

ERIOCAULACEAE

谷精草科 *gu jing cao ke*

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Herbs perennial or annual. Leaves in a rosette, grasslike, linear, occasionally thinly filiform, often thin and transparent, fenestrate, base sheathing. Inflorescences capitate, globose to ovoid; scapes thin, twisted, angled, base surrounded by a bladeless, tubular sheath. Flowers 2- or 3-merous, bracteate, with both sexes usually in same head. Male flowers: sepals 2 or 3, connate or free; petals 2 or 3, often inconspicuous; stamens 6. Female flowers: sepals 2 or 3, free or connate; petals absent to 4, free; ovary (1–)3-loculed; ovules 1 per locule, basal; style 1, 1–3-branched. Fruit a capsule, thin, loculicidal. Seeds small; testa usually reticulate and prickly; endosperm with abundant starch grains.

Ten genera and ca. 1150 species: mainly in tropical and subtropical regions; one genus and 35 species (13 endemic) in China.

Ma Weiliang. 1997. Eriocaulaceae. *In*: Wu Kuo-fang, ed., *Fl. Reipubl. Popularis Sin.* 13(3): 20–63.

1. ERIOCAULON Linnaeus, *Sp. Pl.* 1: 87. 1753.

谷精草属 *gu jing cao shu*

Herbs scapigerous, aquatic or growing in marshes, rarely on dry ground. Stems very short and disciform, rarely elongate. Leaves radical, linear. Scapes 3–8-ribbed; sheath oblique at mouth. Bracts scalelike. Flowers unisexual, with both sexes in same head, minute. Male flowers: sepals 2 or 3, usually connate into an abaxially split tube, rarely free; petals basally connate and funnelform, large, margin usually ciliate, apex distinctly or indistinctly 2- or 3-lobed, usually bearing a gland; stamens in 2 whorls, adnate to petals; anthers black or rarely yellowish. Female flowers: sepals 2 or 3, free, basally connate, or connate into an adaxial spathe, flat, boatlike, or crested, equal or unequal; petals absent to 3, linear, oblanceolate, or spatulate, margin ciliate, apex often bearing a large gland; ovary 1–3-loculed; style 1–3-branched. Seeds yellowish or brown, 1 per valve; testa usually hexagonally reticulate, prickles small and in rows or absent; embryo minute.

About 400 species: mainly in tropical and subtropical regions, with a concentration in Asia; 35 species (13 endemic) in China.

Eriocaulon occurs throughout most of China except for Ningxia, Qinghai, and Xinjiang.

- 1a. Flowers 2-merous; ovary 2-loculed but sometimes only 1 locule developed 35. *E. decemflorum*
- 1b. Flowers 3-merous but sometimes parts fused or degenerate; ovary 3-loculed or 1 or 2 locules not developed.
 - 2a. Sepals of female flowers connate at base or spathe-like, apex 3-lobed.
 - 3a. Ovary 1(or 2)-loculed.
 - 4a. Scapes 20–35 cm; leaves 4–12 cm; sheath 3–7 cm 33. *E. faberi*
 - 4b. Scapes ca. 3.5 cm; leaves 1–2.8 cm; sheath 0.6–1.7 cm 34. *E. mangshanense*
 - 3b. Ovary 3-loculed.
 - 5a. Floral bract abaxially white clavate hairy toward apex.
 - 6a. Receptacle usually densely villous; head straw-colored, 3–5 × 4–5 mm; involucre bracts orbicular to obovate, 2–2.5 mm; seed prickles T-shaped 26. *E. buergerianum*
 - 6b. Receptacle glabrous or with very few short hairs; head yellowish green, ca. 2.5 × 4 mm; involucre bracts broadly ovate, 1.5–2 mm; seed prickles linear, apex truncate or 2-branched 30. *E. chinorossicum*
 - 5b. Floral bract glabrous, glabrescent, margin villous, or abaxially shortly hairy toward apex.
 - 7a. Leaves 0.5–0.7 mm wide at middle 32. *E. minusculum*
 - 7b. Leaves 1–5 mm wide at middle.
 - 8a. Petals of female flowers glabrous 31. *E. glabripetalum*
 - 8b. Petals of female flowers adaxially villous.
 - 9a. Leaves 1–1.5 mm wide at middle, 4–7-veined; involucre bracts lanceolate to linear-lanceolate, 3.5–7.3 mm 27. *E. miquelianum*
 - 9b. Leaves 2–5 mm wide at middle, 7–20-veined; involucre bracts ovate to oblong, 1.5–2 mm.
 - 10a. Leaf veins 12–20; heads turbinate; seed prickles 1 or 2(–4) per cell 28. *E. alpestre*
 - 10b. Leaf veins 7–12; heads subglobose; seed prickles 2–4 per cell 29. *E. robustum*
 - 2b. Sepals of female flowers free (sometimes ± connate in *E. tonkinense*).

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- 11a. Petals of female flowers absent.
- 12a. Apex of involucre bracts acuminate to caudate; sepals of female flowers winged 22. *E. echinulatum*
- 12b. Apex of involucre bracts obtuse to acute; sepals of female flowers wingless.
- 13a. Sepals of male flowers spathe-like, apex 3-cleft; anthers white to milky white or dusky; leaves ca. 1 mm wide at middle 20. *E. cinereum*
- 13b. Sepals of male flowers tubular at base, apex 2-cleft; anthers blackish; leaves 1.8–2 mm wide at middle 21. *E. taishanense*
- 11b. Petals of female flowers present.
- 14a. Sepals of female flowers usually 2, sometimes 3 on flowers near edge of inflorescence.
- 15a. Leaves 6–8 cm, subleathery; scapes 1 or 2, 7-ribbed 19. *E. sclerophyllum*
- 15b. Leaves 2–5 cm, herbaceous or membranous and conspicuously fenestrate; scapes 5–10, (4 or)5(or 6)-ribbed 18. *E. truncatum*
- 14b. Sepals of female flowers 3 (rarely 2 in *E. sexangulare*).
- 16a. Stem elongate.
- 17a. Leaves ca. 0.2 mm wide at middle, 1-veined; sheath 2–2.5 cm; heads ca. 3 mm in diam.; involucre bract ca. 1 mm 10. *E. setaceum*
- 17b. Leaves 3–5 mm wide at middle, 12–28-veined; sheath 3–6 cm; heads ca. 5 mm in diam.; involucre bract 2–2.7 mm 12. *E. nepalense*
- 16b. Stem not elongate.
- 18a. Floral bracts abaxially white clavate hairy toward apex.
- 19a. Involucre bracts villous at least at base abaxially.
- 20a. Leaves 4–6 mm wide; involucre bracts oblong, 3.5–4 × 2.2–3.6 mm; lateral sepals wingless 6. *E. brownianum*
- 20b. Leaves 2–3 mm wide; involucre bracts orbicular-reniform to ovate, 2–2.5 × 2–2.5 mm; lateral sepals winged 7. *E. australe*
- 19b. Involucre bracts glabrous or subglabrous.
- 21a. Involucre bracts brownish, suborbicular 3. *E. angustulum*
- 21b. Involucre bracts straw-colored (sometimes blackish at apex), elliptic, ovate, or obovate.
- 22a. Gland of male flower petals absent, inconspicuous, or present only on lateral petals.
- 23a. Leaves 3–3.5 mm wide at middle; sheath 5.5–8 cm 1. *E. acutibracteatum*
- 23b. Leaves 1–1.8(–3) mm wide at middle; sheath 2.5–4 cm 2. *E. nantoense*
- 22b. Gland of male flower petals present.
- 24a. Heads white, usually with black, triangular patches, 5–6 mm in diam. 9. *E. schochianum*
- 24b. Heads black or blackish, 3–5 mm in diam.
- 25a. Anthers milky white to brownish; seed prickles absent 14. *E. tonkinense*
- 25b. Anthers black; seed prickles linear.
- 26a. Leaves 1–1.8(–3) mm wide at middle; heads 3.5–5 mm in diam. 2. *E. nantoense*
- 26b. Leaves ca. 3 mm wide at middle; heads 3–3.5 mm in diam. 11. *E. sollyanum*
- 18b. Floral bracts glabrous, ciliate, or abaxial hairs not white and clavate.
- 27a. Receptacle glabrous or subglabrous.
- 28a. Sepals of male flowers laterally winged; seed prickles T-shaped 8. *E. sexangulare*
- 28b. Sepals of male flowers wingless; seed prickles absent.
- 29a. Sepals of female flowers keeled; petals of female flowers glabrous, apex emarginate 15. *E. kunmingense*
- 29b. Sepals of female flowers not keeled; petals of female flowers adaxially villous at center, apex acute 16. *E. leianthum*
- 27b. Receptacle sparsely to densely hairy.
- 30a. Male and female flower petals with a gland (sometimes gland on only 2 petals of female flowers in *E. henryanum*).
- 31a. Leaves 4–8 cm; scapes 1–4; sheath 4–9 cm 4. *E. henryanum*
- 31b. Leaves ca. 2.3 cm; scapes 5–23; sheath 2–2.3 cm 23. *E. parvum*
- 30b. Male and female flower petals without a gland (occasionally gland present on lateral petals of female flowers in *E. rockianum*).
- 32a. Floral bracts glabrous, shortly hairy, or margin ciliate.
- 33a. Involucre bracts 2.2–2.5 mm; male flower petals usually

- glabrous 17. *E. zollingerianum*
- 33b. Involucral bracts ca. 2 mm; male flower petals hoary or white clavate hairy 25. *E. ermeiense*
- 32b. Floral bracts villous, hoary, or hispid.
- 34a. Sheath 5.5–10 cm; involucral bracts 3–4 × 2.5–3 cm; floral bracts hispid; seed prickles setiform, 2 or 3 from transverse wall and 1 from longitudinal wall 24. *E. oryzetorum*
- 34b. Sheath 1–5 cm; involucral bracts 2–3 × 1.3–2 cm; floral bracts villous or hoary; seed prickles oblong or linear.
- 35a. Sheath 1–2.5 cm; heads ca. 2 mm; involucral bracts ca. 2.2 mm, membranous; floral bracts villous; prickles oblong 5. *E. rockianum*
- 35b. Sheath 2.5–5 cm; heads 3.5–5 mm; involucral bracts 2.5–3 mm, papery; floral bracts hoary; prickles linear 13. *E. luzulifolium*

1. *Eriocaulon acutibracteatum* W. L. Ma, Acta Phytotax. Sin. 29: 292. 1991.

双江谷精草 *shuang jiang gu jing cao*

Leaves lanceolate-linear, 4–5 cm, 3–3.5 mm wide at middle, glabrous, veins 10–14. Scapes 3–5(–9), 25–40 cm, 4- or 5-ribbed; sheath 5.5–8 cm; heads brownish, globose, 5–7 mm in diam.; receptacle villous; involucral bracts straw-colored, obovate-elliptic, ca. 2.5 × 1.4–1.8 mm, glabrous; floral bracts oblanceolate to obovate, apex acuminate, inner ones abaxially white clavate hairy toward apex. Male flowers: sepals spathe-like, abaxially hairy toward 3-lobed apex; petals 3, oblong to lanceolate, anterior one slightly larger than others, adaxially hairy toward apex, abaxially hairy, gland usually absent or present only on lateral petals; anthers black. Female flowers: sepals 3, free, hairy at margin and abaxially toward apex, posterior sepal narrowly keeled, lateral ones boatlike, keeled; petals 3, linear-oblanceolate, unequal, membranous, hairy, gland absent or present only on lateral petals; ovary 3-loculed; style 3-cleft. Seeds ellipsoid, ca. 0.6 mm; testa hexagonally reticulate, prickles 2 or 3 per cell, toothlike. Fl. and fr. Nov–Dec.

- Marshlands; ca. 1100 m. SW Yunnan (Shuangjiang Xian).

2. *Eriocaulon nantoense* Hayata, Icon. Pl. Formos. 10: 51. 1921.

南投谷精草 *nan tou gu jing cao*

Leaves linear, 2.5–4 cm, 1–1.8(–3) mm wide at middle, veins 6–9(–11). Scapes numerous, 11–15(–20) cm, 4- or 5-ribbed; sheath 2.5–4 cm; receptacle glabrous, sparsely pubescent, or densely villous; heads blackish, subglobose, 3.5–5 mm in diam.; involucral bracts straw-colored, elliptic to obovate, 1.6–1.9(–2.3) × 1.4–1.5 mm, rigid, glabrescent; floral bracts obovate to oblanceolate, abaxially white clavate hairy toward apex. Male flowers: sepals spathe-like, split on abaxial side, apex 3-lobed to 3-parted and white clavate hairy; petals 3, oblong-triangular, equal or anterior one slightly larger than others, white clavate hairy toward apex, gland brownish, gray, black, inconspicuous, or absent; anthers black. Female flowers: sepals 3, dusky, free, boatlike, abaxially narrowly keeled and white clavate hairy toward apex; petals 3, oblanceolate-linear, membranous, hairy, gland present or absent; ovary 3-loculed; style 3-cleft. Seeds ovoid, 0.3–0.5 mm; testa hexagonally reticulate, prickles 1–6 per cell, linear. Fl. and fr. Aug–Dec.

- Swamps, rice fields, ponds; near sea level to 2500 m. Fujian,

Guangdong, Guangxi, Guizhou, Taiwan, Yunnan, Zhejiang.

1a. Receptacle densely villous 2a. var. *nantoense*

1b. Receptacle glabrous or occasionally sparsely pubescent 2b. var. *micropetalum*

2a. *Eriocaulon nantoense* var. *nantoense*

南投谷精草(原变种) *nan tou gu jing cao* (yuan bian zhong)

Receptacle densely villous. Male flowers: 1 petal larger than others; gland usually brownish to gray. Fl. and fr. Aug–Dec.

- Swamps, rice fields; near sea level to 2500 m. Fujian, Guangdong, Guangxi, Guizhou, Taiwan, Yunnan, Zhejiang.

2b. *Eriocaulon nantoense* var. *micropetalum* W. L. Ma, Acta Phytotax. Sin. 29: 293. 1991.

小瓣谷精草 *xiao ban gu jing cao*

Receptacle glabrous or occasionally sparsely pubescent. Male flowers: petals minute, equal; gland usually black. Fl. and fr. Sep–Oct.

- Swamps. EC Yunnan (Songming Xian).

3. *Eriocaulon angustulum* W. L. Ma, Acta Phytotax. Sin. 29: 295. 1991.

狭叶谷精草 *xia ye gu jing cao*

Leaves 2.5–8 cm, 0.8–1.5(–2.5) mm wide at middle, veins 5–9. Scapes numerous, 10–30 cm, 5- or 6-ribbed; receptacle densely villous; heads brownish to dusky, subglobose, ca. 4 mm in diam.; involucral bracts brownish, suborbicular, 1.6–2 × 1.3–1.7 mm, rigid, membranous, glabrous; floral bracts obovate to oblanceolate, abaxially white clavate hairy. Male flowers: sepals spathe-like, abaxially white clavate hairy toward 3-lobed to 3-parted apex; petals 3, oblong, anterior one distinctly larger than others, white clavate hairy, gland borne on 1–3 petals, brownish to black; anthers black. Female flowers: sepals 3, blackish, free, boatlike, not keeled, abaxially white clavate hairy; petals 3, lanceolate-linear, membranous, white clavate hairy, gland inconspicuous; ovary 3-loculed; style 3-cleft. Seeds ovoid, 0.3–0.4 mm; testa hexagonally reticulate, prickles 2–5 per cell, linear. Fl. and fr. Aug–Dec.

- Valleys, pond margins. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Zhejiang.

This species was treated as a synonym of *Eriocaulon nantoense* by Zhang (Diss. Bot. 313: 99. 1999).

4. *Eriocaulon henryanum* Ruhland in Engler, Pflanzenr. 13 (IV. 30): 86. 1903.

蒙自谷精草 meng zi gu jing cao

Leaves ensiform-linear, 4–8 cm, 1.5–3 mm wide at middle, veins 7–11. Scapes 1–4, (8–)25(–37) cm, 5- or 6(–8)-ribbed; sheath 4–9 cm; receptacle villous; heads subglobose, 4–9 mm in diam., glaucous; involucre bracts reflexed, straw-colored, obovate, 1.8–2.8 × 1.5–2.7 mm, rigid, membranous, subglabrous; floral bracts obovate-oblongate, abaxially villous toward apex. Male flowers: sepals blackish, spathe-like, 1.5–3.2 mm, abaxially white clavate hairy toward 3-lobed to 3-cleft apex; petals 3, linear, anterior one ca. 2 × as long as others, villous, gland black to brownish; anthers dusky to black. Female flowers: sepals 3, free, boatlike, villous and white clavate hairy, anterior one occasionally keeled, lateral ones keeled or not; petals 3, spatulate, anterior one larger than others, membranous, villous, gland borne on only 2 or all 3 petals, black; ovary 3-lobed; style 3-cleft. Seeds ovoid, 0.8–0.9 mm; testa hexagonally reticulate, prickles linear. Fl. and fr. Apr–Sep.

Damp soil in valleys; 1600–4000 m. S and W Yunnan [Thailand, Vietnam].

5. *Eriocaulon rockianum* Handel-Mazzetti, Symb. Sin. 7: 1246. 1936.

玉龙山谷精草 yu long shan gu jing cao

Leaves filiform, 1–2.5 cm, 0.2–2 mm wide. Scapes ca. 5, 5–7 cm, 3–5-ribbed; sheath equaling leaf; receptacle sparsely pubescent; heads black, turbinate, ca. 2 × 3.5 mm; involucre bracts black, obovate to oblong, ca. 2.2 × 1.3–1.8 mm, membranous, glabrous; floral bracts obovate-oblongate, abaxially villous at acute apex. Male flowers: sepals ca. 2 mm, abaxially white clavate hairy toward 3-parted apex, lobes oblongate-boatlike; petals (2 or)3, anterior one linear-oblongate, larger than others, sparsely hairy, gland absent, lateral ones occasionally pubescent, 1 or both with a gland; anthers (4–)6, black. Female flowers: sepals 3, free, sparsely downy, occasionally keeled; petals 3, membranous, with a few downy hairs at apex, gland usually absent; ovary 3-lobed; style 3-cleft. Seeds ellipsoid, 0.5–0.6 mm; testa hexagonally reticulate, prickles 1–3 per cell, oblong. Fl. and fr. Oct.

• Mud, meadows; 2700–2900 m. NW Yunnan.

- 1a. Leaves 2–2.5 cm × 0.2–0.6 mm, veins
2 or 3 5a. var. *rockianum*
1b. Leaves ca. 1 cm × 1.7–2 mm, veins 5
or 6 5b. var. *latifolium*

5a. *Eriocaulon rockianum* var. *rockianum*

玉龙山谷精草(原变种) yu long shan gu jing cao (yuan bian zhong)

Leaves 2–2.5 cm × 0.2–0.6 mm, veins 2 or 3.

• Mud; 2700–2900 m. NW Yunnan.

5b. *Eriocaulon rockianum* var. *latifolium* W. L. Ma, Acta Phy-

totax. Sin. 29: 298. 1991.

宽玉谷精草 kuan yu gu jing cao

Leaves ca. 1 cm × 1.7–2 mm, veins 5 or 6. Male flowers: petals short. Female flowers: petals usually emarginate at apex. Fl. and fr. Oct.

• Meadows; ca. 2800 m. NW Yunnan.

6. *Eriocaulon brownianum* Martius in Wallich, Pl. Asiat. Rar. 3: 25. 1832.

云南谷精草 yun nan gu jing cao

Leaves linear, 3.5–4 cm × 4–6 mm, sparsely and shortly hairy, veins ca. 23. Scape 1, ca. 50 cm × 1.5 mm, 5–7-ribbed; sheath 14–28 cm; receptacle densely villous; heads milky white, subglobose, ca. 1 × 1.2–1.5 cm; involucre bracts reflexed, straw-colored or blackish, oblong, 3.5–4 × 2.2–3.6 mm, abaxially villous at base and shortly hairy toward apex; floral bracts oblongate, abaxially white clavate hairy toward apex. Male flowers: sepals spathe-like, 3.2–3.7 mm, abaxially white clavate hairy toward usually 3-lobed apex; petals (2 or)3, obovate, equal, white clavate hairy toward apex, gland black; anthers (4–)6, black. Female flowers: sepals 3, free, boatlike, 3–3.5 mm, densely white clavate hairy toward apex; petals 3, narrowly oblongate to linear, membranous, villous, fascicled white clavate hairy at apex, gland black; ovary 3-lobed; style 3-cleft. Seeds ovoid, 0.7–0.8 mm; testa hexagonally reticulate, prickles T-shaped. Fl. and fr. May–Dec.

Swamps, sunny marshlands, grassy fields with loamy soil; 800–2800 m. Guangdong, SE Hunan, Yunnan [India, Indonesia, Sri Lanka, Thailand, Vietnam].

- 1a. Leaf and scape hairs ca. 0.1 mm 6a. var. *brownianum*
1b. Leaf and scape hairs ca. 0.7 mm 6b. var. *nilagirensis*

6a. *Eriocaulon brownianum* var. *brownianum*

云南谷精草(原变种) yun nan gu jing cao (yuan bian zhong)

Eriocaulon yunnanense Moldenke.

Leaf and scape hairs ca. 0.1 mm. Fl. and fr. May–Dec.

Swamps, sunny marshlands, grassy fields with loamy soil; 800–2800 m. Guangdong, SE Hunan (Yizhang Xian), Yunnan [India, Indonesia, Sri Lanka, Thailand, Vietnam].

6b. *Eriocaulon brownianum* var. *nilagirensis* (Steudel) Fyson, J. Indian Bot. 2: 262. 1923.

印度谷精草 yin du gu jing cao

Eriocaulon nilagirensis Steudel, Syn. Pl. Glumac. 2: 271. 1855.

Leaf and scape hairs ca. 0.7 mm. Fl. and fr. May–Nov.

Sunny marshlands; 800–2700 m. Yunnan [India, Sri Lanka, Thailand].

This variety was treated as a synonym of *Eriocaulon brownianum* var. *brownianum* by Zhang (Diss. Bot. 313: 79. 1999).

7. *Eriocaulon australe* R. Brown, Prodr. 254. 1810.

毛谷精草 mao gu jing cao

Leaves linear, 10–35 cm × 2–3 mm, sparsely villous, veins 10–15. Scapes ca. 10, 15–75 cm, 5–7-ribbed; sheath 6–20 cm, villous; receptacle villous; heads subglobose, not compressed, ca. 6 mm in diam., glaucous, base truncate; involucre bracts reflexed, orbicular-reniform to ovate, 2–2.5 mm in diam., rigid, abaxially sparsely villous; floral bracts obovate, abaxially densely white clavate hairy toward apex. Male flowers: sepals spathe-like, 2–2.3 mm, abaxially hairy toward 3-lobed apex, posterior lobe linear, glabrous, lateral lobes boatlike, winged; petals 3, linear, white clavate hairy at apex, gland black, ovate; anthers black. Female flowers: sepals 3, free, 2–2.3 mm, posterior one linear, glabrous, lateral ones broadly winged, pubescent; petals 3, linear, fleshy, villous at center, white clavate hairy at apex, gland black, elliptic; ovary 3-loculed; style 3-cleft. Seeds ovoid, 0.6–0.8 mm; testa hexagonally reticulate, prickles 1 or 2 per cell, T-shaped. Fl. and fr. summer to autumn.

Ponds, marshlands, sandy soil; 100–2000 m. Fujian, Guangdong, Jiangxi, Yunnan [Cambodia, W Malaysia, Thailand, Vietnam; Australia, Pacific Islands].

8. *Eriocaulon sexangulare* Linnaeus, Sp. Pl. 1: 87. 1753.

华南谷精草 hua nan gu jing cao

Eriocaulon cantoniensis Hooker & Arnott; *E. pterosepalum* Hayata; *E. sinicum* Miquel; *E. sinii* Ruhland; *E. wallichianum* Martius.

Leaves linear, 10–35 cm, 4–13 mm wide at middle, veins 15–37. Scapes 5–20, 20–60 cm, 4–6-ribbed; sheath 4–12 cm; receptacle glabrous; heads subglobose, ca. 6.5 mm in diam., glaucous, base truncate; involucre bracts straw-colored, obovate, 2.2–2.4 mm in diam., rigid, abaxially white clavate hairy; floral bracts obovate to obovate-cuneate, 2–2.5 mm, abaxially hairy toward apex. Male flowers: sepals spathe-like, glabrous, laterally winged, apex (2 or)3-lobed or occasionally truncate; petals (2 or)3, linear, apex pubescent, gland usually indistinct; anthers (4–)6, black. Female flowers: sepals (2 or)3, free, glabrous, posterior one smaller than others, sometimes reduced or absent, wingless, lateral ones boatlike, winged; petals (2 or)3, linear, unequal, membranous, occasionally villous at center, apex white clavate hairy; ovary (2 or)3-loculed; style (2 or)3-cleft. Seeds ovoid, 0.6–0.7 mm; testa hexagonally reticulate, prickles 1 per cell, T-shaped. Fl. and fr. Aug–Mar.

Ponds, rice fields; near sea level to 800 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan [Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Africa (including Madagascar)].

The 2-merous form that is occasionally found in China resulted in the 2-merous *Eriocaulon willdenovianum* Moldenke (*E. longifolium* Nees ex Kunth (1841), not Rafinesque (1840)) being put in synonymy under *E. sexangulare* in FRPS. These two species are distinct outside of China, and it is possible that the 2-merous plants in China represent a reduction from 3-merous to 2-merous within *E. sexangulare*. This question needs further study.

9. *Eriocaulon schochianum* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 57: 238. 1920.

云贵谷精草 yun gui gu jing cao

Leaves ensiform-linear, 3–10 cm, 2–5 mm wide at middle, veins 10–22. Scapes 3–20, ca. 15 cm, 5-ribbed; sheath 2–7 cm; receptacle glabrous; heads white, usually with black, triangular patches, globose, 5–6 mm in diam.; involucre bracts reflexed, straw-colored, ovate to obovate, 1.5–2 mm in diam., membranous, subglabrous; floral bracts black, obovate to oblanceolate, 1.5–2.5 mm, adaxially glabrescent, abaxially densely white clavate hairy toward apex, hairs early deciduous. Male flowers: sepals black, 1.5–2 mm, free or 3-cleft, abaxially white hairy toward apex; petals (2 or)3, oblanceolate-spatulate, anterior one slightly larger than others, white hairy, gland black or brown; anthers black. Female flowers: sepals 3, blackish, free, posterior one flat, lateral ones oblanceolate-boatlike, abaxially densely white clavate hairy toward apex; petals 3, oblanceolate-spatulate, equal or anterior one slightly larger than others, densely white hairy, gland black, large; ovary (2 or)3-loculed; style 3-cleft. Seeds subglobose, ca. 0.5 mm; testa hexagonally reticulate, prickles borne on edge of cells, linear. Fl. and fr. Mar–Jun.

• Ponds, damp soil; 1900–2300 m. Guangxi, Guizhou, Sichuan, Yunnan.

10. *Eriocaulon setaceum* Linnaeus, Sp. Pl. 1: 87. 1753.

丝叶谷精草 si ye gu jing cao

Plants mostly submerged. Stems ca. 25 cm. Leaves filiform, 3–4 cm × ca. 0.2 mm, 1-veined. Scapes 5–15, to 11 cm, 6-ribbed; sheath 2–2.5 cm; receptacle subglabrous or villous; heads dusky, subglobose, ca. 2.5 × 3 mm; involucre bracts reflexed, straw-colored, ovate, ca. 1 mm, membranous, glabrous; floral bracts orbicular to oblanceolate, abaxially white clavate hairy toward apex or glabrous. Male flowers: sepals spathe-like, abaxially shortly hairy toward (2 or)3-lobed apex, lobes truncate at apex; petals 3, elliptic to subulate, small, anterior one slightly larger than others, adaxially white clavate hairy, abaxially white clavate hairy toward apex, gland black, sometimes absent; anthers black. Female flowers: sepals 3, free, boatlike to obovate, abaxially white clavate hairy toward margin; petals 3, free, oblanceolate-linear, unequal, membranous, gland black, sometimes absent; ovary 3-loculed; style 3-cleft. Seeds narrowly ovoid, 0.3–0.4 mm; testa hexagonally reticulate, prickles 1 or 2 per cell, linear, slimy coated. Fl. and fr. Aug–Oct.

Ponds, swamps; near sea level to 1300 m. Guangdong, Guangxi, Sichuan, Yunnan [Bangladesh, Cambodia, India, Indonesia, Japan, Laos, Myanmar, Sri Lanka, Thailand, Vietnam; N Australia].

11. *Eriocaulon sollyanum* Royle, Ill. Bot. Himal. Mts. 409, pl. 97. 1840.

大药谷精草 da yao gu jing cao

Eriocaulon trilobum Buchanan-Hamilton ex Körnicke.

Leaves linear, 3–4.5 cm, ca. 3 mm wide at middle, veins ca. 10. Scapes 5–10, 10–15 cm; sheath ca. 4 cm; receptacle glabrous, slimy; heads black, subglobose, 3–3.5 mm; involucre bracts oblong-obovate, 1.5–1.9 × 1.2–1.4 mm, membranous, abaxially blackish toward apex, glabrous, apex truncate; floral bracts blackish, oblong to obovate, abaxially white clavate hairy toward apex. Male flowers: sepals spathe-like, apex 3-cleft, posterior cleft blackish, flat, 1.6–1.8 mm, lateral clefts boatlike,

abaxially hairy along midvein and at apex; petals 3, small, anterior one slightly larger than others, white clavate hairy toward apex, gland brown to black; anthers black, large. Female flowers: sepals 3, blackish, free, abaxially white clavate hairy toward apex, lateral ones boatlike, 1 or both narrowly keeled; petals 3, oblanceolate-linear, membranous, anterior one hairy adaxially and at apex, margin shortly hairy, apex emarginate, gland brown to black; ovary 3-loculed; style 3-parted. Seeds ovoid, ca. 0.5 mm; testa hexagonally reticulate, prickles 3 or 4 per cell, linear. Fl. and fr. Jul–Nov.

Valleys, ponds; 2300–2800 m. Guizhou, Sichuan, Xizang, Yunnan [Bangladesh, India, Indonesia, Nepal, Sri Lanka, Thailand].

12. *Eriocaulon nepalense* Prescott ex Bongard, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savan 1: 610. 1831.

尼泊尔谷精草 ni bo er gu jing cao

Eriocaulon nantoense Hayata var. *parviceps* (Handel-Mazzetti) W. L. Ma; *E. nantoense* var. *trisectum* (Satake) C. E. Chang; *E. pullum* T. Koyama; *E. schochianum* Handel-Mazzetti var. *parviceps* Handel-Mazzetti; *E. senile* Honda; *E. trisectum* Satake.

Stem 2–6 cm. Leaves linear, 4–8(–11) cm, 2–5 mm wide at middle, veins 12–28. Scapes 5–15, 12–25 cm, 4–7-ribbed; sheath 3–6 cm; receptacle subglabrous; heads dusky to blackish, subglobose, ca. 5 mm in diam.; involucre bracts reflexed, straw-colored or sometimes blackish, obovate, 2–2.7 × 1.5–2 mm, membranous, glabrous; floral bracts blackish, obovate to oblanceolate, adaxially hairy at margin and apex, abaxially hairy toward apex. Male flowers: sepals 3, spathe-like, 1.5–2 mm, abaxially white clavate hairy toward 3-lobed to 3-cleft apex; petals 3, oblong, anterior one slightly longer than others, white clavate hairy, gland black; stamens 6, anthers black. Female flowers: sepals 3, blackish, free, boatlike, 1.5–2 mm, hairy along midvein and at margin, posterior one reduced or absent; petals 3, oblanceolate-linear, posterior one longer than others, membranous, hairy at margin and adaxially toward sometimes emarginate apex, gland borne on 1–3 petals, black or brown; ovary 3-loculed; style 3-cleft. Seeds narrowly ovoid, 0.5–0.6 mm; testa hexagonally reticulate, prickles 1–4 per cell, linear. Fl. and fr. Apr–Oct.

Swamps, ponds, marshlands; near sea level to 2500 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Nepal].

13. *Eriocaulon luzulifolium* Martius in Wallich, Pl. Asiat. Rar. 3: 28. 1832.

小谷精草 xiao gu jing cao

Leaves lanceolate, 2.3–5.6 cm × 3–4 mm, veins 7–9. Scapes 3–21, 6–21 cm, 4–6-ribbed; sheath 2.5–5 cm; receptacle densely pilose or villous; heads ± blackish, 3.5–5 mm in diam.; involucre bracts broadly ovate-orbicular to narrowly lanceolate, 2.5–3 × 1.5–2 mm, papery, glabrous; floral bracts blackish, obovate-oblanceolate, 1.5–1.7 mm, hoary toward apex. Male flowers: sepals 3, blackish, spathe-like, flat, ca. 2 mm, abaxially hairy along midvein and toward 3-cleft apex; petals 3, lanceolate, anterior one larger than others, hairy at apex, gland

absent; stamens 6, anthers black. Female flowers: sepals 3, blackish, free, ca. 1.7 × 0.5 mm, abaxially hairy along midvein and toward acuminate apex; petals 3, oblanceolate, ca. 1.2 × 0.1 mm, adaxially pilose toward acute to emarginate apex, gland absent; ovary 3-loculed; style 3-cleft. Seeds ellipsoid, 0.3–0.4 mm in diam.; testa transversely elongate reticulate, prickles linear. Fl. and fr. Jul–Oct.

Marshlands, stream banks; 300–1700 m. Guangxi, Guizhou [India, Thailand].

14. *Eriocaulon tonkinense* Ruhland in Engler, Pflanzenr. 13 (IV. 30): 72. 1903.

越南谷精草 yue nan gu jing cao

Eriocaulon cristatum Martius var. *brevicalyx* C. H. Wright; *E. filifolium* Handel-Mazzetti; *E. yaoshanense* Ruhland; *E. yaoshanense* var. *brevicalyx* (C. H. Wright) W. L. Ma.

Herbs caulescent. Rhizomes elongate. Leaves filiform, 2–9 cm × 0.6–0.8 mm, veins 5–7. Scapes 1 to numerous, 7–30 cm, 5–7-ribbed; sheath 2.5–3.7 cm; receptacle glabrous; heads brown or black at base and gray at apex, subglobose, 3–8 mm in diam.; involucre bracts reflexed, straw-colored, blackish at apex, ovate to obovate, thickly membranous; floral bracts obovate to subspatulate, abaxially white clavate hairy toward apex. Male flowers: sepals 3, spathe-like, apex 3-lobed to 3-cleft, lobes abaxially with some white, clavate hairs toward apex, posterior one flat, 1.3–2.1 mm, lateral ones boatlike; petals 3, obovate to elliptic, anterior one larger than others, adaxially white clavate hairy toward apex, gland black; stamens 6, anthers milky white to brownish. Female flowers: sepals 3, connate into a spathe, ± basally connate, or free, 1.3–1.7 mm, white clavate hairy adaxially and at apex, posterior sepal flat, lateral ones boatlike; petals 3, free, oblanceolate-linear, fleshy, white clavate hairy adaxially and at apex, gland black; ovary 3-loculed; style 3-cleft. Seeds ovoid, 0.5–0.6 mm; testa inconspicuously reticulate, cells transversely elongate and in vertical rows, prickles absent. Fl. and fr. Oct–Jan.

Damp soil, marshlands; ca. 200 m. Guangdong, Guangxi [India, Vietnam].

15. *Eriocaulon kunmingense* Z. X. Zhang, Novon 10: 92. 2000.

昆明谷精草 kun ming gu jing cao

Eriocaulon bilobatum W. L. Ma, Acta Phytotax. Sin. 29: 301. 1991, not Morong (1892).

Leaves filiform, 3.5–6 cm × 0.4–0.6 mm, veins 4. Scapes numerous, 4–10 cm, 4- or 5-ribbed; sheath 1.2–1.8 mm; receptacle glabrous; heads blackish, ovoid-globose, 2–3.5 mm in diam.; involucre bracts reflexed, straw-colored, obovate to oblong, 1.3–1.5 mm, glabrous; floral bracts obovate to oblanceolate-boatlike, glabrous or occasionally with 1 or 2 hairs. Male flowers: sepals spathe-like, glabrous, apex 3- or irregularly lobed; petals 3, small, equal or anterior one slightly larger than others, usually glabrous, gland black; anthers black. Female flowers borne on margin of head; bracts wider than those of male flowers; sepals 3, free, lanceolate, 0.7–1.2 mm, glabrous or occa-

sionally ciliate, keeled; petals 3, free, linear-oblongate, membranous, glabrous, apex emarginate, gland usually present, black or brown; ovary 3-loculed; style 3-cleft. Seeds ovoid, 0.3–0.5 mm; testa reticulate, prickles absent. Fl. and fr. Sep–Dec.

Marshlands, valleys; ca. 1000 m. Guizhou, Sichuan, Yunnan [India, Vietnam].

16. *Eriocaulon leianthum* W. L. Ma, Acta Phytotax. Sin. 29: 303. 1991.

光萼谷精草 *guang e gu jing cao*

Leaves filiform, 3–5 cm × 0.5–1 mm, veins 2 or 3. Scapes 2–5, ca. 10 cm, slender, 2–4-ribbed; sheath 2.5–3.2 cm; receptacle subglabrous; heads black, subglobose to turbinate, ca. 2 × 2.5 mm, 7- or 8-flowered; involucre bracts blackish, orbicular to ovate, membranous, ca. 2 × 1.3 mm, glabrous or inconspicuously ciliate; floral bracts obovate to oblanceolate-boatlike, glabrous or ciliate. Male flowers: sepals spathe-like, 1.3–1.5 mm, glabrous, apex 3-lobed, lobes triangular to narrowly ovate; petals 3, linear, small, glabrous, gland blackish to brownish; anthers black. Female flowers: sepals 3, free, elliptic to elliptic-lanceolate, margin sparsely hairy, proximal hairs longer than distal ones; petals 3, free, elliptic-oblongate, anterior one slightly larger than others, membranous, adaxially villous at center, apex acute; ovary 3-loculed; style 3-cleft. Seeds ovoid, ca. 0.7 mm; testa hexagonally reticulate, prickles absent. Fl. and fr. about Sep.

• Marshland margins; ca. 3100 m. NW Yunnan (Nujiang Lisu Zu Zizhizhou).

17. *Eriocaulon zollingerianum* Körnicke, Linnaea 27: 682. 1856.

翅谷精草 *chi gu jing cao*

Eriocaulon alatum Lecomte.

Leaves linear-lanceolate, 2–4(–8) cm, 2–4(–6) mm wide at middle, veins 7–11(–17). Scapes numerous, 16(–30) cm, 4- or 5-ribbed; sheath 2.5–5 cm; receptacle hairs sparse, ca. 1.2 mm; heads brownish, globose to subglobose, 2.5–6 × 4–6 mm; involucre bracts reflexed, straw-colored, obovate to narrowly so, 2.2–2.5 × 1.4–1.6 mm, rigid, membranous, glabrous; floral bracts obovate, occasionally crested along midvein, glabrous or abaxially with some short hairs. Male flowers: sepals spathe-like, 1.7–1.9 mm, usually glabrous, apex 3-lobed, lobes truncate or irregularly dentate at apex; petals 3, ovate, anterior one slightly larger than others, usually glabrous, gland absent; anthers black. Female flowers: sepals 3, free, posterior one 0.3–1 mm, deciduous, lateral ones boatlike, 1.8–2 mm, adaxially villous, abaxially broadly winged; petals 3, linear to linear-oblongate, anterior one larger than others, membranous, glabrous or sparsely hairy, gland absent; ovary 3-loculed; style 3-cleft. Seeds ovoid, ca. 0.4 mm in diam.; testa broadly and hexagonally reticulate, prickles not visible. Fl. and fr. after Sep.

Meadows, pond margins; near sea level to 1400 m. Hainan [India, Indonesia, Laos, Malaysia, New Guinea, Philippines, Thailand, Vietnam].

18. *Eriocaulon truncatum* Buchanan-Hamilton ex Martius in Wallich, Pl. Asiat. Rar. 3: 29. 1832.

菲律宾谷精草 *fei lu bin gu jing cao*

Eriocaulon merrillii Ruhland; *E. merrillii* var. *longibracteatum* W. L. Ma; *E. merrillii* var. *suishaense* (Hayata) C. E. Chang; *E. nigrum* Lecomte var. *suishaense* (Hayata) Hatusima & Koyama; *E. suishaense* Hayata.

Leaves linear, 2.5–5(–6.5) cm, 2–4(–5) mm wide at middle, veins 8–11(–20). Scapes 5–10(–18) cm, (4 or)5(or)6-ribbed; sheath 2–3.8 cm; receptacle glabrous or subglabrous to villous; heads straw-colored, subglobose to hemispheric, 2–3 × 2.5–5 mm; involucre bracts straw-colored, 2.5–4 × 0.7–1.8 mm, membranous, glabrous; floral bracts obovate to oblanceolate, hyaline, glabrous or sparsely hairy. Male flowers: sepals blackish, spathe-like, 1–1.8 mm, glabrous or sparsely hairy at margin, apex 2- or 3-lobed; petals 3, each with a black gland or gland absent; anthers (5 or)6, black. Female flowers: sepals 2(or)3, blackish, free, usually glabrous, posterior one reduced; petals 3, villous adaxially and at margin, apex white clavate hairy; ovary 3-loculed; style 3-cleft. Seeds ovoid to subglobose, ca. 4 mm in diam.; testa hexagonally reticulate, cells longitudinally elongate or quadrangular with ribbonlike bands from longitudinal wall and a solitary, incomplete band from transverse wall. Fl. and fr. May–Dec.

Open places along stream banks; near sea level to 500 m. Guangdong, W Hainan (Changjiang Xian), Taiwan [Indonesia, Japan, Philippines, Thailand].

19. *Eriocaulon sclerophyllum* W. L. Ma, Acta Phytotax. Sin. 29: 306. 1991.

硬叶谷精草 *ying ye gu jing cao*

Leaves linear, 6–8 cm, 2–3 mm wide at middle, apex broadly obtuse, veins 12–15, inconspicuous. Scapes 1 or 2, to 22 cm, ca. 7-ribbed; sheath 3–4 cm; receptacle densely villous; heads globose, ca. 5 mm in diam., glaucous; involucre bracts reflexed, straw-colored, narrowly ovate, 2.3–2.5 × 1.3–1.6 mm, membranous, glabrous; floral bracts obovate to obovate-spatulate, abaxially white clavate hairy toward apex, hairs 2–4-celled. Male flowers: sepals 2–2.2 mm, abaxially densely hairy toward apex, basally connate, apex 3-cleft, posterior cleft oblanceolate to linear, smaller than others, lateral clefts boatlike to spatulate; petals 3, ovate, anterior one slightly larger than others, hairy, gland black; anthers black. Female flowers: sepals 2 or 3, free, pubescent abaxially and at margin, posterior one linear, 1–2 mm, sometimes reduced or absent, lateral ones boatlike, 2–2.2 mm; petals 3, posterior one shorter than others, fleshy, adaxially villous, gland black; ovary 3-loculed; style 3-cleft. Seeds ovoid, 0.6–0.7 mm; testa hexagonally reticulate, prickles 1 per cell, T-shaped. Fl. and fr. Apr.

• Damp soil in sunny places. NE Hainan (Wenchang Xian).

20. *Eriocaulon cinereum* R. Brown, Prodr. 254. 1810.

白药谷精草 *bai yao gu jing cao*

Eriocaulon cinereum var. *sieboldianum* (Siebold & Zuccarini ex Steudel) T. Koyama; *E. formosanum* Hayata; *E. heteranthum* Benthams; *E. sieboldianum* Siebold & Zuccarini ex Steudel.

Leaves narrowly linear, 2–5(–8) cm, 0.8–1(–1.7) mm wide at middle, glabrous, veins 3(–5). Scapes 6–30, 6–9(–19) cm, 4–6-ribbed; sheath 1.5–2(–3.5) cm; receptacle villous, occasionally glabrous; heads light yellow to dark green, subglobose to broadly ovoid, ca. 4 × 3–3.5 mm; involucre bracts pale green-yellow to blackish, obovate to elliptic, 0.9–1.9 × 1–1.4 mm, membranous, glabrous; floral bracts oblong to oblanceolate, glabrous or occasionally abaxially villous. Male flowers: sepals spathe-like, 1.3–1.9 mm, glabrous or abaxially hairy toward 3-cleft apex; petals 3, ovate to oblong, anterior one slightly larger than others, shortly hairy at apex, gland black or brown; anthers white to dusky. Female flowers: sepals 2 or 3, blackish, free, linear, sparsely villous abaxially and at margin, posterior one absent or to 1 mm, lateral ones 1–1.7 mm; petals absent; ovary 3-loculed; style 3-cleft. Seeds ovoid, 0.4–0.5 mm; testa hexagonally reticulate, prickles absent. Fl. and fr. Jun–Oct.

Rice fields, valleys, damp soil; near sea level to 1200 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Afghanistan, Bhutan, Cambodia, India, Indonesia, Japan, Korea, Laos, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia].

Medicinal.

21. *Eriocaulon taishanense* F. Z. Li, Acta Phytotax. Sin. 26: 318. 1988.

泰山谷精草 tai shan gu jing cao

Leaves linear, 2–3 cm, 1.8–2 mm wide at middle, veins 7 or 8. Scapes ca. 5, 5–7 cm, 4-ribbed; sheath 1.5–2 cm; receptacle sparsely villous; heads blackish, hemispheric, ca. 2 × 3.5 mm; involucre bracts straw-colored, orbicular to obovate, ca. 1.5 × 1 mm, membranous, glabrous; floral bracts ovate to oblanceolate-boatlike, ca. 1.3 × 0.3–0.7 mm, glabrous. Male flowers: sepals 1–1.2 mm, glabrous, apex 2-cleft; petals 0(–3), small, glabrous, gland absent; stamens (2–)5, blackish, glaucous; ovary reduced, black at center. Female flowers: sepals 2 (or 3), free, linear, ca. 1.1 mm, margin and apex with some white, clavate hairs, posterior sepal reduced or absent; petals absent; ovary 3-loculed; style 3-parted. Seeds ovoid, ca. 0.4 mm; testa reticulate, prickles absent. Fl. and fr. about Oct.

• Damp soil; 300–400 m. C Shandong (Tai Shan).

22. *Eriocaulon echinulatum* Martius in Wallich, Pl. Asiat. Rar. 3: 29. 1832.

尖苞谷精草 jian bao gu jing cao

Leaves linear, 3.5–5.5 cm, 1.5–2 mm wide at middle, veins 7–9. Scapes ca. 12, 6–9(–20) cm, 4-ribbed; receptacle densely villous; heads ovoid, 4–5 × 5–5.5 mm; involucre bracts ca. 12, slightly reflexed, pale straw-colored, lanceolate to rhombic, 2.2–2.9 × 0.6–1.2 mm, membranous, glabrous; floral bracts oblanceolate-boatlike, glabrous, apex caudate. Male flowers: sepals spathe-like, 1.1–1.7 mm, glabrescent, apex 3-lobed, lateral lobes slightly keeled; petals 1 or 2, small or reduced and nearly invisible, glabrous, rarely 1 bearing a gland; stamens 5(or 6), anthers black. Female flowers: sepals 2 or 3, free, posterior one flat, linear, narrow, sometimes reduced and concealed by villous hairs of receptacle, glabrous or margin

with a few hairs, lateral sepals oblanceolate-boatlike, 1.2–1.7 mm, abaxially broadly winged; petals absent; ovary 3-loculed; style 3-cleft. Seeds narrowly ovoid, 0.4–0.5 mm; testa reticulate, prickles thin. Fl. and fr. Sep–Dec.

Damp soil; ca. 1100 m. Guangdong, Guangxi, Jiangxi [Cambodia, India, Japan, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

23. *Eriocaulon parvum* Körnicke in Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 163. 1867.

朝日谷精草 chao ri gu jing cao

Leaves lanceolate, ca. 2.3 cm × 1–2 mm, glabrous, veins 6–8, apex acute. Scapes 5–23, 6–13 cm, 5- or 6-ribbed; sheath 2–2.3 cm; receptacle densely villous; heads blackish, 3–4 mm in diam.; involucre bracts straw-colored, obovate-oblanceolate, ca. 1.8 × 0.2–1.2 mm, apex obtuse; floral bracts blackish, obovate-oblanceolate, 1.8–2 × ca. 0.7 mm, hoary toward acute apex. Male flowers: sepals 3, spathe-like, flat, ca. 1.5 mm, apex hairy, 3-lobed, lobes ovate; petals 3, lanceolate, hairy at apex, gland black; stamens 6, anthers black. Female flowers: sepals 3, blackish, free, ca. 1.2 × 0.7 mm, flat, hoary toward acuminate apex; petals 3, oblanceolate, ca. 2 × 0.2 mm, pilose, gland black. Seeds dark brownish, ellipsoid, 0.4–0.5 mm; testa reticulate, cells transversely elongate, prickles 3–5 per cell, linear. Fl. and fr. Sep–Nov.

Rice fields. Guangxi [Japan, Korea].

24. *Eriocaulon oryzetorum* Martius in Wallich, Pl. Asiat. Rar. 3: 28. 1832.

南亚谷精草 nan ya gu jing cao

Leaves lanceolate, 4.1–7.3 cm × 2–3 mm, veins 7–11. Scapes 1–4, 17–19 cm, 5-ribbed; sheath 5.5–10 cm; receptacle densely hairy; heads ± blackish, globose to subglobose, 3–6.5 mm in diam.; involucre bracts straw-colored, broadly ovate-orbicular to obovate-oblanceolate, 3–4 × 2.5–3 mm, papery, glabrous, apex acute to obtuse; floral bracts obovate-oblanceolate, 2.5–4 × 1.5–2 mm, abaxially hispid toward acuminate to cuspidate apex. Male flowers: sepals 3, flat, ca. 1.5 mm, abaxially hairy toward 3-lobed apex, lobes acuminate at apex; petals 3, subequal, hoary, gland absent; stamens 6, anthers black. Female flowers: sepals 3, blackish, free, oblanceolate, ca. 2 mm, hoary along keel, apex acuminate, middle sepal flat, lateral ones keeled; petals 3, oblanceolate, ca. 2.5 × 0.4 mm, hairy adaxially and at apex, gland absent. Seeds ellipsoid, ca. 0.8 × 0.6 mm; testa reticulate, prickles 2 or 3 from transverse wall and 1 from longitudinal wall of cells, setiform. Fl. and fr. Nov.

1000–2000 m. Yunnan [India, Nepal, Thailand].

25. *Eriocaulon ermeiense* W. L. Ma ex Z. X. Zhang, Diss. Bot. 313: 87. 1999.

峨眉谷精草 e mei gu jing cao

Leaves lanceolate, 4–5 cm × 3–4 mm, veins 6–9. Scapes ca. 22, 4–18 cm, 4-ribbed; sheath 3–4.5 cm; receptacle densely villous; heads blackish, subglobose, ca. 4 mm in diam.; involucre bracts straw-colored, broadly ovate-orbicular to obovate-oblanceolate, ca. 2 × 1.5 mm, glabrous, apex obtuse; floral bracts obovate-oblanceolate, 2.1 × 0.9 mm, margin sparsely

ciliate, apex acute. Male flowers: sepals 3, spathe-like, sparsely hairy; petals 3, subequal, hoary, white clavate hairy at apex, gland absent; stamens 6, anthers black. Female flowers: sepals 3, blackish, free, lanceolate, narrowly keeled, ca. 1.5 × 0.5 mm, subequal or one smaller than others, sparsely hairy, apex acuminate; petals 3, lanceolate, subequal, hairy at margin and apex, gland absent; ovary 3-loculed; style 3-cleft. Seeds ovoid-ellipsoid, ca. 0.4 mm in diam.; testa reticulate, cells ribbonlike. Fl. and fr. Oct.

- 400–500 m. C Sichuan (Emei Shan).

26. *Eriocaulon buergerianum* Körnicke in Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 163. 1867.

谷精草 gu jing cao

Eriocaulon chishingsanensis C. E. Chang; *E. pachypetalum* Hayata; *E. whangii* Ruhland.

Leaves linear, 4–10(–20) cm, 2–5 mm wide at middle, veins 7–12(–18). Scapes numerous, 25(–30) cm, 4- or 5-ribbed; sheath 3–5 cm; receptacle usually densely villous; heads straw-colored, subglobose, 3–5 × 4–5 mm; involucre bracts straw-colored, orbicular to obovate, 2–2.5 × 1.5–1.8 mm, glabrescent; floral bracts obovate to narrowly so, abaxially white clavate hairy toward apex. Male flowers: sepals spathe-like, 1.8–2.5 mm, ± pubescent abaxially and at 3-lobed apex; petals 3, ± subulate, subequal, white clavate hairy at apex, gland black; stamens 6, anthers black. Female flowers: sepals 1.8–2.5 mm, abaxially white clavate hairy toward apex, basally connate, apex 3-lobed; petals 3, free, flat, clavate, fleshy, adaxially villous, gland black; ovary 3-loculed; style 3-cleft. Seeds subglobose, 0.8–1 mm; testa reticulate, prickles T-shaped. Fl. and fr. Jul–Dec.

Rice fields, marshlands; 500–1300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Zhejiang [Japan, Korea].

A smaller form from Taiwan, with obtuse floral bracts, is sometimes separated as *Eriocaulon chishingsanensis*.

Medicinal.

27. *Eriocaulon miquelianum* Körnicke in Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 162. 1867.

四国谷精草 si guo gu jing cao

Eriocaulon kengii Ruhland; *E. sikokianum* Maximowicz; *E. sikokianum* var. *linanense* W. L. Ma.

Leaves lanceolate, 6–14 cm, 1–1.5 mm wide at middle, veins 4–7. Scapes ca. 8, 18–23 cm, 4- or 5-ribbed; sheath 5–7.5 cm; receptacle pilose; heads pale straw-colored, turbinate; involucre bracts straw-colored, lanceolate to linear-lanceolate, 3.5–7.3 mm, glabrous or shortly ciliate, veins 1–3; floral bracts narrowly obovate, glabrous or villous at margin or abaxially densely and shortly hairy toward apex. Male flowers: sepals 3, spathe-like, shortly hairy abaxially and at 3-lobed apex; petals 3, narrowly ovate, anterior one larger than others, glabrous or ciliate at apex, gland black; stamens 6, anthers black. Female flowers: sepals spathe-like, abaxially villous, margin white clavate hairy; petals 3, free, clavate, fleshy, adaxially villous, densely

ciliate or glabrous at apex, gland black; ovary 3-loculed; style 3-cleft. Seeds with testa hexagonally reticulate, prickles 1(or 2) per cell, T-shaped. Fl. and fr. Aug–Dec.

Damp soil, marshlands; 1000–1600 m. Hunan, Zhejiang [Japan, Korea].

28. *Eriocaulon alpestre* J. D. Hooker & Thomson ex Körnicke in Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 163. 1867.

高山谷精草 gao shan gu jing cao

Leaves linear, 8–15 cm, 4–5 mm wide at middle, veins 12–20. Scapes ca. 30, 14–20 cm, 3–5-ribbed; sheath 5–8 cm; receptacle glabrescent, occasionally with some short hairs; heads straw-colored at base, black at apex, turbinate, 3–4 × 4–6 mm; involucre bracts yellowish green, ovate, 1.5–2(–3.8) × 1.2–2(–2.6) mm, usually silky, glabrescent; floral bracts obovate to oblanceolate, glabrescent. Male flowers: sepals spathe-like, 1.4–2 mm, glabrescent, apex 3-lobed or truncate; petals 3, subulate, subequal, fleshy, glabrescent, gland black; anthers black. Female flowers: sepals black, spathe-like, 1.8–2.2 mm, glabrescent, basally connate, apex 3-lobed; petals 3, spatulate, fleshy, adaxially villous, glabrous at apex, gland black; ovary 3-loculed; style 3-cleft. Seeds narrowly ovoid, 0.7–0.8 mm; testa hexagonally reticulate, prickles 1 or 2(–4) per cell, T-shaped or linear. Fl. and fr. Aug–Nov.

Rice fields, damp soil, near marshes; near sea level to 3500 m. Anhui, Guizhou, Heilongjiang, Hubei, Jiangxi, Liaoning, SW Sichuan, Xizang, Yunnan [Bhutan, India, Japan, Korea, Nepal, Philippines, Sikkim, Thailand].

- 1a. Leaves thin, conspicuously fenestrate; seed prickles T-shaped 28a. var. *alpestre*
- 1b. Leaves thick, inconspicuously fenestrate; seed prickles linear 28b. var. *sichuanense*

28a. *Eriocaulon alpestre* var. *alpestre*

高山谷精草(原变种) gao shan gu jing cao (yuan bian zhong)

Leaves thin, conspicuously fenestrate. Seed prickles T-shaped. Fl. and fr. Aug–Nov.

Rice fields, damp soil; near sea level to 3500 m. Anhui, Guizhou, Heilongjiang, Hubei, Jiangxi, Liaoning, Xizang, Yunnan [Bhutan, India, Japan, Korea, Nepal, Philippines, Sikkim, Thailand].

28b. *Eriocaulon alpestre* var. *sichuanense* W. L. Ma, Acta Phytotax. Sin. 29: 309. 1991.

四川谷精草 si chuan gu jing cao

Leaves thick, inconspicuously fenestrate. Seed prickles linear.

- Near marshes; ca. 2700 m. SW Sichuan.

29. *Eriocaulon robustius* (Maximowicz) Makino, J. Jap. Bot. 3: 27. 1926.

宽叶谷精草 kuan ye gu jing cao

Eriocaulon alpestre J. D. Hooker & Thomson ex Körnicke var. *robustius* Maximowicz, Diagn. Pl. Nov. Asiat. 8: 25. 1892.

Leaves linear, 6–15 cm, 2–3.5(–6) mm wide at middle,

veins 7–12. Scapes numerous, 9–15(–20) cm, 4(or 5)-ribbed; sheath 5–6 cm; receptacle glabrous or occasionally sparsely pubescent; heads dusky, subglobose, 2.5–3.5 × 4–5 mm; involucre bracts slightly reflexed, straw-colored, ovate to oblong, 1.5–2.5 × 1.5–2.2 mm, glabrous or shortly hairy at apical margin; floral bracts obovate to oblanceolate, glabrescent. Male flowers: sepals spathe-like, 1.4–1.8 mm, glabrous or sparsely pubescent at 3-lobed apex; petals 3, subulate, glabrous, gland black; anthers black. Female flowers: sepals spathe-like, 1.5–2 mm, glabrescent, basally connate, apex 3-lobed; petals 3, lanceolate-spatulate, fleshy, adaxially villous but glabrous at apex, gland blackish brown; ovary 3-loculed; style 3-cleft. Seeds ovoid, 0.7–0.9 mm; testa reticulate, prickles 2–4 per cell, T- or Y-shaped or linear. Fl. and fr. Jul–Sep.

Beaches along rivers. Heilongjiang, Nei Mongol [Japan, Korea, Russia].

This species was treated as a synonym of *Eriocaulon alpestre* var. *alpestre* by Zhang (Diss. Bot. 313: 203. 1999).

30. Eriocaulon chinorossicum Komarov, Izv. Imp. Bot. Sada Petra Velikago 16: 156. 1916.

中俄谷精草 zhong e gu jing cao

Leaves linear, ca. 13 cm, ca. 1.5 mm wide at middle, veins 5. Scapes ca. 7, to 22 cm, 4-ribbed; sheath 5–6 cm; receptacle glabrous or with very few short hairs; heads yellowish green, subglobose, ca. 2.5 × 4 mm; involucre bracts straw-colored, broadly ovate, 1.5–2 × 1.3–1.7 mm, margin hairy when young; floral bracts obovate to lanceolate, apex with a few white, clavate hairs. Male flowers: sepals spathe-like, ca. 1.6 mm, apex 3-lobed, lobes with a few white, clavate hairs; petals 3, triangular, glabrous, gland black; anthers black. Female flowers: sepals ca. 2 mm, basally connate, margin hairy, apex 3-lobed; petals 3, clavate, fleshy, adaxially villous, glabrous at apex, gland black; ovary 3-loculed; style 3-cleft. Seeds oblong when young, ca. 0.6 mm; testa inconspicuously reticulate, prickles many, linear, truncate or 2-branched at apex. Fl. and fr. Aug–Oct.

E Heilongjiang (Luobei Xian) [Russia].

31. Eriocaulon glabripetalum W. L. Ma, Acta Phytotax. Sin. 29: 310. 1991.

光瓣谷精草 guang ban gu jing cao

Leaves linear, 3.5–4 cm, 1.5–2 mm wide at middle, veins 5 or 6. Scapes ca. 10, ca. 4 cm, 4-ribbed; sheath 2–2.5 cm; receptacle glabrous; heads straw-colored at base, black at apex, turbinate, ca. 2 × 3–3.5 mm, 7- or 8-flowered; involucre bracts straw-colored, ovate to obovate, membranous; floral bracts ovate to linear-oblanceolate, glabrescent. Male flowers: sepals spathe-like, 1.5–1.7 mm, glabrescent, apex 3-lobed; petals 3, broadly ovate, glabrous, gland black; anthers black. Female flowers: sepals ca. 2.3 mm, glabrescent, basally connate, apex 3-lobed; petals 3, narrowly elliptic to clavate, fleshy, glabrous, gland black; ovary 3-loculed; style 3-cleft. Seeds narrowly ovoid, ca. 0.8 mm; testa reticulate, prickles many, T- and Y-shaped.

• Damp soil. Guangdong.

32. Eriocaulon minusculum Moldenke, Phytologia 8: 159. 1962.

极小谷精草 ji xiao gu jing cao

Leaves linear, 2–3 cm, 0.5–0.7 mm wide at middle, veins 3–5. Scapes 1(–5), 3-ribbed; sheath 1.2–1.8 cm; receptacle with a few short hairs; heads yellowish green at base, black at apex, subglobose, ca. 1.5 × 2–3 mm, 3- or 4-flowered; involucre bracts yellowish green to blackish, ovate, ca. 1.7 × 1.2 mm, membranous, glabrous; floral bracts black, obovate to oblanceolate, ca. 1.4 × 0.7–1 mm, glabrous. Male flowers: sepals black, spathe-like, ca. 1.4 mm, glabrous, apex 3-lobed; petals 3, broadly ovate, equal, glabrous, gland black; anthers black. Female flowers: sepals black, spathe-like, ca. 1.4 mm, basally connate, margin with a few short hairs, apex 3-lobed; petals 3, clavate, fleshy, adaxially with 1–3 hairs at center, gland black; ovary 3-loculed; style 3-cleft. Seeds ovoid, ca. 0.9 mm; testa reticulate, prickles nail-shaped. Fl. and fr. Jul–Oct.

• Swamps; ca. 3800 m. W Sichuan (Dawu Xian).

33. Eriocaulon faberi Ruhland in Engler, Pflanzenr. 13(IV. 30): 95. 1903.

江南谷精草 jiang nan gu jing cao

Leaves linear, 4–12 cm, (0.6–)2–4 mm wide at middle, veins 5–15. Scapes numerous, (7–)20–35(–50) cm, 4- or 5-ribbed; sheath 3–7 cm; receptacle densely villous; heads straw-colored, subglobose to conical-cylindric, 4(–7) × 4–6 mm; involucre bracts straw-colored, oblong to ovate, (2–)3–4.5 × 1.2–2.2 mm, adaxially shortly deciduous hairy at margin, abaxially glabrous; floral bracts obovate to oblanceolate, hairy abaxially and at margin. Male flowers: sepals spathe-like, 1.5–2.2 mm, abaxially with a few (and apex with numerous) white, clavate hairs, apex truncate or 3-lobed; petals 3, broadly ovate, small white hairy at apex, gland black; anthers black. Female flowers: sepals spathe-like, 1.5–2 mm, abaxially sparsely hairy, basally connate, margin long hairy, apex shortly hairy, 3-lobed; petals 3, clavate, fleshy, villous adaxially and with many short hairs at apex, gland brown to black; ovary 1-loculed; stigma 1. Seeds subglobose to ellipsoid, ca. 0.9 mm; testa reticulate, prickles 1 per cell, T-shaped. Fl. and fr. Jun–Nov.

• Rice fields, marshlands, valleys. Fujian, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang.

34. Eriocaulon mangshanense W. L. Ma, Acta Phytotax. Sin. 29: 313. 1991.

莽山谷精草 mang shan gu jing cao

Leaves linear, 1–2.8 cm, 1–1.3 mm wide at middle, veins 3 or 4. Scapes 10–20, ca. 3.5 cm, 3- or 4-ribbed; sheath 0.6–1.7 cm; receptacle glabrous; heads brown, turbinate to subglobose, ca. 2 × 3 mm; involucre bracts straw-colored, orbicular, ca. 2 × 1.2–1.5 mm, glabrous; floral bracts blackish, obovate to oblanceolate-spatulate, with a few hairs at margin and abaxially toward apex. Male flowers: sepals spathe-like, ca. 1.5 mm, with short, 2-celled hairs at apex, basally connate, apex 3-lobed; petals 3, triangular, anterior one slightly larger than others, sometimes with a few hairs, gland black; stamens 6, usually basally

connate or reduced to 5; anthers black. Female flowers: sepals spathe-like, ca. 1.5 mm, basally connate, with a few short, 2-celled hairs at margin and 3-lobed apex; petals 3, free, oblanceolate, ± fleshy, abaxially villous, shortly hairy at apex, gland conspicuous, black; ovary 1(or 2)-loculed; style 1-or 2-cleft. Seeds ovoid, ca. 0.8 mm; testa reticulate, prickles T-shaped. Fl. and fr. Jul–Sep.

• Swamps, open places, damp soil; ca. 1700 m. SE Hunan (Yizhang Xian).

35. *Eriocaulon decemflorum* Maximowicz, Diagn. Pl. Nov. Asiat. 8: 7. 1892.

长苞谷精草 *chang bao gu jing cao*

Eriocaulon decemflorum var. *nipponicum* (Maximowicz) Nakai; *E. nipponicum* Maximowicz.

Leaves linear, (4–)6–10(–13) cm, (1–)1.3–1.5 mm wide at middle, veins 3–7(–11). Receptacle glabrous but sparsely or densely villous when well developed; heads straw-colored, subglobose to turbinate, 4–5 × 7–10 mm, bracteate; involucre bracts ca. 14, straw-colored, oblong and apex acute or oblanceolate and apex acuminate, 3.5–6 × 0.8–2 mm, membranous, outer ones glabrous, inner ones abaxially shortly white hairy; floral bracts narrowly obovate to oblanceolate, abaxially densely hairy toward apex. Male flowers: sepals shortly hairy abaxially and at (1 or)2(or 3)-cleft apex, clefts boatlike, 1.6–2.2 mm; petals (1 or)2, narrowly ovate to elliptic, white hairy toward apex or occasionally glabrous, gland black to brown; stamens (2–)4(or 5), anthers black. Female flowers: sepals 1.8–2.3 × (1–)2 mm, abaxially hairy toward apex; petals 2, oblanceolate-linear, ± fleshy, sparsely villous and apically shortly hairy, gland black; ovary (1 or)2-loculed; style (1 or)2-cleft. Seeds subglobose, 0.8–1 mm; testa reticulate, prickles nail-shaped. Fl. and fr. Aug–Oct.

Rice fields, damp soil, mountain slopes; 1600–1700 m. Fujian, Guangdong, Heilongjiang, Hunan, Jiangsu, Jiangxi, Liaoning, Zhejiang [Japan, Korea, Russia (Far East)].

