

108. GLYCINE Willdenow, Sp. Pl. 3: 854, 1053. 1802, nom. cons., not Linnaeus (1753).

大豆属 da dou shu

Sa Ren (萨仁); Michael G. Gilbert

Leptocyamus Bentham; *Leptolobium* Bentham (Jun 1837), not Vogel (Apr–May 1837); *Soja* Moench.

Annual or perennial herbs, twining, climbing, creeping or erect. Roots herbaceous or almost woody, usually with nodules. Leaves pinnately 3(–7)-foliolate; stipules small, free, usually deciduous. Inflorescence axillary, racemose; flowers solitary or clustered at nodes. Bracts small, at peduncle base; bracteoles paired, at calyx base. Calyx membranous, campanulate, hairy, deeply 2-lipped; upper 2 lobes connate, lower 3 lanceolate to setiform. Corolla usually purple, light purple, or white, slightly longer than calyx, glabrous; petals long clawed; standard large, subcircular or obovate, with inconspicuous auricles; wings narrow, slightly connate with keels; keels shorter than wings, obtuse, apex untwisted. Stamens diadelphous; vexillary stamen partly joined to others; anthers uniform. Ovary subsessile; ovules many; style ± filiform, slightly inflexed, glabrous or shortly pubescent; stigma terminal, capitate. Legume stipitate, linear or oblong, straight or curved, dehiscent, valves coiling after dehiscent, compressed or slightly inflated, septate between seeds. Seeds 1–5, ovoid-oblong, almost oblate-tetragonal, oblate, or orbicular.

About nine species: tropics, subtropics, and temperate region of E Hemisphere; six species (two endemic, one introduced) in China.

- 1a. Raceme longer than leaves, 4–8 cm.
 - 2a. Leaflets elliptic to ovate, tomentose; stems twining or climbing 5. *G. tomentella*
 - 2b. Leaflets lanceolate to linear, sparsely strigose; stems procumbent 4. *G. tabacina*
- 1b. Raceme shorter than leaves, usually 1–3 cm.
 - 3a. Perennial herbs; root almost woody 6. *G. dolichocarpa*
 - 3b. Annual herbs; root leathery.
 - 4a. Stem erect; cultivated 1. *G. max*
 - 4b. Stem twining or creeping; wild.
 - 5a. Stem slender, twining; legume 17–23 × 4–5 mm; seed 2.5–4 × 1.8–2.5 mm 2. *G. soja*
 - 5b. Stem robust, twining or creeping; legume 30–60 × 5–7 mm; seed 5–6 × 4–4.5 mm 3. *G. gracilis*

1. Glycine max (Linnaeus) Merrill, Interpr. Herb. Amboin. 274. 1917.

大豆 da dou

Phaseolus max Linnaeus, Sp. Pl. 2: 725. 1753; *Dolichos soja* Linnaeus; *Glycine angustifolia* Miquel; *G. hispida* (Moench) Maximowicz; *Soja angustifolia* Miquel; *S. hispida* Moench; *S. japonica* Savi; *S. max* (Linnaeus) Piper; *S. viridisa* Savi.

Herbs annual, 0.3–0.9 m tall. Stems robust, erect, sometimes ± twining at apex, ± ribbed, densely brown hirsute. Leaves usually pinnately 3-foliolate; stipules broadly ovate, 3–7 mm, acuminate, densely yellow villous; petiole 2–20 cm, sparsely pubescent or hirsute when young; stipels lanceolate, 1–2 mm; petiolules 1.5–4 mm, hirsute; leaflets papery, broadly ovate, almost circular, or elliptic-lanceolate, terminal one larger, 5–12 × 2.5–8 cm, base broadly cuneate or rounded, apex acuminate or ± rounded, mucronate; lateral leaflets smaller, obliquely ovate. Raceme short or long; peduncle 1–3.5 cm; bracts lanceolate, 2–3 mm, strigose. Flowers few to many, those on lower part of stem sometimes solitary or 1 pair between 2 axils; bracteoles lanceolate, 2–3 mm, hirsute. Calyx 4–6 mm, densely long hirsute and strigose, usually 2-lipped; lobes 5, lanceolate, upper 2 connate to above middle, lower 3 separate, all densely white villous. Corolla purple, light purple, or white, 4.5–8(–10) mm; standard obovate-suborbicular, base clawed, apex slightly emarginate and usually reflexed; wings crenate, base narrow, with claws and auricles; keels obliquely obovate, with short claws.

Ovary with undeveloped glands at base, hairy. Legume succulent, oblong, slightly curved, pendulous, 40–75 × 8–15 mm, densely silky hairy. Seeds 2–5, elliptic, suborbicular, or ovate to oblong, ca. 10 × 5–8 mm, many colored; testa smooth; hilum obvious, elliptic. Fl. Jun–Jul, fr. Jul–Sep. $2n = 40$.

Cultivated throughout China [now cultivated throughout temperate and tropical regions].

It has been estimated that *Glycine max*, soybean, provides ca. 35% of human protein (X. Bao et al., FAO/IBPGR Plant Genetic Resources Newsletter 94/95: 1–3. 1993). It is also an important source of oil and used extensively industrially.

There seems very little doubt that *Glycine max*, not known as a wild plant, has been selected from the following species, *G. soja*. It has been confused nomenclaturally with that species.

2. Glycine soja Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(2): 119. 1843.

野大豆 ye da dou

Glycine formosana Hosokawa; *G. gracilis* Skvortsov var. *nigra* Skvortsov; *G. max* (Linnaeus) Merrill subsp. *formosana* (Hosokawa) Tateishi & H. Ohashi; *G. max* subsp. *soja* (Siebold & Zuccarini) H. Ohashi; *G. soja* var. *albiflora* P. Y. Fu & Y. A. Chen; *G. soja* f. *angustifolia* P. Y. Fu & Y. A. Chen; *G. soja* subsp. *formosana* (Hosokawa) W. Liu & X. Y. Zhu; *G. soja* f. *lanceolata* (Skvortsov) P. Y. Fu & Y. A. Chen; *G. soja* var. *lanceolata* Skvortsov; *G. soja* f. *linearifolia* L. Z. Wang; *G. soja* f. *maximowiczii* (Enken) L. Z. Wang; *G. soja* var. *maximowiczii* Enken; *G. soja* f. *nigra* (Skvortsov) X. Y. Zhu & W. Liu; *G. soja*

f. *ovata* (Skvortsov) L. Z. Wang; *G. soja* var. *ovata* Skvortsov; *G. ussuriensis* Regel & Maack; *G. ussuriensis* var. *angustata* Komarov; *G. ussuriensis* var. *brevifolia* Komarov & Alissova-Klobukova; *Rhynchosia argyi* H. Léveillé.

Herbs annual, 1–4 m. Stems slender, twining, hirsute. Leaves pinnately 3-foliolate, to 14 cm; stipules ovate-lanceolate, 1–2 mm, acute, densely yellow villous; petiole 1.5–3.5 cm, densely pubescent; stipels linear, ca. 1 mm; terminal leaflet ovate-circular to ovate-lanceolate, 3.5–6 × 1.5–2.5 cm, both surfaces silky strigose, base subrounded, margin entire, apex acute to obtusely rounded; lateral leaflets obliquely ovate-lanceolate. Raceme usually short, rarely up to 13 cm; peduncle 0.3–0.8 cm, densely hirsute; bracts lanceolate; flowers densely arranged on upper part of inflorescences. Flowers ca. 5 mm. Calyx campanulate, densely long hairy; lobes 5, triangular-lanceolate, apex acute. Corolla reddish purple or white; standard suborbicular, base with short claw, apex slightly emarginate; wings obliquely obovate, with obvious auricles; keels shorter than standard and wings, densely hairy. Style short and inclined to one side. Legume oblong, slightly curved and compressed, constricted between seeds, 17–23 × 4–5 mm, densely hirsute, dehiscent when dry. Seeds 2 or 3, brown to black, elliptic, slightly compressed, 2.5–4 × 1.8–2.5 mm. Fl. Jul–Aug, fr. Aug–Oct. $2n = 40$.

Fields, valleys, beaches, marshes, seashores, islands, ?cultivated; near sea level to 2700 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Afghanistan, Japan, Korea, Russia].

Plants from Henan with cleistogamous flowers 2.5–3(–3.5) mm with only (2 or)3 or 4(or)5 fertile stamens have recently been described as *Glycine soja* var. *cleistogama* C. S. Zhu & S. X. Zhu (J. Wuhan Bot. Res. 26: 361. 2008).

Glycine soja is protected in China because of its importance as the wild progenitor of *G. max* and thus its potential for further plant breeding. It is used as a food and fodder plant.

3. *Glycine gracilis* Skvortsov, Publ. Manckur. Res. Soc., Nat. Hist. Sec. Ser. A, 22: 8. 1927.

宽叶蔓豆 kuan ye man dou

Glycine soja Siebold & Zuccarini var. *gracilis* (Skvortsov) L. Z. Wang.

Herbs annual. Stems robust, twining or creeping, densely hirsute. Leaves pinnately 3-foliolate; stipules lanceolate to linear, villous; petiole 3–13 cm, pale yellow villous; rachis ca. 5 cm; stipels lanceolate, 1.5–2 mm; petiolules ca. 10 mm, pubescent; leaflets ovate-lanceolate to elliptic-lanceolate, 5–8(–9) × 2–4(–5) cm, abaxial surface more densely hairy, adaxial surface more sparsely hairy, lateral veins 5 pairs, obvious, base rounded, margin entire, apex acuminate, shortly acute to obtuse. Raceme usually short, with small lanceolate bracts, hairy; peduncle ca. 1.5 mm. Flowers ca. 7 mm; bracteoles lanceolate, densely villous. Calyx campanulate, membranous, densely hairy. Corolla purple, light purple, or white; standard suborbicular, base with short claw, apex slightly emarginate; wings obovate, apex slightly acute, base acuminate, with auricles and short claws; keels small, with long claws. Ovary hairy. Legume

yellow to brown, succulent, 30–60 × 5–7 mm. Seeds many colored, usually not shiny, elliptic, suborbicular, or almost oblong, 5–6 × 4–4.5 mm. Fl. Jul–Aug, fr. Sep–Oct. $2n = 40^*$.

• Field sides, by villages, roadsides. Heilongjiang, Jilin, Liaoning.

Glycine gracilis is sometimes treated as a synonym of *G. max*.

4. *Glycine tabacina* (Labille) Benth, Fl. Austral. 2: 244. 1864.

烟豆 yan dou

Kennedyia tabacina Labille, Sert. Austro-Caledon. 70. 1824; *Glycine koidzumii* Ohwi; *G. membranacea* Ohwi; *G. pescadrensis* Hayata; *G. tabacina* var. *uncinata* Benth; *Leptocyamus elongatus* (Benth) Benth; *Leptolobium elongatum* Benth; *L. tabacinum* (Labille) Benth.

Herbs perennial. Stems slender, procumbent, usually curved, many branched at base, nodes obvious, sparsely pubescent. Leaves pinnately 3-foliolate; stipules lanceolate, ca. 2 mm, villous; petiole 2–3 cm, sparsely strigose; stipels linear, ca. 1 mm, hairy; leaflets at lower part of stem obovate or ovate to oblong, 0.7–1.2 × 0.4–0.8 cm, both surfaces adpressed white villous, denser abaxially, lateral veins 5–7 pairs, curved, reticulate veins visible, base rounded, apex obtusely rounded, truncate or slightly emarginate, mucronate; leaflets at upper part of stem ovate-lanceolate, narrowly elliptic-oblong, or linear, 1.2–3.2 cm × 5–8 mm. Raceme slender and spreading, 1–5.5 cm; peduncle 3–7.5 cm; bracts linear, villous; flowers sparse, usually 1 per bract or 2 or 3 clustered at lower part of rachis. Flowers 7–9 mm; pedicel ca. 2 mm; bracteoles slender. Calyx membranous, campanulate, densely strigose; lobes 5, triangular, longer than tube, upper 2 connate to middle. Corolla purple or light purple; standard orbicular, ca. 15 mm in diam., with claw; wings and keels smaller, with auricles and claws. Ovary with short stipe, many ovuled. Legume oblong, straight, not constricted between seeds, 20–25 × ca. 2 mm, adpressed white villous, stipe short, apex with beak ca. 2 mm. Seeds 2–5, dark brown, cylindrical, truncate at 2 ends, ca. 2.5 × 2 mm; testa not shiny, with granular small nodules. Fl. Mar–Jul, fr. May–Oct. $2n = 40, 80$.

Fujian, Guangdong, Taiwan [Japan; Australia, Oceania].

The Chinese record of *Glycine clandestina* J. C. Wendland (FRPS 41: 239. 1995) is based on a misidentification, probably of *G. tabacina*. True *G. clandestina* is endemic to Australia.

5. *Glycine tomentella* Hayata, Icon. Pl. Formosan. 9: 29. 1920.

短绒野大豆 duan rong ye da dou

Glycine tomentosa Benth (1864), not Linnaeus (1753);
Leptocyanus tomentosus (Benth) Benth; *Leptolobium tomentosum* Benth.

Herbs annual. Stems robust, twining or climbing, base many branched, yellowish brown villous. Leaves pinnately 3-foliolate; stipules ovate-lanceolate, 2.5–3 mm, yellow-brown tomentose; petiole ca. 1.5 cm; stipels lanceolate; leaflets papery, elliptic or ovate, 1.5–2.5 × 1–1.5 cm, abaxial surface sparsely hairy, adaxial surface densely yellow-brown tomentose, lateral veins 5 pairs, base rounded, apex obtuse-rounded, mucronate. Raceme 3–7 cm, yellowish brown villous; peduncle ca. 4 cm; bracts lanceolate; flowers solitary or 2–7(–9) clustered at top. Flowers ca. 10 mm; pedicel ca. 1 mm; bracteoles linear. Calyx campanulate, membranous, ca. 4 mm, densely pubescent; lobes 5, narrowly triangular, longer than or subequal to tube. Corolla reddish, puniceous, or purple; standard large; wings and keels smaller, clawed. Ovary with short stipe. Legume narrowly oblong, compressed, straight, dehiscent, 18–22 × 4–5 mm, yellow-brown villous; neck short. Seeds 1–4, dark brown, obovate-tetragonal, ca. 2 × 2 mm; testa with micropores and granular nodules. Fl. Jul–Aug, fr. Sep–Oct. $2n = 38, 40, 78, 80$.

By the sea, islands, dry slopes. Fujian, Guangdong, Taiwan [New Guinea, Philippines; Australia, Oceania].

6. *Glycine dolichocarpa* Tateishi & H. Ohashi, Sci. Rep. Tohoku Imp. Univ., Ser. 4, Biol. 40: 23. 1991.

扁豆荚大豆 bian dou jia da dou

Herbs. Stems terete, twining or prostrate, with dense deflexed long tawny hairs. Leaves pinnately 3-foliolate; stipules narrowly triangular, 3–4 mm, striate, densely tawny hairy; petiole 2–4.5 mm; stipels linear-subulate; petiolules 2–4 mm; leaflets papery, both surfaces with rather appressed hairs; terminal leaflet lanceolate to ovate, 3–6 cm; lateral leaflets slightly oblique, lanceolate to narrowly ovate. Raceme usually 2 or more times as long as petiole. Flowers 6–7 mm; pedicels ca. 1 mm; bracteoles subulate to lanceolate, 1.5–2 mm, densely pilose. Calyx campanulate; lobes longer than tubes. Corolla pink; standard orbicular, 8–8.5 × 7.5–8 mm, apex emarginate; wings narrowly obovate, 7–8 × 2.5–3 mm, ± constricted at middle; keels distinctly shorter than wings, elliptic, 5.5–6 × ca. 2 mm. Ovary subsessile, linear, pubescent. Legume linear, compressed, straight, usually 20–30 mm, with long spreading hairs, brown when mature. Seeds 5–9.

- Coasts, wastelands, roadsides. Taiwan.

