

SANTALACEAE

檀香科 tan xiang ke

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Herbs or shrubs, rarely trees, usually root hemiparasites, occasionally aerial hemiparasites (*Dendrotrophe* and *Phacellaria*); nodes not articulated, mostly glabrous, less often hairy, hairs simple. Leaves usually alternate (opposite in *Buckleya*), sometimes scale-like (absent in *Phacellaria*); stipules absent; petiole often indistinct; leaf blade simple, usually pinnately veined, sometimes palmately 3–9-veined (in *Dendrotrophe*), margin entire. Inflorescences mostly axillary, occasionally terminal (in *Buckleya*), cymose, umbellate, paniculate, racemelike, spicate, or clustered, sometimes 1-flowered; bracts scale-like, small, sometimes forming involucre, sometimes ± adnate to pedicel (in *Thesium*); bracteoles sometimes present, paired. Flowers bisexual or unisexual (plants usually dioecious, rarely monoecious), actinomorphic, 3–6(–8)-merous, very small; perianth lobes 3–6(–8), slightly fleshy. Male flowers: perianth lobes valvate or slightly imbricate in bud, incurved or patent when flowering, sparsely hairy or with tongue-shaped appendage at the insertion of the stamens. Disk epigynous or perigynous, sometimes absent, margin sinuate or lobed, sometimes distinct, glandular or scaly. Stamens as many as and opposite to perianth lobes, usually on the base of lobes; filaments filiform, short; anthers gynobasic or dorsifixed near base, 2-celled, parallel or divaricate, dehiscence usually longitudinal. Female and bisexual flowers: perianth tube usually longer than that of male. Ovary inferior or half-inferior, 1- or 5–12-loculed; ovules 1–3(–5), anatropous or hemitropous, integument absent. Style 1; stigma capitate, small, truncate or lobed. Fruit a drupe or a nut, exocarp usually fleshy, endocarp crustaceous or bony. Seed 1, without a differentiated testa; endosperm copious, usually white and partitioned, fleshy; embryo cylindrical, straight, small, smooth, rugose, or many ridged. $2n = 5, 6, 7, 12, 13+$.

About 36 genera and 500 species: widely distributed in tropical and temperate regions; seven genera and 33 species (13 endemic) in China.

Three species of sandalwood, *Santalum album* Linnaeus, *S. myrifolium* Linnaeus, and *S. papuanum* Summerhayes, have been recorded as cultivated in China. Wu Zhengyi (editor's note) adds that he collected a fruiting specimen of a *Santalum* in the coastal forests of Taiwan (at KUN).

Tam Pui-cheung. 1988. Santalaceae. In: Kiu Hua-shing & Ling Yeou-ruenn, eds., Fl. Reipubl. Popularis Sin. 24: 52–86.

- 1a. Leaves and vegetative stems almost absent; aerial epiparasite growing on Loranthaceae or *Dendrotrophe*; flowers minute, sessile, often very densely clustered 7. *Phacellaria*
- 1b. Leaves and vegetative stems usually well developed; trees, shrubs, or vines, or terrestrial herbs with scale-like leaves; flowers often large, pedicellate, solitary, paired, or clustered.
 - 2a. Terrestrial herbs; leaves linear or scale-like; each flower subtended by 1, 2, or rarely 4, prominent, persistent bracteoles; fruit a nutlet, exocarp dry [sometimes fleshy] 5. *Thesium*
 - 2b. Trees, shrubs, or vines; leaves well developed, lanceolate to ovate; flowers usually without conspicuous, persistent bracteoles; fruit a drupe, exocarp fleshy.
 - 3a. Leaves opposite, first-formed leaves on shoots with prominent scarious, scale-like tips; fruit with 4(or 5) conspicuous, persistent, accrescent bracts near apex 1. *Buckleya*
 - 3b. Leaves alternate, tips never scarious; fruit without enlarged persistent bracts.
 - 4a. Leaf blade palmately 3–9(–11)-veined; plants woody vines, often an aerial hemiparasite 6. *Dendrotrophe*
 - 4b. Leaf blade pinnately veined; plants freestanding trees or shrubs.
 - 5a. Inflorescences cymose or 1-flowered; flowers 3(or 4)-merous; stems usually 3-angled; fruit to 1 cm 4. *Osyris*
 - 5b. Inflorescences racemelike, thyrsoid, catkinlike, or 1-flowered; flowers 5(or 6)-merous; stems terete; fruit 3–5 cm.
 - 6a. Inflorescences terminal, on leafy axillary shoots, female inflorescences with flowers subtended by well-developed leaves and effectively solitary and axillary; anther cells longitudinally dehiscent; fruit with apical disk more than 5 mm wide 2. *Pyrrularia*
 - 6b. Inflorescences axillary, lacking normal leaves, male inflorescences sometimes in cluster; anther cells transversely dehiscent; fruit with apical disk to 2.5 mm wide 3. *Scleropyrum*

1. BUCKLEYA Torrey, Amer. J. Sci. Arts 45: 170. 1843, nom. cons.

米面蓊属 mi mian weng shu

Nestronia Rafinesque, nom. rej.

Shrubs deciduous, root hemiparasites. Winter buds acute, with 2–5 pairs of scales. Leaves opposite, shortly petiolate to almost sessile, often lanceolate to ovate, membranous, pinnately veined, margin entire or very minutely serrulate, tips of first-formed leaves prominently scarious and scale-like. Inflorescences axillary and terminal; male ones cymose or umbellate; bracts absent. Flowers

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unisexual (plants dioecious). Male flowers small, perianth 4(or 5)-lobed, campanulate. Stamens 4(or 5), short; filaments filiform, cells parallel, dehiscence longitudinal. Disk superior, adnate to perianth tube, sinuate at margin. Female flowers terminal, sometimes also axillary, solitary; bracts sepal-like, 4(or 5), subterminal on ovary, leafy, alternate to perianth lobes, enlarged after flowering, ± persistent; perianth tube adnate to ovary, lobes 4(or 5), tiny; staminodes absent. Ovary inferior, 8-ridged or smooth when young; ovules 3 or 4. Style short; stigmas 2–4. Fruit a drupe, with deciduous perianth lobes, exocarp ± thinly fleshy, endocarp bony; bracts 4(or 5), prominent, near fruit apex, accrescent, aristate, persistent or deciduous.

Four species: three in E Asia, one in North America; two species (endemic) in China.

- 1a. Scale-like tip of leaf blade whitish yellow; ovary not longitudinally striate; fruit without distinct vascular strands; bracts deciduous; fruiting pedicel to 5 mm 1. *B. graebneriana*
 1b. Scale-like tip of leaf blade reddish brown; ovary longitudinally striate; fruit with vascular strands; bracts persistent; fruiting pedicel 8–15 mm 2. *B. henryi*

1. *Buckleya graebneriana* Diels, Bot. Jahrb. Syst. 29: 306. 1900.

秦岭米面蓊 qin ling mi mian weng

Stems erect, to 2.5 m tall; bark gray to grayish white, with white lenticels, yellowish green when young, setulose, finely furrowed. Buds grayish, ovoid, ca. 3 mm. Petiole short to almost absent, setulose; leaf blade varied in shape; earliest-formed blades obovate to obovate-oblong, usually long elliptic, tip whitish yellow, scale-like; later ones elliptic to ovate, 2–8 × 1–3 cm, both surfaces setulose, denser along the margin, lateral veins 7–9 pairs, base broadly or narrowly cuneate, margin serrulate. Male inflorescences terminal; peduncle 1.5–2.5 cm, sparsely brown pubescent. Male flowers: pedicel 6–10 mm; perianth pale green, ca. 3 mm in diam.; lobes ovate-lanceolate, ca. 1.5 mm. Stamens 4(or 5), shorter than lobes; anthers pale yellow. Female flowers solitary, terminal; lobes pale green, elliptic-lanceolate, 2–3 mm. Ovary glabrous. Drupe orange, ellipsoid, 10–15 × 6–8 mm, glabrous, rugose, without ridges; fruiting pedicel to 5 mm, sometimes almost absent; bracts lanceolate or elliptic-lanceolate, accrescent to ca. as long as fruit, 1–2.5 cm, deciduous. Fl. Apr–May, fr. Jun–Jul.

• Mixed mesic to deciduous forests; 700–1800 m. Gansu, Henan, Shaanxi.

The fruit, which contains starch, is used as an oil or a food source, and in making wine. The young leaves are used as a vegetable.

2. *Buckleya henryi* Diels, Bot. Jahrb. Syst. 29: 306. 1900.

米面蓊 mi mian weng

Stems arching, 1–2.5 m tall; bark grayish brown, sometimes slightly reddish when young, ± papillate-puberulous, ridged or striated when young. Buds red-brown, ovoid. Petiole almost absent; leaf blade membranous; earliest-formed ones elliptic, with reddish brown, scale-like tips; later blades lanceolate, 3–9 × 1.5–2.5 cm, both surfaces sparsely papillate hairy when young, lateral veins 5–12 pairs, inconspicuous, base cuneate or narrowly cuneate, margin entire or very minutely papillate-denticulate. Male inflorescences terminal and axillary. Male flowers: pedicel 3–6 mm; perianth pale yellowish brown, ovoid, 4–4.5 mm in diam.; lobes ovate-oblong, ca. 2 mm, sparsely pubescent. Stamens 4, shorter than lobes. Female flowers usually solitary, terminal; perianth funnellform, 7–8 mm, abaxially puberulous or subglabrous; lobes small, triangular-ovate or ovate, apex acute. Ovary glabrous to puberulous. Style yellow. Drupe ellipsoid or obconic, ca. 15 × 10 mm, glabrous to densely puberulent, longitudinally 8-striate; fruiting pedicel slender, clavate, 8–15 mm; bracts narrowly elliptic, accrescent to ca. 2 × as long as fruit, 3–4 × 0.8–0.9 cm, persistent. Fl. Jun, fr. Sep–Oct.

• Mixed mesic to deciduous forests; 700–1800 m. Anhui, Gansu, Henan, Hubei, Shanxi, Sichuan, Zhejiang.

This species has been confused with the Japanese species *Buckleya lanceolata* (Siebold & Zuccarini) Miquel, which differs by having bracts longer, ca. 3 × as long as fruit, leaves more markedly caudate, and indumentum dense and often multicellular.

The fruit contains starch. The fresh leaves and bark are poisonous.

2. *PYRULARIA* Michaux, Fl. Bor.-Amer. 2: 231. 1803.

檀梨属 tan li shu

Sphaerocarya Wallich.

Shrubs or small trees deciduous. Branches many, terete. Winter buds large, grayish white sericeous. Leaves alternate, petiolate, thickly elliptic to ovate-oblong, membranous or stiffly papery, pinnately veined, lateral veins conspicuous, reaching to near apex, margin entire. Inflorescences often terminal on leafy axillary shoots, racemelike or thyrsoid with umbellate proximal branches, spicate, or cymose; female ones with flowers subtended by well-developed leaves, effectively axillary and solitary; bisexual flowers usually at apex of inflorescences, rarely 1-flowered, bracteate. Flowers paired or solitary, bisexual or unisexual (plants hermaphroditic or polygamous); perianth tube turbinate (very short in male flowers), lobes 5(or 6), patent, abaxially pilose, adaxially sparsely hairy behind stamens. Stamens 5; filaments very short; anthers ovate, cells parallel, dehiscence longitudinal. Disk slightly raised, flat, circular, usually lobed, lobes scale-like. Ovary inferior; ovules 2 or 3. Style tubular; stigma small, capitate, inconspicuously lobed. Fruit a rather large drupe, base rounded, apex truncate to slightly depressed, with conspicuous, relatively broad persistent perianth lobes and broad apical disk (more than 5 mm wide), exocarp thickly fleshy, endocarp bony. Seeds globose or subglobose; embryo surrounding apex.

Two species: Bhutan, China, India, Myanmar, Nepal, Sikkim; North America; one species in China.

1. *Pyrularia edulis* (Wallich) A. Candolle in Candolle, Prodr. 14(2): 628. 1857.

檀梨 tan li

Sphaerocarya edulis Wallich in Roxburgh, Fl. Ind. 2: 371. 1824; *Pyrularia bullata* P. C. Tam; *P. inermis* Chien; *P. sinensis* Y. C. Wu.

Plants 3–5(–15) m tall; bark gray; lenticels oblong. Branches yellowish brown, with or without spines. Petiole 5–8 mm, sparsely pilose; leaf blade 7–15 × 3–6 cm, papery or slightly fleshy, sparsely pilose, midvein adaxially depressed, lateral veins 4–6 pairs, base broadly cuneate, usually oblique, margin entire or ± wavy, apex acuminate or sometimes acute. Inflorescences terminal (or axillary), thyrses, proximal flowers

in pedunculate umbels or cymes, distal flowers solitary. Flowers bisexual or unisexual (plants polygamous); perianth tube oblong-ovoid, lobes 5, subtriangular, abaxial surface and pedicels densely pilose. Stamens 4 or 5; filaments ca. 1 mm, glabrous. Disk 4- or 5-lobed. Style short; stigmas 2. Drupe pear-shaped, 3–5 cm, base narrowed into robust stipe, apex nearly truncate, slightly sunken in young fruits, persistent perianth and disk enlarging to more than 5 mm in diam. Seed subglobose; endosperm oily. Fl. Dec–Apr, fr. Aug–Nov.

Forests; 700(–2700) m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, Sikkim].

The plants have medicinal uses.

3. **SCLEROPYRUM** Arnott, Mag. Zool. Bot. 2: 549. 1838, nom. cons.

硬核属 ying he shu

Heydia Dennstedt ex Kosteletzky, nom. rej.; *Scleromelum* K. Schumann & Lauterbach.

Small trees or shrubs evergreen; bark grayish white. Branches terete, nodes sometimes with spines. Winter buds not formed. Leaves alternate, petiolate, orbicular or elliptic, leathery, pinnately veined, lateral veins conspicuous, mostly not reaching to near apex, margin entire. Inflorescences axillary, catkinlike, short spikes, pendulous; male inflorescences sometimes in clusters. Flowers bisexual or unisexual (plants trioecious). Male flowers: perianth tube rigid, short, lobes 5, usually distinct beyond disk, valvate or slightly imbricate in buds. Stamens 5, on base of lobes; filaments short, cells divaricate, dehiscence transverse. Discs obtusely square, becoming circular, margin slightly prominent, wavy lobed. Female flowers: perianth tube ovoid, adnate to ovary, lobes similar to those of males. Ovary inferior; ovules 3. Style rather strong, short; stigma scutiform, large, 3–5-lobed. Bisexual flowers similar to female but with fertile stamens. Fruit a berrylike drupe, obovoid to pear-shaped, large, base gradually narrowed to form a long stalk, apex slightly raised, relatively narrow, with persistent perianth lobes and relatively narrow rudimentary disk (to 2.5 mm wide), exocarp thickly fleshy, endocarp rigid. Seeds subglobose; embryo terete.

Six species: SE Asia; one species in China.

1. *Scleropyrum wallichianum* (Wight & Arnott) Arnott, Mag. Zool. Bot. 2: 550. 1838.

硬核 ying he

Trees 4–10 m tall. Branches grayish green, strong and thick, smooth, spines sometimes present. Petiole thick, 6–10 mm; leaf blade 9–17 × 5–7 cm, glabrous or sparsely pubescent, abaxially pale green, adaxially deep green, ± glossy, midvein adaxially depressed, abaxially prominent, lateral veins 3 or 4 on each side, lower 2 pairs almost reaching leaf apex, tertiary veins patent and netlike, base subrotund or cuneate, apex obtuse or acute. Inflorescences solitary, paired, or a few in fascicles, 2–2.5 cm, yellow tomentose; bracts narrowly lanceolate, ca. 2 × 0.7 mm, villous abaxially, caducous. Perianth pale yellow to reddish yellow, ca. 3.8 × 5.5 mm, lobes 5, ovate, ca. 2 × 1.5 mm, apex subacute, abaxially villous, hair short near base or tomentose, adaxially with a tuft of hair behind each stamen. Stamen filaments ca. 1.5 mm. Disk depressed in middle, ca. 1.8 mm in diam. Style 0.8–1 mm; stigma shallowly 3- or 4-lobed, sunken in middle. Drupe orange or orange-red when mature, 3–3.5 × 2.3–2.5 cm, glabrous, glossy, apex nipple-like, persistent perianth not conspicuously enlarged, 2–2.5 mm in diam. Fl. Apr–May, fr. Aug–Sep.

Forests, slopes, valleys; 600–1700 m. Guangxi, Hainan, Yunnan [Cambodia, India, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

The seeds contain more than 67% oil, which is suitable as raw

material for lubricants and soap. The young shoots and mature fruits are edible.

- 1a. Branches with spines to 8 cm; leaf blade glabrous, base ± rounded 1a. var. *wallichianum*
- 1b. Branches without spines; leaf blade sparsely pubescent, base cuneate 1b. var. *mekongense*

1a. *Scleropyrum wallichianum* var. *wallichianum*

硬核(原变种) ying he (yuan bian zhong)

Sphaerocarya wallichiana Wight & Arnott, Edinburgh New Philos. J. 15: 180. 1833; *Pyrularia zeylanica* A. Candolle.

Branches with spines to 8 cm. Leaf blade glabrous, base ± rounded. Male perianth lobes abaxially villous, hairs short near base.

Forests, slopes, valleys; 800–1200 m. Guangxi, Hainan, Yunnan [Cambodia, India, Laos, Malaysia, Myanmar, Sri Lanka, Vietnam].

1b. *Scleropyrum wallichianum* var. *mekongense* (Gagnepain) Lecomte, Bull. Mus. Natl. Hist. Nat. 20: 404. 1914.

无刺硬核 wu ci ying he

Scleropyrum mekongense Gagnepain, Notul. Syst. (Paris) 1: 196. 1911.

Branches without spines. Leaf blade sparsely pubescent, base cuneate. Male perianth lobes abaxially tomentose.

Forests; 600–1700 m. S Yunnan [Cambodia, Laos, Vietnam].

4. OSYRIS Linnaeus, Sp. Pl. 2: 1022. 1753.

沙针属 sha zhen shu

Shrubs or small trees evergreen. Branches usually 3-ridged or -angled. Leaves alternate, \pm sessile, elliptic-lanceolate or elliptic-obovate, usually \pm leathery, pinnately veined, lateral veins inconspicuous. Inflorescences axillary; male ones cymose; bisexual and female ones often 1-flowered; bracts and bracteoles on male inflorescences caducous. Flowers unisexual (when plants dioecious) or bisexual. Bisexual flowers: perianth tube mostly connate to ovary, lobes 3(or 4), triangular or ovate, with a tuft of hair adaxially. Stamens 3(or 4), short, on the base of lobes; anthers ovoid, cells distinct, parallel, dehiscence longitudinal. Disk nearly flat, sinuate at margin. Ovary inferior, 1-loculed; ovules 2–4. Style needle-shaped; stigmas 3(or 4)-parted. Male flowers: stamens slightly longer than bisexual flowers; ovary rudimentary. Female flowers: bracteoles more prominent; perianth tube shorter. Fruit a drupe, relatively small (to 1 cm), usually with rudimentary perianth at apex or with only rudimentary disk, exocarp fleshy, endocarp crustaceous. Seeds globose.

Six or seven species: Africa, Asia, Europe; one species in China.

Osyris japonica Thunberg is *Helwingia japonica* (Thunberg) Dietrich (Helwingiaceae/Cornaceae s.l.).

1. *Osyris quadripartita* Salzmann ex Decaisne, Ann. Sci. Nat., Bot., sér. 2, 6: 65. 1836.

沙针 sha zhen

Osyris arborea Wallich ex A. Candolle; *O. arborea* var. *rotundifolia* P. C. Tam; *O. arborea* var. *stipitata* Lecomte [“*tipitata*”]; *O. lanceolata* Hochstetter & Steudel ex A. Candolle, nom. illeg. superfl.; *O. wightiana* Wallich ex Wight.

Plants 2–5 m tall. Branches slender, 3-angled when young. Leaf blade grayish green, 1.2–6 \times 0.6–2 cm, leathery, sometimes rugose on both surfaces, with dense glands, base gradually narrowed or obtuse, apex acute to cuspidate or rounded. Male inflorescences 2–4(–13)-flowered; peduncle to 11 mm. Female inflorescences 1–3-flowered; bracts minute, caducous. Male flowers: pedicel 4–8 mm; perianth ca. 4 mm in diam., lobes 3, yellow or green, sometimes flushed brown, ca. 1.5 mm.

Stamens 3, filaments very short, disk fleshy; sterile ovary very small, at center of disk. Female flowers usually solitary, sometimes to 4 in subumbel; pedicel to 25 mm, enlarged at apex; bracteoles 2, linear-spatulate, ca. as long as ovary, soon caducous, disk and stamens as in male but stamens sterile. Bisexual flowers similar to female but with fertile stamens; stigmas 3. Drupe orange to red when ripe, drying pale blackish, subglobose or pear-shaped, 4.5–10 mm in diam. Fl. Apr–Jun, fr. Oct.

Thickets; 600–2700 m. Guangxi, Sichuan, Xizang, Yunnan [Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam; Africa, S Europe].

This is a very widespread and variable species with several widely used synonyms. Plants with stipitate fruits have been described as *Osyris arborea* var. *stipitata*, but there are collections with shorter stipes that link that form to the typical, sessile-fruited form.

5. THESIUM Linnaeus, Sp. Pl. 1: 207. 1753.

百蕊草属 bai rui cao shu

Herbs perennial or annual, slender, sometimes subshrubs, often root hemiparasites of grasses, \pm evergreen. Stems green. Leaves alternate, usually sessile, usually linear or, sometimes, scale-like, 1–3-veined, lateral veins not apparent. Inflorescences apparently terminal, usually racemelike, often paniculate, less often cymose (or axillary and 1-flowered); bracts and bracteoles leaflike, sometimes partly adnate to pedicels; bracteoles 1 or 2 and opposed, rarely 4, sometimes absent. Flowers bisexual, white or yellowish green; perianth tube connate to ovary, limb campanulate, cylindric, funnellform, or tubular, usually deeply (4 or)5-lobed, lobes valvate, usually with a tuft of hair behind each stamen. Stamens (4 or)5, usually on the base of lobes; filaments not exerted; anthers ovoid or ellipsoid, cells parallel, dehiscence longitudinal. Disk superior, inconspicuous or connate to base of perianth tube. Ovary inferior, stalked or sessile; ovules 2 or 3, pendulous from apex of placenta, usually flexuous or corrugate. Style long or short; stigma capitate or inconspicuously 3-lobed. Fruit a small nut, with persistent perianth at apex, exocarp dry, membranous [rarely fleshy], endocarp bony or slightly rigid, usually ridged; embryo in the middle of fleshy endosperm, erect or slightly curved, usually oblique, terete, radicle as long as or slightly longer than cotyledons.

About 245 species: widely distributed in temperate regions of the Old World, especially numerous in S Africa, a few species in tropical and temperate South America; 16 species (nine endemic) in China.

The inflorescence of *Thesium* has been interpreted in different ways. In the majority of species it is axillary and 1-flowered with a pair of bracts at the apex of the peduncle, which is often fused to the subtending leaf, and with the pedicel proper very short to almost absent. In practice, botanists have often assumed that the inflorescence is a raceme with the peduncles as pedicels and bracts as bracteoles, and for convenience that interpretation has been maintained here.

Thesium chanetii H. Léveillé and *T. glabrum* Schindler are both *Diarthron linifolium* Turczaninow (Thymelaeaceae). A record of *Thesium australe* R. Brown (Prodr. 353. 1810) from Hainan is probably based on a misidentification of the very similar *T. chinense* Turczaninow.

- 1a. Leaves scale-like; inflorescence cymose; bracts and bracteoles very small and scale-like 16. *T. psilotoides*
 1b. Leaves linear to oblong-linear, broadly lanceolate, or oblong (scale-like leaves sometimes present at base of stem); inflorescence racemelike; bracts linear, leaflike.

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- 2a. Pedicels 25–40 mm; bract inserted at base of pedicel 14. *T. remotibracteatum*
 2b. Pedicels to 25 mm; bract often inserted at least partway along pedicel.
 3a. Fruit with reticulate veins; ovary sessile.
 4a. Plants robust; stems erect or ascending; flowers 4(or 5)-merous; persistent perianth hypocrateriform, longer than fruit 5. *T. cathaicum*
 4b. Plants slender; stems ascending; flowers 5-merous; persistent perianth subglobose, shorter than fruit 6. *T. chinense*
 3b. Fruit with longitudinal veins, veins sometimes forked but not reticulate; ovary stalked.
 5a. Stems usually procumbent; branches and leaves sparse.
 6a. Perianth subcampanulate; leaves 2.5–3 cm 1. *T. himalense*
 6b. Perianth funnellform to tubular; leaves 1–2.5 cm.
 7a. Leaves with minutely denticulate margins, ca. 2.5 cm; flowers funnellform, sometimes in clusters of 2 or 3 15. *T. brevibracteatum*
 7b. Leaves with entire margins, 1–2 cm; flowers narrowly funnellform to tubular, always solitary.
 8a. Flowers narrowly funnellform to subtubular; leaves oblong, ca. 1 cm 2. *T. emodi*
 8b. Flowers tubular; leaves linear, ca. 2 cm 3. *T. tongolicum*
 5b. Stems erect or ascending, rarely procumbent; branches and leaves often dense.
 9a. Flowers in proximal inflorescences usually in groups of 2 or 3; racemes usually branched into panicles 4. *T. ramosoides*
 9b. Flower always 1 per axil; racemes usually with few or no branches.
 10a. Fruit 5–6 mm in diam., subglobose; persistent perianth slightly longer than fruit; flowers broadly campanulate 10. *T. jarmilae*
 10b. Fruit 2–4.5 mm in diam., usually ellipsoid; persistent perianth shorter or longer than fruit; flowers broadly funnellform, tubular, or campanulate.
 11a. Bracts at base of pedicels; leaves 0.7–1.8 cm.
 12a. Flowers 6–10 mm; leaves linear, sometimes lanceolate, 0.7–1.7 cm 11. *T. longiflorum*
 12b. Flowers 4–5 mm; leaves oblong-lanceolate, 1.5–1.8 cm 13. *T. orgadophilum*
 11b. Bracts and bracteoles at top of pedicels; leaves lanceolate, linear, or oblong to oblong-linear, 3–5 cm.
 13a. Bracteoles much shorter than bracts; leaves lanceolate, apex acute, usually falcate 7. *T. arvense*
 13b. Bracteoles slightly shorter than or as long as bracts; leaves lanceolate, linear, or oblong to oblong-linear, apex acuminate or obtuse.
 14a. Fruit stalks reflexed when fruit mature; leaves usually 1-veined 8. *T. refractum*
 14b. Fruit stalks not reflexed when fruit mature; leaves 3-veined.
 15a. Stems ascending; perianth yellowish white, campanulate, 4–5 mm 9. *T. longifolium*
 15b. Stems erect; perianth white, tubular, ca. 7 mm 12. *T. bomiense*

1. *Thesium himalense* Royle ex Edgeworth, Trans. Linn. Soc. London 20: 88. 1846.

露柱百蕊草 lu zhu bai rui cao

Herbs; rhizomes brownish, rather thick, divaricate. Stems green, procumbent, sparsely branched, slender, ca. 15–20 cm, striate. Leaves sparse, subsessile, linear, 25–30 × 1–1.5 mm, usually 1-veined, apex acute. Inflorescences racemelike, few flowered; bract usually inserted at or near tip of pedicel or, sometimes in proximal portion of plant, at base, linear, 15–25 mm; bracteoles 2, subulate or linear, 4.5–6 mm, usually longer than flowers; pedicel slender, 3–5 mm, finely striate. Perianth white interior, 3–4 mm; tube subcampanulate, ca. 2 mm; lobes oblong to ovate, ca. 1 mm, apex obtuse, strongly incurved, adaxially hairy. Stamens 5, not exerted. Ovary stalk ca. 0.6 mm. Style terete, 4–4.5 mm; stigma compressed capitate. Nutlet broadly ellipsoid, ca. 3.5 × 3 mm, with 10 or more inconspicuous, sometimes slightly impressed, longitudinal veins, often branched but lacking connecting veins; persistent perianth incurved and shrunken. Fl. Jun, fr. Aug–Sep.

Grassy slopes; 2900–3700 m. Sichuan, Yunnan [NW India, Nepal].

The status of this taxon and the Chinese material so named needs further study; it is said to differ from other species by the exerted style, but this is present neither in the type material nor in the Chinese material examined.

2. *Thesium emodi* Hendrych, Repert. Spec. Nov. Regni Veg. 70: 152. 1965.

藏南百蕊草 zang nan bai rui cao

Thesium dokerlaense C. Y. Wu ex D. D. Tao.

Herbs perennial; rhizomes long, slender. Stems procumbent to ascending, usually unbranched or sparsely branched, slender, 5–15 cm, usually inconspicuously ridged. Leaves sparse, concolor, sometimes dirty greenish, sessile, oblong, ca. 10 × 1.5–2 mm, 1-veined, margin entire. Inflorescences racemelike, with solitary flowers; bracts inserted at pedicel base, connate ca. 1/4 length, leaflike, 10–15 mm; pedicel slender, 5–8 mm; bracteoles 2, narrowly oblong, 4–6 mm, longer than flo-

wer, margin very minutely serrulate, almost entire. Perianth with exterior greenish yellow or pale green, interior white, narrowly funnelliform to subtubular, 5.5–6.5 mm, tube campanulate, divided from middle to near base, lobes oblong, apex acute, becoming incurved after anthesis. Stamens 5, not exerted. Ovary stalk ca. 1.5 mm; stigma capitate, ca. 2 times as wide as style. Nutlet pale yellow, ellipsoid, ca. 3 mm, with longitudinal veins; persistent perianth subterete, ca. 2 mm.

Valleys, thickets; ca. 4200 m. Xizang, Yunnan [Bhutan, Nepal].

The distinction between this species and *Thesium tongolicum* is very subtle, and it may prove best to combine the two species.

3. *Thesium tongolicum* Hendrych, Acta Horti Bot. Prag. 112. 1962.

藏东百蕊草 zang dong bai rui cao

Herbs perennial; rhizomes long, elongated. Stems procumbent, unbranched or sparsely branched, slender, 10–15 cm. Leaves sparse, linear, ca. 20 × 1 mm, 1-veined, margin entire, apex acute. Inflorescences racemelike, with few solitary flowers; bracts linear or narrowly linear, 8–15 mm, margin rugose; pedicel 3–5 mm; bracteoles 2, similar to bract in shape, 5–8 mm. Perianth 5-merous, green or greenish yellow, tubular, 5–7 mm, divided to middle, lobes oblong, apex slightly incurved. Ovary stalk ca. 1 mm. Nutlet ellipsoid, with raised longitudinal veins; persistent perianth terete, as long as or slightly longer than fruit. Fl. Apr, fr. Jun.

• High-elevation scree slopes. Qinghai, W Sichuan, Xizang.

This species may prove to be inseparable from *Thesium emodi*.

4. *Thesium ramosoides* Hendrych, Acta Horti Bot. Prag. 111. 1962.

滇西百蕊草 dian xi bai rui cao

Herbs perennial; rhizomes thick and long. Stems erect or ascending usually many branched, slender, 25–40 cm. Leaves dense, gray-green, sessile, linear, 20–50 × ca. 1.5 mm, 1-veined, apex acute. Inflorescences racemelike, lax, often branched, proximal part with 2–5-flowered branches; bracts inserted at tip of pedicel, narrowly linear, 10–25 mm; pedicel 4–9 mm, ascending or almost patent; bracteoles 2, narrowly linear, 5–10 mm, much shorter than bract. Perianth 5-merous, white, broadly campanulate, ca. 3.5 mm, divided to middle, lobes triangular-oblong, apex recurved, becoming incurved, clawlike. Stamens and style not exerted. Ovary stalk 0.8–1 mm. Nutlet ovoid to ellipsoid, ca. 3 mm, with raised longitudinal veins, shortly stalked; persistent perianth ca. 1 mm. Fl. May.

• Grassy slopes in *Pinus* forests; 2900–3700 m. Sichuan, Yunnan.

5. *Thesium cathaicum* Hendrych, Repert. Spec. Nov. Regni Veg. 70: 150. 1965.

华北百蕊草 hua bei bai rui cao

Herbs perennial; rhizomes rather slender, short. Stems erect or ascending, usually many branched, rather robust, 12–20 cm, glossy, ridged and furrowed. Leaves sessile, narrowly linear, (15–)20–25(–30) × ca. 0.6 mm, inconspicuously 1-veined, margin entire. Inflorescences racemelike, often branched, few

flowered; bracts linear, 8–15 × ca. 0.6 mm, 1-veined; pedicel slender, 5–10 mm, upper ones shorter, patent, ridged, smooth; bracteoles 2, 4–5 mm. Perianth 4(or 5)-merous, interior white, long funnelliform, 5–8 mm, tube tubular, ca. 3 mm, divided to middle, lobes lanceolate-oblong, ca. 1 mm, incurved. Ovary ellipsoid, ca. 1 mm in diam., sessile. Style often exerted. Nutlet ellipsoid, ca. 3 mm, with raised reticulate veins; persistent perianth hypocrateriform, patent apically, 4–5 mm. Fl. and fr. Jun–Jul.

• Grasslands; 300–2500 m. Hebei, Shandong, Shanxi.

6. *Thesium chinense* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 10: 157. 1837.

百蕊草 bai rui cao

Herbs perennial, ± farinose, glabrous. Stems fascicled, ascending, sparsely branched, slender and long, 15–40 cm, furrowed. Leaves linear, 15–35 × 0.5–1.5 mm, 1-veined, margin sometimes very sparsely papillate-ciliolate, apex acute or acuminate. Inflorescences racemelike, many flowered; bracts inserted at tip of pedicel, linear-lanceolate; pedicel to 3.5 mm, sometimes almost absent; bracteoles 2, linear, 2–6 mm, margin rugose. Perianth 5-merous, greenish white, 2.5–3 mm; tube tubular, lobes acute, apex incurved, adaxially inconspicuously hairy. Stamens not exerted. Ovary sessile. Style very short. Nutlet pale green, ellipsoid or subglobose, 2–2.5 mm, with prominent reticulate veins; persistent perianth subglobose, ca. 2 mm; stalk 3.5 mm. Fl. Apr–May, fr. Jun–Jul.

Wet ravines, slopes, grasslands, fields. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [Japan, Korea, Mongolia].

This species may prove to be inseparable from *Thesium australe* R. Brown, which has been recorded from Indonesia east to Australia.

The plants have medicinal uses.

- 1a. Fruiting pedicel to 3.5 mm 6a. var. *chinense*
1b. Fruiting pedicel to 8 mm 6b. var. *longipedunculatum*

6a. *Thesium chinense* var. *chinense*

百蕊草(原变种) bai rui cao (yuan bian zhong)

Thesium decurrens Blume ex A. Candolle.

Fruiting pedicel to 3.5 mm.

Wet ravines, slopes, grasslands, fields. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [Japan, Korea, Mongolia].

6b. *Thesium chinense* var. *longipedunculatum* Y. C. Chu, Fl. Pl. Herb. Chin. Bor.-Orient. 2: 107. 1959.

长梗百蕊草 chang geng bai rui cao

Fruiting pedicel to 8 mm.

• Grasslands. Guangdong, Heilongjiang, Jilin, Liaoning, Shanxi, Sichuan.

7. *Thesium arvense* Horvátovszky, Fl. Tyrnav. 1: 27. 1774.田野百蕊草 *tian ye bai rui cao*

Herbs perennial. Stems erect or ascending, slender, 20–25 cm, furrowed and finely striate. Leaves abaxially pale green, adaxially green, subsessile, lanceolate, usually slightly falcate, 30–38 × ca. 4 mm, rather thick, 3-veined, base decurrent to form short petiole, margin entire, apex acute. Inflorescences racemelike, often branched, with 1 flower per axil, 5–6 cm; bracts inserted at top of pedicels, oblong or narrowly boat-shaped, 7–10(–12) × 1–2 mm, 1-veined, margin thickened; pedicel slender, reflexed when mature, 5–13 mm; bracteoles 2, subulate, 3–4 mm, 1-veined, margin sparsely or inconspicuously serrulate, incurved when mature. Perianth 5-merous, white or greenish white, campanulate, 4–5 mm in diam., tube 1.5–2 × ca. 2 mm, lobes triangular, ca. 2 × 1.2 mm, apex incurved. Stamens 5; anthers yellow. Ovary stalk ca. 1 mm. Style yellowish, ca. 1.5 mm; stigma yellow, capitate, slightly exerted when lobes incurved, usually not exerted. Nutlet ovoid or subglobose, ca. 3.5 × 2–2.2 mm, with conspicuous longitudinal veins; persistent perianth ca. 3 mm.

Shady grasslands; 1600–2300 m. Xinjiang [C Asia, C Europe].

8. *Thesium refractum* C. A. Meyer, Bull. Sci. Acad. Imp. Sci. Saint-Pétersbourg 8: 340. 1841.急折百蕊草 *ji zhe bai rui cao*

Herbs perennial; rhizomes straight, rather strong. Stems erect or ascending, 20–40 cm. Leaves sessile, lanceolate, 30–50 × 2–2.5 mm, rugose on both sides, usually 1-veined, base contracted but not decurrent, apex usually obtuse. Inflorescences racemelike, often branched, rachis zigzagged, especially near apex, with 1 flower per axil; bracts inserted at tip of pedicel, patent, leaflike, 6–8 mm; pedicel decumbent and gradually reflexed after flowering, slender, 5–7 mm, ridged; bracteoles 2, slightly shorter than or as long as bracts. Perianth 5-merous, white, 5–6 mm, tube tubular or broadly funnelform, lobes linear-lanceolate. Stamens 5, not exerted. Ovary stalk very short. Style terete, not exerted. Nutlet ellipsoid or ovoid, ca. 3 × 2–2.5 mm, with 5–10 inconspicuous longitudinal veins (or ridges), ridges sometimes forked; persistent perianth ca. 1.5 mm; fruit stalk to 1 cm, reflexed in mature fruit. Fl. Jul, fr. Sep.

Grassy marshlands, sandy slopes. Gansu, Heilongjiang, Hubei, Hunan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Japan, Korea, Kazakhstan, Kyrgyzstan, Mongolia, Russia].

9. *Thesium longifolium* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 25: 469. 1852.长叶百蕊草 *chang ye bai rui cao*

Thesium longifolium var. *vlassovianum* A. Candolle; *T. vlassovianum* (A. Candolle) Trautvetter [not "*classovianum*"].

Herbs perennial. Stems caespitose, ascending, ca. 50 cm, with evident furrows. Leaves sessile, linear, 40–45 × ca. 2.5 mm, 3-veined, base attenuate, apex acuminate. Inflorescences racemelike, usually sparsely or not branched, with 1 flower per axil; bracts inserted at top of pedicel, linear, ca. 10 mm; pedicel 6–20 mm, finely striate; bracteoles 2, narrowly lanceolate, ca.

4.5 mm, margin rugose. Perianth 5-merous, yellowish white, campanulate, 4–5 mm, lobes narrowly lanceolate, apex acute, incurved. Stamens 5, inserted on the base of lobes, not exerted. Ovary stalk ca. 0.5 mm. Style not exerted. Nutlet yellowish green, subglobose or ellipsoid, 3.5–4 mm, sometimes with forked longitudinal veins (or ridges); persistent perianth shorter than fruit; stalk not reflexed when fruit mature. Fl. and fr. Jun–Jul.

Grassy marshlands; 1200–2000 m. Heilongjiang, Hubei, Hunan, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Shanxi, Sichuan, Xizang, Yunnan [Mongolia, Russia].

10. *Thesium jarmilae* Hendrych, Acta Horti Bot. Prag. 110. 1962.大果百蕊草 *da guo bai rui cao*

Herbs perennial; rhizomes short and thick. Stems procumbent, unbranched or sparsely branched, rather thick, 15–20 cm. Leaves often oblong to oblong-linear, ca. 20 × 1.5–2 mm, 1-veined, apex acute. Inflorescences racemelike, few flowered, with 1 flower per axil; bracts inserted on middle and basal part of pedicels, oblong-linear, 15–25 mm; pedicel ascending or patent, 5–15 mm; bracteoles 2, similar to bracts in shape, 5–8 mm. Perianth 5-merous, broadly campanulate, 4–5(–6) mm, lobes triangular, to 1/3 as long as perianth, apex incurved. Stamens and style not exerted. Ovary stalk ca. 2 mm. Nutlet subglobose, 5–6 mm in diam., with conspicuous longitudinal veins (ridges); persistent perianth nearly as long as or slightly longer than fruit. Fl. Jun.

• Sunny slopes, marshlands in valleys; ca. 3700 m. Xizang.

11. *Thesium longiflorum* Handel-Mazzetti, Symb. Sin. 7: 157. 1929.长花百蕊草 *chang hua bai rui cao*

Thesium himalense var. *pachyrhizum* J. D. Hooker.

Herbs perennial; rhizomes slender, 8–13 cm, 2–2.5 mm thick, sparsely scaly. Stems patent and ascending, often branched at base, to 15 cm, striate. Leaves dense, linear or sometimes lanceolate, 7–17 × 1–2.5 mm, 3-veined, margin rugose. Inflorescences racemelike, often branched, with 1 flower per axil; bracts inserted at base of pedicels and adnate to peduncles, linear-lanceolate, ca. 25 × 2 mm, 1-veined; pedicel usually slender, 11–13 mm; bracteoles 2, linear, 6–7 mm, usually incurved. Perianth yellowish white, 6–10 mm, tube tubular, usually divided to middle, lobes oblong-linear, to 5.5 mm, apex acute, incurved. Stamens and style not exerted. Ovary stalk ca. 2 mm. Nutlet globose, 4.5 mm in diam., with 10 longitudinal veins, usually with ± parallel lateral veins; persistent perianth longer than fruit; fruiting pedicel 13–15 mm. Fl. Jun–Jul, fr. Aug–Sep.

• Sunny grassy slopes, dry open forests; 2600–4100 m. Qinghai, Sichuan, Xizang, Yunnan.

12. *Thesium bomiense* C. Y. Wu ex D. D. Tao in C. Y. Wu, Fl. Xizang. 1: 572. 1983.波密百蕊草 *bo mi bai rui cao*

Herbs perennial; rootstock slender, vertical. Stems soli-

tary, erect, many branched, 20–40 cm, conspicuously striate. Leaves linear, 20–50 × 2–4.5 mm, 3-veined, base and apex acuminate. Inflorescences racemelike, usually with few or no branches, 1 flower per axil; bracts inserted at top of pedicel, leaflike, 7–10 mm; bracteoles 2, filiform, ca. 6 mm. Perianth 5-merous, white, tubular, ca. 7 mm, lobes inflexed, margins membranous. Stamens 5, inserted at upper part of perianth tube. Ovary stalked. Style ca. 7 mm, exserted; stigma capitate. Nutlet subglobose, mature fruit unknown; fruit stalk not reflexed.

- 2800–4000 m. Xizang.

13. *Thesium orgadophilum* P. C. Tam, Bull. Bot. Res., Harbin 1(3): 72. 1981.

草地百蕊草 cao di bai rui cao

Herbs perennial; rhizomes terete, ca. 5 mm thick. Stems ascending, slender, 3–5 cm, furrowed, base yellowish white. Leaves dense, oblong-lanceolate, 15–18 × 2.5–3 mm, both surfaces deep green, 3-veined, base gradually narrowed and decurrent, apex acute. Inflorescences racemelike, with few or no branches, 1 flower per axil; bracts at base of pedicels, oblong-lanceolate, sometimes leaflike, ca. 10 mm, 1-veined; pedicel filiform; bracteoles 2, leaflike, ca. 3.5 mm. Perianth 5-merous, ovoid, 4–5 × ca. 3 mm, usually divided to middle, lobes linear, ca. 3 mm, apex obtuse, incurved. Stamens 5, ca. 2 mm; filaments short and flat. Ovary stalk thick and short, ca. 1.5 mm. Style terete, ca. 3.5 mm; stigma pale yellow, capitate. Fruit not seen. Fl. May.

- Grassy alpine marshlands; ca. 4000 m. Xizang.

The type collection, from Nyalam Xian, is of an immature plant; fruiting material is needed to assess the relationships of this taxon.

14. *Thesium remotibracteatum* C. Y. Wu & D. D. Tao, Acta Phytotax. Sin. 26: 320. 1988.

远苞百蕊草 yuan bao bai rui cao

Herbs perennial; rhizomes slender, erect. Stems few to several, erect or ascending, sparsely branched, slender, furrowed. Leaves sessile, linear, 15–20 × ca. 2 mm, 1-veined, apex acute. Inflorescences racemelike, often branched, few flowered; bracts at the base of pedicels, leaflike, 25–40 mm; pedicel 25–40 mm; bracteoles 2, leaflike, 1/4–1/2 as long as bracts, margin smooth or papillose. Perianth 5-merous, tubular, 4–5 × ca. 2 mm, lobes triangular-lanceolate, 3–4 mm, incurved, glabrous.

Stamens 5, ca. 2.5 mm, not exserted. Style ca. 1.5 mm; stigma yellow, capitate. Mature nutlet not seen. Fl. Jun.

- About 2800 m. Yunnan.

15. *Thesium brevibracteatum* P. C. Tam, Bull. Bot. Res., Harbin 1(3): 73. 1981.

短苞百蕊草 duan bao bai rui cao

Herbs subshrublike; rootstock yellowish brown, ± conic, ca. 8 cm, tip ca. 10 mm thick. Stems usually erect, partly ascending, rigid, slender, to 30 cm, 4-ribbed, furrowed. Leaves sparse, sessile, linear, ca. 25 mm, 1-veined, margin minutely denticulate, apex acute. Inflorescences racemelike, many flowered; bracts narrowly linear, 5–7 mm; pedicel ca. 5 mm, finely striate; bracteoles 2, subulate, ca. 3 mm, curved. Perianth 5-merous, white, funnellform, ca. 8 mm, sometimes longer, tube tubular, ca. 3 mm, lobes narrowly oblong, ca. 4 mm, apex acute, incurved. Stamens ca. 2 mm. Ovary stalk 0.8–1 mm. Style 2.5 mm, not exserted. Nutlet ovoid, 3–3.5 × 2.5–3 mm, with 10, nearly parallel or obliquely lateral veins, not reticulate; persistent perianth funnellform, ca. 4 mm, longer than fruit; stalk 5–6 mm. Fl. and fr. Aug–Sep.

- Sunny dunes. Nei Mongol.

16. *Thesium psilotoides* Hance, J. Bot. 6: 48. 1868.

白云百蕊草 bai yun bai rui cao

Herbs dwarf; rhizomes short, woody. Stems erect, branched at middle (branches rebranched), slender, 15–25 cm. Leaves sessile, scale-like, 1–1.5 mm, decurrent along stems to form ridges, 1-veined. Inflorescences cymose, fasciculate, 1–3-flowered; bracts scale-like, ca. 1.5 mm; bracteoles 4, scale-like, shorter than perianth, bracts and bracteoles forming an involucre around base of perianth. Perianth 5-merous, slightly dirty yellow, broadly campanulate, ca. 1.5 mm, tube divided to middle, ca. 1 mm, lobes triangular, margin inflexed. Stamens 5, on basal 1/3 of lobes; filaments short. Ovary sessile. Style erect, slightly shorter than stamens; stigma ± globose. Nutlet ovoid, ca. 2 × 2 mm, with ridges and inconspicuous reticulate veins, gradually narrowed to base; persistent perianth arched, adnate, slightly umbulate, short. Fl. May, fr. Aug.

Open grasslands under *Pinus* forests; 200–1300 m. Guangdong, [Cambodia, Indonesia, Philippines, Thailand].

6. DENDROTROPHE Miquel, Fl. Ned. Ind. 1(1): 776, 779. 1856.

寄生藤属 ji sheng teng shu

Henslowia Blume (1850), not Wallich (1832), nor Lowe ex Candolle (1844); *Dufrenoya* Chatin.

Woody vines, hemiparasitic, often on branches of other trees, evergreen. Stems terete, ridged when young. Leaves alternate, petiolate or sessile, leathery, palmately 3–9(–11)-veined, lateral veins arched above base, margin entire. Inflorescences axillary, 1-flowered, fasciculate, cymose, or umbellate; bracteoles 3–8 subtending each flower. Perianth lobes 5 or 6, distinct from disk, interior with a tuft of hair or tongue-shaped appendage behind each stamen. Flowers bisexual or unisexual (plants monoecious or dioecious). Male flowers: stamens as many as perianth lobes, nearly on the base of lobes; filaments short; anthers small, introrse, cells divaricate, dehiscence oblique. Disk superior. Female flowers: slightly larger than male, solitary or in fascicles, usually sessile, perianth tube adnate to ovary, lobes similar to those of males, staminodes usually present, discs covering ovary. Ovary inferior; ovules 3, pendulous from apex of placenta. Style almost absent; stigmas lobed or capitate. Fruit a drupe, with ± persistent perianth lobes at apex, lost only in fully mature fruits, endocarp rigid, rugose or tuberculate abaxially, larger tubercles usually forming 8–10 longitudinal lines,

adaxially embedded in seed. Seeds longitudinally furrowed, 8–10 aristate rays on transverse section; embryo straight, short; cotyledons minute.

About ten species: from Himalayas and SE Asia to S Australia; six species in China.

- 1a. Stems tuberculate; leaves with 5–9 basal veins.
- 2a. Branches without lenticels 3. *D. polyneura*
- 2b. Branches lenticellate.
- 3a. Leaves elliptic-ovate or obovate-elliptic, tuberculate on both surfaces; female flowers solitary or in clusters of 3 or 4 1. *D. platyphylla*
- 3b. Leaves broadly ovate, not tuberculate; female flowers solitary or paired 2. *D. granulata*
- 1b. Stems not tuberculate; leaves with 3(or 5) basal veins.
- 4a. Bracteoles connate, forming an involucre; flowers unisexual, solitary, male flower with each stamen with a tongue-like appendage behind it 4. *D. umbellata*
- 4b. Bracteoles semidistinct, rarely forming an involucre; flowers unisexual or bisexual, solitary or clustered, each stamen with a small cluster of hairs behind it.
- 5a. Stigma 3–5-lobed; male inflorescence fasciculate, 1–8-flowered 5. *D. buxifolia*
- 5b. Stigma entire; male inflorescence fasciculate umbellate or cymose, 5- or 6-flowered 6. *D. varians*

1. *Dendrotrophe platyphylla* (Sprengel) N. H. Xia & M. G. Gilbert, **comb. nov.**

异花寄生藤 yi hua ji sheng teng

Basionym: *Viscum platyphyllum* Sprengel, Syst. Veg. 4(2): 47. 1827, based on *V. latifolium* Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 142. 1825, not Lamarck (1789), nor Swartz (1797); *Dendrotrophe heterantha* (Wallich ex Candolle) A. N. Henry & B. Roy; *Dufrenoya heterantha* (Wallich ex Candolle) Chatin; *D. platyphylla* (Sprengel) Stauffer; *Henslowia heterantha* (Wallich ex Candolle) J. D. Hooker & Thomson ex A. Candolle; *Viscum heteranthum* Wallich ex Candolle.

Woody vines, to 2 m tall. Stems erect or twining, 4-ribbed at first, later terete, usually tuberculate and with longitudinally lengthened lenticels. Petiole flat, narrowly winged, short to almost absent; leaf blade varied in shape, usually elliptic-ovate or obovate-elliptic, 2–2.7 × 1.3–1.7(–2) cm, glossy adaxially, tuberculate on both surfaces, basal veins 7–9, usually inconspicuous abaxially, basal 1/2 abruptly narrowed and decurrent into petiole, apex obtuse. Male inflorescences fasciculate, 5- or 6-flowered. Female inflorescences of flowers solitary or 3 or 4 in fascicle; peduncle 3–6 mm; bracts broadly ovate. Flowers ovoid, ca. 1.8 mm, sessile; bracteoles usually several in involucre, elliptic. Male flowers not seen. Female flowers: staminodes sometimes present. Style very short; stigma shallowly 5-lobed. Drupe red or orange, ellipsoid to subglobose, ca. 4 mm in diam.; persistent perianth lobes triangular, apex incurved. Fr. Aug–Oct.

Broad-leaved forests; 2000–3700 m. NW Yunnan [Bhutan, Malaysia, Myanmar, Nepal, Sikkim].

This species is hemiparasitic on the branches of *Quercus*.

2. *Dendrotrophe granulata* (J. D. Hooker & Thomson ex A. Candolle) A. N. Henry & B. Roy, Bull. Bot. Surv. India 10: 276. 1969.

疣枝寄生藤 liu zhi ji sheng teng

Henslowia granulata J. D. Hooker & Thomson ex A. Candolle in Candolle, Prodr. 14(2): 632. 1857; *Dufrenoya*

granulata (J. D. Hooker & Thomson ex A. Candolle) Stauffer; *H. granulata* var. *sikkimensis* A. Candolle.

Woody vines. Stems erect, usually grayish brown, rugose-lenticellate; branchlets terete, densely covered with prominent, granulate, bulliform tubercles. Petiole flat, narrowly winged; leaf blade broadly ovate, 3–4.5 × 1.6–4 cm, abaxially pale green, adaxially glossy, both surfaces brown when dry, densely bullate, basal veins 5–7, reticulate veins inconspicuous, base broadly cuneate or subrotund, usually oblique, abruptly contracted into petiole, margin revolute, apex obtuse or subrotund. Male inflorescences fasciculate or umbellate. Female inflorescences of solitary or paired flowers; peduncle ca. 4 mm, ridged; bracts ovate or broadly ovate, ca. 1 mm. Flowers unisexual, ovoid, ± ciliate, sessile; bracteoles 4 or 5, forming involucre, ovate, smaller than bracts; perianth apex incurved. Styles short or absent; stigma inconspicuously lobed. Drupe reddish brown when mature, ovoid, 4–6 mm; persistent perianth very small. Fl. and fr. May–Aug.

Forested slopes; ca. 1800 m. SE Xizang (Médog) [Bhutan, NE India, Myanmar, Nepal, Sikkim].

3. *Dendrotrophe polyneura* (Hu) D. D. Tao ex P. C. Tam in H. S. Kiu & Y. R. Ling, Fl. Reipubl. Popularis Sin. 24: 52. 1988.

多脉寄生藤 duo mai ji sheng teng

Henslowia polyneura Hu, Bull. Fan Mem. Inst. Biol., Bot. 10: 157. 1940.

Woody vines 30–40 cm tall. Stems terete, striate, with small bullate tubercles, more dense when mature. Petiole flat, 5–7 mm; leaf blade variable in shape, usually obovate to suborbicular, 2–4.5 × 2–3.5 cm, papery, basal veins 7–9, prominent on both surfaces, base cuneate, margin cartilaginous, minutely crisped, apex obtuse. Male inflorescences fasciculate, 6-flowered; peduncle 0.5–1 mm. Female inflorescences 1–5-flowered; peduncle 1–1.5 mm. Flowers unisexual (plants dioecious). Male flowers: perianth lobes triangular, ca. 0.8 mm; stamen filaments short. Female flowers: bracteoles several, ovate, ca. 2 × 1 mm, apex acute; perianth yellow, conic, ca. 1.8 mm, lobes 5, similar

to male. Disk 5-angled. Style absent; stigma capitate. Drupe yellow, ovoid, ca. 4 mm, inconspicuously ridged. Fl. Dec–Mar, fr. May–Jul.

Mixed montane forests; 1400–2000 m. Yunnan [Vietnam].

Although the combination is usually attributed to D. D. Tao (Index Fl. Yunnan. 1: 774. 1984), that work gives only authorities and dates, not places of publication of basionyms, and thus proposed new combinations are invalid. The combination was effectively validated in FRPS, where the full basionym citation is given.

4. *Dendrotrophe umbellata* (Blume) Miquel, Fl. Ned. Ind. 1(1): 779. 1856.

伞花寄生藤 san hua ji sheng teng

Woody vines. Stems pale brown, 4-ribbed at first, becoming terete, smooth. Petiole 4–6 mm; leaf blade obovate to subspatulate, 4–7(–8) × 2–4 cm, thinly leathery, adaxially glossy, basal veins 3, inconspicuous on both surfaces, base broadly cuneate, decurrent to form petiole, apex rotund or obtuse. Male inflorescences umbellate, 3–5-flowered; peduncle 5–7 mm. Female inflorescences 1–3-flowered. Flowers unisexual (plants dioecious). Male flowers ca. 1 mm in diam.; pedicel 2.5–3 mm; bracteoles connate, forming involucre; perianth tube terete, lobes triangular, ca. 0.65 mm, apex incurved; stamen filaments ca. 0.3 mm with 1 tongue-like appendage behind each, cells rounded. Female flowers: pedicel 1.5–2 mm; perianth tube ovoid, lobes 5, triangular. Discs fleshy. Style ca. 0.75 mm; stigma scutiform, suborbicular, inconspicuously 5-lobed. Drupe deep red to black when mature, obovoid, ca. 10 mm, stipitate. Fl. Feb–Apr, fr. May–Jun.

Forests; ca. 1100 m. Hainan, S Yunnan [Cambodia, Indonesia, Laos, Malaysia, Vietnam].

- 1a. Petiole 4–6 mm; leaf blade obovate to subspatulate, 4–7(–8) cm 4a. var. *umbellata*
 1b. Petiole 6–10 mm; leaf blade lanceolate-oblong, 8–11 cm 4b. var. *longifolia*

4a. *Dendrotrophe umbellata* var. *umbellata*

伞花寄生藤(原变种) san hua ji sheng teng (yuan bian zhong)

Viscum umbellatum Blume, Bijdr. Fl. Ned. Ind. 666. 1826; *Henslowia umbellata* (Blume) Blume; *Thesium spathulatum* Blume.

Petiole 4–6 mm; leaf blade obovate to subspatulate, 4–7(–8) × 2–4 cm.

Forests. Hainan [Cambodia, Indonesia, Laos, Malaysia, Vietnam].

4b. *Dendrotrophe umbellata* var. *longifolia* (Lecomte) P. C. Tam in H. S. Kiu & Y. R. Ling, Fl. Reipubl. Popularis Sin. 24: 72. 1988.

长叶伞花寄生藤 chang ye san hua ji sheng teng

Henslowia umbellata var. *longifolia* Lecomte, Fl. Indo-Chine 5: 219. 1915.

Petiole 6–10 mm; leaf blade lanceolate-oblong, 8–11 × 3–4 cm.

Forests; ca. 1100 m. S Yunnan [Cambodia].

5. *Dendrotrophe buxifolia* (Blume) Miquel, Fl. Ned. Ind. 1(1): 781. 1856.

黄杨叶寄生藤 huang yang ye ji sheng teng

Henslowia buxifolia Blume, Mus. Bot. 1: 244. 1851; *Osyris rotundata* Griffith.

Semierect shrubs or woody vines, to 3 m tall. Stems yellowish green, becoming brown when old, terete, twisted, ± smooth. Petiole 3–7 mm; leaf blade elliptic, obovate, or spatulate, (2.2–)2.5–4.5 × 1.5–2.5 cm, basal veins 3, base narrowly cuneate, decurrent to form petiole, apex obtuse or slightly acute. Male inflorescences fasciculate, 1–8-flowered; peduncle 2–4 mm; bracts orbicular. Female inflorescences usually 1-flowered. Flowers unisexual (plants dioecious). Male flowers yellowish green, bracteoles 4 or 5, elliptic, tiny; perianth lobes triangular, incurved; stamen filaments short, with a tuft of hair behind each stamen, cells rounded. Female flowers: style very short, stigma 3–5-lobed. Drupe deep red to glossy black when mature, globose, ca. 3 mm in diam., contracted near apex, slightly umbonulate. Fl. Dec–Feb, fr. Mar–May.

Valleys, ravines; ca. 400 m. SW Yunnan [Cambodia, Indonesia, Malaysia, Thailand, Vietnam].

6. *Dendrotrophe varians* (Blume) Miquel, Fl. Ned. Ind. 1(1): 780. 1856.

寄生藤 ji sheng teng

Henslowia varians Blume, Mus. Bot. 1: 244. 1851; *Dendrotrophe frutescens* (Champion ex Benth) Danser; *D. frutescens* var. *subquinquenervia* P. C. Tam; *D. punctata* C. Y. Wu & D. D. Tao; *Henslowia frutescens* Champion ex Benth; *H. frutescens* var. *subquinquenervia* P. C. Tam; *H. sessiliflora* Hemsley.

Woody vines, usually shrubby, 1–8 m tall. Stems darkish black, yellowish green when young, 3-ribbed, twisted, ± smooth, sometimes reddish brown punctate. Petiole flat, 5–10 mm; leaf blade obovate to broadly elliptic, 3–7 × (1.4–)2–4.5 cm, thick, ± leathery, basal veins 3–5, prominent when dry, base narrowed and decurrent to form petiole, less often rounded, apex obtuse. Male inflorescences umbellate or cymose, 5- or 6-flowered; peduncle to 20 mm; bracteoles 7 or 8, ovate-triangular. Female inflorescences usually of solitary flowers; peduncle 3–4 mm. Flowers usually unisexual (plants usually dioecious). Male flowers globose, ca. 2 mm; pedicel ca. 1.5 mm; bracteoles triangular-ovate, ca. 1 mm; perianth lobes triangular, ca. 1.5 mm; stamen filaments ca. 0.5 mm, with a tuft of hair behind each, cells rounded. Disk 5-lobed to annular. Female flowers: bracteoles 3–5; perianth short terete, 2–3 mm, lobes 5, ovate-triangular, ca. 1 × 1 mm; staminodes present. Style short, stigma not lobed, needle-like. Bisexual flowers ovoid. Drupe reddish, brownish yellow to reddish brown when mature, ovoid, 10–13 mm, inconspicuously 5-ribbed; persistent perianth lobes incurved. Fl. Jan–Mar, fr. Jun–Aug.

Thickets, usually climbing on trees; 100–300 m. Fujian, Guangdong, Guangxi, Hainan [Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

Dendrotrophe punctata was described from material with densely punctate stems and leaves, but such gland dots occur sporadically in collections from at least both China and Thailand, and there is no clear division between *D. punctata* and the very widespread and variable *D.*

varians. There are additional probable synonyms based on collections from Indonesia and the Philippines.

The plants are used medicinally.

7. PHACELLARIA Bentham in Bentham & J. D. Hooker, Gen. Pl. 3: 229. 1880.

重寄生属 chong ji sheng shu

Subshrubs or herbs, usually epiparasitic on the stems of species of Loranthaceae and *Dendrotrophe*. Leaves alternate, reduced to rudimentary scales. Inflorescences axillary, 1-flowered or densely clustered. Flowers bisexual or unisexual (plants dioecious, monoecious, or polygamous), sessile, minute. Male flowers: perianth tube short, lobes 3–6, valvate. Stamens as many as and opposite to perianth lobes; filaments short, compressed; anthers cordate, 2-celled, dehiscence longitudinal. Discs flat or slightly conic. Female flowers: lobes 4–8, valvate. Ovary inferior, 1-loculed; ovules 2 or 3. Bisexual flowers similar to female ones, except with stamens. Fruit a drupe, ellipsoid, with persistent lobes and discs at apex, exocarp fleshy, endocarp bony, 5- or 6-furrowed. Seed 1; endosperm copious; embryo small.

Eight species: tropical and subtropical SE Asia; six species (two endemic) in China.

All known species are epiparasites growing on *Dendrotrophe* and members of the Loranthaceae.

- 1a. Flowers bisexual, solitary; bracts 1–1.3 mm, apex reflexed; stems to 8 cm, unbranched 1. *P. fargesii*
 1b. Flowers mostly unisexual (plants monoecious or dioecious, rarely polygamous), solitary or eventually in clusters; bracts to 1 mm, apex not reflexed; stems to 30 cm, branched or unbranched.
 2a. Stems branched and rebranched; bracts conspicuous, ca. 1 mm; flowers solitary 2. *P. caulescens*
 2b. Stems unbranched or with a few short lateral branches; bracts smaller, less than 1 mm; flowers eventually in clusters.
 3a. Flower clusters few flowered, globose 5. *P. rigidula*
 3b. Flower clusters eventually many flowered, elongated along rachis.
 4b. Plant sparsely papillose-hairy when young, soon glabrous; bracts to 0.5 mm 6. *P. tonkinensis*
 4a. Plant ferruginous-tomentose when young, indumentum persistent at least around inflorescence; young bracts to 1 mm.
 5a. Stems at least partly flattened; drupe ovoid-ellipsoid, 4–6 × 1.5–4 mm in diam. 3. *P. compressa*
 5b. Stems terete; drupe globose, ca. 2.5 × 2.5–3 mm in diam. 4. *P. glomerata*

1. *Phacellaria fargesii* Lecomte, Bull. Mus. Natl. Hist. Nat. 20: 401. 1914.

重寄生 chong ji sheng

Plants 6–8 cm tall. Stems in dense clusters, unbranched, striate, ferruginous pubescent when young. Flowers solitary, bisexual; bracts ovate-triangular, 1–1.3 mm, apex reflexed, ciliate; bracteoles 2, ovate-triangular, very small, ca. 0.5 mm, apex acute, ciliate; involucre absent. Perianth yellowish white, campanulate-terete, 2.3–2.5 × 1.3–1.5 mm, glabrous, lobes (4 or)5, usually distinct from discs, less than 0.7 mm, usually pilose adaxially. Stamens 5. Ovary mostly connate to perianth. Style terete, short; stigmas ± oblong-scutiform. Drupe ovoid-ellipsoid, 6–8 × 3.5 mm, 5- or 6-furrowed, base rounded, apex with straight and incurved persistent perianth lobes. Seed terete. Fl. and fr. Jul–Aug.

- Forests; 1000–1400 m. Guangxi, Guizhou, Hubei, Sichuan.

Phacellaria fargesii is epiparasitic on *Taxillus levinei*, among other species.

2. *Phacellaria caulescens* Collett & Hemsley, J. Linn. Soc., Bot. 28: 122. 1890.

粗序重寄生 cu xu chong ji sheng

Plants 20–30 cm tall. Stems usually twisted, branched and rebranched, strong, terete, finely ridged, not flat, ca. 2.5 mm thick at base, ± tomentose at apex when young, gradually gla-

brous later. Flowers solitary, mostly unisexual (plants dioecious); bracts imbricate, slightly orbicular, rather large, ca. 1 × 0.8 mm, apex shortly acuminate, flat; bracteoles 2 or more, tiny. Male flowers not seen. Female bud globose, ca. 1.3 mm in diam.; perianth ellipsoid to ellipsoid-cylindric, small, lobes 4–6, triangular. Discs rather flat. Style short. Drupe yellow, sessile, ovoid-ellipsoid, 5–6 × ca. 2 mm, basal part slightly condensed, apex with persistent, incurved lobes. Fl. May–Aug, fr. Oct–Dec.

Forests; 900–2400 m. Guangxi, Yunnan [Myanmar].

This species is epiparasitic on *Macrosolen cochinchinensis*.

3. *Phacellaria compressa* Bentham in Bentham & J. D. Hooker, Gen. Pl. 3: 229. 1880.

扁序重寄生 bian xu chong ji sheng

Phacellaria ferruginea W. W. Smith; *P. wattii* J. D. Hooker.

Plants usually to 20 cm tall. Stems unbranched or with very few branches, sparse (not dense), flat or mostly flattened, 1–4 mm thick, ferruginous-tomentose, later gradually deciduous and with rudimentary tomentum at the base of flower clusters. Flowers unisexual (plants usually dioecious), in dense, elongated clusters; bracts imbricate, ovate or obovate, ca. 0.8 × 0.5 mm, apex acuminate; bracteoles numerous, forming involucre, small. Male flowers oblate, ca. 1 × 1.5 mm; perianth divided to base, lobes 5–8, erect or slightly patent, shortly triangu-

lar, ca. 1×1 mm; filaments short and flat. Female flowers: perianth obovoid, ca. 2×1.5 mm, lobes 5, triangular, ca. 0.5 mm. Discs nearly flat. Style short; stigmas truncate. Drupe ovoid-ellipsoid, $4-6 \times 1.5-4$ mm, glabrous, apex with persistent perianth. Fl. May, fr. Oct.

Forests; 500–1800 m. Guangxi, Sichuan, Xizang, Yunnan [Myanmar, Thailand, Vietnam].

This species is usually epiparasitic on *Taxillus chinensis*, other species of *Taxillus*, and sometimes *Dendrotrophe*.

4. *Phacellaria glomerata* D. D. Tao, Acta Phytotax. Sin. 25: 407. 1987.

聚果重寄生 ju guo chong ji sheng

Plants ca. 15 cm tall. Stems in clusters, apparently unbranched, terete, 1–2 mm thick, puberulous. Flowers unisexual, in dense, elongated clusters; bracts imbricate, densely brownish gray pilose; involucre bracteole 1, broadly triangular, ca. 1×1 mm. Male flowers not known. Female flowers: perianth obovoid, lobes 5, triangular, 0.5–1 mm. Style short; stigma peltate. Drupe globose, rarely globose-ellipsoid, 2.5–3 mm in diam., glabrous. Seed black, ovoid, ca. 2.5×2 mm.

- Mixed forests; ca. 2400 m. Yunnan (Jingdong).

This species is epiparasitic on *Taxillus delavayi*.

5. *Phacellaria rigidula* Benth in Benth & J. D. Hooker, Gen. Pl. 3: 229. 1880.

硬序重寄生 ying xu chong ji sheng

Plants 10–25 cm tall. Stems in clusters arising from enlarged basal pulvinus, unbranched or with a few short lateral branches, slender, terete, rigid, ca. 1.5 mm thick, thinly tomentose when young, glabrous except near flowers when mature. Flowers mostly unisexual (plants monoecious), in small globose clusters; bracts imbricate, ovate-elliptic, ca. 1×0.6 mm,

apex acute; bracteoles at periphery of flower clusters, usually 3–6 in involucre. Male flowers subglobose, ca. 1.6 mm in diam.; perianth lobes 4 or 5, triangular. Female flowers: perianth obovoid, 1.5–1.7 mm in diam., lobes as large as or larger than in male. Discs slightly conic; stigmas \pm exserted. Drupe ovoid-ellipsoid, ca. 4×1.5 mm, 5-ridged, base wider than apex; persistent style slightly exserted. Fl. May, fr. Sep.

Forests; 1400–2100 m. Guangdong, Guangxi, Sichuan, Yunnan [Myanmar].

This species is epiparasitic on stems of *Taxillus thibetensis*, *T. limprichtii*, and species of *Viscum*.

6. *Phacellaria tonkinensis* Lecomte, Bull. Mus. Natl. Hist. Nat. 20: 399. 1914.

长序重寄生 chang xu chong ji sheng

Plants 10–30 cm tall. Stems in clusters, unbranched or with a few branches, slender, terete, 1–1.5 mm thick, glabrous. Flowers mostly unisexual, less often bisexual (plants dioecious or monoecious), in dense, elongated clusters; bracts imbricate when young, semiorbicular to suborbicular, small, ca. 0.5 mm, apex sometimes acute; bracteoles inconspicuous or absent; involucre absent. Male flowers: perianth tube whitish, lobes 5, triangular, distinct from discs. Stamens 5; filaments very short; anthers small. Discs nearly flat, shallowly divided. Female and bisexual flowers: perianth ellipsoid, lobes 5(or 6), triangular, 1.5–2 mm. Style short terete; stigmas truncate or slightly oblong-scutiform. Drupe ovoid-ellipsoid, $8-9 \times 2.5-3$ mm, widest at base, gradually narrowing to apex, endocarp 5- or 6-furrowed. Seed ellipsoid. Fl. Jun–Aug, fr. Oct–Feb.

Forests; ca. 1000 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [Vietnam].

This species is usually epiparasitic on stems of *Taxillus chinensis*, *Macrosolen bibracteolatus*, and *Helixanthera parasitica*, among others.

SANTALACEAE