

EPHEDRACEAE

麻黄科 ma huang ke

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Shrubs, subshrubs, or herbs, dioecious, rarely monoecious; stems erect, procumbent, or occasionally climbing, jointed, much branched, photosynthetic; branchlets opposite or whorled, green, terete, longitudinally grooved. Leaves opposite or in whorls of 3, scalelike, basally ± connate and reduced to membranous sheaths, generally ephemeral, mostly not photosynthetic; resin canals absent. Cones terminal or axillary, ovoid or ellipsoid. Pollen cones solitary or clustered at nodes, each cone composed of membranous bracts arranged in 2–8 decussate pairs or whorls of 3; proximal bracts empty; each distal bract subtending a male flower composed of 2 basally fused, orbicular or obovate scales (false perianth); anthers sessile or stipitate on staminal column. Seed cones opposite or in whorls of 3 or 4 at nodes, each cone composed of overlapping bracts; bracts arranged in 2–10 decussate pairs or whorls of 3, red and fleshy at maturity (rarely brown and membranous), proximal bracts empty, most distal bracts subtending an axillary female flower composed of a pair of fused, leathery scales (false perianth) enclosing ovule with a single membranous integument prolonged into a slender, tubular micropyle. Seeds 1 or 2 (or 3) per cone. Cotyledons 2. Germination epigeal. $2n = 14^*$, $?24^*$, 28^* , $?36^*$, 56^* .

One genus and ca. 40 species: arid regions of E and N Africa, Asia, Europe, North America, and South America; 14 species (two endemic) in China.

The strictly flowering plant terms flower, staminal column, and anther are used here to avoid unwieldy descriptions.

Cheng Ching-yung. 1978. Ephedraceae. In: Cheng Wan-chün & Fu Li-kuo, eds., Fl. Reipubl. Popularis Sin. 7: 468–489.

1. EPHEDRA Linnaeus, Sp. Pl. 2: 1040. 1753.

麻黄属 ma huang shu

Morphological characters and geographical distribution are the same as those of the family.

- 1a. Bracts of seed cones almost completely free, connate only at base, light brown and membranous at maturity 1. *E. przewalskii*
- 1b. Bracts of seed cones usually connate for 1/3–5/6 their length, red and fleshy at maturity.
- 2a. Seeds prominently longitudinally ridged, with dense, tiny projections 3. *E. rhytidosperra*
- 2b. Seeds smooth, rarely finely longitudinally striate.
- 3a. Integument tube 3–5 mm, usually spirally twisted 2. *E. intermedia*
- 3b. Integument tube 1–2(–2.5) mm, straight, curved, or slightly twisted.
- 4a. Shrubs or subshrubs, usually 50–150 cm.
- 5a. Bracts of seed cones with margin broad, membranous, often erose; integument tube ca. 1.5 mm, slightly spirally twisted; seeds 2 or 3; subshrubs usually to 50 cm 4. *E. lomatolepis*
- 5b. Bracts of seed cones with margin narrower, entire or almost so; integument tube 1–2 mm, straight or slightly curved; seeds 1 or 2; shrubs or subshrubs often more than 50 cm.
- 6a. Apical pair of bracts of seed cones connate for 3/4–8/9 their length; seeds finely striate dorsally 9. *E. likiangensis*
- 6b. Apical pair of bracts of seed cones connate for 1/2–2/3 their length; seeds completely smooth.
- 7a. Herbaceous branches virgate, often pruinose, 1–1.5 mm in diam., rigid; integument tube to 2 mm, straight or slightly curved; plants to 100 cm or more 10. *E. equisetina*
- 7b. Herbaceous branches not virgate, never pruinose, 1.5–2.5(–3) mm in diam., stout; integument tube ca. 0.5 mm, straight; plants to 60 cm 5. *E. saxatilis*
- 4b. Shrubs or subshrubs not more than 40 cm.
- 8a. Plants (15–)20–60 cm.
- 9a. Integument tube ca. 0.5 mm, straight; bracts of seed cones in 2 or 3 pairs 5. *E. saxatilis*
- 9b. Integument tube 1–2 mm, straight or slightly curved; bracts of seed cones in 4 pairs.
- 10a. Free part of leaves subulate to narrowly triangular, to 5 mm, apex sharply pointed 7. *E. sinica*
- 10b. Free part of leaves triangular, shorter, apex obtuse or subacute 8. *E. distachya*
- 8b. Plants 5–15 cm.

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- 11a. Integument tube 1.5–2 mm, twisted, curved, or straight often in same plant; bracts of pollen cones in 2 or 3(?) or 4) pairs 11. *E. monosperma*
- 11b. Integument tube to 1 mm, straight; bracts of pollen cones in 1–4 or more pairs.
- 12a. Bracts of pollen cones in 1 or 2 pairs; apical bracts of seed cones much longer than others; seeds 6–8(–10) mm, apex acuminate 13. *E. minuta*
- 12b. Bracts of pollen cones in (2 or) 3–6 pairs; apical bracts of seed cones slightly longer than others; seeds shorter, apex acute or obtuse.
- 13a. Apical pair of bracts of seed cones connate for ca. 5/6 their length or more; seeds 3.5–4.5 mm 6. *E. regeliana*
- 13b. Apical pair of bracts of seed cones connate for ca. 3/4 their length at most; seeds 4–6 mm.
- 14a. Internodes of green branchlets 1–2 cm, smooth or nearly so; seeds 4–5 mm, apex acute; pollen cones with 4–6 pairs of bracts 14. *E. fedtschenkoae*
- 14b. Internodes of green branchlets 1–1.5(–2) cm, longitudinally furrowed, often scabridulous; seeds 4–6 mm, apex obtuse or subacuminate; pollen cones with 3 or 4(–6) pairs of bracts 12. *E. gerardiana*

1. *Ephedra przewalskii* Stapf, Österr. Akad. Wiss. Math.-Naturwiss. Kl., Denkschr. 56(2): 40. 1889.

膜果麻黄 mo guo ma huang

Ephedra kaschgarica B. Fedtschenko & Bobrov; *E. przewalskii* var. *kaschgarica* (B. Fedtschenko & Bobrov) C. Y. Cheng.

Shrubs erect or ascending, to 2.4 m, much branched; young branchlets green to pale brownish, internodes stout, 2.5–5 cm × 2–3 mm. Leaves in whorls of 3, rarely opposite, free part triangular, apex acute or acuminate. Cones opposite or whorled at nodes, usually borne on proximal parts of branchlets, often sessile. Bracts of pollen cones in 3 or 4 whorls of 3, rarely opposite, connate at base, with broad, membranous margin surrounding central, herbaceous keel; anthers 5–8, shortly stipitate. Seed cones subglobose; bracts in 4 or 5 whorls of 3, rarely opposite, almost completely free, connate only at base, light brown and membranous at maturity, abruptly narrowed toward base, apical whorl of bracts with female flowers; integument tube 1.5–2 mm, exerted, usually straight. Seeds (2 or) 3, elongate-ovoid, 4–5 × 2–2.5 mm, concealed by scarious bracts. $2n = 14^*$.

Dry and sandy places; 300–3800 m. N Gansu, Nei Mongol, Ningxia, N Qinghai, Xinjiang [Kazakistan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, Uzbekistan].

2. *Ephedra intermedia* Schrenk ex C. A. Meyer, Mém. Acad. Imp. Sci. Saint-Petersbourg, sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 5: 278 [Vers. Monogr. Gatt. *Ephedra* 88]. 1846.

中麻黄 zhong ma huang

Ephedra ferganensis V. Nikitin; *E. glauca* Regel; *E. intermedia* var. *glauca* (Regel) Stapf; *E. intermedia* var. *persica* Stapf; *E. intermedia* var. *schrenkii* Stapf; *E. intermedia* var. *tibetica* Stapf; *E. microsperma* V.

Nikitin; *E. persica* (Stapf) V. Nikitin; *E. tesquorum* V.

Nikitin; *E. tibetica* (Stapf) V. Nikitin; *E. valida* V. Nikitin.

Subshrubs or shrubs to 1 m, densely branched, sometimes with creeping stem producing single, erect, green primary branches; branchlets yellowish or bluish green, often pruinose, internodes usually 2–6 cm × 1.5–3.5 mm. Leaves in whorls of 3 or opposite, connate for at least 2/3 their length. Pollen cones usually clustered at nodes, often sessile; bracts in 3 or 4 pairs or whorls; anthers 5–8, sessile or shortly stipitate. Seed cones ellipsoid, ovoid, or oblong-ovoid; bracts in 2–5 pairs or whorls, outer ones connate at base, apical pair or whorl connate for ca. 1/2 their length, margins membranous, globose, red, and fleshy at maturity; integument tube long, 3–5 mm, usually spirally twisted. Seeds 2 or 3, ovoid or elongate-ovoid, 5–6 × ca. 3 mm, concealed by bracts. Pollination May–Jun, seed maturity Jul–Aug. $2n = 14^*$, 28^* .

Grasslands, deserts, river valleys, floodlands, sandy beaches, cliffs, other dry, sandy or rocky places; (100–)800–4600 m. Gansu, Hebei, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang, Xizang [Afghanistan, Kazakistan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

The character states distinguishing var. *glauca* and var. *tibetica* from typical *Ephedra intermedia* may all be observed together in a single population; the species is therefore not divided here.

This species has medicinal properties.

3. *Ephedra rhytidosperra* Pachomova, Not. Syst. Herb. Inst. Bot. Acad. Sci. Uzbekistan. 18: 51. 1967.

斑子麻黄 ban zi ma huang

Subshrubs to 15(–30) cm, almost matlike; roots, stems, and branches very woody; branches short and stout, multinodular; nodes thick and knotty; green branchlets aggregated at nodes and radially arranged, thin and short; internodes 1–1.5 cm × ca. 1 mm. Leaves opposite, small, ca. 1 mm, connate for ca. 1/2 their length. Pollen cones opposite at nodes, sessile, 2–3 mm; bracts in 2 or

3 pairs; staminal column ca. 1/2 exerted, with 5–8 sessile anthers. Seed cones solitary, red and fleshy at maturity; bracts in 2(or 3) pairs, apical pair connate for ca. 1/2 their length, 2-flowered; micropylar tube ca. 1 mm. Seeds usually 2, yellowish brown, ovoid or oblong-ovoid, 4–8 × ca. 3 mm, exceeding bracts, 1/2–2/3 exerted, prominently longitudinally ridged, with dense, tiny projections. Pollination May, seed maturity Jun.

Dry rocky slopes and flood lands; below 1500 m. Gansu (Baoji Shan), Nei Mongol (Helan Shan), Ningxia (Helan Shan) [Mongolia].

The name *Ephedra lepidosperma* C. Y. Cheng, accepted in FRPS but treated here as a synonym of *E. rhytidosperma*, is invalid because two types (male and female) were designated in the protologue (in W. C. Cheng & al., Acta Phytotax. Sin. 13(4): 87. 1975).

4. *Ephedra lomatolepis* Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. St-Petersbourg 3: 2. 1845.

窄膜麻黄 zhai mo ma huang

Shrubs or subshrubs, to 50 cm; herbaceous branchlets green, 1–1.5 mm in diam., rigid, finely furrowed, internodes 4–6 cm. Leaves and bracts of cones with narrow, membranous margins. Leaves opposite or in whorls of 3. Pollen cones densely aggregated at nodes along branches, 5–6 mm; bracts in 2–4 pairs, connate for ca. 1/2 their length; anthers 6–8, shortly stipitate. Seed cones solitary or in clusters of 3 or 4; peduncle long, 1–5 cm; bracts in 3–5 pairs or whorls, free, margins prominent, broad, membranous, often erose, becoming red and fleshy at maturity; integument tube ca. 1.5 mm, slightly spirally twisted. Seeds 2 or 3, brown, ca. 4 mm. Pollination May, seed maturity Jul. Sandy places; 500–700 m. Xinjiang [Kazakistan, SW Mongolia]. H. Riedl notes that *Ephedra lomatolepis* has seed cones light brown and dry when mature, with bracts free (as in *E. przewalskii*), the membranous margins much wider than the herbaceous center. The characters of the male plant described here seem to apply to a taxon other than *E. lomatolepis* (which is endemic to the Balkhash area of Kazakistan), possibly even to a new species.

5. *Ephedra saxatilis* (Stapf) Royle ex Florin, Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 12: 25. 1933.

藏麻黄 zang ma huang

Ephedra gerardiana Wallich ex C. A. Meyer var. *saxatilis* Stapf, Österr. Akad. Wiss. Math.-Naturwiss. Kl., Denkschr. 56(2): 76. 1889; *E. likiangensis* Florin f. *mairei* (Florin) C. Y. Cheng; *E. likiangensis* var. *mairei* (Florin) L. K. Fu & Y. F. Yu; *E. saxatilis* var. *mairei* Florin.

Shrubs small, to 60 cm; stems erect or ascending, grayish brown or grayish yellow, stout; green branchlets clustered at nodes, radially arranged; internodes 2–3(–4) cm × 1.5–3 mm, prominently furrowed when dry, smooth or scabridulous. Leaves opposite, (2–)3(–6) mm, connate for 1/2–3/4 their length. Pollen cones 1–3, usually opposite at nodes, sessile or shortly pedunculate; bracts in (3–)5 or 6(or 7) pairs, margins broad, membranous; staminal columns

exserted at apex, with 6–8 sessile anthers. Seed cones solitary or opposite sometimes at subsequent nodes, sessile or shortly pedunculate, bracts in 2 or 3 pairs, connate for 1/5–2/3 their length, margins narrowly membranous, red and fleshy at maturity; integument tube ca. 0.5 mm, straight. Seeds often 2, grayish black, pruinose, ovoid to subcylindric, ca. 6 × 3 mm, ridged, usually exerted. Pollination Jul, seed maturity Aug–Sep. $2n = 28^*$.

Mountain slopes and sandy places; 3100–4600 m. S Xizang, N Yunnan [Bhutan, Nepal, Sikkim].

Ephedra saxatilis var. *mairei* is said to differ mainly in having seed cones sessile, pollen cones with fewer (2–5) bracts, and primary branches often pendulous or prostrate. If it is at all distinct, the appropriate taxonomic rank is not clear. It has been transferred to *E. likiangensis*, but one of the most distinctive characters of that species, the degree to which the apical bracts in the female cones are connate (3/4–8/9 their length) is not found in var. *mairei*. The taxon is therefore included here in the synonymy of *E. saxatilis*.

6. *Ephedra regeliana* Florin, Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 12: 17. 1933.

细子麻黄 xi zi ma huang

Ephedra monosperma Gmelin ex C. A. Meyer. var. *disperma* Regel.

Subshrubs very small, to 8(–15) cm, lacking conspicuous, woody stems above ground, only with several woody basal branches 1–2 cm; main branches usually inconspicuous; branchlets clustered at nodes, radially arranged, slender and short, ca. 1 mm in diam., internodes 1–2(–3) cm, apex slightly curved. Leaves opposite, connate for 1/2–2/3 their length, apex acute or slightly blunt. Pollen cones usually solitary or 2 or 3 at nodes of branchlets, ellipsoid, 2–6 × 2–4 mm; bracts in 4–6(–8) pairs; staminal column exerted at apex, with 6 to 8 shortly stipitate anthers. Seed cones opposite at nodes or clustered at apex of branchlets, ovoid or broadly ovoid, ca. 5 × 3–4 mm at maturity; bracts usually in 3 pairs, apical pair connate for ca. 5/6 their length or more, red and fleshy at maturity; integument tube 1–1.5(–2.5) mm, straight. Seeds (1 or)2, glossy, narrowly ovoid, 3–4.5 × 1.5–2 mm, concealed by bracts. Pollination Apr–May, seed maturity Jul–Aug. $2n = 14^*$. Rocky slopes, flood lands and sandy places; 700–3800 m. Xinjiang [Afghanistan, N India, Kazakistan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan].

7. *Ephedra sinica* Stapf, Bull. Misc. Inform. Kew 1927: 133. 1927.

草麻黄 cao ma huang

Ephedra ma-huang Liu.

Subshrubs small, to 40 cm, sparsely branched; woody stems short or prostrate; branchlets straight or curved, sometimes slightly involute, internodes (2.5–)3–4(–5.5) cm × ca. 2 mm, shallowly furrowed. Leaves opposite, connate for 1/3–2/3 their length, free part subulate to narrowly triangular, to 5 mm, apex sharply pointed. Pollen cones sessile or pedunculate, solitary or in clusters at nodes, rarely terminal; bracts in 4 pairs,

margin very narrow, membranous, apex obtuse or subacute; anthers 7 or 8, sessile or shortly stipitate. Seed cones terminal or axillary, solitary, oblong-ovoid or subglobose, ca. 8×6 –7 mm at maturity; bracts in 4 pairs, connate for 1/2–3/4 their length, red and fleshy at maturity; integument tube 1–2 mm, straight or slightly curved. Seeds usually 2, black-red or grayish brown, concealed by or equaling bracts. Pollination May–Jun, seed maturity Aug–Sep. $2n = 28^*$.

Waste and sandy places, plains, mountain slopes; 700–1600 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi [Mongolia].

It seems likely that *Ephedra sinica* var. *pumila* Florin, Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 12: 11. 1933, will also be found in China. It differs from var. *sinica* in its very low growth habit, often curved or involute branches, shorter nodes, and seed cones with only 2 or 3 pairs of bracts. The most appropriate taxonomic rank for this taxon is uncertain.

This species has medicinal properties.

8. *Ephedra distachya* Linnaeus, Sp. Pl. 2: 1040. 1753.

双穗麻黄 *shuang sui ma huang*

Shrubs small or subshrubs, to 25(–40) cm; stems often procumbent; branchlets grayish green or more rarely yellowish green, apex often curved or twisted. Leaves opposite, connate for 1/3–2/3 their length, free part triangular, apex obtuse or subacute. Pollen cones solitary or in clusters of 3 at apex of short branchlets, often pedunculate; bracts in 4 pairs; staminal column ca. 2 mm, exerted, with 7 or 8 sessile or shortly stipitate anthers. Seed cones terminal in short branchlets or axillary, narrowly ovoid; bracts in 3 or 4 pairs, with narrow, membranous margins, apical pair connate for ca. 1/3 their length, red and fleshy at maturity; integument tube 1–1.5 mm, straight. Seeds usually 2, dark brown, glossy, ovoid, 4 – 5×2 –3 mm, smooth. Pollination May–Jun, seed maturity Jul. $2n = ?24^*$, 28^* , $?36^*$.

Grasslands, sandy places, rocky mountain slopes; below 900 m. Xinjiang [Kazakhstan; C and W Asia, S Europe].

It is not certain if the plants from China and Kazakhstan are the same as those from Europe.

9. *Ephedra likiangensis* Florin, Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 12: 33. 1933.

丽江麻黄 *li jiang ma huang*

Shrubs or subshrubs to 1.5 m (usually smaller); stems erect, occasionally procumbent or buried in soil, stout; herbaceous branchlets ascending, green to brownish green, thick, internodes 2–4 cm \times 1.5–2.5 mm, deeply furrowed, finely scabridulous. Leaves opposite, rarely in whorls of 3, connate for 1/2–3/4 their length. Pollen cones clustered at nodes, sessile or shortly pedunculate; bracts in 4 or 5(or 6) pairs, connate at base; staminal column not or slightly exerted, with 5–8 sessile anthers. Seed cones solitary or more often opposite at nodes, sessile or pedunculate, ovoid to subglobose at maturity, 8 – 11×6 –10 mm; bracts in (2 or)3 pairs, apical pair

connate for 3/4–8/9 their length, red and fleshy at maturity; integument tube less than 1 mm, straight. Seeds 1 or 2, 4.5 – 8×2 –4 mm, elongate-ovoid, finely striate dorsally. Pollination May–Jun, seed maturity Jul–Sep. $2n = 28^*$.

• Mountains; 2300–4200 m. W Guizhou, W Sichuan, E Xizang, NW Yunnan.

This species has medicinal properties.

10. *Ephedra equisetina* Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg, sér. 6, Sci. Math. 7: 501. 1851.

木贼麻黄 *mu zei ma huang*

Ephedra shennungiana Tang.

Shrubs to 1(–1.5) m tall; woody stems well developed, erect or partially procumbent, thick; herbaceous branchlets virgate, bluish green or grayish green, priunose, 1–1.5 mm in diam., rigid, internodes short, 1–3 cm \times 1–1.5 mm, finely furrowed. Leaves opposite, brownish, 1.5–3 mm, connate for ca. 3/4 their length, free part bluntly triangular. Pollen cones solitary or in clusters of 3 or 4 at nodes, sessile or shortly pedunculate; bracts in 3 or 4 pairs, connate for ca. 1/3 their length; staminal column slightly exerted, with 6–8 sessile anthers. Seed cones usually opposite at nodes, shortly pedunculate, elongate-ovoid or ovoid at maturity, 8 – 10×4 –5 mm; bracts in 3 pairs, apical pair connate for ca. 2/3 their length, red and fleshy at maturity; integument tube to 2 mm, straight or slightly curved, slightly exerted. Seeds usually 1, elongate-ovoid, 5 – 7×2.5 –3 mm. Pollination Jun–Jul, seed maturity Aug–Sep. $2n = 14^*$.

Dry and rocky places; 800–3000 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan]. This species has medicinal properties.

11. *Ephedra monosperma* Gmelin ex C. A. Meyer, Mém. Acad. Imp. Sci. Saint-Pétersbourg, sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 5: 279 [Vers. Monogr. Gatt. Ephedra 89]. 1846.

单子麻黄 *dan zi ma huang*

Ephedra minima Hao.

Subshrubs small, to 15 cm, often with creeping runners; woody stems short, 1–5 cm, much branched, nodes knotted; green branchlets \pm spreading, usually slightly curved, slender, internodes short, slender, 1–2(–3) cm \times ca. 1 mm. Leaves opposite, 1.5–3.5 mm, connate for 1/3–2/3 their length, free part shortly triangular, apex blunt or pointed. Pollen cones 2 or 3 and sessile or subsessile at nodes, rarely solitary at apex of branchlets, 3 – 4×2 –4 mm; bracts in 2 or 3(or 4?) pairs, connate for ca. 1/2 their length; staminal column ca. 2 mm, exerted, with 6–8 sessile anthers. Seed cones solitary or opposite at nodes, sessile or shortly pedunculate, ovoid to oblong-ovoid at maturity, 6 – 9×5 –8 mm; bracts in 2 or 3 pairs, apical pair connate for ca. 1/2 their length, red and fleshy at maturity; integument tube 1.5–2 mm,

twisted, curved, or straight often in same plant. Seeds 1(or 2), 3.5–6 × 2.5–3 mm, usually not exserted.

Pollination Jun, seed maturity Aug.

Rocky slopes, dry places; 1400–4800 m. Gansu, Hebei, Nei Mongol, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang [Kazakistan, Mongolia, Pakistan, Russia].

12. *Ephedra gerardiana* Wallich ex C. A. Meyer, Mém. Acad. Imp. Sci. Saint-Pétersbourg, sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 5: 292 [Vers. Monogr. Gatt. Ephedra 102]. 1846. 山岭麻黄 shan ling ma huang

Ephedra gerardiana var. *congesta* C. Y. Cheng.

Shrubs small, to 15 cm; woody stems buried in soil, parts above ground scabrous, rarely almost smooth; branchlets directed upward, dark green, later brown, short, stout, usually with 1–3 nodes, internodes 1–1.5(–2) cm × 1.5–2 mm, longitudinally furrowed, often scabridulous. Leaves opposite, 2–3 mm, connate for ca. 2/3 their length. Pollen cones solitary or 2 at nodes, small, 2–5 × ca. 2 mm, sessile; bracts in 3 or 4(–6) pairs; staminal column exserted for ca. 1/2 its length, with 8 sessile anthers. Seed cones solitary, sessile or shortly pedunculate, subglobose at maturity, 5–7 mm in diam.; bracts in 2 or 3 pairs, connate for 1/4–1/3 their length, the apical pair for ca. 2/3 their length, red and fleshy at maturity; integument tube short, ca. 1 mm. Seeds 1 or 2, oblong or obovoid-oblong, 4–6 × 1.5–3 mm, exserted, apex obtuse or subacuminate. Pollination Jul, seed maturity Aug–Sep. $2n = 14^*$, 28^* , 56^* .

Dry and rocky slopes; 3700–5300 m. Qinghai, Xinjiang, Xizang [Afghanistan, N India, Nepal, Pakistan, Sikkim, Tajikistan].

13. *Ephedra minuta* Florin, Acta Hort. Gothob. 3: 8. 1927. 矮麻黄 ai ma huang

Ephedra minuta var. *dioeca* C. Y. Cheng

Subshrubs small, 5–25 cm, dioecious (perhaps rarely monoecious); woody stems short or absent; branchlets erect or slightly spreading, dark green, prominently furrowed, internodes 1.5–3 cm × 1.2–1.5 mm. Leaves opposite, to 4.5 mm, connate for 1/3–2/3 their length, apex sharply pointed, recurved. Pollen cones borne mainly on distal part of branchlets, solitary or opposite at nodes, sessile or rarely pedunculate (peduncle 0–1 cm); bracts in 1 or 2 pairs, connate for ca. 1/4 their length; staminal column exserted, anthers 6–8, sessile. Seed cones usually solitary, terminal on short, lateral branches arising mainly from proximal part of primary branches, rarely terminal also on longer branches, subsessile or shortly pedunculate, oblong or oblong-ovoid at maturity; bracts in 2 or 3 pairs, apical pair much longer than others and connate for ca. 1/2 their length, red, fleshy, and often pruinose at maturity; integument tube 0.5–1 mm, straight. Seeds 1 or 2, purplish black, 6–8(–10) × 2–3 mm, usually exserted (perhaps rarely concealed by bracts), pruinose, apex acuminate. Pollination May–Jul, seed maturity Aug–Sep. $2n = 14^*$.

• High mountains; 2000–4800 m. Qinghai, Sichuan.

H. Riedl notes that the Chinese plants described here do not correspond well with Florin's original description of *Ephedra minuta*. Most important is the difference in the number of bracts in male cones: 3–6 pairs here vs. 1 or 2 pairs according to Florin. Other characters described differently are the presence or absence of monoecious plants, length of leaves, and color of seeds. Further study is required to ascertain whether the Chinese plants are truly *E. minuta*. This species has medicinal properties

14. *Ephedra fedtschenkoae* Paulsen, Bot. Tidsskr. 26: 254. 1905.

雌雄麻黄 ci xiong ma huang

Subshrubs small, to 10 cm, monoecious or dioecious; woody stems short, inconspicuous, much branched; green branchlets short, usually with only 2–4 nodes, internodes 1–2 cm × ca. 1.5 mm, smooth or nearly so. Leaves opposite, connate for 1/2–2/3 their length. Pollen cones and seed cones randomly arranged on the branches, but seed cones more often on the middle to distal parts. Pollen cones usually opposite at nodes, ovoid, 3–4 × 2–3 mm; bracts in 4–6 pairs; staminal column exserted, with 4–8 sessile anthers. Seed cones sessile to subsessile, oblong-ovoid at maturity; bracts in 3 pairs, connate for (1/4–)1/3(–2/3) their length, red and fleshy at maturity; integument tube, ca. 1 mm, straight, rarely slightly curved. Seeds 1 or 2, dark brown, not pruinose, ovoid, 4–5 × 2–3 mm, apex acute. Pollination Jun–Jul, seed maturity Aug–Sep.

Dry and rocky slopes; 1900–3800 m. Xinjiang [Kazakistan, Mongolia, Tajikistan].

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