

GNETACEAE买麻藤科 *mai ma teng ke*Fu Ligu (傅立国 *Fu Li-kuo*)¹, Yu Yongfu (于永福)²; Michael G. Gilbert³

Vines evergreen, woody, less often erect shrubs or trees, dioecious or sometimes monoecious; stems with swollen nodes. Leaves opposite, petiolate, without stipules, simple, pinnately veined, margin entire. Flowers unisexual, borne in whorled, spikelike cones (here termed “spikes”), arranged in lax, dichasial cymes. Cymes terminal or lateral, sometimes arranged in dense, cauliflorous clusters on old stems. Spikes with many cupular to almost flat, annular, involucrell collars, each formed by the fusion of a whorl of bracts. Male spikes with collars closely arranged and \pm hiding axis (less often somewhat laxly arranged), each collar with 20–80 flowers, often also with a whorl of sterile female flowers, apical whorl with sterile female flowers only; male flowers with a cupular, succulent false perianth, usually \pm obconical; stamens 2, filaments fused, exerted from false perianth; anthers opening by a common, apical slit, pollen rounded, with minute projections. Female spikes solitary or several in a panicle, often cauliflorous; involucrell collars widely separated, each with 4–12 flowers; female flowers with a false perianth tightly enclosing ovule; ovule 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 drupelike, enclosed in a red, orange, or yellow, fleshy (rarely corky) false seed coat; female gametophyte tissue copious, succulent. Cotyledons 2. Germination epigeal.

One genus and about 40 species: mostly tropical and subtropical Asia, fewer species in W Africa and NW South America; nine species (six endemic) in China.

Following common convention, the strictly flowering plant terms inflorescence, flower, fruit, stamen, filament, and anther are used here to avoid unwieldy descriptions.

Cheng Ching-yung. 1978. Gnetaceae. *In*: Cheng Wan-chün & Fu Li-kuo, eds., *Fl. Reipubl. Popularis Sin.* 7: 490–504.

1. GNETUM Linnaeus, Syst. Nat., ed. 12, 2: 612, 637; Mant. Pl. 1: 18, 125. 1767.买麻藤属 *mai ma teng shu*

Morphological characters and geographical distribution are the same as those of the family.

Gnetum cleistostachyum C. Y. Cheng, in W. C. Cheng & al., *Acta Phytotax. Sin.* 13(4): 88. 1975, was described from SE Yunnan (Hekou Yaozu Zizhixian), but the name is invalid because the protologue indicated two collections (male and female) as types. It was based on material just at the start of anthesis, with rather deep, \pm urceolate involucrell collars tightly enclosing the flowers. Very little material of other species, at a similar developmental stage, was available for comparison, and it seems advisable to postpone validating this name until more complete collections, particularly with seeds, can be studied.

The name *Gnetum indicum* (Loureiro) Merrill *Interpr. Herb. Amboin.* 77. 1917, based on *Abutua indica* Loureiro (*Fl. Cochinch.* 630. 1790), has been applied in the sense of *G. montanum*, but may in fact be the correct name for *G. parvifolium*. The taxonomic identity of *G. indicum* has often been questioned, and many herbaria followed F. Markgraf (*Bull. Jard. Bot. Buitenzorg, sér. 3, 10: 406. 1930*), who dismissed it as being of uncertain application and placed most material so named in his new species, *G. montanum*. Type material of Loureiro’s original species is available, including part of a seed not seen by Markgraf, which shows that it is not the same as *G. montanum*, even in the very wide sense used by Markgraf, but closely resembles the species widely known as *G. parvifolium* (in the sense of which it has never been used). In order to prevent the name *G. parvifolium* from being displaced, it seems best to follow Markgraf and formally propose that *A. indica* be rejected. It is also necessary to conserve, by lectotypification, the current application of *G. montanum* (see below).

Many species are used in a variety of ways: the bark provides a strong fiber used for making ropes and nets; the sap flows very freely from cut stems and can be drunk to quench thirst; the young leaves of some species are used as a green vegetable; and the seeds are roasted and eaten (the outer, fleshy layer contains irritant, needlelike crystals, and is not generally eaten).

Key based on male plants

- 1a. Shrubs or small trees; leaves drying yellowish; spikes often very lax with axis visible between involucrell collars 9. *G. gnemon*
- 1b. Vines; leaves drying dark green to brown or black; spikes always very dense with axis concealed by involucrell collars and flowers.
- 2a. Flowers immersed in dense cushion of basal hairs.
- 3a. Male flowers (20–)25–45 per involucrell collar 3. *G. montanum*
- 3b. Male flowers (40–)50–80(–90) per involucrell collar.
- 4a. Male spikes each with 9–11 involucrell collars 8. *G. luofuense*
- 4b. Male spikes each with 12–20 involucrell collars.
- 5a. Sterile female flowers 15–20(–30) per involucrell collar 7. *G. hainanense*

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- 5b. Sterile female flowers 10–14 per involucre collar 2. *G. gracilipes*
 2b. Flowers with few, inconspicuous, basal hairs.
 6a. Male spikes each with 5–10(–12) involucre collars; leaf blade 2.5–10(–13) cm 5. *G. parvifolium*
 6b. Male spikes each with (9 or) 10–25 involucre collars; leaf blade 8.5–18(–20) cm.
 7a. Inflorescence laxly paniculate with 3 or 4 levels of branching and 5 or more spikes 1. *G. pendulum*
 7b. Inflorescence simple, or once branched so as to have 3 spikes.
 8a. Leaf blade ovate or oblong-ovate to oblong, lateral veins 7–10 on each side, slender but conspicuous, apex shortly acuminate 4. *G. catasphaericum*
 8b. Leaf blade oblong-elliptic or oblong, lateral veins 5–7 on each side, obscure, apex rounded to bluntly apiculate 6. *G. giganteum*

Key based on female plants

- 1a. Shrubs or small trees; leaves drying yellowish; seed coat usually velvety, rarely glabrous 9. *G. gnemon*
 1b. Vines; leaves drying dark green to brown or black; seed coat glabrous or with minute, silvery scales.
 2a. Seeds clearly stipitate, stipe much longer than thick.
 3a. Seeds 3–4 cm 1. *G. pendulum*
 3b. Seeds (1–)1.2–2.5(–3) cm.
 4a. Seed stipe 1.5–2.5 cm 2. *G. gracilipes*
 4b. Seed stipe 0.2–0.6 cm.
 5a. Seed cylindrical-ovoid or cylindrical, 0.65–0.9(–1.2) cm wide 3. *G. montanum*
 5b. Seed broadly ellipsoid to subglobose, 1.4–2 cm wide 4. *G. catasphaericum*
 2b. Seeds sessile or subsessile with stipe ca. as long as wide.
 6a. Seeds 3–4 × 1.8–2.2 cm.
 7a. Female spikes with 12–21 involucre collars, 1.5–2.5 cm apart in fruit, each subtending 10–12 flowers 1. *G. pendulum*
 7b. Female spikes with 8–11 involucre collars, to 3 cm apart in fruit, each subtending 6–12 flowers 6. *G. giganteum*
 6b. Seeds (1–)1.2–2.8 × (0.4–)0.5–1.6 cm.
 8a. Seeds 1.1–1.6 cm wide.
 9a. Seeds (1.5–)1.9–2.1(–2.5) × 1.1–1.4(–1.6) cm, thinly fleshy, base rounded, apparent stipe not formed or very indistinct 7. *G. hainanense*
 9b. Seeds 2.4–2.8 × 1.5–1.6 cm, very fleshy, base often contracted into an apparent stipe as long as wide when dried 8. *G. luofuense*
 8b. Seeds (0.4–)0.5–0.9(–1.2) cm wide.
 10a. Seeds (1.3–)1.6–2.2 × (0.4–)0.5–0.8(–1) cm, 2–3.2 × as long as wide, surface longitudinally striate when dried 5. *G. parvifolium*
 10b. Seeds (1–)1.2–1.5(–2) × 0.65–0.9(–1.2) cm, 1.6–1.85 × as long as wide, surface smooth or ± longitudinally wrinkled when dried, sometimes covered with silvery scales 3. *G. montanum*

1. *Gnetum pendulum* C. Y. Cheng in W. C. Cheng & al., Acta Phytotax. Sin. 13(4): 88. 1975.

垂子买麻藤 *chui zi mai ma teng*

Gnetum montanum Markgraf f. *megalocarpum* Markgraf; *G. pendulum* f. *subsessile* C. Y. Cheng.

Vines large; bark grayish brown, lenticels conspicuous. Petiole to 1.5 cm; leaf blade narrowly oblong to oblong-ovate, 10–18 × 4–7 cm, leathery, lateral veins 8–10 on each side, base rounded to broadly cuneate, apex acute to acuminate. Male inflorescences terminal, lax, branched 3 or 4 times; male spikes 5 or more, 1–1.5 cm × 3–4 mm, involucre collars each with 45–70 flowers

plus 14–16 sterile female flowers, basal hairs very few, short. Female inflorescences once branched, rarely simple; female spikes with 12–21 involucre collars, each collar 1.5–2.5 cm apart in fruit, rachis 3–4 mm thick, nodes each with 10–12 female flowers. Seeds elongate-ellipsoid, 3–4 × ca. 1.8 cm, base usually attenuate into a stipe, rarely subsessile, apex obtuse or abruptly pointed, outer coat smooth or irregularly and ± longitudinally wrinkled; stipe 2–3 cm × 2–3 mm, usually curved so that seed is drooping.

• Forested mountain slopes and valleys; 200–2100 m. Guangxi, SE Guizhou, SE Xizang (Motuo Xian), S Yunnan.

Apparently closely related to the widespread and variable species *Gnetum latifolium* Blume (from India, Indo-China, and Malesia), differing only by the larger fruits (2–3(–3.5) × 1–1.5 cm in *G. latifolium*). These differences are comparable to those between the described varieties of *G. latifolium*, but the status of these is uncertain, as is that of the described forms of *G. pendulum* with shorter stalked seeds. It seems best, therefore, to maintain the status quo until the pattern of variation has been investigated within the complex as a whole. This will require field population studies. The name *G. pendulum* f. *intermedium* C. Y. Cheng, accepted in FRPS but treated here as a synonym of *G. pendulum*, is invalid because two types (male and female) were designated in the protologue (in W. C. Cheng & al., Acta Phytotax. Sin. 13(4): 88. 1975).

2. *Gnetum gracilipes* C. Y. Cheng in W. C. Cheng & al., Acta Phytotax. Sin. 13(4): 88. 1975.

细柄买麻藤 xi bing mai ma teng

Vines; old branches usually gray. Petiole slender, ca. 1 cm; leaf blade narrowly oblong or narrowly elliptic, sometimes elliptic, 6–15 × 2–5.5 cm, leathery or nearly so, base cuneate or sometimes rounded, apex shortly acuminate or acute. Male inflorescences once branched, occasionally twice; male spikes with 12–16 involucrell collars, each collar with 50–60 flowers plus 10–14 sterile female flowers, basal hairs forming a dense cushion. Female inflorescences axillary, unbranched, short and thick when ripe; female spikes with involucrell collars 6–10 mm apart. Seeds broadly ellipsoid or oblong-ellipsoid, 2.5(–3) × 1.5–1.6 cm, base cuneate into a stipe, apex acute or subacute, outer coat thin and smooth; stipe 1.5–2.5 cm × ca. 2 mm, with inconspicuous, longitudinal grooves.

• Mountain slopes. S Guangxi (Shangsi Xian), SE Yunnan (Xichou Xian).

Shows many similarities to the rather poorly known *Gnetum latifolium* Blume var. *longipes* (Markgraf) Hiep, from Cambodia, New Guinea, the Philippines, and probably Vietnam, and may indeed prove to be the same taxon. The information available suggests that there is a discontinuity between *G. latifolium* var. *longipes* and other varieties of *G. latifolium*, and so the Chinese taxon is here treated as a distinct species.

3. *Gnetum montanum* Markgraf, Bull. Jard. Bot. Buitenzorg, sér. 3 10: 406. 1930.

买麻藤 mai ma teng

Vines to more than 10 m tall; branchlets orbicular or compressed orbicular in cross section, smooth, sometimes wrinkled longitudinally. Petiole 0.8–1.5 cm; leaf blade usually oblong, sometimes oblong-lanceolate or elliptic, 10–25 × 4–11 cm, leathery or nearly so, lateral veins 8–13 on each side, base rounded or broadly cuneate, apex obtuse to acute. Male inflorescences lax, once or twice branched, 2.5–6 cm; peduncle 6–12 mm; male spikes 2–3 cm × 2.5–3 mm, involucrell collars 13–18, each collar with (20–)25–45 flowers plus 10–15 sterile female flowers, basal hairs forming a dense, short cushion. Female inflorescences lateral, solitary or fascicled, main axis thin, with 3 or 4 pairs of branches;

peduncle 2–3 cm; female spikes 2–3 cm × ca. 4 mm, enlarging to ca. 10 cm when mature, nodes each with 5–8 female flowers, basal hairs sparse, short. Seeds yellowish brown or reddish brown, cylindrical-ovoid or cylindrical, (1–)1.2–1.5(–2) cm × 6.5–9(–12) mm, 1.6–1.85 × as long as wide, base rounded, sometimes contracted into a stipe to 3(–5) mm, outer coat smooth or ± longitudinally wrinkled when dried, sometimes covered with silvery scales. Pollination Apr–Jun, seed maturity Aug–Oct.

Forests; 200–2700 m. Guangdong, Guangxi, ?Hainan, S Yunnan [Bhutan, India, Laos, Myanmar, Sikkim, Thailand, Vietnam].

There has been some uncertainty in the exact application of this name due at least in part to the material listed by Markgraf in the protologue being heterogeneous (there are 41 syntypes), including both this taxon and *Gnetum latifolium* Blume. The name has also been used in SE China, especially Hongkong, for material of *G. luofuense*. *Gnetum montanum* is best characterized by the few-flowered male involucrell collars and the relatively small, distinctly stipitate seeds.

The fibers from the bark of the stem are used in making gunny bags, fishing nets, and ropes; the seeds yield an edible oil, are eaten fried, and are used for making wine; the sap is used as a cold drink.

4. *Gnetum catasphaericum* H. Shao, Guihaia 14: 297. 1994.

球子买麻藤 qiu zi mai ma teng

Vines woody, to 10 m. Petiole slender, 5–10 mm; leaf blade glossy, ovate or oblong-ovate to oblong, 8.5–15(–20) × 5–8 cm, thickly leathery, lateral veins 7–10 on each side, slender but conspicuous, base broadly cuneate to rounded, apex shortly acuminate. Male inflorescences apical on young stems, simple or once branched; male spikes ca. 2 cm, involucrell collars 10–14, each collar with 55–70 flowers plus 7–13 sterile female flowers, basal hairs very few, long, multicellular. Female inflorescences once or twice branched, thick stemmed; female spikes with involucrell collars 6–10 mm apart, nodes each with 5 or 6 female flowers. Seeds reddish brown, broadly ellipsoid to subglobose, 1.8–2.2 × 1.4–2 cm, base rounded, abruptly contracted into a slender stipe 2–6 mm, apex obtuse. Pollination Apr–May, seed maturity Sep–Dec.

• Forests. S Guangxi (Shangsi Xian), Yunnan.

No material has been seen by the authors.

5. *Gnetum parvifolium* (Warburg) Chun, Acta Phytotax. Sin. 9: 386. 1964.

小叶买麻藤 xiao ye mai ma teng

Gnetum scandens Roxburgh var. *parvifolium* Warburg, Monsunia 1: 196. 1900; *Gnetum indicum* (Loureiro) Merrill f. *parvifolium* (Warburg) Masamune; *G. montanum* Markgraf f. *parvifolium* (Warburg) Markgraf.

Vines to 12 m, usually thin and weak; bark pale or grayish brown, lenticels usually relatively conspicuous. Petiole 5–8 (–10) mm; leaf blade elliptic to narrowly so, or obovate, 2.5–10(–13) × 1.5–5 cm, leathery, lateral

veins 5–8(–11) on each side, base cuneate to subrounded, apex acute or attenuate, sometimes obtuse. Male inflorescences simple or once branched, branches ternate or in 2 pairs; peduncle slender, 0.5–1.5 cm; male spikes 0.8–1.2(–1.5) cm × 2–3 mm, involucre collars 5–10(–12), each collar with 40–70 flowers plus 10–12 sterile female flowers, basal hairs few, brown, short. Female inflorescences usually borne on old branches, once branched, rarely simple, 10–15 cm in fruit, axis 2–3 mm thick; peduncle 1.5–2 cm; female spikes with involucre collars 6–9 mm apart, nodes each with 5–8 female flowers, basal hairs brown, short. Seeds sessile or nearly so, red, elongate ellipsoid or fusiform to narrowly oblong-obovoid, (1.3–)1.6–2.2 cm × (4–)5–8(–10) mm, 2–3.2 × as long as wide, apex usually with a small, pointed head, outer coat thin, longitudinally striate when dried. Pollination Apr–Jul, seed maturity Jul–Nov.

Forests; 100–1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi [Laos, Vietnam].

Female material from Hainan has been named as *Gnetum formosum* Markgraf (which is known with certainty only from Vietnam). However, it does not differ significantly from plants of *G. parvifolium* occurring elsewhere in China. Vietnamese material of *G. formosum*, including the type of that name, seems to differ from *G. parvifolium* in its larger leaves, longer male spikes, and even more slender fruits, ca. 3 × as long as wide.

The fibers from the bark are used in Guangdong to make ropes; the seeds yield edible oil and are eaten fried.

6. *Gnetum giganteum* H. Shao, Guihaia 14: 298. 1994.

巨子买麻藤 *ju zi mai ma teng*

Vines woody, to 15 m. Petiole slender, 1–1.2 cm; leaf blade oblong-elliptic or oblong, 9–11 × 5–6 cm, lateral veins 5–7 on each side, slender, obscure, base rounded, apex rounded to bluntly apiculate. Male inflorescences terminal on young stems, simple or once branched; male spikes ca. 5 mm thick, involucre collars 10–12, ± patent at pollination, each collar with 60–75 flowers plus up to 26 sterile female flowers, basal hairs very few, brown, short. Female inflorescences simple or once branched; female spikes with 8–11 involucre collars, each collar to 3 cm apart in fruit, nodes each with 6–12 female flowers, basal hairs dense, multicellular. Seeds sessile, broadly ellipsoid, 3–3.2 × 1.8–2.2 cm, base and apex rounded. Pollination Apr–Jun, seed maturity Sep–Oct.

• Forests. Guangxi.

No material has been seen by the authors.

7. *Gnetum hainanense* C. Y. Cheng ex L. K. Fu & al., Novon 9: 187. 1999.

海南买麻藤 *hai nan mai ma teng*

Vines slender, fragile. Petiole 0.8–1.2 cm; leaf blade glossy, oblong-elliptic or oblong-ovate, 10–15(–30) ×

3–7.5 cm, leathery, lateral veins 6–8 on each side. Male inflorescences simple or once branched; male spikes 1.5–3 cm × 3–4 mm, involucre collars 12–20, each collar with (40–)60–80(–90) flowers plus 15–20(–30) sterile female flowers, basal hairs forming a dense cushion. Female inflorescences borne on old branches, axillary, once branched, 10–15 cm in fruit; female spikes with 10–20 involucre collars, rachis thick, nodes each with 8 or 9 female flowers. Seeds sessile or nearly so, red, cylindrical to broadly ellipsoid, (1.5–)1.9–2.1(–2.5) × 1.1–1.4(–1.6) cm, thinly fleshy, base rounded, apex acute or with a small, pointed head in center, outer coat ± smooth when dried. Pollination Feb–Jul, seed maturity Jul–Dec.

• Forests; 100–900 m. S Fujian (Zhao'an Xian), Guangdong, Guangxi, Guizhou, Hainan, SE Yunnan (Funing Xian).

This name was invalid as originally described (C. Y. Cheng in W. C. Cheng & al., Acta Phytotax. Sin. 13(4): 88. 1975) because two types (male and female) were designated.

8. *Gnetum luofuense* C. Y. Cheng in W. C. Cheng & al., Acta Phytotax. Sin. 13(4): 89. 1975.

罗浮买麻藤 *luo fu mai ma teng*

Vines; bark purplish brown, lenticels shallow, obscure. Petiole 8–10 mm; leaf blade oblong or oblong-ovate, 10–18 × 5–8 cm, papery or ± leathery, lateral veins 9–11 on each side, conspicuous, angled at 70–90° to midvein, base rounded or broadly cuneate, apex shortly acuminate. Male inflorescences simple or once branched; male spikes ca. 2.7 cm × 3.5 mm, involucre collars 9–11, each collar with 75–80 flowers plus 9–11 sterile female flowers, basal hairs forming a dense, brown cushion. Female inflorescences borne on old branches, axillary, simple or once branched; female spikes with 10–15 involucre collars, each collar 5–6 mm apart in fruit, nodes each with 10–13 female flowers. Seeds cylindrical to cylindrical-ellipsoid, 2.4–2.8 × 1.5–1.6 cm, very fleshy, base often contracted into an apparent stipe as long as wide when dried, apex subacute, outer coat coarsely reticulate-wrinkled when dried. Pollination May–Jul, seed maturity Aug–Oct.

• Forests; ca. 500 m. Fujian (Longyan, Nanping Shi), Guangdong (Gaoyao Xian, Hongkong, Luofu Shan), S Jiangxi (Xunwu Xian). The spelling "*luofuense*" was used in the protologue immediately above the diagnosis, whereas the accompanying key and illustration, and subsequent account by the same author in FRPS, used the spelling "*lofuense*." The type locality was given in the protologue as "Luofu Shan"; the alternative "Lofu Shan" is Cantonese rather than Mandarin.

9. *Gnetum gnemon* Linnaeus, Syst. Nat., ed. 12, 2: 637; Mant. Pl. 1: 125. 1767.

灌状买麻藤 *guan zhuang mai ma teng*

Shrubs or small trees; bark grayish; crown narrow; branches becoming vinelike, green or yellowish green. Petiole 0.5–1.8 cm; leaf blade drying yellowish green,

elliptic or oblong, $7.5\text{--}20 \times 2.5\text{--}10$ cm, leathery or membranous, lateral veins inconspicuous, curved, base attenuate into petiole, apex acuminate or cuspidate. Male inflorescences axillary, solitary, simple or once branched; male spikes $(1\text{--})3\text{--}6$ cm \times $2.5\text{--}3$ mm, involucre collars clearly separated, to 1 cm apart, each collar with 50–80 flowers plus 5–15 globose sterile female flowers, basal hairs inconspicuous. Female inflorescences similar to male; nodes each with 5–8 female flowers. Seeds sessile or nearly so, yellow to orange-yellow or pink, ellipsoid, $1\text{--}2.5$ ($\text{--}3.5$) \times 0.9 ($\text{--}1.5$) cm, longitudinally ribbed, surface usually velvety, apex mucronate.

SE Xizang, W Yunnan (Yingjiang Xian) [India, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam; Pacific Islands].

No voucher specimens have been seen by the authors but the species is very distinctive: the erect habit, yellow-green dried leaves, and lax male spikes immediately distinguish it from all other species in the area, and it is reasonable to accept these determinations. The species is widely cultivated in SE Asia and is to be expected in S China. F. Markgraf (Bull. Jard. Bot. Buitenzorg, sér. 3, 10: 436–445. 1930) recognized several infraspecific taxa but the authors prefer not to use any of these without having seen the relevant material.

