

### 9. ATRAPHAXIS Linnaeus, Sp. Pl. 1: 333. 1753.

木蓼属 mu liao shu

Bao Bojian (包伯坚); Alisa E. Grabovskaya-Borodina

Shrubs much branched; woody branches with spines or not, herbaceous branchlets of current year with leaves and flowers. Leaves simple, alternate, rarely fascicled, nearly sessile; ocrea membranous, usually with 2 veins, 2-parted at apex. Inflorescence racemose, terminal, or lateral, with dense or sparse axillary flowers. Pedicel slender, jointed. Flowers hermaphroditic. Perianth persistent, 4- or 5-parted, inflated in fruit. Stamens 6 or 8; filaments dilated at base and united into a glandular ring. Ovary lenticularly compressed or trigonous; styles 2 or 3, short; stigmas capitate. Achenes lenticular or trigonous.

About 25 species: N Africa, C, N, and SW Asia, S Europe; 12 species (two endemic) in China.

The reader can refer to Borodina (Rast. Tsentral. Azii 9: 93-97. 1989) for taxa in adjacent Central Asian countries.

- 1a. Tepals 4; stamens 6; styles 2; achenes lenticularly compressed.
  - 2a. Branchlets of current year and leaves with densely papillate hairs ..... 3. *A. canescens*
  - 2b. Branchlets of current year and leaves without papillate hairs.
    - 3a. Leaves fascicled; herbaceous branchlets of current year very short ..... 2. *A. compacta*
    - 3b. Leaves alternate; herbaceous branchlets of current year longer, slender ..... 1. *A. spinosa*
- 1b. Tepals 5; stamens 8; styles 3; achenes trigonous.
  - 4a. Herbaceous branchlets and leaves with papillate hairs; leaves bright green, without raised reticulate veins ... 4. *A. laetevirens*
  - 4b. Herbaceous branchlets and leaves without papillate hairs; leaves with raised reticulate veins.
    - 5a. Leaves grayish green or bluish green.
      - 6a. Woody branches pointed at apex; inflorescence a short raceme ca. 15 mm ..... 5. *A. pungens*
      - 6b. Woody branches obtuse at apex; inflorescence a panicle or raceme.
        - 7a. Shrub 1.5-2 m tall; annual branches lengthened, virgate, dying only in higher part, as a rule branched; inflorescence a panicle with leaves ..... 8. *A. virgata*
        - 7b. Subshrub 30-50 cm tall; annual branches dying for most part, usually not branched; inflorescence a raceme, flowers from ocrea bracteate ..... 9. *A. frutescens*
    - 5b. Leaves green or yellow-green.
      - 8a. Woody branches acuminate into point at apex.
        - 9a. Leaves elliptic or obovate, 15-25 × 10-13 mm, with prominent reticulate veins; pedicel ca. 1 cm, jointed at lower 1/3; perianth light yellow-red ..... 6. *A. pyrifolia*
        - 9b. Leaves linear or lanceolate, 15-30 × 1-3 mm; midvein prominent; pedicel 5-10 mm, jointed at upper 1/3; perianth light green ..... 7. *A. irtyschensis*
      - 8b. Woody branches obtuse at apex, not pointed.
        - 10a. Leaves oblong or elliptic, or lanceolate, prominently veined; outer tepals reniform, spreading in fruit ..... 12. *A. bracteata*
        - 10b. Leaves oblanceolate-oblong or lanceolate to linear, not prominently pinnately veined; outer tepals oblong or oblong-ovate, reflexed in fruit.
          - 11a. Outer tepals oblong-ovate, ca. as long as or slightly shorter than above joint portion of pedicel ..... 10. *A. decipiens*
          - 11b. Outer tepals oblong, longer than above joint portion of pedicel ..... 11. *A. manshurica*

#### 1. *Atraphaxis spinosa* Linnaeus, Sp. Pl. 1: 333. 1753.

刺木蓼 ci mu liao

*Atraphaxis spinosa* var. *angustifolia* Chang Y. Yang & Y. L. Han.

Shrubs 30-100 cm tall. Stem slender, with gray scabrous bark; woody branches slender, without leaves at ends, spine-pointed; herbaceous branchlets of current year soon becoming lignified, straight or slightly flexuous, slender, glabrous. Leaves gray-green or blue-green, orbicular, elliptic, broadly elliptic, or broadly ovate, rarely obovate, 3-7 × 3-5 mm, leathery, both surfaces glabrous, reticulate veins raised abaxially, base rounded or cuneate, gradually narrowing into a short petiole, margin entire or slightly undulate, apex rounded or obtuse, short acumi-

nate; ocrea brown at base, cylindrical, 2-3 mm, membranous and inconspicuously veined in upper part, cleft into 2 aristate teeth. Pedicel ca. 5 mm, jointed at middle or slightly below. Flowers 2-6 at leaf axil of current year's branchlets. Tepals pink; outer tepals reflexed in fruit, oblong-ovate or ovate, 2-3 mm. Achenes compressed, light brown, shiny, ovoid or broadly ovoid, smooth, base rounded, apex acuminate or obtuse. Fl. and fr. May-Sep.

Slopes, deserts including the Gobi, roadsides, margins of cultivated land; 400-1800 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

#### 2. *Atraphaxis compacta* Ledebour, Fl. Altaic. 2: 55. 1830.

拳木蓼 quan mu liao

Shrubs 30–50 cm tall, much branched. Stem flexuous, short, stout; bark gray, splitting longitudinally into fibers; woody branches spreading, straight, without leaves at ends and spine-pointed; herbaceous branchlets of current year very short, soon becoming lignified, with leaves and flowers. Leaves clustered on old branches, gray-green to blue-green, orbicular or broadly ovate, 4–7 × 4–5 mm, both surfaces glabrous, reticulate veins prominent abaxially, base rounded or broadly cuneate, apex rounded or obtuse; ocrea brown at base, cylindrical, 1–3 mm, membranous, cleft into 2 long teeth. Pedicel ca. 5 mm, jointed at middle or slightly above. Flowers 2–6 at leaf axil. Tepals 4, pink; outer tepals reflexed in fruit, ovate-oblong, 2–2.5 × 1.5–2 mm, ca. as long as above joint portion of pedicel; inner tepals orbicular-cordate in fruit, 4–5 × 5–6 mm, prominently reticulate-veined. Achenes light brown, shiny, broadly ovoid, ca. 3.5 mm, smooth. Fl. and fr. Jun–Aug.

Deserts, roadsides, sandy steppes, stony slopes; 300–1500 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia].

**3. *Atraphaxis canescens*** Bunge, Index Sem. Hort. Dorpat. 3. 1839.

糙叶木蓼 cao ye mu liao

Shrubs dwarf, 5–10 cm tall. Stem stout; woody branches without leaves at apex, acuminate to spiny, with gray-brown bark; herbaceous branchlets of current year slender, with dense papillate hairs, apex with leaves or flowers. Leaves gray or gray-green, ovate or broadly elliptic, 5–6 × 4–5 mm, both surfaces with papillate hairs, reticulate veins prominent abaxially, base broadly cuneate and gradually narrowing into a short petiole, apex obtuse, with a short point; ocrea cylindrical, 4–5 mm, base green with dense papillate hairs, upper part membranous, cleft into 2 slender teeth. Pedicel 5–6 mm, jointed at upper portion. Flowers in racemes at apices of herbaceous branchlets. Tepals dark pink, with white margins; outer tepals ovate, smaller, ca. as long as or slightly shorter than above joint portion of pedicel; inner tepals orbicular-reniform, 4–5 × 5–6 mm, margin entire, slightly undulate, with raised reticulate veins. Achenes light brown, shiny, ovoid, smooth. Fl. and fr. May–Jun.

Sandhills; 500–1500 m. Xinjiang [Kazakhstan].

**4. *Atraphaxis laetevirens*** (Ledebour) Jaubert & Spach, Ill. Pl. Orient. 2: 14. 1844.

绿叶木蓼 lü ye mu liao

*Tragopyrum laetevirens* Ledebour, Fl. Altaic. 2: 75. 1830.

Shrubs 30–80 cm tall. Stem spreading, stout, branched; woody branches flexuous, slender, without spines, with dark gray bark; epidermis splitting fibrously, apex with leaves or flowers; herbaceous branchlets of current year dark brown, slender, with dense papillose hairs. Leaves bright green, orbicular or broadly elliptic, 1.5–2.3 × ca. 1 cm, leathery, abaxially with papillose hairs along midvein and margin, adaxially glabrous, base rounded, margin entire or undulate-crenate, apex rounded or obtuse, with a short point; ocrea brown at base, cylindrical, with 2 faint veins, cleft into 2 slender teeth at upper portion. Pedicel ca. 1 cm, jointed at lower 1/3. Flowers fewer in terminal racemes. Tepals 5, pink, with white margins; outer

tepals 2, reflexed in fruit, broadly ovate, smaller, ca. 1/2 as long as above-joint portion of pedicel; inner tepals 3, rounded cordate, 5–6 × 6–7 mm. Achenes dark brown, shiny, ovoid or trigonous-ovoid, smooth. Fl. May–Jun, fr. Jul–Aug.

Stony mountain slopes, stony steppes; 900–1500 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia].

**5. *Atraphaxis pungens*** (Marschall von Bieberstein) Jaubert & Spach, Ill. Pl. Orient. 2: 14. 1844.

锐枝木蓼 rui zhi mu liao

*Tragopyrum pungens* Marschall von Bieberstein, Fl. Taur.-Caucas. 3: 285. 1819–1820.

Shrubs ca. 1.5 m tall. Stem straight, stout, with gray-brown bark; epidermis splitting fibrously; woody branches flexuous, apex without leaves and acuminate into spines; herbaceous branchlets of current year short, stout, soon becoming lignified, white, glabrous, apex acuminate, with leaves or flowers. Leaves blue-green or gray-green, broadly elliptic or obovate, 10–20 × 5–10 cm, both surfaces glabrous, reticulate veins prominent abaxially, base rounded or broadly cuneate, narrowing into a short petiole, margin entire or slightly undulate with teeth, apex rounded, with a short point or emarginate; ocrea brown at base, cylindrical, membranous, faintly veined, cleft into 2 teeth at upper part. Pedicel long, jointed at or above middle. Flowers in short racemes (ca. 1.5 cm) on lateral herbaceous branchlets of current year. Tepals 5, pink or green-white; outer tepals 2, reflexed in fruit, ovate or broadly elliptic, ca. 3 mm; inner tepals 3, orbicular-cordate in fruit, 5–6 × 6–7 mm, with prominent reticulate veins, margin undulate. Achenes dark brown, shiny, ovoid, ca. 2.5 mm, trigonous, smooth. Fl. and fr. May–Aug.

Stony slopes, gravelly deserts; 500–3400 m. Gansu, Nei Mongol, Qinghai, Xinjiang [?India, Kazakhstan, Mongolia, Russia].

**6. *Atraphaxis pyrifolia*** Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg Divers Savans 7: 483. 1851.

梨叶木蓼 li ye mu liao

Shrubs ca. 1 m tall, much branched. Stem stout, tortuous, with gray-brown bark; epidermis splitting longitudinally; woody branches grayish white, straight or tortuous, apex without leaves, acuminate or spiny; herbaceous branchlets of current year glabrous, soon becoming lignified, spiny at apex. Petiole short, 1/6–1/3 length of blade; leaf blade green, broadly elliptic or obovate, 1.5–2.5 × 1–1.3 cm, both surfaces glabrous, reticulate veins prominent abaxially, margin entire or slightly crenate; ocrea brown at base, cylindrical, membranous and pellucid in upper part, deeply cleft into 2 or 3 lanceolate or broadly lanceolate lobes; veins 2 or 3. Pedicel ca. 1 cm, jointed usually at lower 1/3 or below middle. Flowers dense in racemes at lateral branchlets of current year. Tepals 5, light yellow or yellow-red; outer tepals reflexed in fruit, ovate or narrowly ovate, ca. as long as above-joint portion of pedicel; inner tepals broadly elliptic or orbicular-cordate, 6–7 × 7–8 mm. Achenes light brown, shiny, trigonous-ovoid, smooth. Fl. and fr. May–Jun.

Stony slopes, scrub, *Juniperus* stands, stony deserts; 700–1500 m. Xinjiang [Afghanistan, ?India, Kazakhstan, Kyrgyzstan, Pakistan,

Tajikistan].

**7. *Atraphaxis irtyschensis*** Chang Y. Yang & Y. L. Han, Bull. Bot. Res., Harbin 4(2): 150. 1984 [*"irtyschensis"*].

额河木蓼 e he mu liao

Shrubs 1–1.5 m tall. Stem stout, tortuous, glabrous, with gray-white bark; epidermis splitting longitudinally; woody branches spreading, spiny, apex without leaves; herbaceous branchlets of current year slender, glabrous, apex with leaves or flowers. Leaves fascicled, linear or lanceolate, usually sickle-curved, 1.5–3 cm × 1–3 mm, both surfaces glabrous, midvein prominent, base gradually narrowing into petiole, margin revolute, apex acuminate; ocrea white, cylindrical, 5–7 mm, membranous, pellucid, upper part cleft into 2 sharp teeth; veins 2, prominent. Pedicel 5–10 mm, slender, jointed at above 1/3. Flowers fewer in racemes at apices of branchlets of current year. Tepals 5, light green, with white or pink margins; outer tepals reflexed, smaller, ca. 1/2 as long as above joint portion of pedicel; inner tepals ovate, slightly unequal, 5–6 × 6–7 mm, prominently reticulate veined. Achenes yellow-brown, shiny, ovoid, ca. 5 mm, smooth. Fl. and fr. May–Jun.

- Mobile sand dunes; 300–400 m. N Xinjiang (Altay).

**8. *Atraphaxis virgata*** (Regel) Krassnov, Scripta Soc. Geogr. Ross. 19 : 295. 1888.

帚枝木蓼 zhou zhi mu liao

*Atraphaxis lanceolata* var. *virgata* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 397. 1879.

Shrubs 1.5–2 m tall. Stem thick, with brown-gray bark, branched. Stem branches slender, straight, without spines. Ocrea white, cylindrical, 2–3 mm, membranous, pellucid, upper part cleft into 2 sharp teeth; veins 2, prominent. Petiole very short, 0.5–1 mm; leaf blade gray-green, oblong-elliptic or oblong-obovate, large, 2–2.5 × 0.7–0.9 cm, both surfaces glabrous, veins conspicuous only abaxially, base narrowing into petiole, flat or slightly downward revolute, apex acuminate. Pedicel 8–10 mm, jointed below middle. Flowers in terminal racemes 10–15 cm. Tepals 5, pink, with white margin or white; inner segments elliptic, 4–5 × 5–6 mm, margin revolute, apex rounded, outer segments pink, rounded. Achenes dark brown, shiny, narrowly ovate, trigonous, ca. 5 mm, smooth, apex acuminate. Fl. and fr. May–Jul.

Steppes and stony desert slopes; 600–1000 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan].

**9. *Atraphaxis frutescens*** (Linnaeus) Eversmann, Reise Orenbg. Buchara, 115. 1823.

木蓼 mu liao

Shrubs 50–100 cm tall, much branched. Stem stout, with gray-brown bark; epidermis splitting fibrously; woody branches spreading, tortuous, slender, apex obtuse, without spines; herbaceous branchlets of current year straight or slightly flexuous, slowly lignified, glabrous or papillate-hairy, apex with leaves or flowers. Leaves blue-green to gray-green, narrowly lanceolate,

lanceolate, or oblong, 1–2.5 × 0.5–1.5 cm, glabrous or papillate-hairy, with prominent midvein and faint pinnate veins, base gradually narrowing into a short petiole, margin often revolute, apex acuminate or obtuse, with a short point; ocrea brown at base, cylindrical, 2–5 mm, membranous, pellucid; upper part cleft into 2 sharp teeth. Pedicel 5–8 mm, jointed at or slightly below middle. Flowers fewer in terminal racemes (4–6 cm). Tepals pink, with white margin; outer tepals broadly ovate, ca. 2/3 as long as above jointed portion of pedicel; inner tepals orbicular or broadly elliptic, rarely oblong, 4–7 × 4–6 mm, base nearly cuneate or cordate, margin entire or revolute, apex rounded or obtuse. Achenes dark brown, shiny, narrowly ovoid, trigonous, smooth, apex acuminate. Fl. and fr. May–Aug.

Stony or dry slopes, sandy areas and pebbly valleys of steppes, sand dunes, margins of cultivated land, stony river banks; 500–3000 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Kazakhstan, Mongolia, Russia; E Europe].

- 1a. Leaves and herbaceous branchlets of current year glabrous ..... 9a. var. *frutescens*
- 1b. Leaves and herbaceous branchlets of current year densely papillate-hairy ..... 9b. var. *papillosa*

**9a. *Atraphaxis frutescens* var. *frutescens***

木蓼(原变种) mu liao (yuan bian zhong)

*Polygonum frutescens* Linnaeus, Sp. Pl. 1: 359. 1753; *Atraphaxis lanceolata* (Marschall von Bieberstein) Meisner; *Tragopyrum lanceolatum* Marschall von Bieberstein.

Herbaceous branchlets of current year glabrous. Leaves narrowly lanceolate to oblong, narrow, glabrous.

Stony slopes, sandy steppes, sand dunes, margins of cultivated land; 500–3000 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Kazakhstan, Mongolia, Russia; E Europe].

**9b. *Atraphaxis frutescens* var. *papillosa*** Y. L. Liu, J. North W. Teachers' Coll., Nat. Sci. 3: 51. 1985 or 1987.

乳头叶木蓼 ru tou ye mu liao

Leaves and herbaceous branchlets of current year densely papillate-hairy.

- Dry slopes, stony river banks, pebbly valleys of steppes. Xinjiang.

**10. *Atraphaxis decipiens*** Jaubert & Spach, Ill. Pl. Orient. 2: 14. 1844.

细枝木蓼 xi zhi mu liao

Shrubs dwarf, much branched. Stem short, stout, flexuous, with gray-brown bark; epidermis splitting longitudinally; woody branches short, stout, flexuous, apex obtuse, without spines; herbaceous branchlets of current year slender, dense, glabrous, apex with leaves or flowers. Leaves green, lanceolate to linear lanceolate, 0.7–1.5 cm × 1–3 mm, leathery, both surfaces glabrous, midvein prominent abaxially, base attenuate, margin slightly undulate, apex obtuse, with a short point; ocrea brown at base, cylindrical, ca. 5 mm, membranous, pellucid, upper part cleft into 2 sharp teeth. Pedicel ca. 5 mm, jointed slightly above middle. Flowers sparsely arranged in terminal

racemes of current year's branchlets. Tepals 5, pink; outer tepals 2, reflexed in fruit, oblong-ovate, ca. as long as or shorter than above-joint portion of pedicel; inner tepals 3, broadly elliptic, 4–6 × 4–5 mm. Achenes dark brown, shiny, narrowly ovoid, trigonous, smooth, apex acuminate. Fl. and fr. May–Jul.

Sandy steppes, deserts, roadsides; 600–1000 m. N Xinjiang [Kazakhstan].

**11. *Atraphaxis manshurica*** Kitagawa, Rep. First Sci. Exped. Mansh. 4(4): 75. 1936.

东北木蓼 dong bei mu liao

Shrubs ca. 1 m tall. Stem stout, much branched in upper part, with gray-brown bark; epidermis splitting longitudinally; woody branches straight; bark light brown, splitting fibrously; herbaceous branchlets of current year brown, cylindric, glabrous. Leaves very shortly petiolate, green, lanceolate-oblong or linear, 1.4–4 × 0.2–1.5 cm, leathery, glabrous, reticulate veins prominent, base attenuate, margin entire or slightly crenate, apex obtuse, with a short point; ocrea brown at base, cylindric, membranous, pellucid, with 2 slender veins, oblique in upper part and cleft into 2 teeth. Pedicel stout, jointed above middle. Flowers in terminal racemes on branchlets of current year. Tepals 5, pink; outer tepals reflexed in fruit, oblong, longer than above-joint portion of pedicel; inner tepals elliptic, broadly elliptic, or ovate-elliptic, base broadly wedge-form or rounded, apex obtuse. Achenes dark brown, narrowly ovoid, 4–6 mm, trigonous, glabrous, densely granular-raised. Fl. and fr. Jul–Sep.

• Sand dunes, stony slopes, deserts. Hebei, Liaoning, Nei Mongol, Ningxia, Shaanxi.

One of us (Grabovskaya-Borodina) questions whether this is a good species.

**12. *Atraphaxis bracteata*** Losinskaja, Izv. Glavn. Bot. Sada SSSR 26: 43. 1927.

沙木蓼 sha mu liao

*Atraphaxis bracteata* var. *angustifolia* Losinskaja; *A. bracteata* var. *latifolia* H. C. Fu & M. H. Zhao.

Shrubs 1–1.5 m tall. Stem erect, light brown, stout, glabrous; woody branches inclined-spreading, brown, much branched, smooth and glabrous, apex with leaves and flowers. Petiole very short, 1.5–3 mm, glabrous; leaf blade oblong, elliptic, or lanceolate on branchlets of current year, 1.5–3.5 × 0.8–2 cm, leathery, both surfaces glabrous, base rounded or broadly wedge-form, margin slightly undulate, apex obtuse, with a short point; ocrea cylindric, 6–8 mm, membranous, oblique in upper part and cleft into 2 sharp teeth. Racemes terminal on branchlets of current year; bracts lanceolate, ca. 4 mm, membranous, with brown midvein, 2- or 3-flowered. Pedicel ca. 4 mm, jointed at above portion of pedicel. Tepals 5, green-white or pink; outer tepals spreading in fruit, reniform-orbicular, ca. 4 × 6 mm, prominently reticulate-veined; inner tepals ovate, unequal, 7–8 mm in diam., prominently reticulate-veined, margin undulate. Achenes dark brown, shiny, ovoid-trigonous, ca. 5 mm, smooth. Fl. and fr. Jun–Aug.

Semimobile to stable sand dunes; 100–1500. Gansu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Mongolia].

