

159. TRIFOLIUM Linnaeus, Sp. Pl. 2: 764. 1753.

车轴草属 *che zhou cao shu*

Ursia Vassilczenko.

Annual or perennial herbs, glabrous to pubescent. Stems erect to ascending or prostrate. Leaves pinnately 3-foliolate or palmately 3(or 5–9)-foliolate; stipules entire or toothed, partly adnate to petiole; leaflets toothed or entire. Inflorescences axillary or terminal. Flowers sessile or shortly pedicellate, in heads, short racemes, umbels, or rarely solitary; bracts small or absent, often connate into a dentate and membranous involucre. Calyx 5–10[–30]-veined, regular or bilabiate, after flowering sometimes strongly inflated; teeth equal or unequal. Corolla persistent, white, pink, purple, or yellow, sometimes inflated in fruit. Filaments some or all dilated at apex; anthers uniform. Ovary with 1–12 ovules. Legume indehiscent, enclosed by marcescent calyx and petals. Seeds 1 or 2(–9), ovoid to spherical or reniform.

About 250 species: temperate and subtropical Africa, America, Asia, and Europe; 13 species (nine introduced) in China.

- 1a. Stipules almost completely adnate to petiole.
 - 2a. Stem erect; leaflets (3–)5(–9); flowers 20–35, inflorescence capitate 1. *T. lupinaster*
 - 2b. Stem prostrate or decumbent; leaflets 3; flowers 1–5, inflorescence umbellate.
 - 3a. Stem prostrate, thick and short; leaflets with 6 pairs of lateral veins 2. *T. eximium*
 - 3b. Stem decumbent, thin and long; leaflets with 18–24 pairs of lateral veins 3. *T. gordeievii*
- 1b. Stipules adnate to petiole for 1/2 its length or less.
 - 4a. Petioles slender, shorter than or equal to leaflets; flowers less than 8 mm; ovary stipitate.
 - 5a. Leaflets all ± sessile; stipules lanceolate, 1–1.5 cm, adnate to petiole for ca. 1/2 their length 6. *T. aureum*
 - 5b. At least terminal leaflet stalked; stipules ovate to oblong, 4–8 mm, adnate to petiole for less than 1/2 their length.
 - 6a. Flowers 5–15; pedicels larger than or equal to calyx tube; corolla 3–4 mm, standard boat-shaped, acute, smooth; leaflets 5–10 mm 8. *T. dubium*
 - 6b. Flowers 20–40; pedicels smaller than calyx tube; corolla (3–)5–6 mm, standard broadly flattened, emarginate, striate; leaflets 8–16 mm 7. *T. campestre*
 - 4b. Petioles, especially in lower leaves, much longer than leaflets; flowers more than 6 mm; ovary sessile.
 - 7a. Calyx inflated in fruit, veins reticulate, 2 upper teeth longer than 3 lower teeth 9. *T. fragiferum*
 - 7b. Calyx not inflated in fruit, veins not reticulate, teeth subequal or lower longest.
 - 8a. Flowers pedicellate, bracts present; calyx throat glabrous inside.
 - 9a. Stem prostrate, stoloniferous, rooting at nodes; stipules thin and membranous; calyx teeth shorter than tube 4. *T. repens*
 - 9b. Stem erect-ascending; stipules herbaceous; calyx teeth longer than or equal to tube 5. *T. hybridum*
 - 8b. Flowers ± sessile, bracts absent; calyx throat with a thickened hairy ring inside.
 - 10a. Floral heads sessile or very shortly pedunculate, ovoid to globose, involucre by stipules of upper leaves 12. *T. pratense*
 - 10b. Floral heads pedunculate, subglobose to elongate, involucre of small bracts or none.
 - 11a. Plants perennial, rhizomatous; stems flexuous; leaf veins arcuate, running into small marginal teeth 11. *T. medium*
 - 11b. Plants annual, lacking rhizomes; stems upright, straight; leaf veins straight.
 - 12a. Floral heads conic to cylindric, 3–6 cm, involucre absent; calyx teeth ± equal; corolla red or pink, rarely white; stipules broad, apex blunt, dark green to purple 10. *T. incarnatum*
 - 12b. Floral heads ovoid or globose, 1.2–2.5 cm, involucre of small fused bracts; calyx teeth unequal, lower much longer than others; corolla creamy white; stipules narrow, apex attenuate, pale green 13. *T. alexandrinum*

1. *Trifolium lupinaster* Linnaeus, Sp. Pl. 2: 766. 1753.

野火球 *ye huo qiu*

Trifolium lupinaster f. *albiflorum* (Seringe) P. Y. Fu & Y. A. Chen; *T. lupinaster* var. *albiflorum* Seringe.

Perennial herbs, glabrous to slightly pubescent. Stems erect, 30–60 cm, unbranched or branched above. Leaves palmately (3–)5(–9)-foliolate; stipules adnate to petiole for most of

their length, membranous, apex long triangular; petiolule ca. 1 mm; leaflets lanceolate to linear-oblong, 25–50 × 5–16 mm, lateral veins 50 or more pairs, running to serrulate margin, base narrowly cuneate, apex acute or obtuse. Flowers 20–35, in terminal or axillary heads subtended by a membranous, caducous involucre; peduncle 1–3(–5) cm. Calyx 6–10 mm, sparsely pubescent, veins 10; teeth filiform, 1–2 × length of tube. Corolla purple or white, (10–)12–20 mm. Ovary stipitate, glabrous; ovules 5–9. Legume gray-brown, oblong, 6–10 × 2–3 mm; style

persistent. Seeds (2 or)3–9, brown, ovoid, 1.5–2 mm, smooth. Fl. and fr. Jun–Oct.

Forest margins, hillsides, grasslands, moist lowlands. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shanxi, Xinjiang [Japan, Korea, Mongolia, Russia; E Europe].

2. *Trifolium eximium* Stephan ex Seringe, Prodr. 2: 203. 1825.

大花车轴草 da hua che zhou cao

Perennial herbs, pubescent to glabrescent. Stems prostrate to ascending, 3–15 cm, branches 3–10, arising from a taproot, bases covered by persistent stipules and old leaves. Leaves palmately 3-foliolate, sessile to shortly petiolate; stipules ovate-oblong to lanceolate, membranous, connate for most of their length, apex acute; leaflets obovate-elliptic, 5–20 × 4–14 mm, lateral veins 6 pairs, forked and running to serrulate margin, base broadly cuneate, apex obtuse. Flowers 1–5, in axillary umbels subtended by scarious involucre; peduncle 5–40 mm; pedicels 1–4 mm, reflexed in fruit. Calyx 6–8 mm, pubescent to glabrescent, veins 10; teeth broadly triangular, 1–2 × length of tube. Corolla red, rarely white, 15–20 mm. Ovary sessile to shortly stipitate; ovules 6–8. Legume slightly falcate, 11–15 mm. Seeds 3–5, brown, ovoid, 1.8–2 mm, smooth. Fl. Jun–Jul, fr. Jul–Aug.

Moist belt along subalpine coniferous forests, rocky places in alpine valleys, glacial moraines; above 1500 m. N Xinjiang [Mongolia, Russia (Siberia)].

3. *Trifolium gordeievii* (Komarov) Z. Wei, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(9): 82. 1980 [*“gordejevi”*].

延边车轴草 yan bian che zhou cao

Medicago gordeievii Komarov, Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 2: 133. 1921 [*“gordejevi”*]; *Trigonella gordeievii* (Komarov) Grossheim; *Ursia gordeievii* (Komarov) Vassilczenko.

Perennial herbs, villous to glabrescent. Stems 40–80 cm, decumbent-stoloniferous or procumbent-ascending, slender, branched. Leaves palmately 3-foliolate, very shortly petiolate to sessile; stipules lanceolate, membranous, entire, adnate to petiole for most of their length, base sheathing, apex subulate; leaflets obovate to elliptic, (5–)8–15(–18) × 4–8(–12) mm, finely pubescent abaxially, glabrous adaxially, lateral veins 18–24 pairs, prominent on both surfaces, extending into teeth, base broadly cuneate, apex rounded, retuse. Flowers 1(–3), in axillary umbel; involucre absent; peduncle shorter than or equal to leaves; bracts minute, caducous; pedicels (3–)5–7(–9) mm. Calyx 8–9 × ca. 2 mm, veins 10; teeth subulate, 2–3 × length of tube. Corolla white or pink, becoming red to purple, 14–16 mm; standard oblanceolate-elliptic, claw short; wings and keel slightly shorter, with long claw equal to limbs. Ovary shortly stipitate. Legume ovate-oblong, 8–9 × ca. 3 mm, flat, apex with hooked beak. Seeds 1 or 2(–4), broadly ovoid. Fl. Jun–Sep.

Cold coniferous forests, rocky stream banks; 500–800 m. Heilongjiang, Jilin [Russia (Far East)].

4. *Trifolium repens* Linnaeus, Sp. Pl. 2: 767. 1753.

白车轴草 bai che zhou cao

Perennial herbs, stoloniferous, glabrous to glabrescent. Stems 10–30 cm, prostrate, rooting at nodes. Leaves long petiolate, palmately 3-foliolate; stipules ovate-lanceolate, membranous, with veins green or red, sheathing at base, apex subulate; petiolule 1–1.5 mm; leaflets obovate to ovate, 6–20(–40) × 8–16(–25) mm, lateral veins 13 pairs, prominent on both surfaces, base cuneate, apex emarginate to broadly rounded. Flowers 20–50(–80), in terminal, globose umbels, 1.5–4 cm; peduncle equal to or longer than petiole; involucre absent; bracts lanceolate-ovate, membranous; pedicels 2–5 mm, reflexed after anthesis. Calyx 3–5 mm, veins 6–10; teeth shorter than tube. Corolla white, rarely pink-tinged, 5–12 mm, fragrant; standard elliptic, ca. 2 × wings and keel. Ovary sessile; ovules 3 or 4. Legume linear-oblong. Seeds 2–4, ovoid to reniform. Fl. and fr. May–Oct.

Cultivated, escaped, and naturalized; grasslands, ravines, roadsides. Throughout China [native to N Africa, C and SW Asia, and Europe].

5. *Trifolium hybridum* Linnaeus, Sp. Pl. 2: 766. 1753.

杂种车轴草 za zhong che zhou cao

Perennial herbs, glabrous or glabrescent. Stems few to several from crown, erect or ascending, 15–60 cm, ridged vertically. Leaves palmately 3-foliolate; stipules ovate to ovate-lanceolate, base fused for ca. 1/3 of length, free blade long acuminate, tip subulate; petioles very long in lower leaves, gradually reduced in upper leaves; petiolule 1–1.5 mm; leaflets broadly elliptic to ovate-elliptic or obovate, 1–3 × 1–2 cm, lateral veins 15–20 pairs, base broadly cuneate, margins entire to serrulate, apex obtuse (rarely emarginate). Flowers 10–50, in axillary and terminal, globose umbels, 1–2.5 cm; peduncle longer than adjacent leaves; involucre absent; bracts lanceolate, 0.5–1 mm; pedicels 3–5 mm, reflexed after anthesis. Calyx with 5 major and 5 minor veins; teeth subulate, 1–2 × length of tube. Corolla pink to white, 7–10 mm; standard elliptic, longer than wings and keel. Ovary linear; ovules 2. Legume elliptic. Seeds 2, brown to reddish, ovoid, tuberculate. Fl. and fr. Jun–Oct.

Cultivated, escaped, and naturalized; forest margins, grasslands, roadsides. Gansu, Hebei, Heilongjiang, Henan, Hubei, Nei Mongol, Ningxia, Shaanxi, Shanxi, Xinjiang [native to SW Asia and Europe; cultivated worldwide].

6. *Trifolium aureum* Pollich, Hist. Pl. Palat. 2: 344. 1777.

黄车轴草 huang che zhou cao

Trifolium agrarium Linnaeus, nom. utique rej.; *T. strepens* Crantz, nom. illeg. superfl.

Annual herbs, appressed puberulent. Stems erect or ascending, branched at middle, (10–)20–50 cm. Leaves palmately 3-foliolate; stipules lanceolate, 1–1.5 cm, veins prominent, adnate to petiole for ca. 1/2 their length, apex long acuminate; petioles equal to leaflets in lower leaves, shorter in upper leaves; leaflets obovate-oblong to narrowly elliptic, ± sessile, 10–23 × 5–8 mm, papery, lateral veins 10–18 pairs, base cuneate, margins entire at base, serrate distally, apex obtuse (rarely emarginate). Flowers 25–40, imbricate in dense, globose to shortly cylindrical racemes, 1.5–2 cm, axillary and terminal; peduncle as long as or longer than racemes; involucre and bracts absent;

pedicels ca. 1 mm, reflexed after anthesis. Calyx 2–2.5 mm, veins 5; tube short; lower 3 teeth 2–2.5 × length of upper 2. Corolla yellow, turning brown, 6–8 mm; standard elliptic. Ovary long stipitate, oblong; style longer than ovary. Legume narrowly ovoid, 2.5–3 mm, stipitate, apex with persistent style. Seed 1, yellow-brown, ellipsoid, 1–1.2 mm. Fl. and fr. Jun–Jul.

Cultivated, escaped, and naturalized; roadsides, weedy areas. Hebei, Jiangsu, Shaanxi [native to SW Asia and C and N Europe].

7. *Trifolium campestre* Schreber in Sturm, *Deutschl. Fl., Abt. 1, Band 4, Heft 16*. 1804.

草原车轴草 cao yuan che zhou cao

Annual herbs, pubescent to glabrescent. Stems erect, ascending, or prostrate. Leaves pinnately 3-foliolate; stipules ovate to oblong, 5–8 mm, adnate to petiole for 1/2 their length, apex acuminate; petioles shorter than or equal to leaflets; lateral leaflets sessile, terminal petiolule 3–7 mm; leaflets obovate to oblong-elliptic, 8–16 × 4–8 mm, lateral veins 5–8 pairs, base cuneate, margins entire proximally, serrate distally, apex rounded to emarginate. Flowers 20–40, imbricate in globose or cylindrical racemes, 8–13 × 7–10 mm; peduncle 1–3 cm; involucre and bracts absent; pedicels 1–1.8 mm, reflexed after anthesis. Calyx white, 2–2.8 mm, membranous, glabrous to sparsely pubescent, veins 5. Corolla yellow, turning brown, (3–)5–6 mm; standard broadly spatulate, striate, apex emarginate. Legume long ovoid, ca. 3 mm; stipe ca. 1 mm. Seed 1, brown, convex-ovoid, ca. 1 mm. Fl. and fr. Feb–Apr.

Cultivated, escaped, and naturalized; roadsides, grasslands, disturbed areas. Hebei, Jiangsu, Shaanxi [native to N Africa, SW Asia, and Europe].

8. *Trifolium dubium* Sibthorp, *Fl. Oxon.* 231. 1794.

钝叶车轴草 dun ye che zhou cao

Annual herbs, glabrous to sparsely pubescent. Stems erect to decumbent, (5–)10–30(–40) cm. Leaves pinnately 3-foliolate; stipules obliquely ovate, 4–8 mm, base rounded, margins finely dentate, apex acute; petiole shorter than or equal to leaflets; terminal petiolule longer than lateral petioles; leaflets obovate, 5–10(–12) × 3–8 mm, veins 6–8 pairs, base cuneate, margins entire proximally, obscurely serrulate distally, apex rounded or emarginate. Flowers 5–15, in axillary heads; peduncle 0.5–3(–4) cm, pubescent; pedicels less than 1 mm, after flowering pendulous. Calyx ca. 2 mm, veins 5. Corolla pale yellow, turning brown, 3–4 mm; standard narrowly boat-shaped, smooth, apex acute. Legume oblong, 1.5–2 mm, shortly beaked; stipe ca. 1 mm. Seed 1, pale brown, globose. Fl. and fr. Apr–Sep.

Cultivated, escaped, and naturalized. Jiangsu, Shaanxi, Taiwan [native to SW Asia and Europe].

9. *Trifolium fragiferum* Linnaeus, *Sp. Pl.* 2: 772. 1753.

草莓车轴草 cao mei che zhou cao

Perennial herbs, stoloniferous, glabrous or hairy. Stems prostrate or decumbent, 10–30(–50) cm, rooting at nodes. Leaves palmately 3-foliolate, long petiolate; stipules linear-

lanceolate to lanceolate-ovate, 1–2 cm, membranous, base sheathing, tip acuminate to subulate; leaflets obovate to obovate-elliptic, ± sessile, (5–)10–25 × 5–15 mm, glabrous or sparsely pubescent on veins, lateral veins 10–15, base broadly cuneate, apex rounded, retuse. Flowers 10–30, in crowded hemispheric or ovoid heads, 0.8–2.5 cm; peduncle axillary, to 2 × petiole; involucre bracts fused, lobes lanceolate, entire or toothed. Calyx bilabiate, strongly inflated in fruit, veins reticulate; teeth filiform, 2 upper longer than 3 lower, 2 upper and distal 1/2 of tube densely sericeous. Corolla white or pink, 6–8 mm; standard oblong. Ovary linear. Legume ovate-oblong, enclosed in inflated calyx. Seeds 1 or 2, brown, reniform. Fl. and fr. May–Aug.

Alkaline soils, swamps, ditches, roadsides. Xinjiang [N Africa, C and SW Asia, Europe].

10. *Trifolium incarnatum* Linnaeus, *Sp. Pl.* 2: 769. 1753.

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Annual herbs, pubescent. Stems erect or ascending, 30–100 cm, simple to sparingly branched, striate. Leaves palmately 3-foliolate, long petiolate in lower leaves, shortly petiolate in upper leaves; stipules dark green to purple, elliptic, connate and adnate to petiole for ca. 3/4 their length, membranous, veins 3–5, base sheathing, apex broadly triangular or rounded; leaflets broadly obovate to suborbicular, 1.5–3.5 cm, lateral veins 5–10, base cuneate, margins irregularly crenate, apex retuse to obtuse. Flowers 50–80(–120), in dense, cylindrical, terminal heads, 3–6 × 1–1.5 cm; peduncle 2.5–7 cm, stout. Calyx densely hirsute, veins 10; teeth subulate, longer than or equal to tube. Corolla red, pink, or white, 10–15 mm; standard narrowly elliptic, acute. Ovary obovate. Legume ovoid. Seed 1, greenish brown, ovoid. Fl. and fr. May–Jul.

Cultivated as an adaptable forage crop with hopeful prospects in China, escaped. Hebei, Jiangsu, Shaanxi, Shandong [native to Mediterranean region].

11. *Trifolium medium* Linnaeus, *Amoen. Acad.* 4: 105. 1759.

中间车轴草 zhong jian che zhou cao

Perennial herbs, rhizomatous, pubescent to glabrescent. Stems decumbent or ascending, 20–50 cm, branches flexuous. Leaves palmately 3-foliolate, lower long petiolate, upper shortly petiolate; stipules linear-lanceolate, adnate to petiole for ca. 1/2 their length, free blade acuminate lanceolate; leaflets elliptic to broadly lanceolate, 15–55 × 6–20 mm, lateral veins 10–12, arching, branched, running into small marginal teeth, base rounded, margins entire to obscurely serrate, apex obtuse to acute. Flowers numerous, in globose to broadly ovate, terminal, solitary or paired, sessile or shortly pedunculate heads. Calyx 5–6 mm, veins 10; teeth subulate, unequal, lower tooth longest. Corolla purple, 15–18 mm; standard oblong-ovate. Legume ovoid. Seed 1, brown, angled. Fl. May–Jul, fr. Jun–Aug.

Cultivated, persisting after cultivation. Hebei, Shaanxi [native to SW Asia and Europe].

12. *Trifolium pratense* Linnaeus, *Sp. Pl.* 2: 768. 1753.

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Perennial herbs, sparsely villous or glabrescent. Stems numerous from crown, erect or ascending, 20–70 cm, stout, striate. Leaves palmately 3-foliolate, basal and cauline, long petiolate in lower leaves, shortly petiolate in upper leaves; stipules ovate-lanceolate, membranous, base adnate to petiole, apex acuminate-subulate; leaflets ovate-elliptic or obovate, rarely elliptic, 1.5–3.5(–5) × 1–2 cm, lateral veins 15, base broadly cuneate, margins obscurely serrulate, apex obtuse, rarely retuse. Flowers 30–70, in dense globose or ovoid, terminal, sessile to shortly pedunculate heads, subtended by involucre of stipules of reduced leaves. Calyx slightly pubescent or glabrous, veins 10; teeth subulate, unequal, lower tooth ca. 2 × others. Corolla purple, rarely pink or white, 12–14(–18) mm; standard spatulate, apex rounded, retuse. Ovary elliptic. Legume ovoid. Seed 1, yellow or brown, ovoid. Fl. and fr. May–Sep.

Cultivated and naturalized; woodland margins, wet meadows, roadsides. Anhui, Fujian, Guangdong, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Shandong, Taiwan, Xinjiang, Yunnan [native to N Africa, SW Asia, and Europe].

13. *Trifolium alexandrinum* Linnaeus, Cent. Pl. I. 25. 1755.

埃及车轴草 ai ji che zhou cao

Annual herbs, sparsely pubescent to glabrescent. Stems erect or ascending, 20–60 cm, striate, branched at base. Leaves palmately 3-foliolate, alternate on lower part of stem, opposite on upper part; petioles equal to leaflets in lower leaves, shorter in upper leaves; stipules lanceolate, adnate to petiole for 1/2 their length, veins 4 or 5, pale green, margins sparsely ciliate, apex subulate; leaflets obovate or broadly elliptic to oblong-lanceolate, 15–30(–50) × 6–15 mm, lateral veins 6–10, base broadly cuneate to obtuse, margins of apical 1/2 serrate, apex obtuse, rarely retuse. Flowers numerous, in ovoid or conic, terminal or axillary heads, 12–25 × 10–15 mm; peduncles 1–2 × heads; involucre of short bracts, united at base. Calyx 3.5–4 mm, veins 10; teeth unequal, plumose, lower tooth equal to tube, others shorter. Corolla creamy white, 8–13 mm. Legume 22–25 mm. Seed 1, yellow, ovoid. Fl. Apr–May, fr. May–Jun.

Cultivated. Guangdong, Jiangsu, Taiwan [native range unknown; cultivated in N Africa and SW Asia].

