

## 2. TAMARIX Linnaeus, Sp. Pl. 1: 270. 1753.

怪柳属 cheng liu shu

Shrubs or trees, much branched. Young branches usually glabrous; two types of branches present: ligneous growing branches, not deciduous in winter vs. green vegetative branchlets, deciduous in winter. Leaves alternate, sessile, amplexicaul or vaginate, small, scale-like, glabrous, rarely hairy, mostly with salt-secreting glands. Flowers in racemes or panicles, blooming in spring; racemes lateral on growing branches of previous or current year and clustered in terminal panicles, or two types of flowering habits present in some species. Flowers bisexual, rarely unisexual, 4- or 5(or 6)-merous, usually pedicellate; bract 1. Calyx herbaceous or fleshy, 4- or 5-fid; lobes entire or faintly denticulate. Petals as many as calyx lobes, deciduous or persistent after anthesis. Disk variously shaped, mostly 4- or 5-lobed; lobes entire, or apex retuse or even deeply divided. Stamens 4 or 5, opposite to calyx lobes, or numerous, outer series opposite to calyx lobes; filaments often free, inserted between lobes of disk or at apices of lobes; anthers cordate, versatile, 2-thecate, longitudinally dehiscent. Pistil consisting of 3 or 4 carpels; ovary mostly conic, many seeded; placentation basal-parietal; styles 3 or 4; stigmas capitate, short. Capsule conic, abaxially 3-septicidal. Seeds numerous, minute; apical awns villous.

About 90 species: Africa, Asia, Europe; 18 species (seven endemic) in China.

*Tamarix tenuissima* Nakai (J. Jap. Bot. 14: 292. 1938), described from Japan and Korea, was recorded from Liaoning (Dalian) and said to have ten stamens, but the *Tamarix* plants known in this region all have five stamens, so the identity of the record cannot yet be determined. Further study is required.

- 1a. Leaves reduced, totally amplexicaul and vaginate on branches of current year.
  - 2a. Filaments between disk lobes; flowers usually blooming in summer and autumn, rarely in spring ..... 16. *T. aphylla*
  - 2b. Filaments at apex of disk lobes; flowers blooming only in summer and autumn.
    - 3a. Leaves (nearly all) amplexicaul and vaginate; flowers 4–4.5(–7) mm in diam.; petals deciduous after anthesis; racemes 5–7(–15) cm ..... 17. *T. taklamakanensis*
    - 3b. Leaves amplexicaul and vaginate, but sheaths not totally closed; flowers less than 4 mm in diam.; petals persistent after anthesis; racemes 2–5(–8) cm ..... 18. *T. sachensis*
- 1b. Leaves not amplexicaul, nor vaginate.
  - 4a. Racemes in spring lateral on growing branches of previous year; flowers 4- or 5-merous.
    - 5a. Flowers 4-merous.
      - 6a. Racemes 6–15(–25) cm ..... 1. *T. elongata*
      - 6b. Racemes usually 4–6(–7) cm.
        - 7a. Bracts less than 1/2 as long as pedicels ..... 2. *T. laxa*
        - 7b. Bracts ca. as long as pedicels.
          - 8a. Racemes and short vegetative branches appearing simultaneously from growing branches of previous year; flowers white, less than 3 mm in diam. .... 3. *T. androssowii*
          - 8b. Racemes appearing not simultaneously with vegetative branches; flowers pink, 4(–5) mm in diam. .... 4. *T. gracilis*
      - 5b. Flowers 5-merous.
        - 9a. Flowers mostly 5-merous, but mixed with 4-merous ones on same raceme, blooming only in spring ..... 5. *T. gansuensis*
        - 9b. Flowers all 5-merous, blooming in spring, and also in summer and autumn (blooming 2 or 3 times).
          - 10a. Petals completely open, deciduous after anthesis ..... 6. *T. arceuthoides*
          - 10b. Petals not completely open, persistent at fruiting stage, surrounding base of capsule.
            - 11a. Racemes often 2- or 3-clustered; petals contacting each other, apex incurved, and thus corolla globose ..... 7. *T. hohenackeri*
            - 11b. Racemes usually singular; petals nearly straight and ascending, or slightly open, apex recurved ..... 8. *T. chinensis*
    - 4b. Racemes on branches of current year, forming a panicle; flowers all 5-merous; flowers blooming in summer and autumn.
      - 12a. Flowers blooming in spring, then also in summer and autumn (blooming 2 or 3 times).
        - 13a. Petals completely open, deciduous after anthesis.
          - 14a. Flowers blooming in spring 4-merous (occasionally 5-merous); those blooming in summer and autumn 5-merous, large and completely open, 4(–5) mm in diam.; filaments at apex of disk lobes; capsule 4–7 × 1–2 mm ..... 4. *T. gracilis*
          - 14b. Flowers all 5-merous, small, less than 3 mm in diam.; filaments between disk lobes; capsule less than 3 × 1 mm ..... 6. *T. arceuthoides*

- 13b. Petals not completely open, persistent in fruit, surrounding base of capsule.
- 15a. Petals not open, apically often incurved, contacting each other, and thus corolla globose ..... 7. *T. hohenackeri*
- 15b. Petals slightly open, nearly straight and ascending, apically often recurved, and corolla not globose.
- 16a. Branches soft, slender, long, pendulous; young branches with deep green leaves, slender, pendulous; leaves on upper branches half adnate, subulate to ovate-lanceolate, apex acuminate, incurved ..... 8. *T. chinensis*
- 16b. Branches rigid, erect or obliquely ascending; young branches often with gray-green leaves; leaves oblong or oblong-lanceolate, apex acuminate, mostly recurved ..... 9. *T. austromongolica*
- 12b. Flowers blooming only in summer or autumn.
- 17a. Young branches and leaves hispid and puberulous ..... 11. *T. hispida*
- 17b. Young branches and leaves glabrous or sparsely papillose.
- 18a. Petals persistent after anthesis.
- 19a. Filaments between disk lobes; petals straight, ascending, contacting each other, corolla cup-shaped ..... 10. *T. ramosissima*
- 19b. Filaments at apex of disk lobes; petals abaxially raised, contacting each other, corolla globose ..... 12. *T. jintaensis*
- 18b. Petals deciduous or partly so.
- 20a. Petals all deciduous; racemes dense, forming a dense panicle; branches also dense ..... 13. *T. leptostachya*
- 20b. Petals partly deciduous; racemes turning outward, forming a spreading panicle; branches also turning outward.
- 21a. Young branches and leaves sparsely papillose; racemes 4–7(–15) cm; flowers dense, ca. 22 within 1 cm ..... 14. *T. karelinii*
- 21b. Branches and leaves not papillose; racemes 3–5 cm; flowers lax, ca. 5 within 1 cm ..... 15. *T. tarimensis*

**1. *Tamarix elongata*** Ledebour, Fl. Altaic. 1: 421. 1829.

长穗怪柳 chang sui cheng liu

Shrubs large, 1–3(–5) m tall. Branches of previous year grayish yellow or grayish brown; vegetative branchlets yellowish green and tinged with gray-blue. Leaves of growing branches spreading toward outside, enlarged in lower part, lanceolate, linear-lanceolate, or linear, 4–9(–10) × (0.3–)1–3 mm, abaxially raised, base broadly cordate, semiamplexicaul, auriculate, apex acuminate or acute; those of vegetative branchlets cordate-lanceolate or lanceolate, semiamplexicaul, shortly decurrent, faintly auriculate, upward attenuate. Flower buds yellowish, to 5 mm, produced from leaf axils of growing branches in autumn. Racemes lateral in branches of previous year, appearing in spring before or when leaves occur, solitary, robust, 6–15(–25) cm, usually ca. 12 cm, 4–8(–15) mm in diam.; peduncles 1–2 cm; bracts linear-lanceolate or broadly linear, 3–6 mm, conspicuously exceeding calyx (including pedicels) or equaling calyx, 0.3–0.7 mm wide, greenish or membranous, apex acuminate, slightly curved toward outside at anthesis, reflexed after anthesis. Pedicels slightly shorter than or ca. as long as calyx. Flowers larger, 4-merous. Calyx deeply campanulate, base slightly united; sepals ovate, margin membranous, dentate, apex obtuse or acute. Petals open and reflexed when flowers in full bloom, pink, ovate-elliptic or oblong-obovate, inequilateral, 2–2.5 × 1–1.3 mm, apex obtuse, immediately deciduous after anthesis. Disk pseudo-terminal, thin, 4-lobed. Stamens 4, rarely 6 or 7, equaling or slightly exceeding petals; filaments dilated at base, gradually transitional to disk lobes; anthers pink, obtuse or

with small protrusions at apex. Ovary ovoid-conic, 1.3–2 mm; styles nearly absent; stigmas 3. Capsule reddish or orange-yellow, ovoid-conic, 4–6 × ca. 2 mm. Fl. Apr–May, occasionally in autumn for second time. Flowers blooming in autumn 5-merous.  $2n = 24^*$ .

Salty soils of river valleys, river banks, sand dunes in desert regions. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Kazakhstan, Mongolia, Russia, Turkmenistan, Uzbekistan].

**2. *Tamarix laxa*** Willdenow, Abh. Königl. Akad. Wiss. Berlin 1812–1813: 82. 1816.

短穗怪柳 duan sui cheng liu

Shrubs, 1.5(–3) m tall. Branchlets straight, short, fragile. Leaves yellow-green, lanceolate or ovate-oblong to rhombic, 1–2 × ca. 0.5 mm, base attenuate and slightly decurrent, margin narrowly membranous, apex acuminate or acute, mucronate. Racemes lateral in old branches of previous year, blooming in early spring, to 4 cm × 5–7(–8) mm, laxly flowered or flowers congested apically and umbel-like, with sparse, brown, oblong scales; bracts brownish or greenish, ovate or narrowly elliptic, less than 1/2 as long as pedicels, margin membranous, cartilaginous in upper half, often incurved, obtuse. Pedicels ca. 2 mm. Flowers 4-merous. Calyx ca. 1 mm; sepals 4, ovate, margin broadly membranous, apex obtuse or acuminate, recurved at fruiting stage, outer 2 carinate. Petals 4, strongly spreading and reflexed, pink, rarely whitish pink, oblong-elliptic to oblong-obovate, ca. 2 mm, deciduous after anthesis. Disk dark red, fleshy, 4-lobed. Stamens 4, equaling or slightly exceeding petals; filaments dilated at base, inserted at apex of disk lobes;

anthers red-purple, capitate or apiculate. Styles 3; stigmas capitate. Capsule 3–4 mm, narrow. Fl. Apr–May, occasionally in autumn on current year's branches for second time. Flowers blooming in autumn 5-merous.  $2n = 24^*$ .

Salty soils of river banks, lake basins, sand dunes in desert regions. Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Afghanistan, Kazakhstan, Mongolia, Russia, Turkmenistan; SW Asia (Iran)].

- 1a. Racemes to 4 cm, laxly flowered ..... 2a. var. *laxa*  
1b. Racemes 0.5–2 cm, apex congested and  
umbel-like, 3–6-flowered ..... 2b. var. *polystachya*

**2a. *Tamarix laxa* var. *laxa***

短穗怪柳(原变种) *duan sui cheng liu* (yuan bian zhong)

Racemes long, to 4 cm, laxly flowered.

Salty soils of river banks, lake basins, sand dunes in desert regions. Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Afghanistan, Kazakhstan, Mongolia, Russia, Turkmenistan; SW Asia (Iran)].

**2b. *Tamarix laxa* var. *polystachya* (Ledebour) Bunge, Tent. Gen. Tamaric. 35. 1852.**

伞花短穗怪柳 *san hua duan sui cheng liu*

*Tamarix polystachya* Ledebour, Fl. Ross. 2: 133. 1842.

Racemes short, 0.5–2 cm, congested apically and umbel-like, 3–6-flowered.

Salty soils of river banks, lake basins, sand dunes in desert regions. Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Afghanistan, Mongolia, Russia; SW Asia (Iran)].

**3. *Tamarix androssowii* Litvinov, Sched. Herb. Fl. Ross. 5: 41. 1905.**

白花怪柳 *bai hua cheng liu*

Shrubs or small trees, 2–4(–5) m tall. Growing branches of current year reddish green, straight, more than 1.5 m tall, ligneous; vegetative branchlets ascending from growing branches nearly at right angle. Leaves of growing branches greenish, subamplexicaul, faintly auriculate; those of vegetative branches ovate, base obtuse and decurrent, 2/3 of leaf adnate to stem, margin membranous, apex apiculate. Racemes 2–3(–5) cm × 3–4(–5) mm, solitary or 1–3 clustered, lateral in growing branches of previous year, and vegetative branchlets appearing simultaneously and clustered; peduncles 5–10 mm, with sparse, scale-like bracts; bracts oblong-ovate, 0.7–1 mm, shorter than or ca. as long as pedicels, apex obtuse, slightly incurved. Pedicels 1–1.5 mm. Flowers 4-merous, small, less than 3 mm in diam. Calyx 0.7–1 mm, ca. 1/3 shorter than petals; sepals 4, ovate, margin membranous, denticulate, apex acute, carinate, spreading after anthesis. Petals 4, white or whitish, obovate, 1–1.5 × ca. 0.7 mm, slightly spreading after anthesis, mostly persistent at fruiting stage. Disk purple-red, small, thick, 4-lobed; lobes attenuate upward into base of filaments. Stamens 4; filaments equaling or slightly exceeding petals, base dilated, inserted at apex of disk lobes; anthers purple-red or yellow, apex apiculate. Ovary narrowly conic; styles 3, rarely 4, clavate, short, 1/4–1/3 as long as ovary. Capsule narrowly conic, small, 4–5 × ca. 1 mm; seeds yellow-brown. Fl. Apr–May, occasionally in autumn

at apices of new branches. Flowers blooming in autumn 5-merous.

Sandy places, margins of mobile sands in desert regions. Gansu, Nei Mongol, Ningxia, Xinjiang [Mongolia; C Asia].

**4. *Tamarix gracilis* Willdenow, Abh. Königl. Akad. Wiss. Berlin 1812–1813: 81. 1816.**

翠枝怪柳 *cui zhi cheng liu*

Shrubs, 1.5–3(–4) m tall. Branches gray-green, robust. Leaves of growing branches lanceolate, larger, more than 4 mm, amplexicaul; those of vegetative branches lanceolate to ovate-lanceolate or ovate-orbicular, unequal in size, 1–4 mm, base decurrent, amplexicaul, auriculate, imbricate, apex acuminate. Racemes in spring lateral in branches of previous year, 1–4(–5) cm × ca. 9 mm; those in summer 2–5(–7) cm, at apices of growing branches of current year forming a lax panicle. Flowers in spring 4-merous, those in summer 5-merous, 4- and 5-merous flowers mixed in same inflorescence in transitional period from spring to summer. Pedicels 0.5–1.5(–2) mm. Corolla 4(–5) mm in diam., those in spring slightly larger than those in summer; bracts of spring flowers spatulate, 1.5–2 mm, subequaling or slightly exceeding pedicels, abaxially slightly raised, base dilated, apex acuminate. Sepals triangular-ovate, ca. 1 mm, base slightly united, outer 2 larger, green, margin membranous, denticulate, apex obtuse, rarely acutish. Petals ovate-orbicular or elliptic, 2.5–3 mm, completely open and recurved when flowers in full bloom, pink or purplish, deciduous after anthesis. Disk purple-red, thick, 4- or 5-lobed. Stamens 4 or 5; filaments equaling or ca. 1/2 exceeding petals, broadly linear, gradually dilated toward base, inserted at apex of disk lobes, occasionally between disk lobes; anthers purple or pink, apex apiculate, obtuse, or retuse. Styles 3, 1/5–1/2 as long as ovary. Capsule large, 4–7 × ca. 2 mm. Fl. May–Aug.

Banks of river and lakes, sandy places, sand dunes in deserts and dry steppe regions. Gansu, Nei Mongol, Qinghai, Xinjiang [Kazakhstan, Mongolia, Russia, Tajikistan, Turkmenistan; SW Asia (Turkey)].

**5. *Tamarix gansuensis* H. Z. Zhang ex P. Y. Zhang & M. T. Liu, Acta Bot. Boreali-Occid. Sin. 8: 259. 1988.**

甘肃怪柳 *gan su cheng liu*

Shrubs, 2–3(–4) m tall. Branches lax. Leaves lanceolate, 2–6 × 0.5–1 mm, base semiamplexicaul, auriculate. Racemes lateral in branches of previous year, solitary, 6–8(–12) cm × ca. 5 mm; bracts ovate-lanceolate or broadly lanceolate, 1.5–2 mm, thinly membranous, apex acuminate. Pedicels 1.2–2 mm. Flowers mostly 5-merous, mixed with numerous 4-merous flowers, rarely mostly 4-merous mixed with numerous 5-merous flowers. Calyx slightly united at base; sepals ovate-orbicular, ca. 1 × 0.5 mm, margin membranous, apex acuminate. Petals purplish or pink, ovate-oblong, ca. 2 × 1–1.5 mm, apex obtuse, deciduous after anthesis. Disk purple-brown, 5-lobed; lobes obtuse or retuse. Stamens 5; filaments to 3 mm, mostly exceeding corolla, slender, inserted between disk lobes, or at apex of disk lobes; disk of 4-merous flowers 4-lobed. Filaments inserted at apex of disk lobes. Ovary narrowly conic; styles 3; stigmas capitate. Capsule conic; seeds 25–30. Fl. Apr–May.

• River banks, lakesides, margins of sand dunes in desert regions. Gansu, Nei Mongol, Qinghai, Xinjiang.

**6. *Tamarix arceuthoides*** Bunge, Beitr. Fl. Russl. 119. 1852.

密花怪柳 mi hua cheng liu

Shrubs or small trees, 2–4(–5) m tall. Branchlets spreading, dense; branches of current year mostly ascending. Leaves of vegetative branches subamplexicaul, ovate, ovate-lanceolate, or nearly triangular-ovate, 1–2 × ca. 0.6 mm, base slightly decurrent, margin often cartilaginous, apex long acuminate or acute; those of growing branches semiamplexicaul, narrowly ovate, base subrounded or decurrent, faintly auriculate, apex shortly acuminate. Racemes mostly in branches of current year, 3–6(–9) cm × 2.5–4 mm; flowers small and dense, usually clustered in fascicles, sometimes in lax terminal panicles, appearing in early summer and lasting to September, sometimes (in mountain areas) racemes appearing in spring on branches of previous year; bracts ovate-subulate or linear-lanceolate, 1–1.5 mm, equaling or exceeding calyx, apex acuminate. Pedicels 0.5–0.7 mm, shorter than or subequaling calyx. Calyx 5-fid; sepals ovate-triangular, 0.5–0.7 × ca. 0.3 mm, ca. 1/2 shorter than petals, margin membranous, subentire, apex slightly obtuse; outer 2 more obtuse than inner 3, tightly enveloping ovary after anthesis. Petals 5, completely open, white or pink to purple, obovate or elliptic, 1–1.7(–2) × ca. 0.5 mm, deciduous after anthesis. Disk often purple-red, 5-fid; lobes often retuse at apex or deeply subdivided into 10 lobules. Stamens 5; filaments long, often 1.2–2 × exceeding petals, slender, usually inserted between disk lobes; anthers small, apex obtuse or sometimes mucronate. Ovary narrowly conic, 0.7–1.3 mm; styles 3, short, 1/3–1/2 as long as ovary. Capsule small, ca. 3 mm, narrow. Fl. May–Sep.  $2n = 24^*$ .

River banks in Gobi Desert. Gansu, Xinjiang [Afghanistan, Mongolia, Pakistan; C and SW Asia].

**7. *Tamarix hohenackeri*** Bunge, Tent. Gen. Tamaric. 44. 1852.

多花怪柳 duo hua cheng liu

Shrubs or small trees, 1–3(–6) m tall. Branches of previous year dark red-purple. Leaves of vegetative branches linear-lanceolate or ovate-lanceolate, small, 2–3.5 mm, base semiamplexicaul, margin scarios, slightly dentate, apex long acuminate or acute, mucronate, incurved; those of growing branches nearly amplexicaul, ovate-lanceolate, base enlarged, decurrent, apex acuminate. Flowers blooming from spring to summer (to autumn). When blooming in spring, racemes lateral in growing branches of previous year, mostly several clustered, 1.5–9 cm × 3–5(–8) mm, without peduncles or peduncles ca. 2 cm; when blooming in summer, racemes terminal in young branches of current year, clustered in lax or dense short panicles; bracts linear-oblong, linear, or obovate-oblong, slightly carinate, 1–2 mm, slightly exceeding pedicels, or equaling calyx, rarely slightly longer, often thinly membranous, apex acute. Pedicels equaling or slightly exceeding calyx. Flowers 5-merous. Sepals ovate-orbicular, ca. 1 mm, margin membranous, dentate, apex obtuse; inner 3 slightly more obtuse than outer 2. Petals rose or pink, ovate or ovate-elliptic, 1.5–2(–2.5) × 0.7–1 mm, ca. 2 × as long as calyx, carinate at

least in lower half, apex subrounded, often contacting each other and thus corolla globose, persistent in fruit. Disk purple-red, thick, 5-fid; lobes obtuse or retuse at apex. Stamens 5, equaling or ca. 1/3 exceeding petals; filaments gradually narrowing and slender, inserted between disk lobes; anthers cordate, apex obtuse or mucronate. Styles 3, clavate-spatulate, ca. 1/2 or rarely 1/3–3/5 as long as ovary. Capsule 4–5 mm, ca. 4 × exceeding calyx. Fl. May to early Jun, autumn.  $2n = 24^*$ .

Forests on river banks in deserts, salty soils of river banks, lakesides in deserts. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Mongolia; C and SW Asia].

Baum (Gen. *Tamarix*, 44. 1978) considered this species to be conspecific with *Tamarix smyrnensis* Bunge.

**8. *Tamarix chinensis*** Loureiro, Fl. Cochinch. 1: 182. 1790.

怪柳 cheng liu

*Tamarix juniperina* Bunge.

Trees or shrubs, 3–6(–8) m tall. Branchlets dense, often pendulous, red-purple, slender. Leaves green, those of vegetative branches slightly spreading, oblong-lanceolate or narrowly ovate, 1.5–1.8 mm, abaxially carinate at base, often thinly membranous, apex acute; those of vegetative branches in upper part subulate or ovate-lanceolate, 1–3 mm, abaxially carinate, base attenuate, apex acuminate, incurved. Flowers blooming 2 or 3 times each year. When blooming in spring, racemes lateral in pendulous, ligneous, growing branchlets of previous year, 3–6 cm × 5–7 mm, few flowered, lax, and pendulous; peduncles short or nearly absent, with or without bracts; bracts linear-oblong or oblong, equaling or slightly exceeding pedicels, apex acuminate; pedicels shorter than calyx, slender; flowers 5-merous; sepals 5, narrowly ovate, 0.8–1.3 mm, slightly shorter than petals, outer 2 carinate abaxially, margin slightly entire, apex mucronate; petals 5, pink, usually ovate-elliptic or elliptic-obovate, rarely obovate, ca. 2 mm, slightly exceeding calyx, persistent in fruit; disk purple-red, fleshy, 5-fid; lobes obtuse or retuse at apex; stamens 5, exceeding petals; filaments inserted between disk lobes; ovary conic; styles 3, clavate, ca. 1/2 as long as ovary. Capsule conic. When blooming in summer and autumn, racemes 3–5 cm, smaller than those in spring, forming terminal large panicles on branches of current year; flowers 5-merous, slightly smaller than those in spring, dense; bracts green, linear to linear-conic or narrowly triangular, smaller and narrower than those of spring flowers, longer than pedicels, abaxially raised at base, base attenuate, margin entire, apex acuminate; calyx triangular-ovate; petals pink, straight or slightly oblique outward, much exceeding calyx; disk 5-lobed, or subdivided into 10 lobules; stamens 5, equaling or ca. 2 × as long as petals; anthers obtuse; filaments inserted between disk lobes; styles clavate, 2/5–3/4 as long as ovary. Fl. Apr–Sep.  $2n = 24^*$ .

• Plains along rivers, seashores, moist salty places, sandy places. Anhui, Hebei, Henan, Jiangsu, Liaoning, Shandong; also widely cultivated in S and SW provinces.

**9. *Tamarix austromongolica*** Nakai, J. Jap. Bot. 14: 291. 1938.

甘蒙怪柳 gan meng cheng liu

*Tamarix chinensis* Loureiro subsp. *austromongolica* (Nakai) S. Q. Zhou.

Shrubs or trees, 1.5–4(–6) m tall. Young branches straight, not pendulous, hard in texture. Leaves gray-green, 2–3 mm, base turgid; those in lower part of growing branches broadly ovate, apex acute; those in upper part ovate-lanceolate, apex acute. Flowers blooming in spring, summer, and autumn. When blooming in spring, racemes lateral in ligneous branches of previous year; inflorescence axis straight, ascending, 3–4 × ca. 0.5 cm, hard in texture, densely flowered; peduncles short or absent; bracts whitish or purple-green, linear-lanceolate; pedicels very short. When blooming in summer and autumn, racemes smaller than those in spring, forming terminal large panicles on young branches of current year, mostly straight and ascending; flowers 5-merous; sepals 5, green, ovate, margin membranous and pellucid, apex acute; petals 5, purplish red, obovate-oblong, apex reflexed, persistent after anthesis; disk purple-red, 5-lobed; lobes emarginate at apex; stamens 5, exserted; filaments filiform, inserted between disk lobes; anthers red; ovary triquetero-ovoid, red; styles ca. as long as ovary; stigmas 3, recurved. Capsule narrowly conic, ca. 5 mm. Fl. May–Sep.

• Salty riversides and plains, salty sandy fields. Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi.

**10. *Tamarix ramosissima*** Ledebour, Fl. Altaic. 1: 424. 1829.

多枝怪柳 duo zhi cheng liu

Shrubs or small trees, 1–3(–6) m tall. Old branches dark gray; growing branches of current year ascending, reddish or orange-yellow, long. Leaves of growing branches lanceolate, semiamplexicaul, slightly decurrent; those of vegetative branches broadly ovate-orbicular or triangular-cordate, 2–5 mm, base decurrent, nearly amplexicaul, apex acute. Racemes terminal on branches of current year, clustered into terminal panicles, (0.5–)3–5(–8) cm × 3–5 mm; peduncles 2–10 mm; bracts lanceolate, ovate-lanceolate, linear-subulate, or ovate-oblong, 1.5–2(–2.8) mm, equaling or exceeding calyx, apex acuminate. Pedicels 0.5–0.7 mm, shorter than or ca. as long as calyx. Flowers 5-merous. Calyx 0.5–1 mm; sepals broadly elliptic-ovate or ovate, apex acuminate or obtuse; inner 3 wider than outer 2, 0.5–0.7 × 0.3–0.5 mm, margin narrowly membranous, irregularly dentate, not carinate. Petals pink or purple, obovate to broadly elliptic-obovate, 1–1.7 × 0.7–1 mm, ca. 1/3 longer than calyx, apex emarginate, ascending, contacting each other and forming a cup-shaped corolla, persistent in fruit. Disk 5-lobed; lobes emarginate at apex. Stamens 5, equaling or ca. 1.5 × exceeding corolla; filaments not dilated at base, inserted between disk lobes; anthers obtuse or with obtuse protrusions at apex. Ovary conic, triquetar; styles 3, clavate, 1/4–1/3 as long as ovary. Capsule triquetar, conic, 3–5 mm, 3–4 × as long as calyx. Fl. May–Sep.  $2n = 24^*$ .

Riversides, river valleys, sandy or clayey salty plains, sand dunes. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang, W Xizang [Afghanistan, Mongolia; C and SW Asia, E Europe].

**11. *Tamarix hispida*** Willdenow, Abh. Königl. Akad. Wiss. Berlin 1812–1813: 77. 1816.

刚毛怪柳 gang mao cheng liu

Shrubs or small trees, 1.5–4(–6) m tall. Young branches reddish or brown-gray, densely hispid throughout. Leaves of growing branches grayish yellow, ovate-lanceolate or narrowly lanceolate, abaxially raised, base broad and obtuse, auriculate, semiamplexicaul, apex acuminate; those of vegetative branches broadly cordate-ovate to broadly ovate-lanceolate, 0.8–2.2 × 0.5–0.7 mm, densely puberulous, abaxially raised, base auriculate, semiamplexicaul, apex acuminate, mucronate, incurved. Racemes 2–7(–17) cm × 3–5 mm, terminal on branches of current year in summer and autumn, clustered into terminal, large, dense panicles; bracts narrowly triangular-lanceolate or, narrowly lanceolate, 1–1.5 mm, subequaling or sometimes slightly exceeding calyx, abaxially raised at base, margin entire, apex acuminate. Pedicels 0.5–0.7 mm, shorter than or nearly as long as calyx. Flowers 5-merous. Calyx 5-fid, ca. 1/3 as long as petals; sepals ovate-orbicular, 0.7–1 × ca. 0.5 mm, margin membranous, nearly pellucid, denticulate, apex slightly obtuse or acutish; outer 2 faintly carinate abaxially, apex acute. Petals 5, spreading, reflexed in upper part, purple-red or red, usually obovate to oblong-elliptic, 1.5–2 × 0.6–1 mm, caducous. Disk 5-lobed. Stamens 5, opposite to sepals, exserted, inserted at apex of disk lobes; filaments thickened at base, with nectary; anthers cordate, apex obtuse, often apiculate. Ovary narrowly bottle-shaped; styles 3, ca. 1/3 as long as ovary; stigmas very short. Capsule red to purple, conic, 4–5(–7) × ca. 1 mm, 4–5 × as long as calyx, ca. 15-seeded. Fl. Jul–Sep.  $2n = 24^*$ .

Riversides, lake basins, salty meadows and sand dunes in desert regions. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Afghanistan, Mongolia; C and SW Asia].

**12. *Tamarix jintaensis*** P. Y. Zhang & M. T. Liu, Acta Bot. Boreal.-Occid. Sin. 8: 260. 1988 [*"jintaenaia"*].

金塔怪柳 jin ta cheng liu

Shrubs, 1–3(–4) m tall. Branchlets of current year deep red or deep purple-red. Leaves of vegetative branches lanceolate or ovate-lanceolate to triangular-ovate, ca. 1.5 mm, base decurrent, semiamplexicaul, apex acuminate to acute, incurved. Racemes terminal, 3–5 cm × ca. 5 mm; bracts broadly ovate, exceeding pedicels. Flowers 5-merous. Sepals 5, deep green, short, ca. 1 mm, less than 1/2 as long as petals, margin membranous, semi-pellucid. Corolla semispreading; petals 5, deep red or purple-red, oblong-ovate, ca. 1.5 mm, persistent. Disk purple-red, thick, fleshy, 5-lobed. Stamens 5; filaments filiform, inserted at apex of disk lobes; anthers cordate, apex often apiculate. Ovary bottle-shaped; styles 3. Capsule triangular-conic, ca. 0.6 mm; seeds black-purple, ca. 0.5 mm. Fl. Sep–Oct.

• Riversides, lakesides, sandy lowlands. Gansu (Jinta).

**13. *Tamarix leptostachya*** Bunge, Beitr. Fl. Russl. 117. 1852.

细穗怪柳 xi sui cheng liu

Shrubs, 1–3(–6) m tall. Growing branches of current year gray-purple or red. Leaves of growing branches narrowly ovate or ovate-lanceolate, base slightly decurrent, semiamplexicaul, apex acute; those of vegetative branches narrowly ovate or ovate-lanceolate, 1–4(–6) × 0.5–3 mm, base decurrent, apex

acute. Racemes long, slender, 4–12 cm × 2–3 mm, terminal on branches of current year, clustered into terminal, dense, large, globose or ovoid panicles; peduncles 0.5–2.5 cm; bracts ascending, subulate, ca. 1.2 mm, equaling pedicels or subequaling calyx, apex acuminate. Pedicels equaling or slightly exceeding calyx. Flowers 5-merous, small. Calyx 0.7–0.9 mm; sepals ovate, 0.5–0.6 × ca. 0.4 mm, margin narrowly membranous, apex acuminate. Petals purplish red or pink, obovate, ca. 1.5 × 0.5 mm, ca. 2 × as long as calyx, apex obtuse, recurved, caducous. Disk 5-lobed, occasionally subdivided into 10 lobules. Stamens 5, opposite to sepals; filaments exerted, long, ca. 2 × as long as petals, base dilated, inserted at apex of disk lobes, or if disk lobes subdivided into lobules, then stamens inserted between lobes; anthers cordate, not apiculate. Ovary conic; styles 3. Capsule small, ca. 1.8 × 0.5 mm, ca. 2 × exceeding calyx. Fl. Jun–Jul.  $2n = 24$ .

Salty soils, riversides, lakesides, lowlands in desert regions. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Mongolia; C Asia].

**14. *Tamarix karelinii*** Bunge, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 7: 294. 1851.

盐地怪柳 *yan di cheng liu*

*Tamarix hispida* Willdenow var. *karelinii* (Bunge) B. R. Baum.

Trees or large shrubs, 2–4(–7) m tall. Branches smooth, occasionally stiffly hairy, inconspicuously papillose. Leaves ovate, 1–1.5 × 0.5–1 mm, base obtuse, slightly decurrent, nearly semiamplexicaul, apex acute, incurved. Racemes 4–7(–15) cm × 2–4 mm, terminal on branches of current year, clustered into spreading, large panicles; bracts lanceolate, subulate, 1.7–2 mm, subequaling or exceeding calyx, base enlarged, apex acute. Pedicels 0.5–0.7 mm. Calyx ca. 1 mm; sepals 5, suborbicular, to 0.8 mm, margin membranous, semipellucid, subentire, apex obtuse. Petals deep red or purple-red, obovate-elliptic, ca. 1.5 mm, more than 2 × as long as calyx, abaxially raised, apex obtuse, incurved, partly deciduous after anthesis. Disk small, thinly membranous, 5-lobed. Stamens 5, exerted from corolla or often equaling corolla, with nectary at base of filaments; anthers mucronate. Styles 3, oblong-clavate. Capsule 5–6 mm, 5–6 × exceeding calyx. Fl. Jun–Sep.  $2n = 24^*$ .

Salty soils, margins of sand dunes, riversides, lakesides. Gansu, Nei Mongol, Qinghai, Xinjiang [Afghanistan, Mongolia, Russia; SW Asia (Iran)].

**15. *Tamarix tarimensis*** P. Y. Zhang & M. T. Liu, Acta Bot. Boreal.-Occid. Sin. 8: 263. 1988.

塔里木怪柳 *ta li mu cheng liu*

Shrubs, 2–4(–5) m tall. Leaves of vegetative branches sparse, not vaginate; those in upper part triangular-ovate or ovate-lanceolate, apex mucronate or acuminate; those in lower part ovate, ca. 1 mm, base decurrent, apex acute. Racemes 3–5 cm, laxly flowered, terminal on branches of current year, clustered into lax panicles; bracts ovate-lanceolate, subulate, exceeding pedicels but shorter than calyx, base decurrent, apex acuminate. Flowers 5-merous. Calyx 5-fid; sepals yellowish green, ovate, carinate, margin membranous. Petals semispreading or spreading, purplish red or pink, obovate-oblong, 1.5–

mm, apex slightly incurved, mostly persistent after anthesis. Disk 5-lobed. Stamens 5; filaments inserted at apex of disk lobes; anthers red. Capsule purple-red or black-purple, ca. 4 mm, 3-septicidal; seeds small, 0.4–0.5 mm. Fl. Jun–Sep.

• Margins of mobile sand dunes, sand dunes, sandy places at riversides. Xinjiang.

**16. *Tamarix aphylla*** (Linnaeus) H. Karsten, Deutschl. Fl. 641. 1882.

无叶怪柳 *wu ye cheng liu*

*Thuya aphylla* Linnaeus, Cent. I Pl. 32. 1755.

Trees or large shrubs. Young branches smooth. Leaves sessile, vaginate, ca. 2 mm, base amplexicaul, apex acute. Racemes 3–6 cm × 4–5 mm; when flowering in spring, racemes solitary; flowers blooming more commonly in summer, then racemes on new branches; flowers subsessile; bracts triangular or broadly triangular, exceeding pedicels, base slightly amplexicaul, apex acuminate. Pedicels much shorter than calyx. Calyx 5-fid, ca. 1.5 mm, margin entire, apex obtuse; outer 2 lobes slightly smaller, broadly ovate or broadly elliptic, abaxially slightly carinate; inner 3 larger, broadly elliptic or suborbicular. Petals 5, elliptic, oblong, or ovate-elliptic, 2–2.3 mm, deciduous, sometimes 1 or 2 persistent in fruit. Disk 5-lobed; lobes emarginate at apex or deeply divided into 10 lobules. Stamens 5; filaments inserted between disk lobes. Fl. Sep–Oct and rarely in spring.  $2n = 24^*$ .

Cultivated. Taiwan [native to N Africa and SW Asia].

**17. *Tamarix taklamakanensis*** M. T. Liu, Acta Phytotax. Sin. 17(3): 120. 1979.

沙生怪柳 *sha sheng cheng liu*

Large shrubs or small trees, 3–5(–7) m tall. Branches often pendulous, slender. Leaves reduced, those in vegetative branches almost all amplexicaul, vaginate, slightly oblique outward, gray-green in spring, mostly yellow-green in summer, broadly triangular, only ca. 1 mm; those in growing branches ovate-lanceolate, base broad, semiamplexicaul, slightly decurrent, apex acuminate. Racemes at apices of growing branches in summer and autumn, laxly flowered, 5–7(–15) cm × 6–8 mm, clustered into terminal, large panicles; bracts broadly triangular-ovate, ca. 0.9 mm, ca. 1/2 as long as pedicels, base broad, semiamplexicaul. Pedicels ca. 2 mm. Flowers 5-merous. Sepals 5, yellowish green, ovate, shorter than pedicels. Petals 5, slightly reflexed, pink, obovate or narrowly obovate, 3–4 × 2–2.5 mm, deciduous after anthesis. Disk 5-lobed. Stamens 5; filaments straight, base slightly enlarged, inserted at apex of disk lobes; anthers cordate, apex obtuse. Styles 3, united at base; stigmas capitate, short. Capsule yellow, conic, 5–7 × ca. 2.5 mm, 3-septicidal, 15–20-seeded; seeds black-purple, large, 2–2.5(–3) × ca. 0.7 mm. Fl. Jul–Sep(–Oct).  $2n = 24^*$ .

• Sand dunes. Gansu, Xinjiang.

**18. *Tamarix sachensis*** P. Y. Zhang & M. T. Liu, Acta Bot. Boreal.-Occid. Sin. 8: 262. 1988.

莎车怪柳 *sha che cheng liu*

Shrubs, 2–3(–4) m tall. Branchlets of current year brown or deep brown. Leaves on vegetative branchlets reduced, totally adnate to branches, gray-green, amplexicaul, vaginate, apex acute. Racemes at apices of branches of current year, clustered into terminal, lax, small panicles 2–5(–8) cm × 4–6 mm; bracts ovate-lanceolate, ca. 1.5 mm, subequaling or exceeding sepals, base amplexicaul, decurrent, slightly auriculate, apex acuminate. Pedicels very short, less than 1 mm. Sepals greenish, ovate-orbicular, longer than pedicels, margin membranous, semipellucid, apex acute. Petals open or half open, purplish or purple-red, obovate or narrowly elliptic, slightly oblique, 1.7–2 × 1.3–1.5 mm, ca. 2 × as long as calyx, persistent after anthesis. Disk 5-lobed. Stamens 5, slightly longer than corolla and ovary; filaments inserted at apex of disk lobes; anthers cordate, apex with conspicuous protrusions. Styles 3, 1/4–1/3 as long as ovary. Capsule 3-septical, ca. 5 mm; seeds black-purple, 0.5–0.6 mm. Fl. Jul–Sep.

- Salty sandy places along margins of mobile sand dunes. Xinjiang.

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