

103. PUERARIA Candolle, Ann. Sci. Nat. (Paris) 4: 97. 1825.

葛属 ge shu

Wu Delin (吴德邻 Wu Te-lin); Mats Thulin

Neustanthus Benth.

Twining herbs or shrubs. Roots sometimes tuberous. Stipules sometimes produced below point of insertion. Leaves pinnately 3-foliolate; leaflets large, stipellate, ovate or rhomboid, entire or sinuately lobed. Inflorescences axillary, racemose or paniculate with an elongated peduncle, or several racemes aggregated at tip of branchlets. Bracts usually small or narrow, very caducous; bracteoles small, subpersistent or minute and caducous. Flowers blue or purplish, usually several flowers clustered at each node of rachis. Calyx campanulate, 2 upper teeth connate into entire or bifid lip. Corolla exceeding calyx; standard with 2 inflexed auricles; wings narrowly oblong or obovate-falcate, often adherent to middle of keel; keel sometimes beaked, subequal to wings. Vexillary stamen free at base, connate in middle with others, rarely quite free; anthers uniform. Ovary subsessile, many ovuled; style filiform, inflexed above; stigma small, capitate. Legumes linear or cylindric, continuous within or filled or septate between seeds. Seeds compressed, suborbicular or transversely oblong.

About 20 species: distributed in tropical and E Asia; ten species (three endemic) in China.

- 1a. Stipules basifixed.
 - 2a. Legumes ca. 4 mm wide, with 15–20 seeds; standard suborbicular 1. *P. phaseoloides*
 - 2b. Legumes 6–12 mm wide, with 4–10 seeds; standard obovate.
 - 3a. Shrubs, erect or climbing; standard 5–8 mm 2. *P. stricta*
 - 3b. Twining herbs; standard 12–14 mm.
 - 4a. Leaflets ovate or obliquely ovate, densely hirsute on both surfaces; corolla white; standard ca. 14 mm; legumes 5–8 cm × 6–8 mm 3. *P. peduncularis*
 - 4b. Leaflets obovate, sparsely pubescent abaxially; corolla reddish; standard ca. 12 mm; legumes 7.5–12.5 cm × 6–12 mm 4. *P. wallichii*
- 1b. Stipules dorsifixed.
 - 5a. Stipules not 2-lobed at base.
 - 6a. Lowest calyx lobe distinctly longer than lateral ones, acuminate; keel petals larger than wings 5. *P. montana*
 - 6b. Lowest calyx lobe slightly longer than lateral ones, acute; keel petals equal to wings.
 - 7a. Leaflets to 14.5 × 12 cm, lateral ones entire; inflorescences to 17 cm, axis with retrorse hairs; keel petals not auriculate 9. *P. bouffordii*
 - 7b. Leaflets to 8 × 6.5 cm, all 3-lobed; inflorescences to 48 cm, branched, axis without retrorse hairs; keel petals auriculate at base 10. *P. xyzhui*
 - 5b. Stipules 2-lobed at base, sagittate.
 - 8a. Bracts longer than flower buds, hirsute; standard to 1.5 cm 6. *P. alopecuroides*
 - 8b. Bracts shorter than flower buds, glabrous or thinly pubescent; standard over 1.8 cm.
 - 9a. Leaflets suborbicular, usually entire or lateral leaflets irregularly 5–7-lobed; calyx 11–15 mm 7. *P. calycina*
 - 9b. Leaflets broadly ovate, 3-lobed or lateral leaflets 2-lobed; calyx 4–7 mm 8. *P. edulis*

1. Pueraria phaseoloides (Roxburgh) Benth., J. Linn. Soc., Bot. 9: 125. 1865.

三裂叶野葛 san lie ye ye ge

Dolichos phaseoloides Roxburgh, Fl. Ind., ed. 1832, 3: 316. 1832; *Neustanthus phaseoloides* (Roxburgh) Benth.

Herbaceous vines. Stem slender, 2–4 m, brownish hirsute. Stipules basifixed, ovate-lanceolate, 3–5 mm; stipels linear, 2–3 mm; leaflets broadly ovate, rhomboid, or ovate-rhomboid, terminal one broader, 6–10 × 4.5–9 cm, lateral ones smaller, oblique, entire or 3-lobed, abaxially densely white hirsute, adaxially adpressed hirsute. Racemes solitary, 8–15 cm or more. Bracts and bracteoles linear-lanceolate, 3–4 mm, hirsute. Flowers with short pedicels, clustered at slightly distant nodes. Calyx ca. 6 mm, pilose; lower tooth as long as tube, apex hirsute, others deltoid, shorter than tube. Corolla bluish or lilac; stan-

dard suborbicular, 8–12 mm, base with 2 incurved auricles; wings obovate-oblong, slightly longer than keel, one side of base with rounded auricle, claw slender; keel falcate, apex with short beak, base truncate, clawed. Ovary linear, thinly hairy. Legumes subcylindric, 5–8 cm × ca. 4 mm, first adpressed hirsute, later subglabrous. Seeds 15–20, oblong-elliptic, subtruncate at both ends, ca. 4 mm. Fl. Aug–Sep, fr. Oct–Nov.

Thickets of mountainous and hilly areas. Guangdong, Guangxi, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Laos, Malaysia (Peninsular), Myanmar, Nepal, Thailand, Vietnam; widely cultivated elsewhere in the tropics].

This species is used as a cover plant, forage, and green manure.

2. Pueraria stricta Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42: 254. 1874.

小花野葛 xiao hua ye ge

Galactia simaoensis Y. Y. Qian; *Pueraria brachycarpa* Kurz; *P. colletii* Prain; *P. hirsuta* Kurz; *P. longicarpa* Thuan; *P. siamica* Craib.

Shrubs, erect or rarely climbing. Stem 1–2.5 m tall. Branches striate, gray pubescent when young, glabrous when old. Stipules triangular-ovate, ca. 7 mm, gray pubescent; terminal leaflet rhombic to ovate, 11–24 × 4–12 cm, lateral ones obliquely ovate, gray pubescent on both surfaces. Racemes usually unbranched. Bracts lanceolate, 2–3 mm, pubescent with ± hooked hairs; bracteoles ca. 1 mm. Flowers 4–6(–8) aggregated at nodes. Calyx tube 1.5–2.5 mm; teeth 0.5–1.5 mm, gray pubescent. Corolla white, pink, purple, blue, or yellow; standard obovate, 5–8 × 4.5–7 mm, apex emarginate, base clawed, auricles inflexed, without callosities; wings and keel nearly as long as standard, all clawed. Vexillary stamen joined to middle. Ovary silky pubescent along suture; ovules ca. 10. Legumes brownish, oblong, 3.5–6 × 0.5–0.7 cm, flattened, glabrous to thinly pubescent, with oblique stripes, suture thickened. Seeds 5–10, brown or black, ovate, ca. 4 × 3 mm, tuberculate. Fl. May–Jun, fr. Sep–Oct.

Forests, among grasses. Yunnan [Myanmar, Thailand].

3. *Pueraria peduncularis* (Graham ex Benth) Benth, J. Linn. Soc., Bot. 9: 124. 1865.

苦葛 ku ge

Neustanthus peduncularis Graham ex Benth in Miquel, Pl. Jungh. 232. 1852; *Derris bonatiana* Pampanini; *Pueraria peduncularis* var. *violacea* Franchet; *P. yunnanensis* Franchet.

Twining herbs, thinly or densely hirsute. Stipules basifixed, lanceolate, caducous; petiole 4–12 cm; stipels small, bristly; leaflets ovate or obliquely ovate, 5–12 × 3–8 cm, hirsute on both surfaces, rarely glabrous adaxially, base acute to truncate, margin entire, apex acuminate. Racemes slender, 20–40 cm. Bracts and bracteoles caducous. Flowers white, 3–5 clustered at nodes of rachis; pedicels slender, 2–6 mm. Calyx ca. 5 mm, villous; upper lobes very broad, lower ones slightly acute, shorter than tube. Standard obovate, ca. 1.4 cm, base attenuate, with narrow auricles, without callosities; wings slightly longer than keel; keel apex incurved, widened, more pale in color. Vexillary stamen broader, first adherent to others but not connate. Legumes linear, 5–8 cm × 6–8 mm, straight, valves subperpy, subglabrous or thinly pubescent. Fl. Aug, fr. Oct.

Forests. Guangxi, Guizhou, Sichuan, Xizang, Yunnan [Bangladesh, Bhutan, India, Myanmar, Nepal, Pakistan].

Pueraria yunnanensis was treated as a separate species by Z. F. Le and X. Y. Zhu (Ann. Bot. Fenn. 46: 419–424. 2009).

4. *Pueraria wallichii* Candolle, Ann. Sci. Nat. (Paris) 4: 97. 1825.

须弥葛 xu mi ge

Shrubs, sometimes climbing. Branches slender, thinly pubescent or glabrescent. Stipules basifixed, lanceolate, caducous; stipels small, bristly; terminal leaflet obovate, 10–13 cm, abaxially with few adpressed hairs, adaxially green, glabrescent, base deltoid, margin entire, apex caudate-acuminate. Racemes

up to 15 cm, often fascicled or paniculate; peduncle long, slender. Pedicels slender, clustered at nodes of rachis. Calyx ca. 4 mm, subglabrous; teeth obscure or very broad, lower ones broader. Corolla white to reddish; standard obovate, ca. 1.2 cm, base narrowed into a short claw, without auricles; wings slightly shorter than curved keel; keel equal to standard. Vexillary stamen only free at base, other part joined with filament tube. Legumes straight, 7.5–12.5 cm × 6–12 mm, glabrous. Fl. Sep–Oct.

Hill slopes in forests or thickets. Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, Thailand].

5. *Pueraria montana* (Loureiro) Merrill, Trans. Amer. Philos. Soc., ser. 2, 24(2): 10, 210. 1935.

葛 ge

Robust climbers, with tuberous roots. Stems to 8 m, woody at base, hirsute with yellowish hairs in all parts. Stipules dorsifixed, ovate-oblong, striate; stipels linear-lanceolate, equal to petiolules or longer; leaflets 3-lobed, rarely entire, terminal one broadly ovate, 7–15(–19) × 5–12(–18) cm, apex acuminate, lateral ones obliquely ovate, smaller, with yellowish adpressed hairs adaxially, more densely hairy abaxially. Racemes 15–30 cm. Flowers 2 or 3 aggregated at nodes. Bracts linear-lanceolate to linear, shorter or longer than bracteoles, caducous; bracteoles ovate, less than 2 mm. Calyx 7–20 mm, villous with yellow-brown hairs; lobes lanceolate, acuminate, slightly longer than tube. Corolla purple; standard obovate, 8–18 mm, auriculate and with yellow callosities at base, shortly clawed; wings falcate, narrower than keel, base with linear auricles; keel falcate-oblong, with very small and acute auricles. Vexillary stamen free in upper part. Ovary linear, hairy. Legumes long elliptic, 4–14 cm × 6–13 mm, flattened, brown hirsute. Fl. Jul–Oct, fr. Oct–Dec.

Mountain forests, thickets, open places. Everywhere in China except Qinghai, Xinjiang, and Xizang [SE Asia to Australia].

This plant is commonly known as kudzu vine.

- 1a. Bracts shorter than bracteoles; calyx 7–8 mm; standard ca. 8 mm in diam.; legumes 4–9 cm × 6–8 mm 5a. var. *montana*

- 1b. Bracts longer than bracteoles; calyx 8–20 mm; standard 10–18 mm; legumes 5–14 cm × 8–13 mm.
- 2a. Calyx 8–10 mm; standard obovate, 10–12 mm; wings subequal to keel; legumes 5–9 cm × 8–11 mm 5b. var. *lobata*
- 2b. Calyx to 20 mm; standard suborbicular, 16–18 mm; wings slightly shorter than keel; legumes 10–14 cm × 10–13 mm 5c. var. *thomsonii*

5a. *Pueraria montana* var. *montana*

葛(原变种) *ge* (yuan bian zhong)

Dolichos montanus Loureiro, Fl. Cochinch. 2: 440. 1790; *Glycine javanica* Linnaeus (1753), not *Pueraria javanica* (Benth.) Benth. (1865); *P. lobata* (Willdenow) Ohwi var. *montana* (Loureiro) Maesen; *P. thunbergiana* (Siebert & Zuccarini) Benth. var. *formosana* Hosokawa; *P. tonkinensis* Gagnepain.

Bracts shorter than bracteoles. Calyx 7–8 mm. Standard ca. 8 mm in diam. Legumes 4–9 cm × 6–8 mm. Fl. Jul–Sep, fr. Oct–Dec.

Open places, thickets, forests. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Laos, Myanmar, Philippines, Thailand, Vietnam].

5b. *Pueraria montana* var. *lobata* (Willdenow) Maesen & S. M. Almeida ex Sanjappa & Predeep in Sanjappa, Legumes India, 288. 1992.

葛麻姆 *ge ma mu*

Dolichos lobatus Willdenow, Sp. Pl. 3: 1047. 1802; *D. hirsutus* Thunberg; *Neustanthus chinensis* Benth.; *Pachyrhizus thunbergianus* Siebold & Zuccarini; *Pueraria argyi* H. Léveillé & Vaniot; *P. bodinieri* H. Léveillé & Vaniot; *P. caerulea* H. Léveillé & Vaniot; *P. koten* H. Léveillé & Vaniot; *P. lobata* (Willdenow) Ohwi; *P. lobata* var. *chinensis* (Benth.) Ohwi; *P. montana* var. *chinensis* (Benth.) Maesen & S. M. Almeida ex Sanjappa & Predeep; *P. thunbergiana* (Siebold & Zuccarini) Benth.

Calyx 8–10 mm. Standard obovate, 10–12 mm; wings subequal to keel. Legumes 5–9 cm × 8–11 mm.

Mountain forests or cultivated. Everywhere in China except Qinghai, Xinjiang, and Xizang [SE Asia to Australia; also introduced in Africa, America, and Europe].

This taxon is used medicinally and as edible tubers, a cover crop, and fodder.

5c. *Pueraria montana* var. *thomsonii* (Benth.) M. R. Almeida, Fl. Maharashtra 2: 122. 1998.

粉葛 *fen ge*

Pueraria thomsonii Benth., J. Linn. Soc., Bot. 9: 122. 1865 [“*thomsonii*”]; *P. lobata* subsp. *thomsonii* (Benth.) H. Ohashi & Tateishi; *P. lobata* var. *thomsonii* (Benth.) Maesen.

Calyx to 20 mm. Standard suborbicular, 16–18 mm; wings slightly shorter than keel. Legumes 10–14 cm × 10–13 mm. Fl. Sep, fr. Nov.

Thickets, open forests, or cultivated. Guangdong, Guangxi, Hainan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Laos, Myanmar, Philippines, Thailand, Vietnam].

This taxon is used as a vegetable and for extracting starch.

6. *Pueraria alopecuroides* Craib, Bull. Misc. Inform. Kew 1910: 276. 1910.

密花葛 *mi hua ge*

Woody climbers. Branches hispid with ferruginous hairs. Stipules dorsifixed, sagittate, ca. 2.2 cm × 8 mm, striate; petiole 10–20 cm, sparsely hispid with ferruginous hairs; stipels linear-lanceolate, slightly longer than petiolules, striate; terminal leaflet broadly ovate, 10–15 × 6.5–12 cm, sparsely pubescent on both surfaces, lateral veins 6–8 pairs, conspicuous on both surfaces, base rounded, margin crenate, apex caudate-acuminate, mucronate or acute when young; lateral leaflets smaller, oblique. Inflorescences paniculate, very dense before flowering, ca. 22 cm, branches ca. 10 cm. Bracts lanceolate or linear-lanceolate, ca. 1.3 cm, longer than flower bud, ferruginous hispid; bracteoles ca. 5.5 mm. Pedicels ca. 5 mm. Calyx puberulent and ferruginous pilose; tube ca. 3 mm; lobes lanceolate, 4–6 mm, upper 2 connate. Standard white, suborbicular, ca. 1 cm in diam., emarginate, with yellow spot at base, with incurved auricles and callosities, claw ca. 2.5 mm; wings oblong, longer than keel, with long appendage; keel purple, ca. 1 cm, obtuse. Vexillary stamen free at base. Ovary sessile, ca. 7 mm, sparsely villous.

Mixed forests, among grasses. S Yunnan [Myanmar, Thailand].

7. *Pueraria calycina* Franchet, Pl. Delavay. 181. 1890.

黄毛葛 *huang mao e ge*

Pueraria forrestii W. E. Evans.

Woody climbers. Stem base bulbous; branches villous with brownish hairs, glabrescent when old. Stipules dorsifixed, sagittate, striate, pubescent, upper part ovate, 1–2 cm, base 2-lobed, lobes 5–10 mm; petiole 5–12 cm; stipels lanceolate, 5–10 mm; leaflets suborbicular, 7–16 × 6–14 cm, terminal one broader, lateral ones oblique, margin irregularly 5–7-lobed, apex mucronate, brownish villous on both surfaces. Racemes 10–25 cm, villous. Bracts ovate-lanceolate to lanceolate, 5–10 mm, sparsely villous; bracteoles ovate-lanceolate, 2–3 mm. Flowers 2 at each node. Calyx ferruginous hispid; tube 3–5 mm; lobes 4, lanceolate, 11–15 mm, upper one bifid. Corolla purplish red; standard obovate, ca. 1.6 × 1.3–1.5 cm, apex emarginate, shortly clawed, auricles reflexed; wings oblong, 1.5–1.7 cm, base auriculate; keel as long as wings, oblique, clawed. Vexillary stamen free, joined with others at middle. Ovary stipitate, silky pubescent. Legumes oblong, 7–8 × 8–12 cm, flattened, yellow-brown hirsute. Seeds red or brown, reniform, 7–9 × 5–6 mm, compressed. Fl. Jul–Aug.

• Mountain thickets; 2000–2600 m. Yunnan.

8. *Pueraria edulis* Pampanini, Nuovo Giorn. Bot. Ital., n.s., 17: 28. 1910.

食用葛 *shi yong ge*

Pueraria bicalcarata Gagnepain; *P. edulis* var. *likiangensis* P. C. Li.

Twining herbs, with tuberous roots. Stems sparsely hirsute with brown hairs. Stipules dorsifixed, sagittate, upper lobes 5–11 mm, basal 2 lobes 3–8 mm, striate and ciliate; petiole 3.5–16 cm; stipels lanceolate, 5–7 mm; terminal leaflet ovate, 9–15 × 6–10 cm, 3-lobed to entire, lateral ones obliquely broadly ovate, smaller, ± 2-lobed, base cuneate or rounded, apex shortly acuminate, pubescent on both surfaces. Racemes up to 30 cm, simple or once branched. Bracts ovate, 4–6 mm, glabrous or ciliate; bracteoles 2–3 mm, glabrous or sparsely hirsute. Flowers 3 at each node of rachis; pedicels slender, up to 7 mm, glabrous. Calyx hairy on both surfaces or glabrous outside; tube 3–5 mm; lobes 4, lanceolate, 4–7 mm, subequal, upper one broader. Corolla purple or pink; standard suborbicular, 14–17 mm, apex emarginate, base auriculate and with callosities, claw ca. 3.5 mm; wings obovate, ca. 16 mm, clawed and auriculate; keel oblique. Ovary shortly hirsute, subsessile. Legumes linear-oblong, 5.5–6.5(–9) × ca. 1 cm, very sparsely hirsute with yellowish hairs, suture thickened, densely hairy. Seeds 9–12, reddish brown, ovate, flattened, ca. 4 × 2.5 mm. Fl. Sep, fr. Oct.

Forests; 1000–3200 m. Sichuan, Yunnan [Bhutan, India].

9. *Pueraria bouffordii* H. Ohashi, J. Jap. Bot. 80: 9. 2005.

贵州葛 gui zhou ge

Twining herbs. Stems densely adpressed sericeous. Stipules unknown; petiole 9–10 cm; stipels linear, ca. 4 mm; terminal leaflet broadly ovate, up to 14.5 × 12 cm, shallowly 3-lobed, lateral ones oblique, slightly smaller, entire, base rounded, apex acute, sericeous abaxially, sparsely adpressed sericeous adaxially. Inflorescences branched, up to 17 cm, densely sericeous with reflexed hairs. Bracts narrowly ovate, ca. 1.5 mm; bracteoles 1–1.5 mm. Pedicels 3–4 mm. Calyx densely adpressed sericeous; tube ca. 2.5 mm; upper 2 lobes connate, ca. 3 mm, lateral lobes ca. 2 mm, lowest lobe 2.5–3 mm. Corolla white with tips of wings and keel purple; standard broadly elliptic, 11–12 × 10–11 mm, apex emarginate, base slightly auriculate and with callosities, claw ca. 1 mm; wings oblong, ca. 12.5 mm, clawed and slightly auriculate; keel ca. 12 mm, clawed, not auriculate. Vexillary stamen free at base. Ovary sessile, adpressed sericeous. Legumes unknown.

• Riverbanks; 700–1000 m. Guizhou.

10. *Pueraria xyzhui* H. Ohashi & Iokawa, J. Jap. Bot. 81: 27. 2006.

云南葛 yun nan ge

Twining herbs. Stems densely adpressed sericeous with reflexed hairs. Stipules dorsifixed, 3–4 mm wide; petiole 7–8 cm; stipels narrowly ovate-triangular, 4–5 mm; terminal leaflet broadly ovate, to 8 × 6.5 cm, 3-lobed, lateral ones oblique, almost as large as terminal one, 3-lobed, base rounded, apex acute, sericeous abaxially, adpressed sericeous with short hairs on veins adaxially. Inflorescences branched, up to 48 cm, densely adpressed sericeous. Bracts deciduous; bracteoles ca. 3 mm. Pedicels 3–4 mm. Calyx densely adpressed sericeous; tube ca. 2 mm; upper 2 lobes connate, ca. 4.5 mm, lateral lobes ca. 4

mm, lowest lobe ca. 4.5 mm. Standard suborbicular, ca. 11 × 13 mm, apex ± emarginate, base slightly cordate, with callosities, claw ca. 2 mm; wings elliptic, ca. 12.5 mm, clawed and slightly auriculate; keel ca. 12 mm, clawed, auriculate. Vexillary stamen

free at base. Ovary sessile, adpressed sericeous. Legumes unknown.

- Mountain regions; ca. 1500 m. Yunnan.

