

## 12. PHYLLAGATHIS Blume, Flora 14: 507. 1831.

锦香草属 jin xiang cao shu

Herbs, shrublets, or shrubs, erect or stoloniferous. Stems usually 4-sided. Leaves petiolate; leaf blade secondary veins 2–4 on each side of midvein, tertiary veins parallel, margin entire or denticulate. Inflorescences terminal, subterminal, or axillary, umbellate, cymose umbellate, cymose paniculate, or rarely capitate, usually long pedunculate; bracts caducous. Flowers (3 or)4-merous. Pedicel bracteolate. Hypanthium funnel-shaped or subcampanulate, (3 or)4-sided, longitudinal (6 or)8-ribbed. Calyx lobes (3 or)4. Petals ovate, obovate, or broadly ovate, usually oblique. Stamen whorls  $\pm$  equal in shape and length or only slightly unequal in length; anthers subulate to oblong-linear, base tuberculate, expanded, or not appendaged; connective decurrent, forming a short spur. Ovary inferior, urceolate, rarely cup-shaped, (3 or)4-celled. Style filiform; stigma acute. Capsule cup-shaped or globose-urceolate; hypanthium 8-ribbed. Seeds small, cuneate, angulate, densely tuberculate or not.

About 56 species: China, Indonesia, Malaysia, Myanmar, Thailand; 24 species (19 endemic) in China.

Although the genus has recently been revised (Hansen, Bull. Mus. Natl. Hist. Nat., B, Adansonia 14: 355–428. 1993 [“1992”]), the Chinese species are poorly collected and understood.

- 1a. Inflorescences 2- or 3-branched.
  - 2a. Leaf blade 3–7  $\times$  1.5–3.5 cm; inflorescences less than 5  $\times$  3 cm; plants less than 50 cm tall ..... 3. *P. hainanensis*
  - 2b. Leaf blade 8.5–16  $\times$  4.7–10.5 cm; inflorescences 8–10  $\times$  ca. 4 cm or ca. 4  $\times$  4 cm; plants 30–100 cm tall.
    - 3a. Leaf blade abaxially densely white bullate, margin entire; branchlets puberulous ..... 1. *P. erecta*
    - 3b. Leaf blade abaxially puberulous and sparsely strigose, margin inconspicuously denticulate; branchlets densely puberulous and with sparse glandular trichomes ..... 2. *P. cymigera*
- 1b. Inflorescences usually not branched.
  - 4a. Peduncle 4–24 cm.
    - 5a. Leaf blade adaxially usually with a line of whitish yellow spots between secondary veins ..... 19. *P. scorpiothyrsoides*
    - 5b. Leaf blade adaxially without whitish yellow spots between secondary veins.
      - 6a. Fertile stamens 4 plus 4 staminodes or staminodes lacking.
        - 7a. Stamens 4, staminodes absent; calyx furfuraceous puberulous; leaf blades elliptic, ovate, or rarely suborbicular, both surfaces furfuraceous puberulous ..... 20. *P. tetrandra*
        - 7b. Fertile stamens 4 plus 4 staminodes; calyx furfuraceous and with sparse glandular trichomes; leaf blades elliptic to suborbicular, rarely obovate, adaxially sparsely short setose ..... 21. *P. elattandra*
      - 6b. Fertile stamens 8, equal or subequal in length.
        - 8a. Petiole hirsute or tomentose; leaf blades strigose; stamens subequal in length ..... 22. *P. cavaleriei*
        - 8b. Petiole puberulous, glabrescent; leaf blades puberulous; stamens equal in length ..... 23. *P. asarifolia*
  - 4b. Peduncle less than 4 cm.
    - 9a. Leaf blade base cordate to shallowly cordate or if rounded or obtuse then branchlets puberulous.
      - 10a. Hypanthium with glandular trichomes or glandular puberulous.
        - 11a. Flower 3-merous; calyx only with glandular trichomes; anther connective decurrent into a short non-tuberculate spur ..... 13. *P. ternata*
        - 11b. Flower 4-merous; calyx puberulous and with glandular trichomes; anther connective decurrent into a short tuberculate spur ..... 14. *P. velutina*
      - 10b. Hypanthium setose or puberulous and villous.
        - 12a. Hypanthium puberulous; calyx lobes shorter than 1 mm ..... 15. *P. gracilis*
        - 12b. Hypanthium setose or puberulous and villous; calyx lobes greater than 1 mm.
          - 13a. Leaf blade 11–23  $\times$  7–13 cm, abaxially densely furfuraceous and puberulous, adaxially densely furfuraceous and sparsely strigose ..... 16. *P. longiradiosa*
          - 13b. Leaf blade 3.5–7.5  $\times$  1.5–4 cm, abaxially densely pustulate or only puberulous on veins, adaxially puberulous and strigose.
            - 14a. Leaves with 2 secondary veins on each side of midvein ..... 17. *P. longearistata*
            - 14b. Leaves with 3 secondary veins on each side of midvein ..... 18. *P. latisejala*
    - 9b. Leaf blade base cuneate to obtuse or if rounded-subcordate then branchlets appressed setose or hirsute.
      - 15a. Branchlets glabrous or puberulous and with sparse glandular trichomes.
        - 16a. Peduncle 2.5–6 cm ..... 11. *P. oligotricha*
        - 16b. Peduncle less than 1 cm or nearly absent.
          - 17a. Leaf blades 10–17(–20)  $\times$  3–7(–8) cm, both surfaces densely bullate ..... 4. *P. setotheca*
          - 17b. Leaf blades 5–10(–12.5)  $\times$  1–2.3(–6.5) cm, both surfaces smooth.

- 18a. Leaf blades 1–2.3 cm wide, both surfaces glabrous; secondary veins 1 on each side of midvein ..... 5. *P. stenophylla*
- 18b. Leaf blades 3–6.5 cm wide, both surfaces puberulous; secondary veins 2 or 3 on each side of midvein ..... 6. *P. plagiopetala*
- 15b. Branchlets densely setose, villous, or retrorse setose.
- 19a. Branchlets and hypanthium densely appressed setose or branchlets retrorse setose and hypanthium puberulous and with glandular trichomes.
- 20a. Petals ca. 1.4 cm; anther connective abaxially tuberculate; leaf blade base cuneate ..... 7. *P. melastomatoides*
- 20b. Petals 0.8–1 cm; anther connective not tuberculate; leaf blade base rounded or slightly cordate.
- 21a. Branchlets obtusely 4-sided, appressed densely setose ..... 8. *P. fengii*
- 21b. Branchlets terete, with stout brownish or white bristles to 1.5 cm at nodes, glabrous when old ..... 24. *P. tentaculifera*
- 19b. Branchlets hirsute or villous, hypanthium densely stellate pilose, puberulous, and sparsely hispid or with dense glandular trichomes.
- 22a. Hypanthium with glandular trichomes; leaf blade 5–13 × 1.5–4 cm ..... 12. *P. deltoidea*
- 22b. Hypanthium with stellate trichomes or puberulous and sparsely hirsute; leaf blade 7–18 × 3–8.5 cm.
- 23a. Hypanthium with 8–12 mm whitish trichomes ..... 9. *P. hispidissima*
- 23b. Hypanthium puberulous and sparsely hirsute ..... 10. *P. ovalifolia*

**1. *Phyllagathis erecta*** (S. Y. Hu) C. Y. Wu ex C. Chen, Bull. Bot. Res., Harbin 4(3): 41. 1984.

直立锦香草 zhi li jin xiang cao

*Stapfiophyton erectum* S. Y. Hu, J. Arnold Arbor. 33: 174. 1952.

Herbs or shrubs, 30–100 cm tall, erect, branched. Stems nearly 4-sided, densely puberulous, becoming glabrous. Petiole 1.5–3.5 cm, both sides slightly winged, glabrous; leaf blade elliptic, ovate-elliptic, or broadly elliptic, 8.5–16 × 4.7–6.2(–9) cm, papery to stiffly papery, both surfaces glabrous, abaxially furfuraceous or sometimes tuberculate, adaxially densely white bullate, secondary veins 2 on each side of midvein, veins conspicuous, base cuneate to obtuse, margin entire, apex shortly acuminate. Inflorescences terminal, umbellate cymose panicles, 5–8 × ca. 4 cm, furfuraceous. Flowers unknown. Capsule cup-shaped, ca. 4 × 6 mm, 4-sided. Pedicel 5–8 mm, 4-sided, narrowly winged on angles, furfuraceous. Fr. Nov–Jan.

• Dense forests, limestone hills, moist places; 1000–1500 m. Guangxi, Yunnan.

**2. *Phyllagathis cymigera*** C. Chen, Bull. Bot. Res., Harbin 4(3): 41. 1984.

聚伞锦香草 ju san jin xiang cao

?*Phyllagathis plurumbellata* R. H. Miao.

Shrubs to 1 m tall. Stems 4-sided, sulcate, densely puberulous and with sparse glandular trichomes. Petiole 2–7.5 cm, sulcate, densely puberulous and sparsely setose; leaf elliptic to broadly elliptic, 10–13.5 × 6–10.5 cm, oblique, blade papery, both surfaces puberulous and sparsely strigose, secondary veins 3 or 4 on each side of midvein, base obtuse to subcordate, margin inconspicuous denticulate with each tooth having a terminal seta, apex acute. Inflorescences terminal, cymose paniculate, ca. 4.5 × 4 cm, densely puberulous. Pedicel ca. 2 mm, puberulous. Hypanthium funnel-shaped, ca. 3 mm, 4-sided, puberulous. Calyx lobes ovate-triangular, margin ciliate, apex acute with a

setose tip. Petals pink, broadly obovate, ca. 7 × 7 mm, minutely oblique. Stamens equal; anthers lanceolate, ca. 2.5 mm, base not tuberculate; connective decurrent, forming setose spur. Ovary ovoid. Fl. Dec.

• Forests, valleys, mountain slopes; 1300–1400 m. Yunnan.

**3. *Phyllagathis hainanensis*** (Merrill & Chun) C. Chen, Bull. Bot. Res., Harbin 4(3): 42. 1984.

海南锦香草 hai nan jin xiang cao

*Bredia hainanensis* Merrill & Chun, Sunyatsenia 6: 145. 1940; *Plagiopetalum hainanense* (Merrill & Chun) Merrill ex H. L. Li.

Shrubs 30–50 cm tall, many-branched. Stems grayish white, obtusely 4-sided; branchlets 4-sided, puberulous and with sparse glandular trichomes. Petiole 0.5–2 cm, puberulous and with sparse glandular trichomes; leaf blade oblong-elliptic, elliptic, or ovate, 3–7 × 1.5–3.5 cm, papery, abaxially puberulous and shortly setose, adaxially with a sparse line of setose trichomes between veins but otherwise glabrous, secondary veins 2 or 3(or 4) on each side of midvein, base broadly cuneate to subround, margin denticulate, apex acute to obtuse. Inflorescences terminal, cymose contracted to becoming subumbellate, 4–5 × ca. 3 cm; peduncle 2.5–3 cm, puberulous and with glandular trichomes. Pedicel 6–7 mm, puberulous and with glandular trichomes. Hypanthium funnel-shaped, ca. 4 mm, 4-sided, puberulous and with glandular trichomes. Calyx lobes shortly triangular, ca. 1 mm, apex acute. Petals pink to purplish red, obovate, 8–11 × 6–8 mm, oblique, apex apiculate. Stamens 8, ca. 8 mm, equal; anthers lanceolate, ca. 4 mm; connective decurrent, forming a short spur, abaxially inconspicuously tuberculate. Ovary ovoid, apical margin with glandular trichomes. Capsule cup-shaped, ca. 4 × 4 mm, 4-sided; hypanthium exceeding capsule, 8-ribbed; calyx lobes puberulous and with sparse glandular trichomes. Fl. May–Aug, fr. Aug–Dec.

• Forests, mountain slopes, limestone, hillsides, stream banks; 600–800 m. Hainan.

**4. *Phyllagathis setotheca*** H. L. Li, J. Arnold Arbor. 25: 32. 1944.

刺蕊锦香草 ci rui jin xiang cao

*Phyllagathis setotheca* var. *setotuba* C. Chen.

Shrubs to 1 m tall. Stems obtusely 4-sided, nodes slightly inflated; branchlets 4-sided, densely denticulate, glabrous. Petiole 1–7.5 cm, densely bullate; leaf blade stiffly oblong-lanceolate, elliptic, or obovate, 10–17(–20) × 3–7(–8) cm, papery, surfaces glabrous and densely bullate, secondary veins 2 on each side of midvein, base cuneate to broadly cuneate, margin entire, apex acuminate to acute. Inflorescences terminal, cymose contracted to umbellate. Pedicel 0.8–1.8 cm, densely bullate. Hypanthium funnel-shaped, ca. 6 mm, 4-sided, densely bullate, glabrous or with dense twisted setose trichomes. Calyx lobes long triangular, ca. 6.5 mm, apex acuminate to obtuse. Petals ca. 1.4 × 0.8 cm. Stamens equal; filaments filiform, ca. 7 mm; anthers lanceolate, ca. 1 cm; connective decurrent, forming a short spur, abaxially tuberculate. Ovary ovoid, apical margin with glandular trichomes. Capsule cup-shaped, ca. 7 × 6 mm, 4-sided; hypanthium exceeding capsule, 8-ribbed. Fl. May–Jul, fr. Jun.

Forests, valleys, stream banks, damp places, rock crevices, trailsides. Guangdong, Guangxi [Vietnam].

**5. *Phyllagathis stenophylla*** (Merrill & Chun) H. L. Li, J. Arnold Arbor. 25: 32. 1944.

窄叶锦香草 zhai ye jin xiang cao

*Bredia stenophylla* Merrill & Chun, Sunyatsenia 5: 146. 1940.

Shrubs 0.8–3 m tall. Stems obtusely 4-sided; branchlets glabrous. Petiole 5–10 mm, glabrous; leaf blade oblong-lanceolate to oblong-oblong-lanceolate, 5–10 × 1–2.3 cm, stiffly papery, both surfaces glabrous, secondary veins 1 on each side of midvein, base cuneate, margin basally entire but denticulate apically from middle, apex acuminate to shortly acuminate. Inflorescences, terminal, cymose contracted to umbellate, (2 or)3-flowered; peduncle ca. 4 mm. Pedicel 5–8 mm, 4-sided, glabrous. Hypanthium funnel-shaped, 5–6.5 mm, 4-sided. Calyx lobes narrowly triangular, ca. 1 mm, apex acuminate. Petals rose-colored to pale purplish red, ovate, ca. 12 × 6 mm, minutely oblique, apex acuminate. Stamens equal; filaments ca. 7 mm; anthers subulate-lanceolate, ca. 6 mm; connective decurrent, slightly prolonged, abaxially slightly inflated. Ovary ovoid, apex 4-lobed, lobes 2-denticulate. Capsule cup-shaped, ca. 6 × 5 mm, 4-sided; hypanthium 8-ribbed. Fl. May–Aug, fr. Aug–Oct.

• Open or dense forests, valleys, stream banks, rock crevices; 500–1000 m. Hainan.

**6. *Phyllagathis plagiopetala*** C. Chen, Bull. Bot. Res., Harbin 4(3): 44. 1984.

偏斜锦香草 pian xie jin xiang cao

Shrublets 30–40 cm tall, base woody. Stems 4-sided, sulcate, puberulous, glabrescent. Petiole 0.8–4(–5.2) cm, puberulous; leaf blade broadly elliptic to ovate, 5–12.5 × 3–6.5 cm, pa-

perly to stiffly papery, both surfaces puberulous, secondary veins 2 or 3 on each side of midvein, base cuneate, obtuse, or rarely shallowly cordate, margin subentire, ciliate, and sometimes denticulate with each tooth having a terminal seta, apex acuminate to acute. Inflorescences terminal or sometimes axillary, cymose umbellate; peduncle 0.5–3 cm, puberulous. Pedicel ca. 1 cm, puberulous. Hypanthium funnel-shaped, 4-sided, 8-ribbed, ca. 6 mm, puberulous. Calyx lobes lanceolate, ca. 5 mm, both surfaces puberulous, apex acuminate. Petals pink, red, or purple, broadly obovate, ca. 7 × 5 mm, very oblique, apex acute. Stamens equal or subequal in length, 1.1–1.3 cm; anthers ca. 7 mm, base tuberculate; connective decurrent, forming a short spur. Ovary ovoid, furfuraceous ciliate, apex 4-lobed. Capsule cup-shaped, exserted ca. 1.5 mm beyond hypanthium; hypanthium, ca. 4 × 4 mm. Fl. Jun, fr. Oct.

• Open or dense forests, valleys, hillsides, stream banks; 800–1200 m. Guangxi, Hunan.

**7. *Phyllagathis melastomatoides*** (Merrill & Chun) W. C. Ko, Acta Phytotax. Sin. 8: 267. 1963.

毛锦香草 mao jin xiang cao

Shrubs to 1 m tall, many-branched. Stems terete, nodes usually inflated; branchlets densely appressed setose, glabrescent. Petiole 1–5(–10) cm, densely appressed setose; leaf blade oblong-elliptic to oblong-ovate, 6–14 × 2–6 cm, stiffly papery to papery, abaxially appressed sparsely setose on veins, adaxially densely bullate with a sparse setose line between veins, secondary veins 2 or 3 on each side of midvein, base cuneate, margin denticulate with each tooth having a terminal seta, apex shortly acuminate to acuminate. Inflorescences axillary, cymose, usually 1(–3)-flowered; peduncle ca. 2 mm. Pedicel in fruit less than 0.8 or 1.2–1.8 cm, appressed setose. Petals rose-colored, obovate, ca. 1.4 × 0.9 cm, oblique, glandular ciliate up middle, apex rounded. Stamens equal; filaments ca. 7 mm; anthers lanceolate, ca. 7 mm; connective decurrent, forming a short spur, abaxially tuberculate. Ovary half inferior, ovate, apex with glandular trichomes. Capsule cup-shaped, ca. 7 × 5 mm, 4-sided; hypanthium 8-ribbed. Fl. Oct–Dec, fr. Dec–Feb.

• Valleys, stream banks. Hainan (Ding'an, Lingshui).

- 1a. Pedicel 1.2–1.8 cm in fruit ..... 7a. var. *melastomatoides*
- 1b. Pedicel less than 0.8 cm in fruit ..... 7b. var. *brevipes*

**7a. *Phyllagathis melastomatoides* var. *melastomatoides***

毛锦香草(原变种) mao jin xiang cao (yuan bian zhong)

*Osbeckia melastomatoides* Merrill & Chun, Sunyatsenia 2: 293. 1935.

Pedicel 1.2–1.8 cm in fruit.

• Valleys, stream banks. Hainan (Ding'an).

**7b. *Phyllagathis melastomatoides* var. *brevipes*** W. C. Ko, Acta Phytotax. Sin. 8: 268. 1963.

短柄锦香草 duan bing jin xiang cao

Pedicel less than 0.8 cm in fruit.

- Valleys, stream banks. Hainan (Lingshui).

**8. *Phyllagathis fengii*** C. Hansen, *Nordic J. Bot.* 10: 23. 1990.

刚毛锦香草 gang mao jin xiang cao

*Cyphotheca hispida* S. Y. Hu; *Phyllagathis hispida* (S. Y. Hu) C. Y. Wu ex C. Chen (1979), not King (1900).

Shrubs to 1 m tall, branched. Stems obtusely 4-sided, appressed densely setose, glabrescent. Petiole 0.8–5 cm, densely setose; leaf blade ovate to oblong-ovate, 5–10 × 2.5–5 cm, papery to submembranous, both surfaces densely setose but almost glabrescent, abaxially only appressed setose on veins, secondary veins 2 on each side of midvein, base rounded to subcordate, margin entire and setose ciliate or denticulate with each tooth having a terminal seta, apex acuminate. Inflorescences, terminal, cymose umbellate, 1–4-flowered; peduncle 0.7–2(–3) cm, setose. Pedicel ca. 8 mm, densely appressed setose. Hypanthium subcampanulate, ca. 5 mm, nearly 4-sided, densely appressed setose. Calyx lobes ovate, ca. 1.5 mm, setose and setose ciliate. Petals pink, obovate, ca. 8 mm, apex emarginate. Stamens subequal; anthers of longer stamens ca. 5 mm; anthers or shorter stamens ca. 3.5 mm; connective decurrent, forming a very short spur. Ovary urceolate, ca. 6 × 6 mm; hypanthium obtusely 4-sided. Fl. Jun, fr. Nov.

- Mixed forests, woodland margins; 1000–1600 m. Yunnan.

**9. *Phyllagathis hispidissima*** (C. Chen) C. Chen, *Bull. Bot. Res.*, Harbin 4(3): 46. 1984.

密毛锦香草 mi mao jin xiang cao

*Bredia hispidissima* C. Chen, *Fl. Yunnan.* 2: 105. 1979; *Phyllagathis xinyiensis* Z. J. Feng.

Shrubs 25–150 cm tall. Stems terete, densely hirsute, with long, whitish, spiny trichomes. Petiole 2–5 cm, densely hirsute; leaf blade elliptic to ovate, 6–14 × 4.5–7.5 cm, papery, both surfaces densely strigose, secondary veins 3 on each side of midvein, base broadly obtuse, rounded, or subcordate, margin entire and ciliate, apex acuminate. Inflorescences terminal or axillary, cymes, 3–6-flowered; peduncle ca. 1 cm or shorter. Pedicel ca. 1 cm or shorter, densely hirsute. Hypanthium cup-shaped or subcampanulate, 6–8 mm, densely stellate pilose. Calyx lobes ovate to triangular-ovate, ca. 2 mm, hirsute, ciliate. Petals purplish or rose-colored, obovate, 0.6–1.1 cm, oblique, apex acuminate and with a 1–3-setose tip. Stamens equal; anthers lanceolate; connective decurrent, forming a spur ca. 1 mm. Ovary urceolate, margin setose ciliate, apex with a membranous crown. Capsule cup-shaped, ca. 5 × 5 mm, 4-lobed; hypanthium 8-ribbed. Fl. May–Jun, fr. Dec.

Dense forests, valleys, damp places, rock crevices; 100–1900 m. Guangdong, Yunnan [Vietnam].

**10. *Phyllagathis ovalifolia*** H. L. Li, *J. Arnold Arbor.* 25: 31. 1944.

卵叶锦香草 luan ye jin xiang cao

*Phyllagathis calisaurea* C. Chen; *P. ovalifolia* var. *pauciflora* R. H. Miao.

Herbs or shrubs, 0.3–1(–2) m tall, branched. Stems 4-

sided, densely retrorse hirsute, glabrescent. Petiole (1.5–)2.5–6.5 cm, densely hirsute to setose; leaf blade ovate, oblong-ovate, or broadly elliptic, 7–18 × (2–)3–8.5 cm, papery to submembranous, both surfaces sparsely strigose or abaxially sometimes puberulous, adaxially puberulous and sparsely setose, secondary veins 2 or 3 on each side of midvein, base obtuse to subcordate, margin entire or sometimes inconspicuously denticulate and ciliate, apex acuminate to acute. Inflorescences terminal, umbellate, (3–)5–30-flowered; peduncle 1–1.5(–3) cm, densely hirsute or retrorsely setose. Pedicel 5–10 mm, sparsely hirsute and glandular puberulous. Hypanthium funnel-shaped, 5–9 mm, puberulous and sparsely glandular hirsute. Calyx lobes triangular-ovate, 2–3 mm, densely (glandular) villous. Petals purplish, broadly ovate, 6–9 mm, apex acute. Stamens equal to unequal, longer stamens with filaments 4–5.5 mm; anthers lanceolate, ca. 6 mm; connective decurrent, forming a short spur. Shorter stamens aborted; filaments 3–4 mm; anthers ca. 3 mm. Ovary urceolate, apex with a crown, crown margin puberulous ciliate. Capsule cup-shaped, ca. 7 × 7 mm, 4-lobed; hypanthium 8-ribbed. Fl. Jun–Aug, fr. Dec.

Dense forests, hillsides, valleys, damp places; 800–1200 m. W Guangxi (Jingxi), Yunnan [Vietnam].

**11. *Phyllagathis oligotricha*** Merrill, *Sunyatsenia* 1: 74. 1930.

毛柄锦香草 mao bing jin xiang cao

*Phyllagathis anisophylla* Diels; *Phyllagathis nudipes* C. Chen.

Shrublets 10–20 cm tall, stoloniferous, branched or not. Stems terete, densely lenticellate; branchlets nearly 4-sided, puberulous, with sparse glandular trichomes, or glabrous. Petiole 0.6–2 cm, puberulous, both sides barbate setose or glabrous; leaf blade broadly ovate to broadly elliptic, sometimes lanceolate-ovate basally on stem, (4.5–)5–11(–14) × (2.5–)4–8(–9) cm, stiffly papery to subleathery, abaxially sparsely setose but glabrescent, adaxially puberulous and sparsely setose but later puberulous then glabrescent, secondary veins 2 on each side of midvein, base obtuse to rounded, margin entire or inconspicuously denticulate with each tooth having a terminal seta, apex acute to obtuse. Inflorescences terminal and axillary, cymose or contracted to subumbellate, (2.5–)3.5–6 cm, densely puberulous or glabrous. Pedicel ca. 6 mm, puberulous. Hypanthium funnel-shaped, 2–3 mm, 4-sided, with sparse glandular trichomes or glabrous. Calyx lobes broadly triangular, apex acute. Petals purple or pink, oblong to elliptic-oblong, 6–7 × ca. 4.5 mm, slightly oblique, apex acute. Stamens subequal; connective decurrent, forming a short adaxial spur, abaxially not tuberculate. Longer stamens 0.8–1.2 cm. Shorter stamens 0.6–1 cm. Ovary subglobose, 4-lobed, apex truncate. Capsule cup-shaped, 4-sided, apex truncate; hypanthium 4–6 × ca. 4.5 mm, exceeding capsule, sparsely setose. Fl. May–Jun, fr. Aug–Nov.

- Sparse to dense forests, valleys, hillsides, shaded moist places, stream banks, rock crevices, trailsides; 500–2300 m. Guangdong, Guangxi, Hunan, Jiangxi.

**12. *Phyllagathis deltoidea*** C. Chen, *Bull. Bot. Res.*, Harbin 4(3): 48. 1984 [“*deltoda*”].

三角齿锦香草 san jiao chi jin xiang cao

Shrubs to 1 m tall. Stems 4-sided, with dense glandular trichomes, later subterete and glabrous. Petiole 0.7–5 cm, densely villous; leaf blade elliptic to long elliptic, 5–13 × 1.5–4 cm, stiffly papery, abaxially sparsely setose on veins otherwise sparsely puberulous, adaxially puberulous and sparsely setose, secondary veins 2 on each side of midvein, base cuneate, margin entire or inconspicuously sparsely denticulate with each tooth having a terminal seta, apex long acuminate. Inflorescences terminal, umbellate; peduncle 1–2 cm, with dense glandular trichomes. Pedicel ca. 8 mm, with dense glandular trichomes. Hypanthium funnel-shaped, ca. 3.5 mm. Calyx lobes broadly triangular, ca. 2 mm, margin setose ciliate, apex abruptly acuminate. Petals purple to pink, broadly ovate, ca. 5 mm, apex acute. Stamens ca. 7 mm; connective decurrent, forming a short spur, not tuberculate. Ovary ovoid, 4-lobed, apex with a membranous crown. Fl. Nov–Dec.

• Forests, hillsides, in rock crevices; ca. 1300 m. Guangxi (Ningming).

**13. *Phyllagathis ternata*** C. Chen, Bull. Bot. Res., Harbin 4(3): 49. 1984.

三瓣锦香草 san ban jin xiang cao

Shrublets or herbs, to 25 cm tall, basally branched, base woody. Stems 4-sided, densely patent setose. Petiole 1.5–3.5 cm; leaf blade ovate, 5–8 × 2.5–4 cm, papery to stiffly papery, abaxially patent long setose on veins, adaxially setose strigose, secondary veins 3 or 4 on each side of midvein, base subcordate to cordate, margin double serrulate with each tooth having a terminal seta, apex acuminate. Inflorescences terminal, umbellate, 3–7-flowered; peduncle short; bracts 2, foliaceous. Flowers 3-merous. Pedicel 5–10 mm, with patent glandular trichomes. Hypanthium funnel-shaped, 3-sided, ca. 3.5 mm. Calyx lobes 3, broadly triangular, ca. 2.5 mm, with glandular trichomes, margin ciliate, apex abruptly acuminate. Petals purplish, obovate, ca. 7 × 4 mm, glabrous, apex abruptly acuminate with a setose tip. Stamens 6, ca. 1.2 cm, equal; connective decurrent, forming a short spur, not tuberculate. Ovary ovoid, 3-lobed, apex with a membranous crown; persistent calyx lobes triangular, margin entire. Fr. Aug.

• Forests, hillsides, stream banks. Guangdong (Xinyi).

**14. *Phyllagathis velutina*** (Diels) C. Chen, Bull. Bot. Res., Harbin 4(3): 51. 1984.

腺毛锦香草 xian mao jin xiang cao

*Bredia velutina* Diels, Bot. Jahrb. Syst. 65: 109. 1932.

Herbs or shrubs, 0.3–1 m tall, branched. Stems terete, densely ferruginous with glandular trichomes and tomentose. Petiole 3–6(–11.5) cm, densely puberulous and with glandular trichomes; leaf blade ovate to elliptic-ovate, 6–11 × 4.5–7 cm, papery to substiffly papery, abaxially purplish red and densely pilose on veins otherwise sparsely pubescent, adaxially green and densely pubescent, secondary veins 3 or 4(or 5) on each side of midvein, base cordate, margin ciliate and densely serrulate to subentire with each tooth having a terminal seta, apex acuminate. Inflorescence terminal, an umbellate or cymose panicle, 3(–7)-flowered, ferruginous puberulous and with glandular

trichomes. Pedicel 5–8 mm but to 1.2 cm in fruit. Hypanthium sometimes purplish red, ca. 6 mm. Calyx lobes narrowly triangular, less than 1 mm, both surfaces puberulous. Petals pink, ovate, ca. 8 mm, oblique, puberulous, margin ciliate, apex acute. Stamens subequal; anthers slightly curved; connective forming a short triangular spur, abaxially tuberculate. Ovary ovoid, apex with a membranous crown. Capsule ovoid, exserted, apex with a membranous crown; hypanthium ca. 6 mm, puberulous and with sparse glandular trichomes; calyx lobes ca. 2 mm. Fl. May–Jun, fr. Oct.

• Dense forests, hillsides, damp places; 1000–2300 m. Fujian, Yunnan.

**15. *Phyllagathis gracilis*** (Handel-Mazzetti) C. Chen, Bull. Bot. Res., Harbin 4(3): 51. 1984.

细梗锦香草 xi geng jin xiang cao

*Fordiophyton gracile* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 63: 10. 1926; *Bredia gracilis* (Handel-Mazzetti) Diels.

Shrublets 20–40 cm tall. Stems 4-sided, puberulous, later nearly glabrous. Petiole 1.5–6 cm, puberulous; leaf blade long elliptic to ovate, 8–16 × 4–6 cm, papery to stiffly papery, both surfaces puberulous, secondary veins 3 on each side of midvein, base obtuse to subcordate, margin sparsely serrulate and inconspicuously ciliate, apex acuminate. Inflorescences terminal or axillary, cymose, 3–12-flowered; peduncle 1–3(–11) cm. Peduncles, pedicel, calyces puberulous. Pedicel 5–10 mm. Hypanthium funnel-shaped, ca. 3 mm. Calyx lobes less than 1 mm, apex shortly acute. Petals purplish red to purple, broadly ovate, ca. 7 × 5 mm, oblique, apex acuminate. Longer stamens 1–1.2 cm; shorter stamens 8.5–9.5 mm; anthers erect, base tuberculate; connective decurrent, forming a short spur. Ovary half inferior, ovate, with glandular trichomes, apex with a membranous crown. Fl. Aug–Sep.

• Dense forests, hillsides, valleys, trailsides, thickets, in well-drained soil; 1100–1300 m. Hunan.

**16. *Phyllagathis longiradiosa*** C. Chen, Bull. Bot. Res., Harbin 4(3): 51. 1984.

大叶熊巴掌 da ye xiong ba zhang

Herbs or shrubs, 30–100 cm tall. Stems terete, glabrescent or sparsely villous. Petiole 3–8.5 cm, sulcate, lateral sides villous or not, glabrescent; leaf blade broadly ovate to subelliptic, 11–23 × 7–13 cm, papery to submembranous, abaxially usually purplish red, densely furfuraceous, and puberulous, adaxially green, densely furfuraceous, and sparsely strigose, secondary veins 3 on each side of midvein, base cordate, margin denticulate to subentire and ciliate or sparsely ciliate, apex acuminate. Inflorescences terminal, umbellate; peduncle 2–4 cm but to 6 cm in fruit, puberulous and sparsely villous. Pedicel ca. 1 cm, puberulous. Hypanthium ca. 1 cm, setose with inflate bases or puberulous. Calyx lobes semiorbicular, ca. 2 mm, outside sparsely setose or puberulous, inside puberulous, apex retuse. Petals rose-colored, broadly ovate, ca. 4 × 5 mm, margin ciliate, apex retuse. Stamens subequal; anther bases tuberculate; connective base inflated forming a short spur. Ovary ovoid, apex with a

membranous ciliate crown. Capsule crown minutely exerted from calyx; hypanthium ca. 6 × 8 mm, setose with inflated bases. Fl. May–Jul or Nov, fr. Dec–Jan.

• Broad-leaved evergreen forests; 300–2200 m. Guangxi, Guizhou, Yunnan.

- 1a. Leaf margin ciliate; petiole lateral sides villous; hypanthium setose with inflated bases, calyx lobes sparsely setose and inside puberulous ..... 16a. var. *longiradiosa*
- 1b. Leaf margin sparsely ciliate; petiole lateral sides not villous; hypanthium and calyx lobes puberulous on both surfaces ..... 16b. var. *pulchella*

**16a. Phyllagathis longiradiosa var. longiradiosa**

大叶熊巴掌(原变种) da ye xiong ba zhang (yuan bian zhong)

*Barthea cavaleriei* H. Léveillé, Repert. Spec. Nov. Regni Veg. 8: 61. 1910; *Bredia cavaleriei* (H. Léveillé) Diels (1933), not H. Léveillé & Vaniot (1906); *B. longiradiosa* C. Chen ex Govaerts; *Fordiophyton cavaleriei* (H. Léveillé) Guillaumin.

Petiole lateral sides villous; leaf blade margin ciliate. Hypanthium setose with inflated bases. Calyx lobes sparsely setose and inside puberulous. Fl. Jun–Jul.

• Broad-leaved evergreen forests; 300–2200 m. Guangxi, Guizhou, Yunnan.

**16b. Phyllagathis longiradiosa var. pulchella** C. Chen, Bull. Bot. Res., Harbin 4(3): 52. 1984.

丽萼熊巴掌 li e xiong ba zhang

Petiole not villous on lateral sides; leaf blade margin sparsely ciliate. Hypanthium and sepals puberulous on both surfaces. Fl. May or Nov.

• SW Guangxi (Daxin).

**17. Phyllagathis longearistata** C. Chen, Bull. Bot. Res., Harbin 4(3): 52. 1984.

长芒锦香草 chang mang jin xiang cao

Shrubs, creeping or ascending, ca. 40 cm. Stems 4-sided, villous and puberulous. Petiole 1.5–3 cm, villous and puberulous; leaf ovate to oblong-ovate, 4–7.5 × 1.5–3.5 cm, papery, abaxially puberulous on veins otherwise glabrous, adaxially puberulous and sparsely strigose between teeth, secondary veins 2 on each side of midvein, base subcordate to obtuse, margin inconspicuously serrulate with each tooth having a terminal seta, apex obtusely acute. Inflorescences terminal, umbellate; peduncle ca. 5 mm. Pedicel ca. 1.5 mm, puberulous. Hypanthium campanulate, ca. 5 mm, villous and puberulous. Calyx lobes broadly ovate, ca. 2 mm, sparsely puberulous, margin villous ciliate, apex acute. Petals white, ovate, ca. 3 × 4.5 mm, with glandular trichomes, margin ciliate, apex acute with and with an aristate tip. Stamens equal, ca. 5.5 mm; anthers lanceolate, ca. 3.5 mm; connective decurrent, discoid. Ovary ovoid, apex with a membranous crown, crown margin abruptly denticulate. Capsule cup-shaped; hypanthium cup-shaped, ca. 7 × 6 mm, setose, apex truncate. Fl. Jun.

• Stream banks. Guangxi (Hechi).

**18. Phyllagathis latisejala** C. Chen, Bull. Bot. Res., Harbin 4(3): 53. 1984.

宽萼锦香草 kuan e jin xiang cao

Herbs or shrublets, to 20 cm tall. Stems stoloniferous, 4-sided, puberulous. Petiole 1.5–3.5 cm, densely puberulous, laterally with sparsely long setose trichomes; leaf blade elliptic, oblong-elliptic, or sometimes ovate-elliptic, 3.5–7 × 2.2–4 cm, papery, abaxially densely bullate and puberulous on veins, adaxially puberulous and strigose, secondary veins 3 on each side of midvein, base rounded to obtuse, margin ciliate and subtire to inconspicuously sparsely serrulate, apex acute to obtuse. Inflorescences terminal, cymose umbellate, 1- or 2-flowered; peduncle 0.5–2 cm, puberulous. Pedicel ca. 1.2 mm, ca. 1.5 cm in fruit. Hypanthium cup-shaped, ca. 4 × 3 mm, puberulous and sparsely setose. Calyx lobes broadly ovate, ca. 2 × 2 mm, both surfaces glabrous, margin setose ciliate, apex acute. Petals white. Stamens equal, ca. 1.2 cm; anthers lanceolate, ca. 6 mm, base setose; connective decurrent and tuberculate. Ovary ovoid, apex with a membranous crown, crown margin ciliate with glandular trichomes. Capsule cup-shaped; hypanthium ca. 5 × 4 mm, puberulous and sparsely setose. Fl. Sep, fr. Sep.

• Mountain slopes, rock crevices, shaded areas; 300–400 m. Hubei.

**19. Phyllagathis scorpiothyrsoides** C. Chen, Bull. Bot. Res., Harbin 4(3): 55. 1984.

斑叶锦香草 ban ye jin xiang cao

Herbs to 20 cm tall. Stems stoloniferous, 4-sided or 6-angled, furfuraceous. Petiole 3.5–6.5 cm, furfuraceous; leaf blade broadly elliptic to ovate, 7–10 × 5.2–8.8 cm, stiffly papery, both surfaces furfuraceous, adaxially with (or sometimes without) a line of whitish yellow spots between secondary veins, base cordate to subcordate, margin inconspicuously denticulate, apex acute. Inflorescences terminal, umbellate; peduncle ca. 6.5 cm; bracts leaflike, lanceolate, ca. 6 × 1.7 mm, with or without whitish yellow spots. Pedicel ca. 8 mm in fruit, 4-sided. Capsule cup-shaped; hypanthium cup-shaped, 4-sided, sparsely triangular setose, furfuraceous. Fr. Jun.

Forests, valleys, hillsides, shaded damp places. Guangxi [Vietnam].

**20. Phyllagathis tetrandra** Diels, Bot. Jahrb. Syst. 65: 116. 1932.

四蕊熊巴掌 si rui xiong ba zhang

*Stapfiophyton tetrandrum* (Diels) H. L. Li.

Herbs, repent, stoloniferous, rooting at nodes, nodes inflated. Stems 4-sided, densely ferruginous setose. Petiole 5–9(–14) cm, furfuraceous puberulous and sparsely setose; leaf blade elliptic, ovate, or rarely suborbicular, 6.5–12.5 × 5.5–9.5(–10.5) cm, papery to substiffly papery, both surfaces furfuraceous puberulous, abaxially sometimes sparsely setose on veins, secondary veins 3 on each side of midvein, base cordate, margin entire, apex acute, obtuse, or retuse. Inflorescences terminal, umbellate or cymose, (5–)9–26 cm, 3–12-flowered; pe-

duncle (4–)8–24 cm. Pedicel 5–12 mm to subsessile, furfuraceous puberulous and sparsely setose. Hypanthium funnel-shaped, ca. 5 mm, 4-sided, furfuraceous puberulous, sparsely setose. Calyx lobes broadly triangular-ovate, furfuraceous puberulous. Petals pink, rose-colored, or rarely red, ovate to subelliptic, ca. 6 mm. Stamens 4, pink, ca. 1.3 cm; anthers ca. 7 mm; connective decurrent, forming a short spur. Ovary ovoid, apex with a membranous crown. Capsule funnel-shaped, ca. 4 mm in diam., 4-sided; hypanthium exceeding capsule, furfuraceous puberulous. Fl. Dec or Mar–May, fr. May–Jun.

Dense forests, mountain slopes, valleys, shaded damp places; 1000–1700(–2000) m. Hainan, Yunnan [Vietnam].

**21. *Phyllagathis elattandra*** Diels, Bot. Jahrb. Syst. 65: 116. 1932.

红敷地发 hong fu di fa

*Stapfiophyton elattandrum* (Diels) H. L. Li.

Herbs, repent. Stolons ca. 1 cm thick, with conspicuous leaf scar. Stems very short, with 2 or 3 pairs of leaves. Petiole 4–8 cm, sometimes winged; leaf blade elliptic or rarely obovate to suborbicular, 10–22 × 7–15(–18) cm, papery, abaxially furfuraceous and sometimes very sparsely setose on veins, adaxially sparsely setose, secondary veins 3 or 4 on each side of midvein, base cordate to obtuse, margin entire or sometimes inconspicuously sparsely denticulate, apex obtuse to retuse. Inflorescences terminal, umbellate or umbellate panicles; peduncle 8–10 cm, furfuraceous and sometimes with sparse glandular trichomes. Pedicel ca. 1 cm, 4-sided, furfuraceous and with sparse glandular trichomes. Hypanthium funnel-shaped, ca. 5 mm, 4-sided. Calyx lobes inconspicuous. Petals pink, red, or purplish red, oblong-ovate, ca. 10 × 5 mm, oblique, apex acuminate. Stamens 8, whorls unequal, outer stamens fertile, inner ones staminodial. Fertile stamens ca. 1.3 cm; anthers ca. 7 mm, base not tuberculate; connective decurrent, forming a short spur. Ovary ovoid, apex with a membranous ciliate crown. Capsule cup-shaped, apex truncate; hypanthium ca. 6 × 4 mm, 4-sided, 8-ribbed, furfuraceous, wings with glandular trichomes on angles. Fl. Sep–Nov, fr. Jan–Mar.

• Sparse forests, hillsides, valleys, in stone damp soil; 200–1000(–2000) m. Guangdong, Guangxi, Yunnan.

**22. *Phyllagathis cavaleriei*** (H. Léveillé & Vaniot) Guillaumin, Notul. Syst. (Paris) 2: 325. 1913.

锦香草 jin xiang cao

*Allomorpha cavaleriei* H. Léveillé & Vaniot, Mém. Soc. Sci. Nat. Cherbourg 35: 394. 1906; *Phyllagathis cavaleriei* var. *tankahkeei* (Merrill) C. Y. Wu; *P. cavaleriei* var. *wilsoniana* Guillaumin; *P. longipes* H. L. Li; *P. tankahkeei* Merrill; *P. wenshanensis* S. Y. Hu.

Herbs 10–20 cm tall. Stems 4-sided, erect or creeping, densely hirsute or tomentose, glabrescent. Petiole 1.5–9 cm or longer, densely hirsute or tomentose; leaf blade ovate, broadly ovate, broadly elliptic, or orbicular, 6–12.5(–16) × 4.5–11(–14) cm, papery to substiffly papery, both surfaces green or abaxially purplish red, abaxially puberulous, sometimes strigose, or veins spreading-hirsute, sometimes shortly setose, or sometimes gla-

brscent, adaxially sparsely strigose-hirsute or puberulous and strigose, secondary veins 3 or 4 on each side of midvein, base cordate, margin inconspicuously minutely repand and ciliate, apex broadly acute, acuminate, subround, or sometimes retuse. Inflorescences terminal, umbellate; peduncle 4–17 cm, hirsute, rarely glabrescent or glabrous. Pedicel 3–8 mm, furfuraceous. Hypanthium funnel-shaped, 5–6 mm, 4-sided, furfuraceous, sometimes long setose. Calyx lobes broadly ovate, ca. 1 mm, apex acute. Petals pink to purple, broadly obovate, 5–6 mm, slightly oblique, apex acute. Stamens subequal, longer stamens ca. 1.5 cm, shorter stamens ca. 1.1 cm; anther base 2-tuberculate or not; connective decurrent, forming a short spur. Ovary cup-shaped, apex with a membranous crown, crown margin 8-dentate. Capsule cup-shaped, 4–5 × 6–7 mm, crown 4-lobed and exerted from calyx; hypanthium 8-ribbed, furfuraceous. Fl. May–Aug, fr. Jul–Oct.

• Sparse to dense forests, valleys, mountain slopes, stream banks, shaded damp places; 300–3100 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang.

**23. *Phyllagathis asarifolia*** C. Chen, Bull. Bot. Res., Harbin 4(3): 56. 1984.

细辛锦香草 xi xin jin xiang cao

Herbs. Stems ca. 3 cm, erect or creeping, with conspicuous leaf scar. Leaves ± in a basal rosette; petiole 13–16 cm, puberulous, glabrescent; leaf blade orbicular to ovate-orbicular, ca. 11

× 11 cm, papery, adaxially sparsely strigose but glabrescent, both surfaces puberulous, secondary veins 4 or 5 on each side of midvein, base cordate, margin very small denticulate, apex rounded, retuse, or sometimes abruptly acute. Inflorescences terminal, umbellate, ca. 9-flowered; peduncle 12–15 cm, puberulous. Pedicel 5–8 mm, puberulous. Hypanthium campanulate, ca. 5 mm, glabrous. Calyx lobes ovate, ca. 2 mm, apex acuminate. Petals purple, broadly ovate, ca. 7 × 6 mm, oblique, apex acuminate. Stamens ca. 1.1 cm, equal; anthers lanceolate, ca. 6 mm, base 2-setiform tuberculate; connective inflated, decurrent forming a ca. 1 mm clavate spur. Ovary ovoid, apex with a membranous crown, crown margin abruptly denticulate. Capsule cup-shaped, crown slightly exerting calyx; hypanthium cup-shaped, ca. 8 × 7 mm, apex truncate. Fl. May.

- Dense forests. Guangxi (Pingnan).

**24. *Phyllagathis tentaculifera*** C. Hansen, Bull. Mus. Natl. Hist. Nat., B, Adansonia 12: 40. 1990.

须花锦香草 xu hua jin xiang cao

Shrubs 30–60 cm tall, branched. Branchlets terete, with an irregular small purple swelling between bristles at each side of leaf base, with dense appressed stout brownish or white bristles to 1.5 cm at nodes but glabrescent. Petiole 0.5–2 cm, pubescent as branchlets; leaf blade ovate to elliptic, 3.5–9 × 1.3–3.5 cm, abaxially with patent bristles, adaxially with sparse ascending bristles, secondary veins 1 or 2 on each side of midvein, base rounded, margin entire, apex long acuminate. Inflorescences a cluster of 2–4 flowers, ca. 2.5 cm; peduncle ca. 0.4 cm. Hypanthium cup-shaped, 3–4 mm, with minute brown glands and ascending bristles. Calyx lobes ca. 8 mm, with an apical keel. Petals pink, suborbicular, ca. 11 × 9 mm, apex apiculate. Stamens 6.4–7.4 cm, unequal in size; anthers narrowly ovate, ca. 3.6 × 2.7 mm, base not tuberculate; connective thickened toward base, with a short stout abaxial spur. Ovary apex deeply depressed, crown large, with flat gland-tipped trichomes. Capsule immature ca. 5 × 5.5 mm, 4-sided, valves with accrescent trichomes on edge. Fl. Jan.

- Old forests. Yunnan (Mengzi).

