distr. Indo-China, in *Malaysia*: Borneo (Kina-balu), Philippines, SE. Celebes.

Ecol. In Borneo up to 1500-1800 m.

var. funiculare (BL.) MGF, Bull. J.B.B. III, 10 (1930) 463.—*G. funiculare* BL. Tijds. Nat. Geschied. & Phys. 1 (1834) 162; Ann. Sc. Nat. II, 2 (1834) 106; MIQ. Fl. Ind. Bat. 2 (1856) 1068, Suppl. (1860) 252; PARL. in DC. Prod. 16, 2 (1868) 351; KARSTEN, Ann. Jard. Bot. Btzg 11 (1893) 210, t. 17, f. 5.—*G. edule* BL. Tijds. Nat. Geschied. 1 (1834) 161; Ann. Sc. Nat. II, 2 (1834) 106.—*G. neglectum* (non BL.!) KARSTEN, Bot. Zeit. 50 (1892) 206.—*G. ula* (non BRONGN.!) KARSTEN, Ann. Jard. Bot. Btzg 11

(1893) 211, t. 18, f. 7, 10.—*G. kingianum* GAMBLE, Kew Bull. (1915) 92; RIDL. Fl. Mal. Pen. 5 (1925) 276.

Leaves brown when dry, nerves distinctly joining, tertiary venation distinct, reticulate; blade elliptic, large.

Distr. Peninsular Siam to *Malaysia*: through the Malay Peninsula and the islands round Sumatra (Banka, Lingga, Riouw, Simalur) to Java.

Vern. *Areuj kasungka*, S, *tangkil*, J.

5. *Gnetum arboreum* Foxw. Philip. J. Sc. 6 (1911) 174, t. 32; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 472, t. 6, f. 11-14.

Twigs conspicuously lenticellate. *Leaves* obovate-cuneate, small, up to 8 cm long, long-petiolate, leathery, brown when dry; secondary nerves 4-5 pairs, joining, tertiary ones distinct, reticulate. ♂ *Inflorescences* short, once branched; spikes 1-1½ cm long, 3 mm broad. ♂ *Flowers* few, scarcely 1 mm long; sporophyll 2½ mm long, thick. Sterile ♀ flowers about 8, narrow, their inner envelop not split. ♀ *Inflorescences* unknown. Fruit-bearing axis 4 cm long; collars 5 mm spaced. *Fruit* broad-elliptic, tipped, 2½ cm long, not shining, stalk 2 cm long, outer envelop fleshy but thin.

Distr. *Malaysia*: Philippines (Luzon). Fig. 4.

Subsection *Sessiles*

MGF, l.c. 472.

Collars of male inflorescences cylindric, not bent outward (except in *G. gnemonoides*), so that in anthesis the flowers must force their way out. Fruits sessile.

6. *Gnetum neglectum* BL. Rumphia 4 (1848) 6, t. 175, f. 2, s. str.; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 473, t. 9, f. 13-16.

Small liana. *Leaves* papery, not shining, lanceolate-elliptic, tailed, up to 23 by 9 cm, changing from yellowish to black when dried; secondary nerves straight, broken before the margin, joining, very distant from each other, up to 3 cm; petiole rather long, ca 2 cm. ♂ *Inflorescences* unknown. ♀ *Inflorescences* unbranched or once branched, slender, 8 cm long; collars 3 mm spaced. ♀ *Flowers* globose, apiculate, immersed in a dense hair cushion, 5-6 in each collar. *Fruits* elliptic, obtuse, not shining, yellowish-brown, 1½ cm long, 8 mm thick, whorls spaced ca 8 mm on the slender axis; outer envelop rather thin-fleshy, middle one leathery, inner one papery.

Distr. *Malaysia*: Borneo. Fig. 4.

Ecol. Small climber of swampy rain forests at low altitudes.

Note. BLUME and most other authors have partly mixed this species with *G. cuspidatum* BL. Male plants are very much desired.

7. *Gnetum cuspidatum* BL. Rumphia 4 (1848) 5; MIQ. Fl. Ind. Bat. 2 (1856) 1067, Suppl. (1860) 252, 588; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 475, t. 10, f. 1-8.—*G. neglectum var. procerum* BL. et *var. macrostachyum* BL. l.c. 6.—*G. longispica* RIDL. J. Str. Br. R. As. Soc. 60 (1911) 63.—*G. penangense* RIDL. l.c.

Liana with flattened, woody stems. *Leaves* leathery, brown or blackish when dry, oblong-elliptic, up to 25 by 10 cm, often much smaller; secondary nerves bent, distinctly joining, rather distant from each other, tertiary nerves indistinct. ♂ *Inflorescences* cauline, simple, thick, about 6 cm long, 5 mm thick, pendulous. ♂ *Flowers* numerous, 80-100, obconic, 2 mm high; sporophyll exerted by 1 mm; sterile flowers 10, acute, ovate. ♀ *Inflores-*

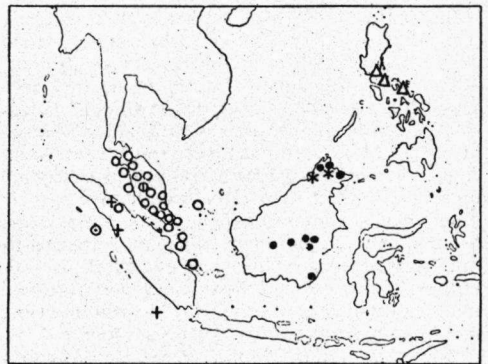


Fig. 4. Distribution of Δ *G. arboreum* Foxw., * *G. klossii* MERR., ● *G. neglectum* BL., + *G. loeringii* MGF, ⊙ *G. oxycarpum* RIDL., ⊕ *G. ridleyi* GAMBLE, ○ *G. microcarpum* BL.

cences cauline, thick, pendulous, 5 cm long, collars 5 mm spaced. ♀ Flowers 5–7 to each collar, embedded in a dense, long hair tuft, broadly ovate, 5 mm long, inner envelop 2½ mm exerted, split. *Fruits* sessile on an elongated axis up to 15 cm, ellipsoid, shining, up to 3 cm long and half as broad, sometimes with a basal cushion; outer envelop fleshy and fibrous, middle one firmly papery, innermost papery.

Distr. Peninsular Siam, in *Malaysia*: Malay Peninsula, Sumatra, Banka, Java, Borneo, Celebes, Talaud Islands, Moluccas (Sula Isl.), and New Guinea, not in the Lesser Sunda Islands. Fig. 3.

Ecol. Rather common in rainforest, up to 1600 m.

Vern. *Kéliat* (Celebes), *baranggo* (Talaud), *akar katankil* (Banka).

8. *Gnetum klossii* MERR. ex MARKGRAF, Bull. Jard. Bot. Btzg 10 (1930) 478, t. 11, f. 6–8.

Liana. *Leaves* leathery, brown when dry, elliptic, not tailed, about 22 cm long, 11 cm broad, secondary nerves bent, indistinctly joining, tertiary nerves finely reticulate. *Inflorescences* unknown. Fruiting axes simple, cauline, 20 cm long, with thick, rough, 2 cm long internodes. Unpollinated ♀ flowers in a dense hair tuft, 5 mm long, broadly ovate; outer envelop rough, very fleshy, middle and inner ones papery. *Fruit* obovate-oblong, obtuse, to 5.3 cm long, 1½–3 cm diam., rough by wavy warts formed by protruding, flabellate epidermal cells; outer envelop moderately fleshy, middle one leathery and indistinctly ribbed, inner one papery. Seed 3 cm long.

Distr. *Malaysia*: NE. Borneo (Sandakan and Mt Kinabalu). Fig. 4.

Note. The rough surface of branches, inflorescences, flowers, and fruits is so characteristic, that it should be easy to recognize male plants.

9. *Gnetum ridleyi* GAMBLE ex (BURKILL & HENDERSON, Gard. Bull. S. S. 3, 1925, 458, *nomen*) MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 479, t. 11, f. 5.

Stout climber. *Leaves* leathery, elliptic, black when dry, up to 18 by 9 cm, transversely striate above by some fibres; secondary nerves straight, directed forward, indistinctly joining, tertiary ones reticulate. ♂ *Inflorescences* unknown. ♀ *Inflorescences* cauline, large, 16 cm long, 18 cm wide, branched twice or three times, spike 8 cm long, collars numerous. ♀ Flowers 6–8 to each collar, immersed in dense hair tufts, broadly ovate, their outer envelop containing many fibres. *Fruits* large, 5–6 cm long, 2½ cm thick, ellipsoidal, tapering to both ends, sessile, but by means of a basal cushion, obtuse; outer envelop fleshy and very fibrous, middle one slightly woody, with longitudinal ribs, inner one papery, fibrous. Seed 3 cm long.

Distr. *Malaysia*: Malay Peninsula (Pahang: Telom), rare. Fig. 4.

10. *Gnetum loerzingii* MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 480, t. 12, f. 8–10.

Liana. *Leaves* obovate, cuneate, leathery, up to

16 by 6 cm, brown when dry; secondary nerves bent, indistinctly joining, tertiary ones inconspicuous, upper leaf surface transversely striped by fibres. ♂ *Inflorescences* axillary, erect, once branched, thick, 3 cm long, 7 mm broad. ♀ Flowers broadly obconic; sterile ♀ flowers ovate. ♂ *Inflorescences* unknown. Internodes of fruit-bearing axis 1½ cm long, 4 mm thick; unpollinated flowers 6 in each collar, ovate. *Fruits* wine-red, obovate-ellipsoid, not shining, 4½ by 2½ cm; outer envelop fleshy, middle one woody and fibrous, inner one papery. Seed oblong, striped, 24 mm long.

Distr. *Malaysia*: N. Sumatra and Enggano Island. Fig. 4.

11. *Gnetum gneumonoides* BRONGN. in DUPERREY, Voy. Coquille (1829) 12; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 480, t. 13.—*Funis gneumoniformis* RUMPH. Herb. Amb. 5 (1747) 11, t. 7.—*Gnetum rumphianum* BECC. Malesia 1 (1877) 182.—*G. macrocarpum* BECC. l.c.—*G. ovalifolium* (non POIR.) KARST. Ann. Jard. Bot. Btzg 11 (1893) 215.—*G. verrucosum* KARST. l.c. 216.—*G. moluccense* KARST. ex MGF in E. & P. Nat. Pfl. Fam. ed. 2, 13 (1926) 435.—*G. kerstingii* LAUT. in K. SCH. & LAUT. Fl. D. Schutzgeb. Südsee (1901) 157.—*G. wrayi* GAMBLE, Kew Bull. (1915) 92.—*G. edule* (non BLUME) HASSK. Abh. Naturf. Ges. Halle 9 (1866) 231.—Fig. 5.

Liana. *Leaves* coriaceous, yellowish-brown when dry, elliptic, up to 20 cm long, 8 cm wide, but mostly short, upper surface silky by means of a transverse striping by densely set fibres; secondary nerves straight, joining at a conspicuous distance before the margin, tertiary nerves reticulate below. ♂ *Inflorescences* axillary, branching once, spikes about 2–3 cm long, 4 mm thick; collars bent outward by their upper edges. ♀ Flowers numerous, narrowly obconic, 1½ mm long; sporophyll filiform, 2½ mm long, with only one sporangium. Sterile ♀ flowers 8 to each collar, globose, apiculate. ♀ *Inflorescences* axillary, not branching; spike 4 cm long; collars densely approximate. ♀ Flowers 4–6 to each collar, ovate-globose, rather obtuse, outer envelop fleshy and fibrous, tube of the inner one not split. *Fruits* sessile on a much thickened axis, 5–6 cm long, 2 cm thick, ellipsoidal, obtuse, tapering into a basal cushion, shining, but very warty; outer envelop very thick, 5 mm, fleshy, very fibrous, middle one woody, conspicuously ribbed, inner one papery. Seed oblong, 3½ cm long.

Distr. New Hanover, in *Malaysia*: Malay Peninsula (Taiping), Billiton; Borneo, Celebes, Philippines (rare), Moluccas (Aru Islands), New Guinea. Absent from the outer arch of islands (Sumatra, Java, Lesser Sunda Islands).

Ecol. In rainforests at low altitude, up to 300 m.

Vern. *Rukiti gumi gumini* (Halmaheira).

12. *Gnetum diminutum* MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 483, t. 10, f. 9–13.

Climber. *Leaves* coriaceous, brown when dry, elliptic; shining, small, 15 cm long, 6 cm broad, secondary nerves bent, indistinctly joining, tertiary

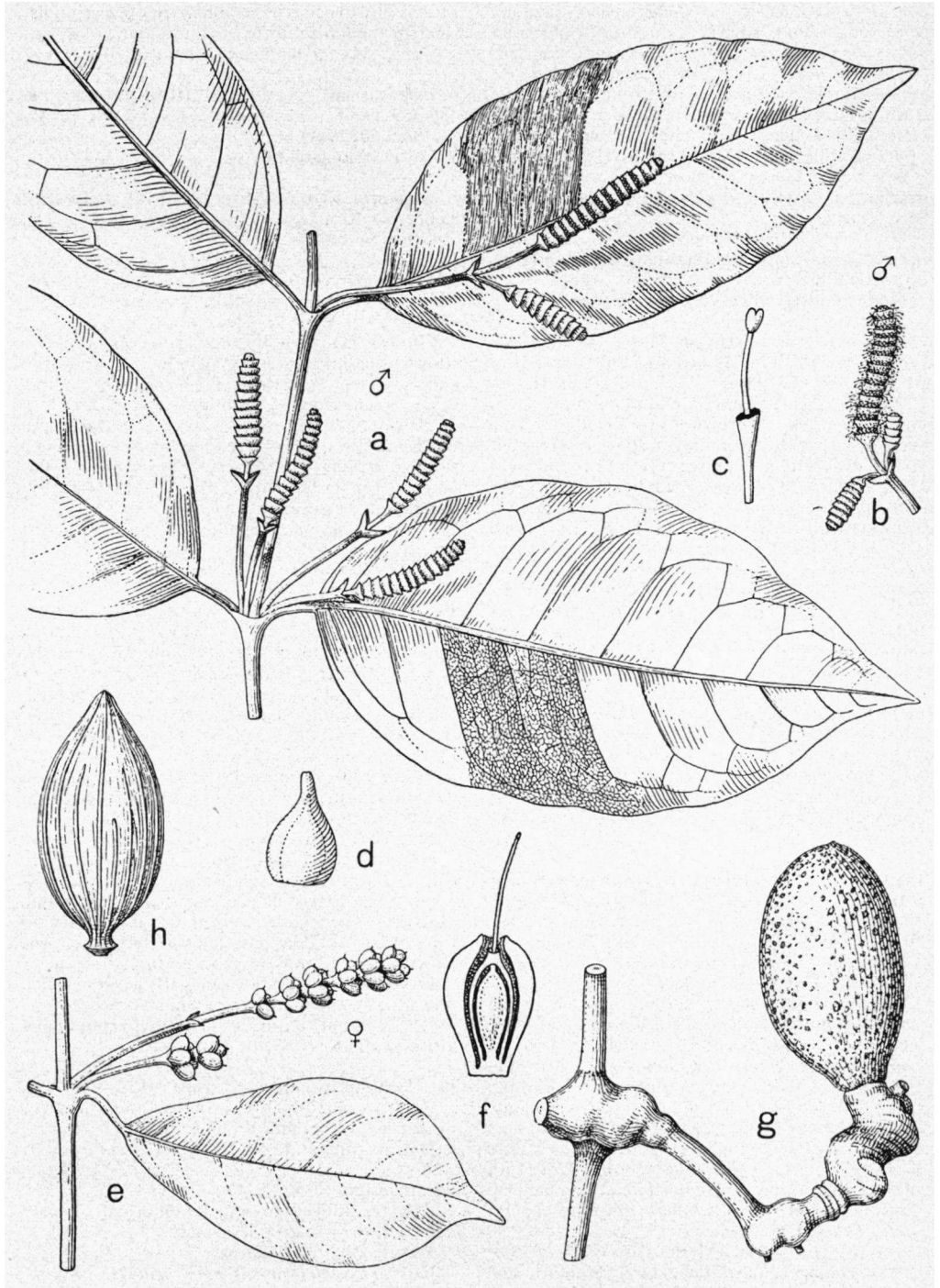


Fig. 5. *Gnetum gnemonoides* BRONGN. a-c ♂, d-h ♀ (a. twig, b. inflorescence, c. flower, × 10, d. sterile ♀ flower, × 10, e. inflorescence, f. section of flower, × 4, g. infructescence, h. fruit without outer layer).

ones reticulate below. ♂ *Inflorescences* cauline, pendulous, short, spikes 3 cm long. ♂ Flowers numerous, obconic; sporophyll 1/2 mm exserted. Sterile ♀ flowers 6 to each collar, ovate. ♀ *Inflorescences* simple, cauline, up to 10 cm long in the fruiting stage. ♀ Flowers 10 to each collar, immersed in a dense hair tuft, obliquely ovate. *Fruits* shining, ellipsoidal, small, 1 1/2 cm long, 8 mm broad; outer envelop moderately fleshy, middle one slightly woody, inner one papery. Seed 1 cm long.

Distr. *Malaysia*: Borneo. Fig. 3.

Ecol. In rainforests especially on mountains, up to 1800 m.

Note. Closely allied to *G. cuspidatum*.

13. *Gnetum macrostachyum* HOOK. f. Fl. Brit. India 5 (1890) 642; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 484, t. 12, f. 1-7.—Fig. 11.

Climber. *Leaves* leathery, elliptic-oblong, 18 cm long, 8 cm broad, brown when dry, secondary nerves bent, distinctly joining, tertiary ones reticulate. ♂ *Inflorescences* simple, thick (7 mm), 5 cm long, axillary. ♂ Flowers obconic, 1 1/2 mm long; sporophyll very shortly exserted, embedded in a dense hair tuft twice as long as the collars. Sterile ♀ flowers about 10 to each collar, ovate. ♀ *Inflorescences* cauline, simple, 9 cm long, 1 cm thick. ♀ Flowers 8-10 to each collar, embedded in a thick, long hair mass which is still more conspicuous than in the ♂ ones, globose, apiculate. *Fruits* shining, ellipsoidal, small, 2 cm long, 12 mm broad; outer envelop thinly fleshy, middle one leathery, inner one papery; hair masses twice as long and twice as large as in the flowering stage.

Distr. Tenasserim (Tavoy), Siam, and Indo-China to *Malaysia*: Sumatra, Malay Peninsula, Java, Borneo, and New Guinea.

Ecol. Apparently restricted and rare in the Archipelago, more frequent only in the Malay Peninsula.

14. *Gnetum microcarpum* BL. Rumphia 4 (1848) 7, t. 175, f. 1; MIQ. Fl. Ind. Bat. 2 (1856) 1068, Suppl. 1 (1860) 252; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 485.—*G. apiculatum* GRIFF. Not. Pl. As. 4 (1854) 31.—*G. neglectum* var. *microcarpum* PARL. in DC. Prod. 16, 2 (1868) 350.

Climber. *Leaves* fleshy, shining, greyish brown when dry, oblong or lanceolate, about 10 by 4 cm; secondary nerves indistinct, straight. ♂ *Inflorescences* cauline, erect, long-stalked, 1 1/2 cm long, 3 1/2 mm thick. ♂ Flowers numerous, obconic; sporophyll long-exserted. Sterile ♀ flowers many, ca 20-30 to each collar, fusiform. ♀ *Inflorescences* cauline, simple, erect; spikes 2 1/2 cm long. ♀ Flowers 8 to each collar, ovate, 3 mm long. *Fruits* not shining, up to 2 cm long, ellipsoidal; outer envelop thinly fleshy, middle one leathery, inner one papery. Seed oblong, 1 by 1/2 cm.

Distr. Tenasserim (Mergui) to *W. Malaysia*: Malay Peninsula (also Langkawi), Sumatra and surrounding islands (Lingga, Riouw, Anambas, Banka). Fig. 4.

Ecol. The Malay Peninsular *f. campestris* (RIDL.)

MGF is said to occur in savannahs or open grounds, whereas the typical form inhabits rainforests.

Vern. *Manindjan hatan* (Lingga).

f. microcarpum.—*f. silvestre* (RIDL.) MGF, l.c. 486, t. 9 f. 2-8.—var. *silvestris* RIDL. J. Str. Br. R. As. Soc. 60 (1911) 62.

Leaves oblong-elliptic.

f. campestris (RIDL.) MGF l.c., t. 9, f. 1.—var. *campestris* RIDL. l.c.

Leaves lanceolate.

15. *Gnetum oxycarpum* RIDL. Kew Bull. (1926) 94; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 488, t. 9, f. 9-12.

Climber. *Leaves* fleshy, greyish brown when dry, elliptic, small, 12 cm long, 5 cm broad, secondary nerves straight, indistinct. ♂ *Inflorescences* cauline, short, erect, simple. ♂ Flowers clavate. Sterile ♀ ones ovate. ♀ *Inflorescences* similar. ♀ Flowers 8-10 to each collar, ovate, 4 mm long. *Fruits* yellow, not shining, oblong with a very acute apex, 2 1/2 cm long, 8 mm broad; outer envelop thinly fleshy, middle one coriaceous, inner one papery.

Distr. *Malaysia*: Mentawai Islands (Siberut) near Sumatra. Fig. 4.

Note. Related to *G. microcarpum*.

16. *G. leptostachyum* BL. Rumphia 4 (1848) 5; PARL. in DC. Prod. 16, 2 (1868) 352; MARKGRAF, Bull. Jard. Bot. Btzg III, 10 (1930) 488.—Fig. 1f.

Stout climber. *Leaves* coriaceous, brown when dry, elliptic-oblong, up to 30 by 12 cm, often much smaller; secondary nerves bent, distinctly joining. ♂ *Inflorescences* often cauline, much branched, up to 33 cm long, catkins 3-6 cm long, 3-4 mm thick. ♂ Flowers 30-40 to each collar, immersed in a dense hair tuft, broadly obconic; sporophyll filiform, twice as long as the perianth. Sterile ♀ flowers 8-10 in each collar, broadly ovate. ♀ *Inflorescences* similar, their catkins 10 cm long. ♀ Flowers 6 to each collar, immersed in a dense hair tuft, globose, 3 mm thick. *Fruits* pink, shining, shortly ellipsoidal, obtuse, 2 cm long, 1 1/2 cm thick; outer envelop thinly fleshy, middle one thinly woody, inner one papery. Seed 12 mm long, 8 mm thick.

Distr. *Malaysia*: Borneo, with a var. *elongatum* MGF in Indo-China and Siam. Fig. 3.

Ecol. Stout rainforest liana, preferring higher altitudes, up to 1500 m.

var. *leptostachyum*.—var. *tenuis* MGF, l.c. 489. ♂ Spikes narrow, 3-4 cm long, 3 mm broad. ♀ Spikes lax, internodes 8 mm long.

Distr. *Malaysia*: Borneo.

var. *robustum* MGF, l.c. 490.

♂ Spikes stout, 6 cm long, 4 mm broad. ♀ Spikes compact, their internodes 3 mm long.

Distr. *Malaysia*: Borneo.

Vern. *Baluhu* (Dusun), *paliat paliat* (Kedayan).

var. *abbreviatum* MGF, nov. var.

Leaves small (up to 12 by 6 cm), hard, distinctly

reticulate below. ♂ Inflorescences short (up to 6 cm), catkins 1½ cm by 3 mm. Internodes of fruiting ♀ ones very short (5 mm). Fruits large (2½ by 1½ cm).

Distr. *Malaysia*: Br. N. Borneo (Kinabalu).

Ecol. Stout liana of mossy, tall forest, 1300–1800 m.

Note. The varieties *leptostachyum* and *robustum* are without geographical significance. *Var. elongatum* MGF, however, and *var. abbreviatum* prefer higher altitudes, the more so, the nearer to the aequator. Both combine floral characters of the lowland varieties in a different manner.

Doubtful

Gnetum funicularis BRONGN. in DUPERREY, Voy. Coquille (1829) 12.—*Gnemon funicularis* RUMPH. Herb. Amb. 5 (1747) 12, t. 8. RUMPHIUS's plate and description is insufficient for a proper identification.

Gnetum indicum (LOUR.) MERR. Interpr. Rumph. Herb. Amb. (1917) 77.—*Abutua indica* LOUR. Fl. Coch. (1790) 630.

Sheets from *Malaysia* distributed under this name belong to *G. latifolium* BL.; from other regions they either belong to *G. formosum* MGF or to *G. montanum* MGF. A real type of *Abutua*

indica does not exist, only uncertain leaves in the British Museum; the type locality is the home of more than one species. So the name remains doubtful.

Gnetum karstenianum WARB. Monsunia (1900) 196, 197; Moluccas (Batjan). The type consists of leaves only.

Gnetum philippinense WARB. *l.c.* Philippines (Luzon). The type consists of leaves only.

Gnetum polystachyum REINW. *ex* BL. Cat. Gew. Btzig (1823) 106, *nomen*. No type found.