

2. HIPPOPHAË Linnaeus, Sp. Pl. 2: 1023. 1753.

沙棘属 sha ji shu

Rhamnoides Miller.

Shrubs or trees, deciduous, dioecious, spiny. Leaves alternate, opposite, or whorled, subsessile to petiolate, blade margin entire. Flowers unisexual, clustered at base of lateral shoots. Male flowers in small catkins that appear before the leaves; calyx segments 2, membranous, free; stamens 4; disk small. Female flowers in small racemes, appearing with the leaves; calyx tubular, 2-lobed; style stigmatic on one side. Drupe globose, ellipsoid, or cylindric, sometimes longitudinally ribbed. Seed enclosed in parchmentlike endocarp, sometimes difficult to separate from seed. $2n = 24$.

Seven species: from NW Europe to E Asia, with a center of diversity on the Qinghai-Xizang plateau, most species associated with seasonally moist situations; seven species (four endemic) in China.

There has been uncertainty in the taxonomy of this genus, reflected in the range of treatments from that of Avdeyev (Izv. Akad. Nauk Tadzh. SSR, Biol. Nauk 4(93): 11–17. 1983), who recognized only one species with two subspecies, to Bartish et al. (Syst. Bot. 27: 41–54. 2002), who suggested on the basis of both morphological and molecular data that there is a good case for recognizing seven species plus a total of ten further subspecies. This latter view is accepted here. Flowering material is relatively rarely collected and the following key is based largely on fruiting material.

- 1a. Shrub 0.1–0.5(–1) m tall; leaves mostly in whorls of 3, to 2 cm, abaxially with mostly subentire peltate scales 7. *H. tibetana*
- 1b. Shrub or tree (0.6–)2–10 m tall; leaves mostly alternate, sometimes opposite, ca. 3.5 cm or more, abaxially with stellate hairs and/or deeply divided scales.
 - 2a. Fruit globose to ovoid, smooth.
 - 3a. Abaxial leaf surface gray with clearly distinct reddish brown midrib 2. *H. salicifolia*
 - 3b. Abaxial leaf surface uniformly silvery white, sometimes with scattered reddish brown scales.
 - 4a. Abaxial leaf surface with scales only; seed coat glossy, usually easily detached from endocarp at maturity 1. *H. rhamnoides*
 - 4b. Abaxial leaf surface with hairs; seed coat mat, fused with endocarp 3. *H. gyantsensis*
 - 2b. Fruit ± cylindric, with 3–7 longitudinal ribs or ridges.
 - 5a. Plant with distinctly flattened crown; fruit distinctly curved 6. *H. neurocarpa*
 - 5b. Plant with rounded or irregular crown; fruit straight.
 - 6a. Most plants with some leaves opposite; abaxial leaf surface with scales only; fruit with 3–5 small ridges 5. *H. goniocarpa*
 - 6b. Leaves always alternate; abaxial leaf surface with both scales and hairs; fruit with 5–7 small ridges 4. *H. litangensis*

1. *Hippophaë rhamnoides* Linnaeus, Sp. Pl. 2: 1023. 1753.

沙棘 sha ji

Elaeagnus rhamnoides (Linnaeus) A. Nelson; *Rhamnoides hippophaë* Moench.

Shrubs or trees, 1–15(–18) m tall. Bark brownish green, yellowish brown, or black; branches many, spines 2–7 cm. Leaves alternate; petiole ± absent; leaf blade abaxially silvery white suffused with brown or yellow, adaxially dark grayish green, linear or linear-lanceolate, 2–8 × 0.2–0.8 cm, ± narrowed at base, abaxially with white and brown stellate scales, margin ± revolute, apex subobtusate. Male inflorescence a minute spike, 5–8 × 4–6 mm. Male flowers: calyx lobes greenish brown, ovate-orbicular, 3–4 × 3–3.5 mm, concave, outside with numerous brown and sparse white stellate scales; stamens 1/2–2/3 as long as calyx; anthers nearly sessile, oblong-linear, ca. 1.5 mm. Female flowers 2–5 in axils of branchlets; pedicels ca. 0.5 mm, to 5 mm in fruit; calyx brown, tubular, oblong-obovate, 2.5–4 × 1–1.5 mm, outside with stellate brown and few white scales, lobes obtuse, interior with rather long white hairs, dense in upper part; Ovary globose-ovoid, 1–2 mm, ca. 1/2 as long as calyx, glabrous; style ca. 0.5 mm; stigma oblong, 0.5–1 mm, exserted. Peduncle 1–7 mm. Fruit orange or reddish, globose, ovoid, globose-ovoid, or ellipsoid, terete, 4–9(–10) × 3–8 mm,

glabrous, succulent and aromatic. Endocarp easy to separate from seed. Seed dark brown, sometimes nearly black, glossy, ovoid-oblong, or oblong-ellipsoid, 4–7 × 1.5–2 or 4–5 mm. Fl. Apr–May, fr. Sep–Oct. $2n = 24^*$.

River banks and terraces, dry river beds, forest margins, thickets on mountain slopes, moraines, meadows at highest elevations; 600–4200 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, N and SE Xizang, Yunnan [Afghanistan, India, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe].

Hippophaë rhamnoides subsp. *rhamnoides* is found in coastal N Europe, from France and Ireland east to the E Baltic. There are a further three subspecies recognized from Europe and C and SW Asia.

- 1a. Young stems silvery; spine-tipped shoots many, often with short lateral spines; leaf blade 2–4(–5) mm wide 1c. subsp. *turkestanica*
- 1b. Stems dull grayish or brownish; spine-tipped shoots often few, rarely with lateral spines; leaf blade (3–)4–16 mm wide.
 - 2a. Leaves mostly opposite or subopposite, with few or no rust-colored hairs 1e. subsp. *sinensis*
 - 2b. Leaves mostly alternate, occasionally subopposite on vigorous shoots, often

with rust-colored hairs or scales.

- 3a. Leaf blade 5–8.5 × 0.6–1.6 cm, margin usually ± sinuous; flower buds whorled 1a. subsp. *wolongensis*
- 3b. Leaf blade 3–6 × 0.5–1 cm, margin not sinuous; flower buds spirally arranged.
- 4a. Leaf blade abaxially dirty gray with many rust-colored peltate hairs 1d. subsp. *yunnanensis*
- 4b. Leaf blade abaxially silvery white, rarely with scattered rust-colored stellate hairs 1b. subsp. *mongolica*

1a. *Hippophaë rhamnoides* subsp. *wolongensis* Y. S. Lian et al., *Novon* 13: 200. 2003.

卧龙沙棘 wo long sha ji

Shrubs or trees, 3–5 m tall. Older branches dark brown; new shoots red-brown. Leaves mostly alternate, occasionally subopposite on vigorous shoots; petiole 2–4 mm; leaf blade elliptic-lanceolate, 5–8.5 × 0.6–1.6 cm, abaxially with gray peltate scales, mostly divided to ca. 1/2 radius, adaxially initially scaly but glabrescent, becoming green, base cuneate, margin ± sinuate, apex acute or acuminate. Male inflorescence 5–11-flowered; female inflorescence 5–7-flowered, buds ± whorled, outside reddish brown scaly. Peduncle 3–5 mm. Fruit yellow, subglobose, 4–6 × 4.5–6(–7) mm. Seed obovoid to oblong, 3–4 × ca. 1.5 mm. Fr. Sep–Oct.

- Mountain slopes; 1600–2000 m. Sichuan.

1b. *Hippophaë rhamnoides* subsp. *mongolica* Rousi, *Ann. Bot. Fenn.* 8: 210. 1971.

蒙古沙棘 meng gu sha ji

Shrubs, to 2.5(–6) m tall. Older branches often rough, twisted; branches dull grayish or brownish; lateral spines slender, usually unbranched. Leaves alternate; leaf blade abaxially silvery white, adaxially green or slightly silvery, narrowly oblanceolate to elliptic, 4–6 × 0.5–0.8 mm, abaxially rarely with scattered rust-colored stellate hairs, base cuneate to attenuate, apex subobtuse. Peduncle 1–4 mm. Fruit globose or nearly so, 6–9 × 5–8 mm. Seed flattened ellipsoid, 3.8–5.1 mm. Fr. Sep. $2n = 24$.

Xinjiang [Mongolia, Russia].

1c. *Hippophaë rhamnoides* subsp. *turkestanica* Rousi, *Ann. Bot. Fenn.* 8: 208. 1971.

中亚沙棘 zhong ya sha ji

Shrubs or small trees, to 6(–15) m tall. Branches with glossy white epidermis peeling off with age, lateral spines usually branched, very many. Leaves alternate; leaf blade usually silvery on both surfaces, adaxially sometimes green, linear, 1.5–4.5 × 0.2–0.5 cm, rust-colored hairs absent, base cuneate, apex subobtuse. Peduncle 3–4(–7) mm. Fruit red to yellow, subglobose to broadly ellipsoid or obovoid, 5–7(–9) × 3–5 mm when

dried. Seed usually somewhat flattened, 2.8–4.2 mm.

River terraces, dry river beds, occasionally on moraines or open mountain slopes; 600–4200 m. Xinjiang, N Xizang [Afghanistan, India, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, Turkmenistan, Uzbekistan].

1d. *Hippophaë rhamnoides* subsp. *yunnanensis* Rousi, *Ann. Bot. Fenn.* 8: 213. 1971.

云南沙棘 yun nan sha ji

Hippophaë salicifolia D. Don subsp. *yunnanensis* (Rousi) Hyvönen.

Shrubs or trees, 2–12 m tall. Trunk to 30 cm in diam.; bark dark gray, longitudinally fissured; branches rough, nearly black; new shoots with dense reddish brown stellate hairs; lateral spines relatively few, stout. Leaves alternate; leaf blade abaxially dirty gray, adaxially green, narrowly lanceolate, 3–6 × 0.6–1 cm, abaxially with many rust-colored peltate hairs. Peduncle 1–2 mm. Fruit usually yellow, 5–7 × 5–7 mm. Seed strongly flattened. 3–3.9 mm.

- Sandy or stony river terraces, forest margins, thickets on mountain slopes, occasionally in meadows at highest elevations; 2200–3700 m. W Sichuan, SE Xizang, Yunnan.

1e. *Hippophaë rhamnoides* subsp. *sinensis* Rousi, *Ann. Bot. Fenn.* 8: 212. 1971.

中国沙棘 zhong guo sha ji

Hippophaë rhamnoides var. *procera* Rehder; *H. salicifolia* D. Don subsp. *sinensis* (Rousi) Hyvönen.

Shrubs or trees, 1–15(–18) m tall. Trunk to 30 cm in diam.; bark brownish; branches nearly black, rough; lateral spines relatively few, stout. Leaves mostly opposite or subopposite; leaf blade abaxially usually silvery, adaxially green, narrowly lanceolate, 3–6 cm × 6–10 mm, rust-colored hairs absent. Peduncle 1–2 mm. Fruit yellow to deep red, 4–6 × 4–6 mm. Seed somewhat flattened, 2.8–4 mm.

- Open sunny habitats on river banks, dry river beds, forest margins or thickets on mountain slopes; 800–3600 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Shanxi, W Sichuan.

2. *Hippophaë salicifolia* D. Don, *Prodr. Fl. Nepal.* 68. 1825.

柳叶沙棘 liu ye sha ji

Elaeagnus salicifolia (D. Don) A. Nelson; *Hippophaë rhamnoides* Linnaeus subsp. *salicifolia* (D. Don) Servetaz.

Shrubs or trees, 2–3(–10) m tall. Trunk to more than 30 cm in diam. Petiole 2–3 mm; leaf blade abaxially whitish with usually reddish brown midrib, adaxially ± green, linear-oblong, 4.2–6.2 × 0.6–1.2 cm, abaxially tomentose, adaxially stellate-hairy, margin usually revolute. Male flowers 2.5–3(–4) mm; anthers 2–2.5 mm. Female calyx ca. 2 mm. Peduncle 1–4 mm. Fruit orange-yellow to greenish brown or yellow to deep red, globose, terete, 5–7 × 5–7 mm. Endocarp easy to separate from seed. Seed broadly ellipsoid to ovoid, ± flattened, 2.8–5.2 mm. Fl. Jun, fr. Oct.

- Moist gravel or stony areas, often beside rivers or streams; 2800–

3500 m. S Xizang [Bhutan, N India, Nepal].

The leaves of *Hippophaë salicifolia* are used to make tea; the fruit is used for polishing gold and silver.

3. *Hippophaë gyantsensis* (Rousi) Y. S. Lian, *Acta Phytotax. Sin.* 26: 235. 1988.

江孜沙棘 *jiang zi sha ji*

Hippophaë rhamnoides Linnaeus subsp. *gyantsensis* Rousi, *Ann. Bot. Fenn.* 8: 214. 1971.

Shrubs or trees, 5–8 m tall. Branches brown or grayish, rather long, slender. Leaves alternate; petiole ± absent; leaf blade abaxially uniformly dull white, adaxially green or slightly silvery, linear-oblong or linear-lanceolate, (1.2–)3.5–5.5 × 0.3–0.5 cm, abaxially ± tomentose, with or without rust-colored stellate hairs, adaxially hairy, base cuneate, margin slightly revolute, apex acute. Peduncle ca. 2 mm. Fruit ellipsoid, terete, 5–7 × 3–5 mm. Endocarp difficult to separate from seed. Seed flattened ellipsoid, ca. 4.5 mm, surface mat, slightly furrowed. Fr. Sep.

• Gravelly river terraces and dried river beds; 3500–4000(–5000) m. Xizang.

4. *Hippophaë litangensis* Y. S. Lian & Xue L. Chen ex Swenson & Bartish, *Syst. Bot.* 27: 52. 2002.

理塘沙棘 *li tang sha ji*

Shrubs or small trees. Young shoots hairy; lateral spines unbranched. Leaves alternate; leaf blade linear, abaxially hairy, white scaly, margin revolute. Fruit yellow to red, cylindrical, with 5–7 small ridges, 6–8 mm. Seed straight, longitudinally ridged.

• Hillsides; ca. 3700 m. Sichuan (Litang).

Molecular data support the suggestion by Lian et al. (Proceedings of International Workshop on Seabuckthorn, 60–66. 1995) that this taxon might have originated from hybridization between *Hippophaë neurocarpa* subsp. *stellatopilosa* and *H. rhamnoides* subsp. *yunnanensis*.

5. *Hippophaë goniocarpa* Y. S. Lian et al. ex Swenson & Bartish, *Syst. Bot.* 27: 52. 2002.

棱果沙棘 *leng guo sha ji*

Shrubs or small trees, to 7 m tall. Bark white; branches (sub)glabrous, lateral spines unbranched. Leaves alternate or opposite; leaf blade abaxially white, margin flat, abaxially with scales only. Fruit yellow to red, cylindrical, with 3–5 small ridges, 6–10 mm. Seed straight, longitudinally ridged.

• River banks and terraces; 2500–3500 m. Qinghai, Sichuan.

Lian et al. (Proceedings of International Workshop on Seabuckthorn, 60–66. 1995) suggest that this taxon is of hybrid origin (*Hippophaë neurocarpa* × *H. rhamnoides* subsp. *sinensis*) but it is uniform over a number of localities and produces fully fertile seeds, and thus merits treatment as a full species.

6. *Hippophaë neurocarpa* S. W. Liu & T. N. He, *Acta Phytotax. Sin.* 16(2): 107. 1978.

肋果沙棘 *lei guo sha ji*

Shrubs or dwarf trees, usually flat-topped, 0.6–3.5 m tall. Leafy stems slender, unbranched, spine tipped. Leaves alternate; leaf blade abaxially silvery, 2–6(–8) × 0.2–0.4 cm, margin revolute or flat. Fruit brown or yellowish red, ± cylindrical, distinctly curved, with 5–7 ribs, 5.5–8(–9) × 3–4 mm, silvery scaly. Endocarp difficult to separate from seed. Seed cylindrical, curved, 4–6 mm, surface mat, longitudinally ridged. $2n = 24^*$.

• Valley bottoms, flood plains, river banks and terraces; 3400–4400 m. Qinghai, Sichuan, Xizang.

The flat-topped habit and obviously curved fruit make *Hippophaë neurocarpa* very easy to identify.

- 1a. New shoots with scales only; leaf margin narrowly revolute; fruit brown 6a. subsp. *neurocarpa*
- 1b. New shoots pilose, hairs caducous; leaf margin flat; fruit red to yellow 6b. subsp. *stellatopilosa*

6a. *Hippophaë neurocarpa* subsp. *neurocarpa*

肋果沙棘(原亚种) *lei guo sha ji* (yuan ya zhong)

Hippophaë rhamnoides Linnaeus subsp. *neurocarpa* (S. W. Liu & T. N. He) Hyvönen.

New shoots nearly white, with scales only. Leaf blade margin revolute, abaxially with scales only. Fruit brown, 6–8(–9) mm.

• Valley bottoms, flood plains; 3400–4000 m. Qinghai, Sichuan, Xizang.

6b. *Hippophaë neurocarpa* subsp. *stellatopilosa* Y. S. Lian et al. ex Swenson & Bartish, Syst. Bot. 27: 52. 2002.

密毛肋果沙棘 mi mao lei guo sha ji

New shoots pilose, glabrescent. Leaf blade abaxially with long hairs, margin flat. Fruit red to yellow, 5.5–6.5 mm.

• River banks and terraces; 3400–4400 m. Sichuan, Xizang.

7. *Hippophaë tibetana* Schlechtendal, Linnaea 32: 296. 1864.

西藏沙棘 xi zang sha ji

Hippophaë rhamnoides Linnaeus subsp. *tibetana* (Schlechtendal) Servettaz.

Shrubs, small, sometimes rhizomatous, (5–)10–60(–80) cm tall. Older stems dark gray, thick, with regularly spaced scars of deciduous leafy branches; leafy stems slender, unbranched, spine tipped. Leaves mostly in whorls of 3; petiole ca. 1 mm; leaf blade abaxially whitish, adaxially grayish, linear-oblong, 1.2–2 × 0.25–0.4 cm, densely scaly, abaxially with scattered subentire, reddish brown scales and reddish brown midrib, margin flat. Male flowers ca. 2 mm; anthers ca. 1.5 mm. Peduncle 1–2 mm. Fruit yellowish green, globose to elliptic, terete, 8–11 × 6–9 mm. Endocarp difficult to separate from seed. Seed somewhat flattened, 4–5.6 × 1.9–2.8 mm. Fr. May. $2n = 24^*$.

Dry gravelly or stony places, especially on riverbeds and flood plains; 3600–4700 m. Gansu, Qinghai, Xizang [Bhutan, N India, Nepal].

The distinctively whorled leaves of *Hippophaë tibetana* seem to have been overlooked by previous authors.

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