

GNETACEAE

D. Cicuzza

Blume, Nov. Pl. Expos. (1833) 23, as ‘Gneteeae’, nom. cons.; Markgraf, Fl. Males., ser. 1, 4(3) (1951) 337; Whitmore, Tree Fl. Malaya 1 (1972) 54; Phengkklai, Fl. Thailand 2(3) (1975) 204; Keng, Ord. Fam. Malayan Seed Pl., ed. 3 (1983) 14; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 6; Kubitzki in Kramer & Green (ed.), Fam. Gen. Vasc. Pl. 1 (1990) 383. **Type:** *Gnetum* L.

Vines, rarely shrubs or trees; dioecious, sometimes monoecious. **Stems** terete, with swollen nodes. **Leaves** opposite, simple, petiolate, without stipules; lamina entire, pinnately veined, when slightly torn the torn parts connected by fibres. **Male and female reproductive units** arranged in whorls in a spikelike cone (here called a spike), simple or ramified, arranged in lax, dichasial cymes; cymes axillary (also terminal elsewhere) in clusters on stems, particularly on old stems. **Spikes** with annular collars, each formed by the fusion of a whorl of bracts, containing moniliform hairs and sessile reproductive units; spikes structurally bisexual but functionally dioecious in Singapore, the male spikes smaller than female spikes, reproductive units numerous, arranged in whorls, the upper collars with female reproductive units, these sterile in male spikes, the lower collars with male reproductive units, these sterile in female spikes, the space between them filled with hairs. **Male spikes** with reproductive units with a cupular, succulent false perianth, usually $\pm$ obconical; filaments fused, exerted from false perianth, units opening by a common, apical slit, pollen spherical, with minute projections. **Female spikes** solitary or in panicles; ovules with 2 integuments, innermost integument elongated into a micropylar tube exerted from false perianth; outer integument with a fleshy outer layer connate with false perianth and developing into a false seed coat, inner layer bony. **Seeds** in drupe-like false fruits, these red, orange or yellow, with a fleshy (rarely corky) false seed coat.

Distribution. A single genus with approximately 40 extant species mostly in tropical and subtropical Asia, West Africa and South America. In Singapore, 1 genus and 5 native species.

Ecology. *Gnetum* species occur primarily in lowland forests, including mixed dipterocarp, peat swamp and coastal dry forests. With the exception of a few species, the majority are climbers.

Uses. Today, the most utilised species of *Gnetum* is *Gnetum gnemon* L. This species is cultivated for its seeds which are eaten primarily in Indonesia but also throughout Southeast Asia, particularly in snack form as emping. Seeds from other species are also eaten to a much lesser degree, whereas young and tender leaves are eaten as vegetables. In the past, rope made from *Gnetum* fibre was prized for its resistance to seawater and hence used for fishing nets and lines.

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Taxonomy. The family Gnetaceae in the order Gnetales is an evolutionarily isolated gymnosperm clade, found primarily in tropical regions. Due to superficial similarities in the reproductive structures of Gnetaceae and the angiosperms and a belief that Gnetaceae and the angiosperms were sister groups, angiosperm morphological terminology was commonly applied to the reproductive structures in Gnetaceae (Endress, *Int. J. Plant Sci.* 157 (1996) 113). It is now accepted that the gymnosperms, including Gnetaceae, are monophyletic and that the gymnosperms as a whole are sister to the angiosperms (Hou et al., *Taxon* 64 (2015) 239–253). Angiosperm morphological terminology has consequently come to be considered much less appropriate and is best avoided when describing Gnetaceae species. In Asia, *Gnetum* species can easily be divided into arborescent and lianoid taxa, with the majority of taxa being lianas. Amongst the liana species, the variability within some species is particularly high leading some authors to describe a plethora of varieties and forms. Here, for the most part, the complex infraspecific classifications of some species is not recognised in favour of treating the species as highly variable (cf., Markgraf, *Fl. Males.*, ser. 1, 4(3) (1951) 346). More detailed morphological, molecular and population studies are required to better understand the extreme variability within some species in Singapore and the wider region.

GNETUM L.

(from a vernacular name for *Gnetum gnemon*)

Mant. Pl. (1767) 18; Linnaeus, *Syst. Nat.*, ed. 12, 2 (1767) 612, 637; Markgraf, *Bull. Jard. Bot. Buitenzorg*, sér. 3, 10 (1930) 407; Markgraf, *Fl. Males.*, ser. 1, 4(3) (1951) 337; Whitmore, *Tree Fl. Malaya* 1 (1972) 54; Phengklai, *Fl. Thailand* 2(3) (1975) 204; Kubitzki in Kramer & Green (ed.), *Fam. Gen. Vasc. Pl.* 1 (1990) 386. **Type:** *Gnetum gnemon* L.

Lianas or trees. **Leaves** opposite, simple; lamina margin entire. **Male and female reproductive units** in whorls on spikes, axillary in clusters on stems, particularly on old stems. **Spikes** with annular collars; male and female reproductive units numerous, spirally arranged; male spikes smaller than female spikes in dioecious species, collars closely arranged, 20–80 reproductive units per collar, male units with a terminal cupular shape, microsporophyll composed of two parts, filaments fused, exerted from the false perianth; female spikes solitary or in panicles, often cauliflorous, collars with 4–12 reproductive units each. **Seeds** in drupe-like false fruits, red, orange or yellow, fleshy, cotyledons 2.

Distribution. A genus of approximately 40 species mostly in tropical and subtropical Asia, West Africa and South America. In Singapore, 5 native species.

Ecology. *Gnetum* species in Singapore occur in primary and secondary forest.

Taxonomy. Hou et al. (*Taxon* 64 (2015) 239–253) found that the arborescent species were sister to the Asian liana species and that some of the existing sections and subsections are not monophyletic.

Key to *Gnetum* species

1. Shrubs or small trees; leaves yellowish when dry; spike lax, the central axis always visible between collars **1. *G. gnemon***
 Vines; leaves usually darker when dry; spike usually dense, the central axis covered by collars, reproductive units or hairs 2
2. Collars on the spikes dish like, reproductive units protruding from the spikes or with male units partly covered 3
 Collars on the spikes cylindrical, enclosing the reproductive units 4
3. Spikes not branched, to 2 cm long; leaves $9-13 \times 4.2-6.2$ cm; male reproductive units visible on the spike, not covered with a collar; false fruits 3–5 cm long, (sub)sessile **2. *G. gnemonoides***
 Spikes branched, to 4 cm long; leaves $11-20 \times 5-8$ cm; male reproductive units partly covered by a collar; false fruits 1.5–1.6 cm long, stalk 1–1.5 cm long **3. *G. latifolium***
4. Leaves elliptic, $13-22 \times 4.5-9$ cm; reproductive units immersed in long hairs; false fruits apiculate, 1–2.2 cm long, yellow to orange **4. *G. macrostachyum***
 Leaves lanceolate, $6.5-10 \times 2.1-4.7$ cm; reproductive units not immersed in long hairs; false fruits obtuse, 2–2.3 cm long, yellow **5. *G. microcarpum***

1. *Gnetum gnemon* L.

(from a vernacular name)

Mant. Pl. (1767) 125; Linnaeus, Syst. Nat., ed. 12, 2 (1767) 637; Hooker, Fl. Brit. India 5, fasc. 15 (1888) 641; Ridley, J. Straits Branch Roy. Asiat. Soc. 60 (1911) 60; Ridley, Fl. Malay Penins. 5 (1925) 273; Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 436; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1091; Corner, Wayside Trees (1940) 726; Markgraf, Fl. Males., ser. 1, 4(3) (1951) 340; Whitmore, Tree Fl. Malaya 1 (1972) 54; Keng, Gard. Bull. Singapore 26(2) (1973) 237; Phengklai, Fl. Thailand 2(3) (1975) 205, fig. 23; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 6, fig. 7.1; Turner, Gard. Bull. Singapore 45 (1993) 20; Wong et al., Gard. Bull. Singapore 46(2) (1995 [‘1994’]) 71; Turner et al., Gard. Bull. Singapore 48 (1998 [‘1996’]) 139; Chew et al., Gard. Bull. Singapore 49(2) (1999 [‘1997’]) 187; Lee et al., Gard. Bull. Singapore 55 (2003) 287; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 45, 98, 206; Neo et al., Nat. Singapore 5 (2012) 281; Wong et al., Checkl. Pl. Sp. Nee Soon Swamp Forest (2013) 132, 275; Neo et al., Nat. Singapore 6 (2013) 14; Neo et al., Nat. Singapore 6 (2013) 80; Neo et al., Nat. Singapore 6 (2013) 121; Neo et al., Nat. Singapore 6 (2013) 278; Neo et al., Nat. Singapore 7 (2014) 64; Neo et al., Nat. Singapore 7 (2014) 103; Lindsay et al., Gard. Bull. Singapore 74(Suppl. 1) (2022) 114. **Type:** [Published illustration] Rumphius, Herb. Amboin. 1 (1741) t. 71, lectotype designated by Stevenson & Zanoni in Göerts-van Rijn (ed.), Fl. Guianas, ser. A, 9 (1991) 13. **Fig. 1.**

Gnetum acutatum Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 588. **Type:** *Diepenhorst s.n.*, [Indonesia, Sumatra], Priaman (lectotype U [U0043393], designated here).

Distribution. Northeast India, southern China, continental Southeast Asia through Malesia to northern Australia and the western Pacific islands.

Notes. Markgraf (Fl. Males., ser. 1, 4(3) (1951) 340) recognised several varieties in this species. Only *Gnetum gnemon* var. *gnemon* is native to Singapore. Many names at different ranks have been proposed for the morphological forms within the species, some of which have been suggested by various authors to be synonyms of *Gnetum gnemon* var. *gnemon*. As an exhaustive synonymy here would require a study of the variation of the species throughout its wide distribution, which would anyway not affect the accepted name of the taxon as found in Singapore, this has not been attempted.

var. *gnemon*

Trees or shrubs, dioecious, to 22 m tall; crowns monopodial and conical, short branches moderately pendent; bark grey, trunk marked with conspicuous or indistinct rings. **Leaves:** petiole 0.5–1.2 cm long, dark brown when dry; lamina coriaceous, elliptic or oblong, 7.5–21 × 3.5–6.5 cm, apex short acuminate, base cuneate, margin entire and undulate, light green when dry, glabrous above and beneath, secondary veins visible, curving towards margin, brochidodromous, looped intramarginal vein 0.5–1.1 cm from margin. **Male spikes** solitary, axillary, simple, glabrous, yellow, 3.5–7 cm long, 3–4 mm wide; collars 0.4–0.6 mm apart, 2–3 mm across, collar margin undulate, each collar with 50–70(–80) male reproductive units and 5–14 sterile globose female units. **Female spikes** similar to male, each collar with 5–8 female reproductive units. **Seeds** in drupe-like false fruits, sessile, yellow to orange-yellow or red-purple, ellipsoid and apiculate, 0.9–2 × 0.8–1.9 cm when dry; seed coat ribbed, surface usually velvety.

Distribution. India and South China through continental Southeast Asia and Malesia to the Pacific Islands. In Singapore, known from Changi (*Ridley* 4822, 1893, SING [SING0017605]), Bukit Timah (*Ahmad s.n.*, 13 Mar 1956, SING [SING0016073]; *Leon* 453NPARK, 13 Sep 2018, SING [SING0274161]), Lower Peirce (*Maxwell* 82-38, 11 Feb 1982, SING [SING0017587]) and several offshore islands (e.g., *Corner* 29964, 29 Sep 1935, SING [SING0017586]).

Ecology. Across its range, found in rain forests at lower elevations, sometimes at forest margins. Shrubby forms ascend to submontane forest in India. In Singapore, in primary and secondary forest and more open vegetation.

Conservation assessment. Globally, Least Concern (LC) (IUCN Red List, 2026, under *Gnetum gnemon*). In Singapore, it is assessed as Critically Endangered (CR/D) by Middleton et al. (in Davison et al., Singapore Red Data Book, ed. 3 (2024) 465).

Uses. Young leaves and inflorescences can be eaten as a green vegetable and the fruits can be processed into crackers (*emping*).

Vernacular names. *Bago*, *belinjau*, *gnemon tree*, *maninjau*, *meninjau*, *minjau*, *songkok*, *Spanish joint fir*, 灌状买麻藤 (NParks' Flora & Fauna Web, 2026).



Figure 1. *Gnetum gnemon* L. **A.** Habit. **B.** Fruiting twigs. **C–F.** Differing stages of maturity of spikes with male and female units on collars. **G.** Trunk. **H.** Spikes with mature seeds. (A–H from Singapore, A, Sungei Tengah; B & G, Singapore Island Country Club; C–F & H, Pulau Salu, *Lua et al. SING2019-1197*. Photos: A, W.F. Ang; B & G, Zaki Jamil; C–F & H, X.Y. Ng).

Notes. The description above applies to the species as found in Singapore. Considerably more variation is found elsewhere.

2. *Gnetum gnemonoides* Brongn.

(the species *Gnetum gnemon*, Greek, *-oides* = resembling; resembles *Gnetum gnemon* L.)

in Duperrey, Voy. Monde, Phan., fasc. 7 (1829) 12; Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 480, t. 13; Markgraf, Fl. Males., ser. 1, 4(3) (1951) 344, fig. 5; Keng, Gard. Bull. Singapore 26(2) (1973) 237; Corner, Gard. Bull. Singapore, Suppl. 1 (1978) 82; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 6; Turner, Gard. Bull. Singapore 45 (1993) 21; Turner et al., Gard. Bull. Singapore 46(2) (1995 ['1994']) 8; Turner et al., Gard. Bull. Singapore 48 (1998 ['1996']) 139; Chew et al., Gard. Bull. Singapore 49(2) (1999 ['1997']) 187; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 45, 98, 206; Wong et al., Checkl. Pl. Sp. Nee Soon Swamp Forest (2013) 133, 276; Lindsay et al., Gard. Bull. Singapore 74(Suppl. 1) (2022) 114. **Type:** [Published illustration] Rumphius, Herb. Amboin. 5 (1747) t. 7, lectotype designated here. **Fig. 2, 3.**

Gnetum rumphianum Becc., Malesia 1 (1877) 182. **Type:** [Published illustration] Rumphius, Herb. Amboin. 5 (1747) t. 7, lectotype designated here.

Gnetum macrocarpum Becc., Malesia 1 (1877) 182. **Type:** *Beccari 3081*, [Malaysia], Sarawak, Kuching, January 1867 (lectotype FI [FI013439], designated by Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 481).

Gnetum ovalifolium H.Karst., Ann. Jard. Bot. Buitenzorg 11 (1893) 215, nom. illeg. non Poir. (1812). **Type:** *Karsten 734*, [Indonesia], cult. in Bogor Botanic Garden, originally from Seram (lectotype HAL [HAL0114646], designated here).

Gnetum verrucosum H.Karst., Ann. Jard. Bot. Buitenzorg 11 (1893) 216. **Type:** *Karsten 217c*, [Indonesia], cult. in Bogor Botanic Garden, originally from Buru, 1879 (lectotype HAL [HAL0114641], designated here; islectotype HAL [HAL0114640]).

Gnetum kerstingii Lauterb. & K.Schum. in Schumann & Lauterbach, Fl. Schutzgeb. Südsee (1901) 157. **Type:** *Lauterbach 2174*, Kaiser Wilhelmsland [Papua New Guinea], Oertzen Gebirge, 18 May 1896 (lectotype B [B 10 0001509], designated by Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 482).

Gnetum wrayi Gamble, Bull. Misc. Inform. Kew 1915 (1915) 92; Ridley, Fl. Malay Penins. 5 (1925) 276. **Type:** *Hullett 603*, Singapore, Chan Chu Kang, 10 February 1887 (lectotype K [K000454386], designated by Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 481 [with a correction to the collector]).

Gnetum moluccense H.Karst. ex Markgr., in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 13 (1926) 435. **Type:** *Karsten s.n.* [Indonesia], cult. in Bogor Botanic Garden (lectotype HAL [HAL0114638], designated here; islectotypes HAL [HAL0114383, HAL0114637, HAL0114647]).

Gnetum edule auct. non (Willd.) Blume: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 151; Ridley, J. Straits Branch Roy. Asiat. Soc. 60 (1911) 64.

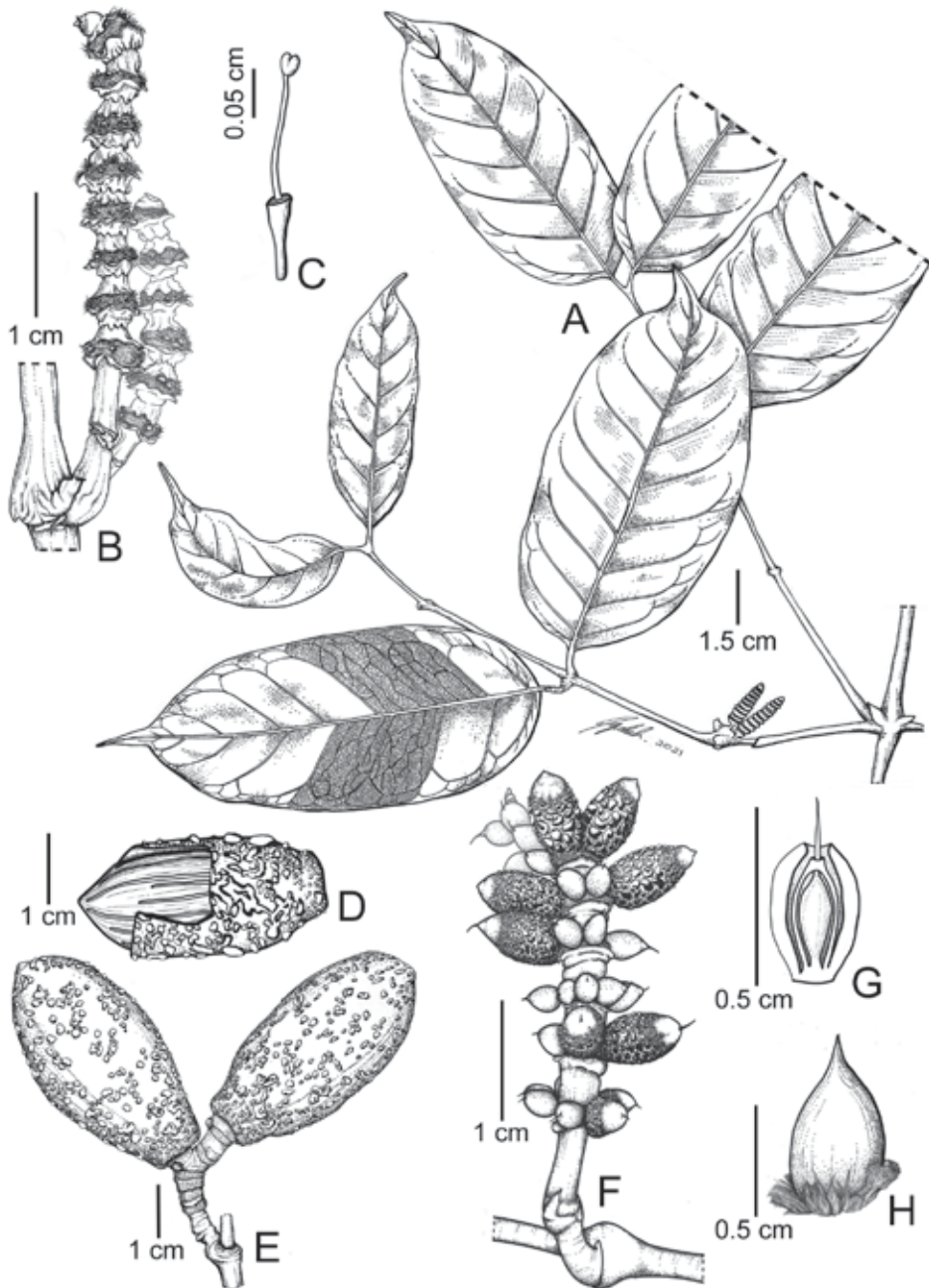


Figure 2. *Gnetum gnemonoides* Brongn. **A.** Habit. **B.** Male spike. **C.** Male unit. **D.** Seed with outer layer partially removed. **E.** Fruit. **F.** Female spike. **G.** Section of female unit. **H.** Female unit. (A, B, D–F & H from Singapore, A, Nee Soon, *Ali Ibrahim & Chin* *Al* 214; B, Jurong Road, *Corner* 26191; D & E, Nee Soon, *Sidek Kiah* SK 635; F & H, Nee Soon, *Lim et al. SING2018-240*; C & G drawn from *Flora Malesiana*, ser. 1, 4(3) (1951) 345. Drawn by Nur Aqilah).

Woody high-climbers, dioecious, stems terete and dichotomously branched; young terminal branchlets with dark brown to nearly black bark, older branches with lenticels, these not more than 2 mm long. **Leaves:** petiole 0.6–0.7 cm long, superficially grooved on the adaxial side; lamina coriaceous, oblong, 9–13 × 4.2–6.2 cm, apex acuminate, tip to 1.5 cm long, base obtuse, margin entire, shining dark green above and light green below, dark brown-black to dark maroon when dry, glabrous above and beneath, secondary veins visible, curving towards margin, brochidodromous. **Male spikes** in clusters or simple, axillary, glabrous, yellow, 1.5–2 cm long, c. 4 mm wide; collars c. 0.5 mm apart, to 1 mm across, collar margin undulate, each collar with 50–70(–80) reproductive units of which c. 14 are sterile, globose female units. **Female spikes** axillary, simple, to 4 cm long; collars less than 10 mm apart, each collar with 7–8 reproductive units, ovate-globose, glabrous. **Seeds** in drupe-like false fruits, sessile; when young, surrounded at the base with a crown of dense golden hairs, these c. 1 mm long; yellow to orange-yellow or red-purple, sometimes light brown with white spots when fresh, greenish brown and almost entirely covered with brown pale brown corky lenticels when dry; seed ellipsoid and apiculate, 3–5 × 1.3–2.4 cm.

Distribution. Peninsular Malaysia, Borneo, Sulawesi, Philippines, Moluccas (Aru Islands) and New Guinea. In Singapore, known from Nee Soon (*Sidek Bin Kiah* 635, 10 Feb 1983, SING [SING0017591]); *Lua* SING2015-036, 30 Jan 2015, SING [SING0213851]), Jurong (*Corner* 26191, 5 Mar 1933, SING [SING0017598]), Tuas (*Ridley s.n.*, 1894, SING [SING0017594]) and Chan Chu Kang (*Ridley* 6126, 1894, SING [SING0017597]).

Ecology. Tropical lowland forest. Outside of Singapore, also recorded from kerangas forest.

Conservation assessment. Globally, Least Concern (LC) (IUCN Red List, 2026). In Singapore, it is assessed as Critically Endangered (CR/D) by Middleton et al. (in Davison et al., Singapore Red Data Book, ed. 3 (2024) 465).

Vernacular name. *Tali ganemu* (NParks' Flora & Fauna Web, 2026).

3. *Gnetum latifolium* Blume

(Latin, *latus* = broad, wide, *folium* = leaf; with wide leaves)

Nov. Pl. Expos. (1833) 30; Blume, Tijdschr. Natuurl. Gesch. Physiol. 1 (1834) 160; Blume, Ann. Sci. Nat., Bot., sér. 2, 2 (1834) 105; Blume, Rumphia 4, fasc. 37–40 (1849) 5, t. 174; Ridley, J. Straits Branch Roy. Asiat. Soc. 60 (1911) 65; Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 458, t. 7: fig. 1, 6–13; Markgraf, Fl. Males., ser. 1, 4(3) (1951) 342, fig. 1: h; Phengkklai, Fl. Thailand 2(3) (1975) 210; Lee et al., Gard. Bull. Singapore 55 (2003) 287; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 45, 98, 206; Lindsay et al., Gard. Bull. Singapore 74(Suppl. 1) (2022) 114. **Synonym:** *Gnetum latifolium* Blume var. *blumei* Markgr., Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 459, t. 7: fig. 1, nom. inval. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype L [L0050746], first step designated by Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 460, second step designated by Khuraijam et al., Ann. Bot. Fenn. 57 (2020) 134). **Fig. 4.**

Gnetum laxifrutescens Elmer, Leaflet. Philipp. Bot. 4 (1912) 1478. **Synonym:** *Gnetum latifolium* Blume

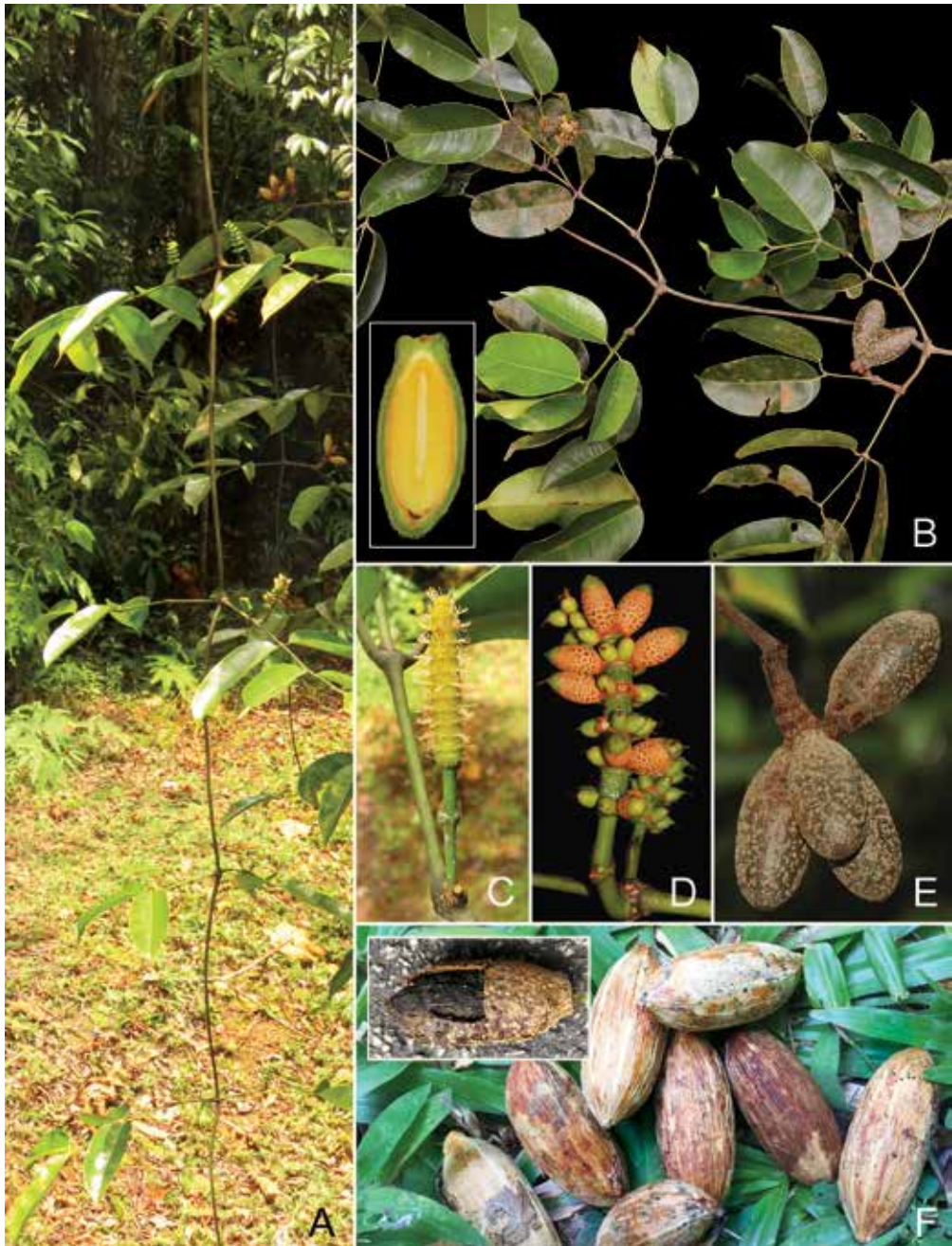


Figure 3. *Gnetum gnemonoides* Brongn. **A.** Climbing habit. **B.** Fruiting branch. Inset: Cross-section of fruit. **C.** Male reproductive spike. **D.** Immature fruit. **E.** Mature fruit. **F.** Fallen fruits. Inset: Seed with outer layer partially removed. (A–F from Singapore, Nee Soon, *Lim et al. SING2018-240*. Photos: A & C, R.C.J. Lim; B, P.K.F. Leong; B inset & D–F & F inset, X.Y. Ng).

var. *laxifrutescens* (Elmer) Markgr., Bot. Jahrb. Syst. 60(1–2) (1925) 148; Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 463, t. 7: fig. 8–10; Markgraf, Fl. Males., ser. 1, 4(3) (1951) 342, fig. 1: g. **Type:** *Elmer 12301*, Philippines, Province of Capiz, Island of Sibuyan, Magallanes, Mt Giting-Giting, April 1910 (lectotype MO [MO2246651], designated here; isolectotypes A [A00022593], B [B 10 0001483], BM [BM000795181], F [F0077223F], K [K000496108], NY [NY00001419], P [P00731187], US [US00086502]).

Gnetum kingianum Gamble, Bull. Misc. Inform. Kew 1915 (1915) 92; Ridley, Fl. Malay Penins. 5 (1925) 276. **Type:** *Ridley 9126*, Singapore, Bukit Timah, 1897 (lectotype SING [SING0226191], designated here).

Gnetum latifolium Blume f. *brachypodum* Markgr., Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 459, 462, t. 7: fig. 6. **Type:** *Elmer 15185*, Philippines, province of Sorsogon, Island of Luzon, Irosin, Mt Bulusan, November 1915 (lectotype P [P00731184], designated here; isolectotype P [P00731182]).

Gnetum latifolium Blume var. *funiculare* Markgr., Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 463; Markgraf, Fl. Males., ser. 1, 4(3) (1951) 343; Keng, Gard. Bull. Singapore 26(2) (1973) 237; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 7, fig. 7.2; Turner, Gard. Bull. Singapore 45 (1993) 21; Wong et al., Checkl. Pl. Sp. Nee Soon Swamp Forest (2013) 133, 276. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype B [B 10 0001473], designated by Khuraijam et al., Ann. Bot. Fenn. 57 (2020) 135; possible isolectotype L [L.1192749]).

Gnetum scandens auct. non Roxb.: Hooker, Fl. Brit. India 5, fasc. 15 (1888) 643.

Gnetum funiculare auct. non Buch.-Ham. ex Sm.: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 151; Ridley, J. Straits Branch Roy. Asiat. Soc. 60 (1911) 65.

Gnetum indicum auct. non (Lour.) Merr.: Merrill, Interpr. Herb. Amboin. (1917) 77, p.p.

Woody high-climbers, dioecious, stems terete, with dark brown bark. **Leaves:** petiole 1–2 cm long, adaxially deeply grooved; lamina coriaceous, elliptic, 11–20 × 5–8 cm, apex acuminate, tip to 0.5 cm long, base rounded, margin entire, dark green when mature, light red with green midrib and secondary veins when young, black when dry, secondary veins curving, not reaching the leaf margin and not clearly joining together, fibres within the leaves not always visible, glabrous above and beneath. **Male spikes** branched, to 8 cm long (exceptionally to 12 cm long), single spikes 4–5 cm long, c. 4 mm wide; collars open, 0.5–0.6 mm apart, to 3 mm across, each collar with c. 50 male reproductive units, half exserted, sterile female units conical, 6–8 per collar. **Female spikes** to 15 cm long, branched, each branch to 4 cm long; collars 3–4 mm apart, margin entire, partly covering the lower part of the unit, fertile female units 5–9 per collar, c. 4 mm long. **Seeds** in drupe-like false fruits, pink, shining, fleshy, ellipsoid, 1.5–1.6 × 0.9–1.5 cm; stalk 1–1.5 cm long when mature; the spike axis elongating to 20–30 cm long; seed broad-oblong shiny maroon, 0.9–1.9 × 0.5–1.1 mm, with a terminal acute tip.

Distribution. Thailand, Laos, Vietnam, and throughout Malesia to the Solomon Islands, except for the Lesser Sunda Islands. In Singapore, known from Pulau Ubin, Chek Jawa (*Gwee et al. GAT155*, 7 Jan 2003, SING [SING0042881]), Sumbawang (*Ridley s.n.*, 1892, SING [SING0056071]), Kranji (*Goodenough 1612*, 5 Feb 1890, SING [SING0056070]), Tanglin (*Ridley 5688*, 1893, SING [SING0011181]), and the Western Catchment (*Hassan et al. SING2010-768*, 15 Jun 2010, SING [SING0146683]).

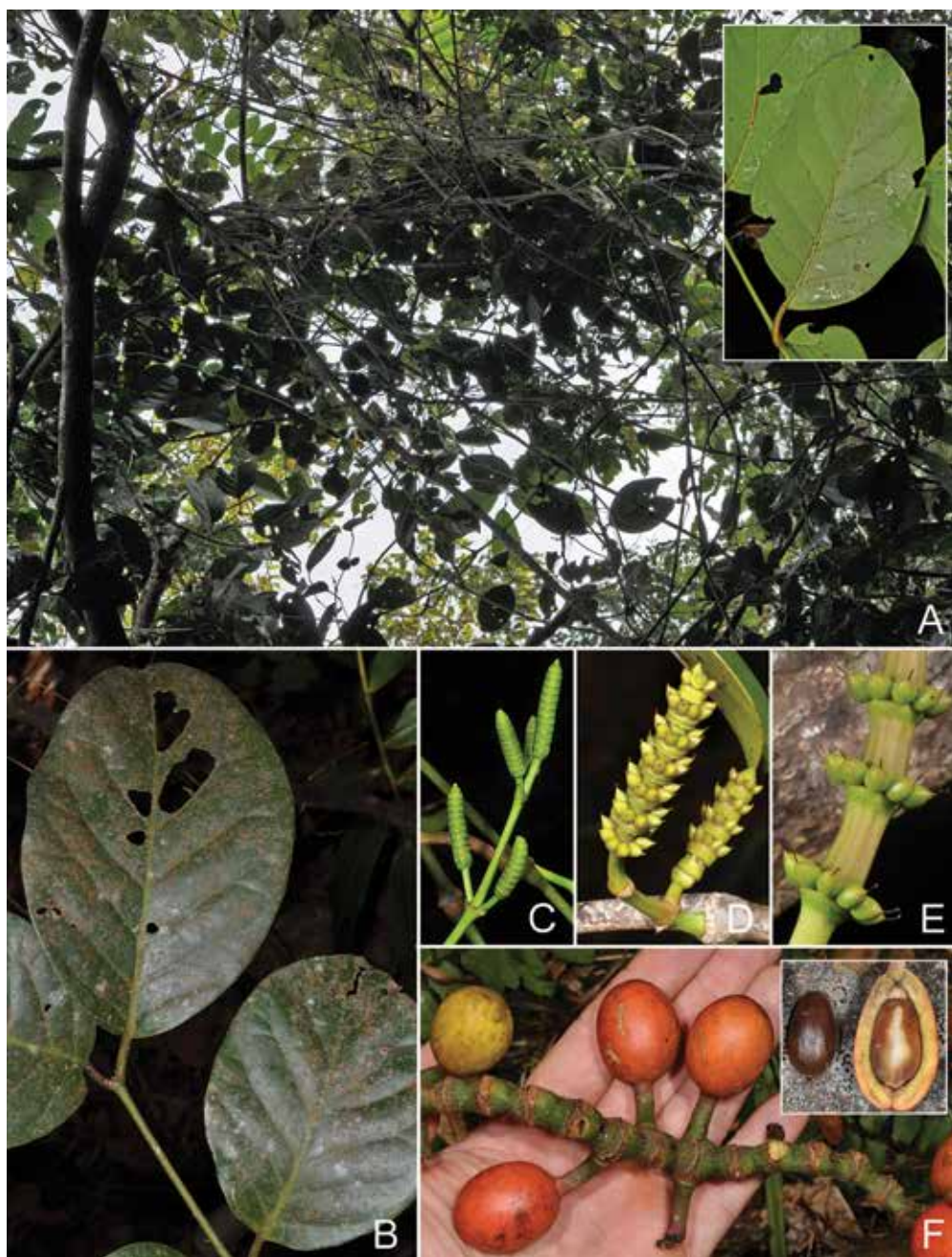


Figure 4. *Gnetum latifolium* Blume. **A.** Habit. Inset: Leaves (lower surface). **B.** Leaves (upper surface). **C.** Spikes. **D.** Female spikes. **E.** Young seeds. **F.** Mature fruit. Inset: Longitudinal section showing the seed. (A–F including insets, from the Philippines. Photos: P.B. Pelser, reproduced with kind permission).

Ecology. In lowland rain forests and degraded secondary forests. Outside Singapore, the species also occurs in submontane forests.

Conservation assessment. Globally, Least Concern (LC) (IUCN Red List, 2026). In Singapore, it is assessed as Critically Endangered (CR/D) by Middleton et al. (in Davison et al., Singapore Red Data Book, ed. 3 (2024) 465).

Notes. The name *Gnetum funiculare* Buch.-Ham. ex Sm. and the later homonym *Gnetum funiculare* Blume have been much confused in the literature. These confusions have had knock-on effects in how other names have been interpreted. The problems have been clarified by Turner & Middleton (Kew Bull. 80-403 (2025) 403–405) and implemented here.

4. *Gnetum macrostachyum* Hook.f.

(Greek, *macro* = large, *stachys* = spike; referring to the size of the fertile parts of the plant)

Fl. Brit. India 5, fasc. 15 (1888) 642; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 151; Ridley, J. Straits Branch Roy. Asiat. Soc. 60 (1911) 63; Ridley, Fl. Malay Penins. 5 (1925) 274; Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 484, t. 12: fig. 1–7; Markgraf, Fl. Males., ser. 1, 4(3) (1951) 346, fig. 1: i; Keng, Gard. Bull. Singapore 26(2) (1973) 237; Phengkklai, Fl. Thailand 2(3) (1975) 207, fig. 26; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 7; Turner, Gard. Bull. Singapore 45 (1993) 21; Turner et al., Gard. Bull. Singapore 46(2) (1995 [‘1994’]) 8; Turner et al., Gard. Bull. Singapore 48 (1998 [‘1996’]) 139; Chew et al., Gard. Bull. Singapore 49(2) (1999 [‘1997’]) 187; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 45, 98, 206; Turner & Chua, Checkl. Vasc. Pl. Sp. Bukit Timah Nat. Res. (2011) 33; Wong et al., Checkl. Pl. Sp. Nee Soon Swamp Forest (2013) 133, 276; Neo et al., Nat. Singapore 7 (2014) 103; Ho et al., Gard. Bull. Singapore 71(Suppl. 1) (2019) 64; Lindsay et al., Gard. Bull. Singapore 74(Suppl. 1) (2022) 115. **Type:** *Hullett* 55, Singapore, Changhie [Changi], March 1885 (lectotype SING [SING0051298], designated by Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 485). **Fig. 5.**

Woody high-climbers, dioecious, stems terete, with brown bark and light brown lenticels when dry. **Leaves:** petiole 0.7–1.8 cm long, glabrous, slender, dark brown, black when dry; lamina leathery, elliptic-oblong, 13–22 × 4.5–9 cm, apex distinctly mucronate, tip to 0.8–1.5 cm long, base obtuse, margin entire, brown to dark maroon when dry, secondary veins visible, curved and joining together 3–6 mm from the leaf margin. **Male spikes** solitary, axillary, simple, yellow, 3.1–5.5 cm long, 0.7–1 cm wide; collars 15–18 per spike, 0.6–0.7 mm apart, to 2 mm across, covering the male and female reproductive units, collar margin serrate, undulate; hairs in the male spike longer than the collar by up to 0.5 mm; 50–70(–80) male units and 5–14 sterile globose female units per collar. **Female spikes** solitary, axillary, simple, 0.7–1 cm long, 4–6 cm wide, opposite along the twigs; collars 15–18 per spike, collar margin serrate, undulate; hairs in the female spike longer than the collar by up to 10 mm, covering the adjacent collar; 5–8 female units per collar. **Seeds** in drupe-like false fruits, sessile, yellow to orange-yellow or red-purple, light shiny maroon when dry, seeds ellipsoid and apiculate, 1–2.2 × 1–1.4 cm.

Distribution. Continental Southeast Asia, western Malesia and New Guinea but absent from Philippines, Sulawesi, Moluccas and Lesser Sunda Islands. In Singapore, known from Changi (*Ridley* 4822, 1893, SING [SING0017605]), Lower Peirce (*Maxwell* 82-34, 9 Feb 1984, SING



Figure 5. *Gnetum macrostachyum* Hook.f. **A.** Climbing habit. **B.** Climbing stem. **C–E.** Differing stages of maturity of spikes. **F.** Mature fruit. (A–F from Thailand. Photos: S. Homhual, reproduced with kind permission).

[SING0017607], *Gwee SING2008-35a*, 26 Feb 2008, SING [SING0105437]), Siglap (*Ridley 9201*, 1898, SING [SING0017600]) and Mandai (*Gwee SING2010-288*, 2 Feb 2010, SING [SING0144519]) and many other places.

Ecology. In Singapore, recorded mainly from secondary forest habitats.

Conservation assessment. Globally, Least Concern (LC) (IUCN Red List, 2026). In Singapore, it is assessed as Critically Endangered (CR/D) by Middleton et al. (in Davison et al., Singapore Red Data Book, ed. 3 (2024) 465).

Uses. Young leaves may be eaten raw or cooked.

5. *Gnetum microcarpum* Blume

(Greek, *micros* = small, *carpos* = fruit; referring to the small fruit)

Rumphia 4, fasc. 37–40 (1849) 7, t. 175: fig. 1; Miquel, Fl. Ned. Ind. 2, fasc. 7 (1859) 1068; Ridley, J. Straits Branch Roy. Asiat. Soc. 60 (1911) 62; Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 485, t. 9: fig. 1–8; Markgraf, Fl. Males., ser. 1, 4(3) (1951) 346; Keng, Gard. Bull. Singapore 26(2) (1973) 237; Phengklai, Fl. Thailand 2(3) (1975) 208; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 7; Turner, Gard. Bull. Singapore 45 (1993) 21; Turner et al., Gard. Bull. Singapore 46(2) (1995 [‘1994’]) 8; Turner et al., Gard. Bull. Singapore 48 (1998 [‘1996’]) 139; Chew et al., Gard. Bull. Singapore 49(2) (1999 [‘1997’]) 187; Lee et al., Gard. Bull. Singapore 55 (2003) 287; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 45, 98, 206; Turner & Chua, Checkl. Vasc. Pl. Sp. Bukit Timah Nat. Res. (2011) 33; Wong et al., Checkl. Pl. Sp. Nee Soon Swamp Forest (2013) 133, 276; Neo et al., Nat. Singapore 7 (2014) 103; Ho et al., Gard. Bull. Singapore 71(Suppl. 1) (2019) 64; Lindsay et al., Gard. Bull. Singapore 74(Suppl. 1) (2022) 115. **Synonym:** *Gnetum neglectum* Blume var. *microcarpum* (Blume) Parl. in de Candolle, Prodr. 16(2), fasc. 2 (1868) 350. **Type:** *Korthals s.n.*, [Indonesia], Sumatra (lectotype L [L.1193215], designated by Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 487; isoelectotype B [B 10 0001492]). **Fig. 6.**

Gnetum apiculatum Griff., Not. Pl. Asiat. 4 (1854) 30. **Type:** *Griffith s.n.* [HEIC 4972], [Myanmar], Mergui (lectotype CAL, n.v., designated by Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 486; isoelectotypes K [K001057627], P [P00722147]).

Gnetum microcarpum Blume var. *campestre* Ridl., J. Straits Branch Roy. Asiat. Soc. 60 (1911) 62, as ‘*campestris*’. **Synonyms:** *Gnetum campestre* (Ridl.) Gamble ex Ridl., J. Fed. Malay States Mus. 7 (1916) 51; Ridley, Fl. Malay Penins. 5 (1925) 275; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1091. – *Gnetum microcarpum* Blume f. *campestre* (Ridl.) Markgr., Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 487, t. 9: fig. 1. **Type:** *Curtis 877*, [Malaysia], Penang, Government Hill, June 1886 (lectotype SING [SING0050774], designated by Turner & Chin, Asian J. Trop. Biol. 3(1) (1998) 34; isoelectotype K [K001057625]).

Gnetum microcarpum Blume var. *sylvestre* Ridl., J. Straits Branch Roy. Asiat. Soc. 60 (1911) 62, as ‘*sylvestris*’. **Synonyms:** *Gnetum sylvestre* (Ridl.) Gamble in Ridley, Fl. Malay Penins. 5 (1925) 275, nom. illeg. non Brongn. (1892). – *Gnetum microcarpum* Blume f. *sylvestre* (Ridl.) Markgr., Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 486 t. 9: fig. 2–8. **Type:** *Ridley 5862*, Singapore, Pulau Tekong, 1894



Figure 6. *Gnetum microcarpum* Blume. **A.** Climbing habit. **B.** Portion of stem. **C.** Leaves. **D.** Immature fruit. **E.** Mature fruit. (A–E from Singapore, A, Tanjong Skopek, O'Dempsey & Nur Adibah SING2019-1061; B–D, MacRitchie, Yeoh SING2012-473; E, Pulau Tekong, Gwee & Leong SING2007-243. Photos: A, T. O'Dempsey; B–D, Y.S. Yeoh; E, P.K.F. Leong).

(lectotype SING [SING0050775], designated by Turner & Chin, Asian J. Trop. Biol. 3(1) (1998) 34; isolectotype K [K001057624]).

Gnetum neglectum auct. non Blume: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 151.

Woody high-climbers, dioecious, stems terete, bark light brown. **Leaves:** petiole c. 0.5 cm long, adaxially deeply grooved; lamina fleshy, very variable in size and shape, oblong or lanceolate, 6.5–10 × 2.1–4.7 cm, apex distinctly mucronate, tip to 1.5–2 cm long, base obtuse, margin entire, shining and brown when dry, midrib prominent on the abaxial side, secondary veins not prominent and sometimes difficult to observe, curved and joining together 2–3 mm from the leaf margin. **Male spikes** solitary, axillary, simple, glabrous, yellow, erect on stalk to 1.7 cm long, fertile part 2.4–3 cm long, 4–5 mm wide; collars 11–12 per spike, c. 1 mm apart, to 2–3 mm across, male units numerous, obconic, hidden within collars; sterile female reproductive units c. 20–30 per collar, fusiform. **Female spikes** simple, erect, stalk 1.4–2 cm long, fertile part 4–5.5 cm long; female units c. 8 per collar, ovate, 3 mm long. **Seeds** in drupe-like false fruits, yellow, 2–2.3 cm long, ellipsoid; outer layer thinly fleshy, middle layer leathery, inner layer papery; seed oblong, 1.2–2.3 cm long.

Distribution. Southern Myanmar, Thailand, Peninsular Malaysia, Sumatra and Borneo. In Singapore, known from Bukit Timah (*Ridley s.n.*, 1892, SING [SING0017611]), the Central Catchment (*Lai* 232, 1 Apr 1997, SING [SING0030105]), Tengah, Labrador and many offshore islands (e.g., *Sinclair* 39002, 22 Sep 1950, SING [SING0017613]; *Gwee* SING2007-405, 3 Aug 2007, SING [SING0095145]; *Lua* SING2010-808, 13 Jul 2010, SING [SING0146714]).

Ecology. Tropical lowland forests, forest margins and beach vegetation.

Conservation assessment. Globally, Least Concern (LC) (IUCN Red List, 2026). In Singapore, it is assessed as Endangered (EN/D) by Middleton et al. (in Davison et al., Singapore Red Data Book, ed. 3 (2024) 465).

Notes. In Markgraf (Fl. Males., ser. 1, 4(3) (1951) 346) two forms are recognised based on leaf shape. The species is very variable and although the difference in leaf shape between the two forms is somewhat discernible, across a wider range of morphological characters, there is a considerable overlap in all characters. In this treatment, varieties and forms are not recognised and instead only *Gnetum microcarpum* at the rank of species is recognised. Further studies using a combined morphological and molecular approach should be undertaken to clarify the phylogeny and classification of this species.

Markgraf (Bull. Jard. Bot. Buitenzorg, sér. 3, 10 (1930) 487) typified *Gnetum microcarpum* var. *campestre* with the collection *Wray* 3783 without specifying a herbarium. However, this collection is not one of the several collections listed in the protologue. Therefore, the later lectotypification by Turner & Chin (Asian J. Trop. Biol. 3(1) (1998) 34) must be followed.