

## 67. GASTRODIA R. Brown, Prodr. 330. 1810.

天麻属 tian ma shu

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*Epiphanes* Blume.

Herbs terrestrial, leafless, holomycotrophic. Rhizomes horizontal, tuberous, cylindrical, sometimes slightly coralloid, slightly fleshy, usually densely noded. Inflorescence erect, terminal, noded below middle, nodes with tubular or scalelike sheaths, glabrous, yellowish brown or dull brown, usually few to many flowered, rarely 1-flowered, sometimes elongating in fruit. Flowers spreading or nodding, campanulate, urceolate, or cylindrical, resupinate or not, cream-brown, yellowish brown, or dull brown, occasionally greenish brown, lip often lighter brown and sometimes with orange markings; pedicel usually elongating in fruit. Sepals and petals united and forming a perianth tube, only apical portions free; perianth tube sometimes dilated and saccate at base, sometimes with a deep sinus between lateral sepals, outer surface often verrucose; petals much smaller than sepals; lip enclosed within perianth tube, adnate to apex of column foot, usually small, usually clawed at base, simple or 3-lobed; disk with a pair of globose calli at base. Column elongate, with a short but distinct column foot at base, winged toward apex, sometimes with a pair of toothlike projections at apex; anther borne on a filament, large, subterminal, incumbent; pollinia 2, granular-farinaceous, usually composed of friable massulae, without caudicles; stigma raised, shield-shaped. Capsule erect.

About 20 species: from NE India through the E Himalayas, across S China to Japan and E Siberia, throughout SE Asia to E Australia and the SW Pacific islands, also in tropical Africa, Madagascar, and the Mascarene Islands; 15 species (nine endemic) in China.

- 1a. Plants 2–15 cm tall in flower; perianth tube campanulate.
  - 2a. Outer surface of perianth tube smooth ..... 11. *G. pubilabiata*
  - 2b. Outer surface of perianth tube verrucose.
    - 3a. Disk of lip with 6–8 parallel ridges ..... 12. *G. fontinalis*
    - 3b. Disk of lip unadorned or with a single forked, fleshy keel.
      - 4a. Lip 3-lobed, lateral lobes papillose; disk with a forked, fleshy keel ..... 15. *G. shimizuana*
      - 4b. Lip simple, glabrous; disk unadorned.
        - 5a. Column with an elongate, forked appendage on ventral surface ..... 13. *G. appendiculata*
        - 5b. Column lacking an appendage ..... 14. *G. confusa*
- 1b. Plants 10–100 cm tall in flower; perianth tube cylindrical or urceolate.
  - 6a. Perianth tube cylindrical, lacking a deep sinus between lateral sepals.
    - 7a. Perianth tube 16–18 mm; lobes of perianth tube not crisped ..... 10. *G. longitubularis*
    - 7b. Perianth tube 5–12 mm; lobes of perianth tube crisped.
      - 8a. Lip shallowly 3-lobed; disk with a fleshy longitudinal ridge ..... 7. *G. menghaiensis*
      - 8b. Lip simple, unadorned.
        - 9a. Lip connate with perianth tube for most of its length ..... 8. *G. peichatieniana*
        - 9b. Lip free of perianth tube ..... 9. *G. wuyishanensis*
  - 6b. Perianth tube urceolate, inflated at base, with a deep sinus between lateral sepals.
    - 10a. Disk of lip rugose and thickened, but without ridges, lamellae, or calli ..... 1. *G. javanica*
    - 10b. Disk of lip with longitudinal ridges, lamellae, or calli.
      - 11a. Disk of lip with a pair of fleshy reniform calli.
        - 12a. Rachis subdensely to densely 20–50-flowered; lip obscurely 3-lobed, apical margin irregularly fimbriate; claw with a pair of gibbous foldings ..... 5. *G. elata*
        - 12b. Rachis 7–20-flowered; lip simple, apical margin entire; claw with a pair of ellipsoid calli ..... 6. *G. flavilabella*
      - 11b. Disk of lip with longitudinal ridges or lamellae.
        - 13a. Lip obscurely 3-lobed; disk with 4 longitudinal ridges ..... 2. *G. tuberculata*
        - 13b. Lip simple; disk with 2 longitudinal lamellae or ridges.
          - 14a. Lip ovate-triangular, 5–6 mm, slightly papillose ..... 3. *G. gracilis*
          - 14b. Lip oblong-rhombic, ca. 15 mm, glabrous ..... 4. *G. angusta*

**1. *Gastrodia javanica*** (Blume) Lindley, Gen. Sp. Orchid. Pl. 384. 1840.

南天麻 nan tian ma

*Epiphanes javanica* Blume, Bijdr. 421. 1825; *Gastrodia lutea* Fukuyama; *G. stapfii* Hayata.

Plants 20–80 cm tall. Rhizome cylindrical, subterete, 3–15 cm, ca. 1 cm in diam., fleshy, densely noded. Peduncle dull brown, to 60 cm, with scattered scales toward base; rachis 5–20 cm, laxly 4–18-flowered; floral bracts triangular, 3–4 mm. Flowers spreading, not resupinate, pale yellowish beige to yellowish green, lip yellowish green at base and flushed yellow at apex; pedicel and ovary 5–6 mm; pedicel not elongating in

fruit. Perianth tube urceolate, ca. 10 × 13 mm, with sinus between lateral sepals extending almost to base, base inflated, outer surface smooth; free portion of sepals broadly ovate-orbicular, 2.5–3 mm, apex obtuse; free portion of petals ovate, slightly smaller than sepal lobes, apex obtuse; lip exposed by deep sinus in perianth tube, simple, rhombic-ovate, 5–7 × 5–6 mm, glabrous, base clawed, margin involute, apex acute; claw 3–4 mm, with a pair of calli; disk rugose and thickened. Column 6–8 mm, with a pair of narrow wings, yellowish white; column foot prominent, ca. 3 mm; anther ovoid. Capsule cylindrical, ca. 20 mm. Fl. Jun–Jul.

Forests. N Fujian, S Taiwan [Indonesia, Japan (Ryukyu Islands), Malaysia, Philippines, Thailand].

**2. *Gastrodia tuberculata*** F. Y. Liu & S. C. Chen, Acta Bot. Yunnan. 5: 76. 1983.

疣天麻 you tian ma

Plants 24–35 cm tall. Rhizome ovoid or obconic, 3–6 cm, stout, 1.5–2.8 cm in diam., fleshy, sparsely papillose, densely noded, with small scales at nodes. Peduncle 18–25 cm, with white longitudinal stripes, fleshy, with several sheaths at base; sheaths 7–12 mm; rachis 4–7 cm, laxly 2–10-flowered; floral bracts lanceolate, 5–8 mm. Flowers suberect, resupinate, whitish with greenish gray stripes; pedicel and ovary 6–7 mm, sparsely papillose. Perianth tube urceolate, 11–13 × 5–6 mm, with a deep sinus between lateral sepals, base inflated; free portion of sepals subovate to broadly ovate-triangular, 2–2.5 mm, outer surface smooth but minutely papillose, apex obtuse; free portion of petals broadly ovate, 1–1.5 mm, apex acute; lip obscurely 3-lobed, triangular-ovate, 6–8 × ca. 4 mm, glabrous, base shortly clawed, margin irregularly erose at apex, apex acute; claw 1.5–2 mm, with a pair of calli; disk with 4 fleshy, tuberculate, longitudinal ridges extending from base to apex. Column 7–8 mm, with a pair of toothlike projections at apex; column foot short. Capsule obovoid-ellipsoid, 11–13 × 6–7 mm. Fl. and fr. Mar–Apr.

• Bamboo forests, forest margins; 1900–2300 m. C Yunnan.

**3. *Gastrodia gracilis*** Blume, Mus. Bot. 2: 174. 1856.

细天麻 xi tian ma

*Gastrodia dioscoreorrhiza* Hayata; *G. taiwaniana* Fukuyama.

Plants 10–60 cm tall. Rhizome brown, cylindrical or conic, 3–10 cm, 0.3–2 cm in diam., fleshy, pilose. Peduncle pale yellow, to 50 cm, with several scattered scales at base; rachis 3–10 cm, densely 3–20-flowered; floral bracts ovate or elliptic, 2–4 mm. Flowers nodding, resupinate, yellowish brown, lip flushed orange-red toward apex; pedicel and ovary 8–15 mm; pedicel elongating to 15 cm in fruit. Perianth tube urceolate, 8–11 × 5–7 mm, with a deep sinus between lateral sepals, base inflated, outer surface smooth; free portion of sepals ovate, ca. 2 mm, apex rounded and usually 3-lobed; free portion of petals ovate, much shorter than sepal lobes; lip simple, ovate-triangular, 5–6 mm, base clawed, margin undulate, apex obtuse; claw with a pair of ellipsoid or subglobose calli; disk with 2 longitudinal lamellae, slightly papillose. Column 5–6 mm, with a pair of

semilunar wings toward apex; column foot prominent; anther orbicular, ca. 1 mm. Capsule obovoid or ellipsoid, 20–23 × 7–8 mm. Fl. May–Jun.

Forests; 600–1500 m. C and N Taiwan [Japan].

**4. *Gastrodia angusta*** S. Chow & S. C. Chen, Acta Bot. Yunnan. 5: 363. 1983.

原天麻 yuan tian ma

Plants 40–60(–80) cm tall. Rhizome grayish white, ellipsoid-fusiform, 5–10(–15) cm, stout, 3–5 cm in diam., densely noded, fleshy, with scales at nodes. Peduncle 25–35 cm, with a few scattered scales at base; rachis 15–25 cm, 20–30-flowered; floral bracts elliptic, 7–8 mm, much shorter than ovary, apex acuminate. Flowers suberect, resupinate, cream-white; pedicel and ovary 10–12 mm. Perianth tube urceolate, 10–12 mm, with a deep sinus between lateral sepals, base inflated, outer surface smooth; free portion of dorsal sepal ovate to suborbicular, ca. 3 mm, margin involute, apex obtuse; free portion of lateral sepals obliquely triangular, 6–7 mm, margin involute, apex obtuse to acute; free portion of petals concave, ovate, ca. 2.5 mm, apex obtuse to acute; lip simple, oblong-rhombic, ca. 15 × 5–6 mm, glabrous, base shortly clawed, margin erose toward apex; claw with a pair of lunar calli at base; disk with 2 yellowish, slightly raised longitudinal ridges. Column 7–8 mm; column foot short; stigma linear, narrow. Capsule obovoid, ca. 20 × 7–8 mm. Fl. and fr. Mar–Apr.  $2n = 36^*$ .

• 1600–1800 m. NW and SE Yunnan.

**5. *Gastrodia elata*** Blume, Mus. Bot. 2: 174. 1856.

天麻 tian ma

*Gastrodia elata* f. *alba* S. Chow; *G. elata* f. *flavida* S. Chow; *G. elata* f. *glauca* S. Chow; *G. elata* var. *gracilis* Pamp. panini; *G. elata* f. *pilifera* Tuyama; *G. elata* f. *viridis* (Makino) Makino; *G. elata* var. *viridis* (Makino) Makino; *G. mairei* Schlechter; *G. viridis* Makino.

Plants 30–100 cm, rarely to 200 cm tall. Rhizomes usually ellipsoid, 8–12 cm, stout, 3–5(–7) cm in diam., sometimes larger, fleshy, densely noded, with triangular or broadly ovate scales at nodes. Peduncle orange, yellow, grayish brown, or greenish, 25–80(–150) cm, with several membranous sheaths toward base; rachis 5–30(–50) cm, subdensely to densely 20–50-flowered; floral bracts oblong-lanceolate, 10–16 mm, often exceeding ovary, membranous, apex acuminate. Flowers suberect, resupinate, opening weakly, orange, pale yellow, bluish green, or yellowish white; pedicel and ovary 7–12 mm. Perianth tube urceolate, 8–10 × 5–7 mm, with a deep sinus between lateral sepals, base inflated, outer surface smooth; free portion of sepals ovate-triangular, 3–5 mm, apex obtuse; free portion of petals suboblong, smaller than sepal lobes, apex acute; lip obscurely 3-lobed, oblong-ovoid, 6–7 × 3–4 mm, glabrous, base clawed, apical margin irregularly fimbriate; claw with a pair of gibbous foldings; disk papillose, with a pair of fleshy reniform calli. Column 5–7 mm; column foot short. Capsule obovoid-ellipsoid, 14–18 × 8–9 mm. Fl. and fr. May–Jul.  $2n = 24, 30, 36$ .

Sparse forests, open places in forests, forest margins, thicket margins; 400–3200 m. Anhui, N Fujian, Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, NE India, Japan, Korea, Nepal, Russia (Far East)].

This species is widely cultivated for its tubers (*tianma*) that are used in traditional Chinese medicine for the treatment of convulsive disorders such as epilepsy.

**6. *Gastrodia flavilabella*** S. S. Ying, Quart. J. Chin. Forest. 17: 83. 1984.

夏天麻 xia tian ma

Plants 40–100 cm tall. Rhizome 4–10 cm, stout, 0.6–1.6 cm in diam., with many coral-like roots. Peduncle lower part yellowish brown, dull purplish brown above, to ca. 70 cm, with several scalelike sheaths; rachis 7–25 cm, laxly 7–20-flowered; floral bracts caducous, ovate-lanceolate, apex acute. Flowers spreading or nodding, resupinate, yellowish green, lip yellowish; pedicel and ovary ca. 6 mm; pedicel not elongating in fruit. Perianth tube urceolate, 10–11 mm, with a deep sinus between lateral sepals, base inflated, outer surface smooth; free portion of sepals ovate, 2.5–4 mm, apex rounded; free portion of petals ovate to suborbicular, much smaller than sepal lobes; lip simple, obovate or obovate-oblong, 6–7 × 5–6 mm, glabrous, base shortly clawed, apical margin entire; claw with a pair of ellipsoid calli; disk with a pair of large, fleshy reniform calli near apex. Column pale green, ca. 7 mm, winged; column foot prominent; stigma rounded. Capsule dark brown, ellipsoid, ca. 15 mm. Fl. Jul.

- Open humid places in forests; 1100–1300 m. C Taiwan.

**7. *Gastrodia menghaiensis*** Z. H. Tsi & S. C. Chen, Acta Phytotax. Sin. 32: 559. 1994.

勐海天麻 meng hai tian ma

Plants 13–30 cm tall. Rhizome subellipsoid, 1–2.5 cm, rather stout, 0.5–1 cm in diam., with a few roots. Peduncle brown to gray, 10–25 cm, with 5–7 cylindrical, membranous sheaths below middle; rachis 2–5 cm, laxly 3–10-flowered; floral bracts brownish, ovate, 3–4 mm, apex acute. Flowers suberect, not opening widely, white; pedicel and ovary 4–5 mm; pedicel elongating to ca. 2.2 cm in fruit. Perianth tube cylindrical, 8–12 mm, lacking a deep sinus between lateral sepals, outer surface smooth; free portion of sepals deltoid, 1.5–2 mm, margin crisped, apex obtuse-rounded; free portion of petals orbicular, much smaller than sepal lobes, margin crisped, apex rounded; lip shallowly 3-lobed, broadly ovate, 2–2.8 × 1.8–2.2 mm, glabrous, base long clawed, margin denticulate, apex obtuse; claw ca. 4.5 × 1 mm, connate to inner surface of perianth tube for its entire length, with a pair of calli at base; disk with a fleshy longitudinal ridge. Column 4–5 mm, winged, papillate at base; column foot short or inconspicuous. Capsule ellipsoid, 15–18 × 5–8 mm. Fl. and fr. Sep–Oct.

- Forests; ca. 1200 m. S Yunnan (Menghai).

**8. *Gastrodia peichatieniana*** S. S. Ying, Coloured Ill. Fl. Taiwan 2: 690. 1987 [*“peichatieniana”* and *“peichiatieniana”*].

北插天天麻 bei cha tian tian ma

*Gastrodia autumnalis* T. P. Lin.

Plants 10–40 cm tall. Rhizome 1.8–2.6 cm, 0.5–0.8 cm in diam., fleshy, villous. Peduncle pale whitish brown, 20–32 cm, 3- or 4-noded, with several sheaths at base; sheaths not persistent; rachis 1–6 cm, subdensely 2–8-flowered; floral bracts pale brown, narrowly oblong-ovate, 2.5–4 mm, apex acute. Flowers erect, not resupinate, not opening widely, white, sometimes tinged brown; pedicel and ovary white, tinged pale brown, 7–9 mm; pedicel elongating in fruit. Perianth tube cylindrical, 5–8 mm, slender, lacking a deep sinus between lateral sepals, outer surface smooth; free portion of sepals deltoid, 0.8–1.5 mm, margin crisped; free portion of petals elliptic or suborbicular, smaller than sepal lobes, margin crisped; lip connate with perianth tube for most of its length, only apical portion free; free portion of lip exerted at sinus between lateral sepals, simple, ovate, slightly concave, small, glabrous, sometimes absent. Column 4–6 mm, with glandular spots on ventral surface toward base; column wings 1–1.5 mm wide; column foot short. Capsule ellipsoid, to 20 mm. Fl. Oct.

- Forests; 900–1500 m. C and N Taiwan.

This species has a petaloid lip. It may well represent a peloric form of a species such as *Gastrodia menghaiensis*.

**9. *Gastrodia wuyishanensis*** Da M. Li & C. D. Liu, Novon 17: 354. 2007.

武夷山天麻 wu yi shan tian ma

Plants 13–28 cm tall. Rhizome brown, cylindrical-ellipsoid, 1.5–2 cm, 0.6–0.8 cm in diam., 3- or 4-noded, with several fleshy roots, papillose. Peduncle grayish brown or grayish green, 10–20 cm, 3- or 4-noded below middle, with sheaths at nodes; sheaths cylindrical, 4–13 mm; rachis 2.5–7 cm, laxly 5–8-flowered; floral bracts caducous, brown, broadly ovate, 2–3 mm, apex acute. Flowers spreading or nodding, not resupinate, not opening widely, grayish white; pedicel and ovary greenish white, 3–7 mm. Perianth tube cylindrical, 7–11 × 4–5 mm, lacking a deep sinus between lateral sepals, outer surface smooth; free portion of sepals triangular to suborbicular, 1.5–2 mm, margin crisped, apex obtuse; free portion of petals suborbicular, 0.7–0.9 mm, margin crisped, apex rounded; lip simple, rhombic-ovate, 2–3 × 1.5–2 mm, glabrous. Column 4–5 mm; column wings narrow, dilated toward apex; column foot short. Capsule ca. 5 mm. Fl. Aug–Sep.

- Dense forests; 1200–1400 m. W Fujian (Wuyi Shan).

**10. *Gastrodia longitubularis*** Q. W. Meng, X. Q. Song & Y. B. Luo, Nordic J. Bot. 25: 23. 2008.

海南天麻 hai nan tian ma

Plants 12–30 cm tall. Rhizome cylindrical or digitate, 4–7 cm, 0.3–0.6 cm in diam., with several roots. Peduncle 10–24 cm, several noded; rachis 1–3.5 cm, 2–6-flowered; floral bracts brown, lanceolate-ovate, ca. 6 mm, apex acuminate. Flowers spreading or nodding, not resupinate, not opening widely, gray-brownish, lip tinged red or orange-red; pedicel and ovary 8–10 mm; pedicel not elongating in fruit. Perianth tube cylindrical, 16–18 × 6–8 mm, lacking a deep sinus between lateral sepals, outer

surface smooth; free portion of sepals ovate to suborbicular, 2–3 mm, apex acute; free portion of petals elliptic, ovate, or suborbicular, much smaller than sepal lobes, apex acute; lip simple, ovate or cordate, ca.  $6 \times 4\text{--}5$  mm, glabrous, base clawed, margin entire or undulate, apex cuspidate; claw with a pair of subglobose calli; disk with 3–5 longitudinal grooves, with 2 longitudinal lamellae toward apex. Column 6–7 mm, with a pair of toothlike projections at apex; column wings narrow; column foot prominent. Capsule 12–15 mm. Fl. Apr–Jun, fr. May–Jul.

- Dense tropical forests; 800–1000 m. Hainan.

**11. *Gastrodia pubilabiata*** Sawa, Res. Rep. Kochi Univ. 29: 60. 1980.

冬天麻 dong tian ma

*Gastrodia hiemalis* T. P. Lin; *G. nipponica* (Honda) Tuyama var. *hiemalis* (T. P. Lin) S. S. Ying.

Plants 2–5 cm tall. Rhizome subcylindric to fusiform, 3–5(–10) cm. Peduncle dark brown, densely many noded; rachis very short, 1–3-flowered; floral bracts broadly ovate, 3–4 mm. Flowers suberect, resupinate, opening widely, brown; pedicel and ovary dark brown, 10–12 mm, papillate; pedicel elongating to 50 cm in fruit. Perianth tube campanulate, ca. 15 mm, outer surface smooth; free portion of sepals spreading, ca. 5 mm, apex obtuse-rounded; free portion of petals ovate to suborbicular, much smaller than sepal lobes; lip simple to obscurely 3-lobed, broadly ovate-rhombic, ca.  $5 \times 6.5$  mm, base shortly clawed, apex cuspidate; claw ca.  $1.5 \times 3.3$  mm, with a pair of stalked, globose calli; disk with white hairs, with 2 small lamellae near apex of lip. Column ca. 6 mm, narrowly winged; column foot prominent, with a pair of subglobose calli. Capsule 20–35 mm. Fl. Dec.

Bamboo forests, bamboo plantations; 200–300 m. C and N Taiwan [Japan].

**12. *Gastrodia fontinalis*** T. P. Lin, Native Orchids Taiwan 3: 129. 1987.

春天麻 chun tian ma

Plants 7–12 cm tall. Rhizome flexuous, cylindric, slender. Peduncle pale brown, to ca. 10 cm, with 3 or 4 amplexicaul sheaths below middle; sheaths 6–7 mm; rachis ca. 2 cm, 1–3-flowered; floral bracts ca.  $3.5 \times 3$  mm, apex acute. Flowers spreading or nodding, resupinate, opening widely, dark brown, fleshy; pedicel and ovary dark brown, ca. 15 mm; pedicel elongating to ca. 17 cm in fruit. Perianth tube campanulate, ca.  $17 \times 18$  mm, outer surface verrucose; free portion of sepals broadly ovate-triangular, ca.  $6 \times 7\text{--}9$  mm, dorsal one concave at apex, lateral ones obtuse at apex and wider than dorsal one; free portion of petals ovate, ca.  $4 \times 3.5$  mm, apex acute; lip simple, ovate or rhombic,  $6.5\text{--}7.5 \times 5\text{--}6$  mm, fleshy, glabrous, base shortly clawed, lateral margins erect, apex cuspidate; claw with a pair of small, oblong, verrucose calli; disk with 6–8 parallel ridges, central 2 terminating in raised, fleshy red calli at apex of lip. Column ca. 8 mm, narrowly winged, with a pair of toothlike projections at apex, white, tinged reddish brown toward base; column foot short. Capsule cylindric, ca. 30 mm, papillate. Fl. and fr. Feb.

- Bamboo forests. N Taiwan.

**13. *Gastrodia appendiculata*** C. S. Leou & N. J. Chung, Quart. J. Exp. Forest. Natl. Taiwan Univ. 5(4): 138. 1991.

无喙天麻 wu hui tian ma

Plants 3–6 cm tall. Rhizome yellowish brown, fusiform, 2–4 cm, 0.5–1.2 cm in diam., with scales at nodes, pilose. Peduncle brown, to ca. 4 cm, fleshy, densely noded; rachis less than 1 cm, densely 2–10-flowered; floral bracts lanceolate, shorter than pedicel, apex acute. Flowers suberect or spreading, opening weakly, pale greenish brown, often turning dark brown; pedicel and ovary 11–16 mm; pedicel elongating to 25–50 cm in fruit. Perianth tube campanulate, 8–11 mm, outer surface verrucose, with a deep sinus between lateral sepals; free portion of sepals broadly ovate, apex obtuse; free portion of petals ovate to suborbicular, much smaller than sepal lobes, apex rounded; lip simple, ovate, ca.  $7 \times 5$  mm, glabrous, base shortly clawed, margin usually slightly erose, apex acute; claw with a pair of globose or ellipsoid calli. Column clavate, 4–5 mm, with an elongate, forked appendage on ventral surface; column wings subquadrate; column foot short; stigma subterminal. Capsule cylindric, 30–40 mm. Fl. Sep–Oct.

- Forests, bamboo plantations; 800–1200 m. C Taiwan.

**14. *Gastrodia confusa*** Honda & Tuyama, J. Jap. Bot. 15: 659. 1939.

八代天麻 ba dai tian ma

Plants 6–15 cm tall. Rhizome brown, obconic or fusiform, 2–4.5 cm, 5–8-noded, with 8–10 scales at each node, pilose. Peduncle pale brown, to ca. 13 cm, with several sheaths; rachis short, densely 3–10-flowered; floral bracts ovate, 6–8 mm, apex acute. Flowers suberect or nodding, resupinate, pale brown or blackish; pedicel and ovary 15–20 mm; pedicel elongating to ca. 30 cm in fruit. Perianth tube campanulate, 11–12 mm, outer surface verrucose; free portion of sepals curved inward, ovate, 3–5.5 mm, apex obtuse; free portion of petals subelliptic, much smaller than sepal lobes, thickened at base; lip yellow, simple, ovate,  $7\text{--}8 \times$  ca. 4 mm, glabrous, base clawed, margin irregularly denticulate; claw broad, with a pair of crestlike calli at base. Column clavate, ca. 4.5 mm; column wings triangular or subsquare; column foot prominent. Capsule fusiform, 32–35 mm. Fl. Sep–Nov.  $2n = 22$ .

Bamboo forests; ca. 1200 m. C Taiwan [Japan (Ryukyu Islands), Korea].

**15. *Gastrodia shimizuana*** Tuyama, Acta Phytotax. Geobot. 33: 380. 1982.

叉脊天麻 cha ji tian ma

Plants 2–5 cm tall. Rhizome cylindrical, 5–9 cm, 0.5–0.8 cm in diam., with deltoid sheaths at nodes, sparsely pubescent. Peduncle dark brown, to ca. 4 cm, with several short tubular sheaths toward base; rachis 1–1.5 cm, densely 1–4-flowered; floral bracts broadly oblong-ovate, 5–7 mm, shorter than ovary, apex acuminate. Flowers suberect or spreading, resupinate, yellowish brown, 15–18 mm in diam.; pedicel and ovary 8–10 mm, shortly papillate; pedicel elongating in fruit. Perianth tube campanulate, outer surface verrucose; free portion of sepals spreading, broadly ovate, 4.5–6 × 5–6.3 mm, margin entire or crisped, apex obtuse; free portion of petals spreading, orbicular to broadly ovate, 3–3.5 × 3–3.5 mm, margin entire or crisped, apex obtuse; lip 3-lobed, orange-brown at base, tinged pale cream-brown toward apex, deltoid-ovate, 5–6 × 5.5–6.5 mm, base clawed; lateral lobes suborbicular to deltoid, 3.2–3.5 × 4.8–5 mm, apex obtuse to acute; mid-lobe oblong, 2–2.1 × ca. 1 mm, apex obtuse-truncate; claw quadrate or broadly obovate, 2.5–2.8 mm, with a pair of globose, papillose calli; disk papillose on lateral lobes, with a central fleshy keel that forks below mid-lobe into 2 shallow lamellae. Column 4–5 mm; column wings truncate, incurved; anther ovoid, 1.3–1.5 mm; column foot prominent, with a pair of rounded calli where it meets base of lip. Capsule cylindrical. Fl. Mar.

Evergreen forests; 300–400 m. N Taiwan [Japan (Ryukyu Islands)].

