

87. FERULA Linnaeus, Sp. Pl. 1: 246. 1753.

阿魏属 a wei shu

She Menglan (佘孟兰 Sheh Meng-lan); Mark F. Watson

Euryangium Kauffmann; *Sumbulus* H. Reinsch.

Herbs, perennial, monocarpic or polycarpic, often onion-*(Allium)*-scented. Taproot stout, often woody. Stem branching, alternate, opposite or verticillate, base often clothed in fibrous remnant sheaths. Leaves petiolate, base sheathing, usually broadly so; blade 2–4-pinnate or 2–4-pinnatisect. Cauline leaves reduced upwards. Inflorescences often polygamous, terminal umbels compound, flowers perfect; lateral umbels both compound and simple, flowers bisexual or staminate; bracts usually absent; bracteoles present or absent. Calyx teeth obsolete or minute, triangular (except *F. kingdon-wardii*). Petals yellow or pale yellow (rarely greenish-yellow), ovate or lanceolate-oblong, apex acuminate, inflexed. Stylopodium conic, base sometimes dilated, lobed. Fruit ellipsoid or ovate-globose, strongly dorsally compressed, glabrous (rarely sparsely puberulent); dorsal ribs filiform, usually prominent, lateral ribs winged, wings narrow or broad; vittae 1–4 in each furrow, 2–12 on commissure. Seed face plane or slightly concave. Carpopore 2-cleft to base.

About 150 species: N Africa, C and SW Asia, Mediterranean region; 26 species (seven endemic) in China.

- 1a. Inflorescence of compound and simple umbels, compound umbels terminal, simple umbels axillary, opposite or successively verticillate forming crowded moniliform racemes.
- 2a. Stem 1–1.5 m, stout, simply branched 24. *F. feruloides*
- 2b. Stem 0.3–0.6 m, slender, duplicately branched.
- 3a. Leaves roughened, hispid and deciduous; fruits ca. equal to pedicels 25. *F. caspica*
- 3b. Leaves adaxially glabrous, abaxially pubescent, not deciduous; fruits longer than pedicels 26. *F. dubjanskyi*
- 1b. Inflorescence of only compound umbels in an ample loose panicle.
- 4a. Petals persistent for a long time after flowering; polycarpic; vittae 3–4 in each furrow, 10–12 on commissure 10. *F. lehmannii*
- 4b. Petals deciduous after flowering, monocarpic or polycarpic.
- 5a. Stem stout, spongy; leaves usually smooth, not papillose, deciduous.
- 6a. Segments of leaves larger, oblong-ovate, more than 5 cm.
- 7a. Plants strongly onion-scented; stem elongate-conic; fruit ribs narrowly winged 1. *F. conocaula*
- 7b. Plants not onion-scented; stem terete; fruit ribs broadly winged 2. *F. jaeschkeana*
- 6b. Segments of leaves smaller, shapes various, less than 5 cm.
- 8a. Petals abaxially glabrous 9. *F. canescens*
- 8b. Petals abaxially pubescent.
- 9a. Stem slender, suberect or flexuose, 15–50 cm high, plants not onion-scented.
- 10a. Plants 15–30 cm; bracteoles densely white villous; fruits 5–8 mm, longer than pedicels; vittae 2 on commissure 7. *F. syreitschikowii*
- 10b. Plants ca. 50 cm; bracteoles glabrous; fruits 8–10 mm, shorter than pedicels; vittae 2–6 on commissure 8. *F. hexiensis*
- 9b. Stem stout, erect, above 1 m high, plants strongly onion-scented.
- 11a. Segments of leaves lobed or toothed; fruit vittae 3–5 in each furrow, 10–14 on commissure.
- 12a. Stem roughened, pubescent; mature fruits 10–12 mm, equaling or shorter than pedicels 3. *F. sinkiangensis*
- 12b. Stem subglabrous; mature fruits 12–16 mm, longer than pedicels 4. *F. fukanensis*
- 11b. Segments of leaves lanceolate; fruit vittae 1–2(–3) in each furrow, 6 on commissure.
- 13a. Umbellules 10–20-flowered; fruit 10–12 mm, vittae 1–2 in each furrow 5. *F. teterrima*
- 13b. Umbellules 10–13-flowered; fruit ca. 14 mm, vittae 2 in each furrow, rarely 3 6. *F. krylovii*
- 5b. Stem slender, not spongy; leaves roughened; usually papillose, persistent until plant has withered.
- 14a. Leaves thick, sub-leathery, rigid, not deciduous.
- 15a. Ultimate leaf segments linear, 1–2 mm, branchlets often verticillate; bracteoles deciduous 14. *F. dissecta*
- 15b. Ultimate leaf segments elliptic or ovate, never linear.
- 16a. Plants low, 30–60 cm, leaves densely puberulous, bluish green; rays 4–15, spreading, unequal; lateral umbel absent 11. *F. bungeana*
- 16b. Plants tall, 1–3 m, leaves roughened, hispid or sparingly pubescent; lateral umbel present.
- 17a. Ultimate leaf segments 5–10 mm, toothed or lobed; fruit vittae 4–8 on commissure 12. *F. ovina*
- 17b. Ultimate leaf segments 20–30 mm, parted, lobules entire or serrate; fruit vittae 2 on commissure 13. *F. lapidosa*
- 14b. Leaves thin, papery, flexible, deciduous.
- 18a. Ultimate segments linear or lanceolate.

- 19a. Leaves ternate-3–4-pinnatisect, ultimate segments up to 30 mm 20. *F. songarica*
 19b. Leaves 2–3-pinnatisect, ultimate segments 2–10 mm.
 20a. Plants sparsely pubescent, leaves adaxially glabrous, abaxially pubescent; fruit 5–7 mm, vittae 2 on
 commissure 21. *F. gracilis*
 20b. Plants glabrous; fruit (7–)10–15 mm, vittae 4–8 on commissure 22. *F. licentiana*
 18b. Ultimate segments elliptic-ovate, never linear or lanceolate.
 21a. Plants glabrous.
 22a. Leaf blade 2–3-pinnatisect, ultimate segments oblong, 0.3–1 × 0.2–0.6 cm; calyx teeth conspicuous,
 long-triangular 17. *F. olivacea*
 22b. Leaf blade 3-pinnate, ultimate segments long-ovate or broadly ovate; calyx teeth obsolete
 or rarely subulate 18. *F. kingdon-wardii*
 21b. Plant pubescent or hispid.
 23a. Leaves adaxially glabrous, abaxially pubescent, articulate between petiole and blade.
 24a. Stem 0.5–1 m, 1 × branched; leaf blade ternate-pinnate, pinnae pinnately parted; lateral umbels
 single 15. *F. moschata*
 24b. Stem 2–3 m, 2 × branched; leaf blade ternate-3-pinnatisect; lateral umbels absent 16. *F. kirialovii*
 23b. Leaves roughened, hispid, not articulate between petiole and blade.
 25a. Leaves adaxially glabrous, abaxially sparsely hirsute, basal leaves long-petiolate; bracteoles
 persistent 19. *F. akitschkensis*
 25b. Leaves hispid on both surfaces, basal leaves sessile or short-petiolate; bracteoles deciduous
 23. *F. karataviensis*

1. *Ferula conocaula* Korovin, Monogr. Ferula, 33. 1947.

圆锥茎阿魏 yuan zhui jing a wei

Plants ca. 2 m, monocarpic, strongly onion-scented. Stem solitary, very stout, up to 15 cm thick at base, tapering towards apex, hispid, paniculate-branched, branches thick, lower branches alternate, upper branches verticillate, purplish tinged with age. Basal leaves petiolate; blade triangular in outline, ternate-pinnatifid; ultimate segments lanceolate or lanceolate-elliptic, to 27 × 7 cm, finely crenate, adaxially glabrous, abaxially densely puberulous. Cauline leaves reduced with expanded sheaths, uppermost almost wholly sheathing. Terminal umbels often sessile or short-pedunculate, lateral umbels long-pedunculate, usually exceeding terminal; umbels 8–14 mm across; bracts absent; rays 12–50, subequal; bracteoles few, lanceolate, small, deciduous; umbellules ca. 15-flowered. Stylopodium low-conic, base dilated; styles elongate, recurved. Fruit ellipsoid, ca. 10 × 5 mm; vittae 1–2 in each furrow, 8–14 on commissure. Fl. May–Jun, fr. Jun–Jul.

Mountain valleys, semi-deserts; ca. 2800 m. SW Xinjiang (Wuqia) [Kyrgyzstan].

This species is used in Xinjiang as a regional substitute for the traditional Chinese medicine “a wei” (*Ferula assafoetida* Linnaeus).

2. *Ferula jaeschkeana* Vatke, Index Sem. Hort. Berol. 1876, App. 2. 1876.

中亚阿魏 zhong ya a wei

Ferula jaeschkeana var. *parkeriana* O. E. Schulz; *Peucedanum jaeschkeanum* (Vatke) Baillon.

Plants 1–2 m, monocarpic, not strongly scented. Stem solitary, thick, robust, reddish brown, paniculate-branched, lower branches alternate, upper branches verticillate. Basal leaves petiolate; blade broadly triangular in outline, 2-ternately dissected, glabrous adaxially, pubescent abaxially, soon wilting; segments broadly ovate, ternate-bipinnatisect, ultimate segments oblong or oblong-lanceolate, 10–15 × 4–5 cm, 2-pinnatisect, base de-

current, finely serrate, apex short-acuminate. Cauline leaves reduced upwards, sheaths ovate-lanceolate, embracing. Umbels 3–10 cm across; terminal umbels sessile or subsessile, lateral umbels long-pedunculate, exceeding terminal; rays (5–)10–20 (–25), unequal; bracts absent; umbellules 15–20-flowered. Petals long-elliptic, apex acuminate, incurved. Stylopodium low-conic, base dilated, margin undulate; styles elongate. Fruit ellipsoid, 14–20 × 8–12 mm; vittae 1 in each furrow, 4–6 on commissure. Fl. Jun, fr. Jul.

Grassy slopes, among shrubs; ca. 3600 m. W Xizang (Ngari, Zanda) [Afghanistan, Bhutan, NE India, W Pakistan; C Asia].

3. *Ferula sinkiangensis* K. M. Shen, Acta Phytotax. Sin. 13(3): 88. 1975.

新疆阿魏 xin jiang a wei

Plants 0.5–1.5 m, strongly onion-scented. Rootstock thick, conical. Stem stout, pubescent, paniculate-branched, lower branches alternate, upper branches verticillate, often purplish red. Leaf blade gray-green, triangular-ovate in outline, ternate-3-pinnatisect; ultimate segments broadly elliptic, ca. 10 mm, shallowly lobed or toothed, base decurrent, adaxially sparsely pubescent, abaxially densely puberulent. Terminal umbel subsessile, lateral umbels (1–)2–4, opposite or alternate, peduncles elongate, exceeding terminal; umbels 8–12 cm across; bracts absent; rays 5–25, puberulent; bracteoles broadly lanceolate, deciduous. Petals abaxially puberulous. Stylopodium low-conic, base dilated, undulated-margined. Fruit ellipsoid, 10–12 × 5–6 mm, sparsely puberulent; vittae 3–4 in each furrow, unequal, 12–14 on commissure. Fl. and fr. Apr–Jun.

- Desert gravels; 800–900 m. W Xinjiang (Yining).

This species is used in Xinjiang as a regional substitute for the traditional Chinese medicine “a wei” (*Ferula assafoetida* Linnaeus).

4. *Ferula fukanensis* K. M. Shen, Acta Phytotax. Sin. 13(3): 89. 1975.

阜康阿魏 fu kang a wei

Plants 0.5–1.5 m, strongly onion-scented. Stem solitary, stout, subglabrous, paniculate-branched, lower branches alternate, upper branches verticillate. Leaf blade ovate in outline, ternate-2-pinnatisect; ultimate segments oblong, proximally parted, distally lobed or toothed, ca. 20 mm, adaxially glabrous, abaxially puberulent, base decurrent, irregular crenate. Umbels 6–10 cm across; terminal peduncle 3–5 cm, lateral peduncles 6–15 cm, exceeding terminal; bracts absent; rays 5–18(–31), unequal; bracteoles lanceolate, deciduous; umbellules 7–21-flowered. Petals abaxially sparsely pubescent. Stylopodium conic, base dilated, margins shallowly lobed; styles elongate and reflexed. Fruit ellipsoid, 12–16 × 6–8 mm; vittae 4–5 in each furrow, unequal, 10–12 on commissure. Fl. and fr. Apr–Jun.

• Valley sides at desert margins; ca. 700 m. NC Xinjiang (Fukang).

This species is used in Xinjiang as a regional substitute for the traditional Chinese medicine “a wei” (*Ferula assafoetida* Linnaeus).

5. *Ferula teterrima* H. Karsten & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 363. 1842.

臭阿魏 xiu a wei

Plants ca. 2 m, strongly onion-scented. Taproot fusiform, thickened. Stem solitary, stout, conspicuously fluted, pubescent, paniculate-branched, lower branches alternate, upper branches verticillate. Basal leaves broadly ovate in outline, ternate-3-pinnatisect; ultimate segments gray-green, lanceolate, ca. 10 mm, thin-leathery, soon wilting, distally crenulate to slightly lobed, densely pubescent, base cuneate, deciduous. Cauline leaves often less divided than basal, uppermost reduced to bladeless sheaths. Terminal umbels subsessile, lateral umbels 2–3, smaller, verticillate with elongate peduncles exceeding terminal; umbels ca. 12 cm across; bracts absent; rays 15–23, subequal, sparsely pubescent; bracteoles lanceolate, deciduous; umbellules 12–20-flowered. Petals abaxially pubescent. Fruit ellipsoid, ca. 10–12 mm; vittae 1–2 in each furrow, 6 on commissure. Fl. and fr. Apr–Jun.

Desert gravels; ca. 900 m. N Xinjiang (Ili) [Kazakhstan, Russia].

This species has reputed medicinal value.

6. *Ferula krylovii* Korovin, Sist. Zametki Mater. Gerb. Krylova Tomsk. Gosud. Univ. Kujbyševa. 2–3: 2. 1934.

托里阿魏 tuo li a wei

Plants 0.5–1.5 m, strongly onion-scented. Taproot fusiform, thickened, rootstock unbranched. Stem solitary, stout, paniculate-branched, lower branches alternate, upper branches verticillate, usually pale purplish-red with age. Leaves broadly ovate, ternate-3-pinnatisect; ultimate segments gray-green, oblong, lobed or toothed, lobules lanceolate, densely pubescent, deciduous. Cauline leaves reduced upwards, sheaths lanceolate. Terminal umbel sessile, lateral umbels 2–3, with elongate peduncles exceeding terminal; umbels ca. 12 cm across; bracts absent; rays 12–23, rather short, umbels subglobose; umbellules 10–13-flowered. Petals abaxially pubescent. Stylopodium conic, base dilated; styles elongate. Fruit long-ellipsoid, ca. 14 mm;

lateral ribs narrowly winged; vittae 2–3 in each furrow, 6 on commissure. Fl. and fr. May–Jul.

Alkaline grasslands; 600–800 m. NW Xinjiang (Toli) [Russia (W Siberia); C Asia].

This species has reputed medicinal value.

7. *Ferula syreitschikowii* Koso-Poljansky, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 3: 71. 1922 [“*syreitschikowi*”].

荒地阿魏 huang di a wei

Plants 15–30 cm, not onion-scented. Stem slender, slightly flexuose, densely hirsute, corymbose-branched, branches alternate. Basal leaves subsessile or sessile; leaf blade rhombic, 2–3-pinnatisect, ultimate segments gray-green, elliptic, ca. 2 cm, densely pubescent on both surfaces, 3–5-lobed, lobules triangular, deciduous. Uppermost leaves often bladeless, petioles sheathing throughout. Compound umbels terminal on stem and branches; umbels 4–6 cm across; rays 6–12, subequal; bracteoles lanceolate, densely white pubescent, persistent; umbellules 1–25-flowered. Petals abaxially puberulous. Stylopodium low-conic, base dilated, undulate-margined. Fruit ellipsoid, 5–8 × ca. 3 mm; lateral ribs narrowly winged, wings grayish white; vittae large, 1 in each furrow, 2 on commissure. Fl. and fr. May–Jun.

Valley sides, gravelly slopes, sandy places in cultivated land; 500–1000 m. N Xinjiang [Kyrgyzstan, Uzbekistan].

8. *Ferula hexiensis* K. M. Shen, Acta Phytotax. Sin. 24: 314. 1986.

河西阿魏 he xi a wei

Plants ca. 50 cm, roughened and hispid throughout, not onion-scented. Stem slender, solitary, paniculate-branched, lower branches alternate, upper branches verticillate. Leaf blades broadly ovate, ternate-3–4-pinnatisect; ultimate segments ca. 5 mm, margins triangular-toothed or lobed, apex acute, mucronate. Upper leaves often bladeless, petioles wholly sheathing. Terminal umbel long-pedunculate, lateral umbels few, shorter than terminal; umbels 5–10 cm across; bracts few, linear, persistent; rays 10–18, subequal; bracteoles several, subulate or narrow-lanceolate, glabrous; umbellules 10–15-flowered. Petals abaxially sparsely pubescent. Stylopodium low-conic, base dilated. Fruit broadly ellipsoid or obovoid, 8–10 × 4–7 mm, sparsely pubescent; lateral wings broad; vittae 1 in each furrow, 2–6 on commissure, unequal. Fl. Jun, fr. Jul.

• Moist places on mountain slopes. N Gansu (Sunan).

9. *Ferula canescens* (Ledebour) Ledebour, Fl. Ross. 2: 302. 1844.

灰色阿魏 hui se a wei

Peucedanum canescens Ledebour, Fl. Altaic. 1: 307. 1829.

Plants 30–40 cm. Stem slender, slightly flexuose, corymbose-branched, lower branches alternate, upper branches opposite. Leaves triangular-ovate in outline, 3-pinnate/pinnatisect; ultimate segments gray-green, oblong-lanceolate or ovate, 5–10 mm, densely pubescent on both surfaces, deciduous. Cauline

leaves few, less divided than basal, uppermost often bladeless, petioles wholly sheathing, sheaths oblong-lanceolate, pubescent. Terminal umbel pedunculate, lateral umbels 1–2, exceeding terminal; umbels 3–6 cm across; bracts absent; rays (2–)4–5(–8), subequal; bracteoles few, lanceolate, scarious-margined; umbellules ca. 10-flowered. Petals glabrous. Stylopodium low-conic, base dilated, lobed. Fruit oblong-ellipsoid, 8–14 × 3.5–6 mm; vittae 1 in each furrow, large, 2 on commissure. Fl. Jun, fr. Jul.

Desert gravels; ca. 800 m. N Xinjiang (Fuyun) [Kyrgyzstan, Russia (W Siberia), Uzbekistan].

10. *Ferula lehmannii* Boissier, Fl. Orient. 2: 992. 1872.

大果阿魏 da guo a wei

Plants 40–50 cm, polycarpic, strongly onion-scented. Caulis thick, branched. Stem solitary, erect, paniculate-branched, lower branches alternate, upper branches verticillate. Basal leaves short-petiolate, sheaths dilated; blade broadly ovate, ternate-2-pinnatisect; ultimate segments gray-green, long-ovate, ca. 20 mm, pinnate or sometimes 3–5 crenate-toothed, pubescent, base decurrent. Cauline leaves reduced, uppermost bladeless, petioles wholly sheathing, pubescent. Terminal umbel sessile or short-pedunculate, lateral umbels 1–2, exceeding terminal; umbellules 6–10-flowered. Petals abaxially puberulent, persistent for a long time after flower. Fruit long-ellipsoid, 12–14 × 6–7 mm; vittae 3–4 in each furrow, 10–12 on commissure, very unequal. Fl. and fr. May–Jun.

Sandy places on low mountain slopes; 1000–1100 m. NC Xinjiang (Manas) [Afghanistan, Kazakhstan, Kyrgyzstan, W Pakistan, Uzbekistan; C Asia, SW Asia (Iran)].

The rootstock is used medicinally.

11. *Ferula bungeana* Kitagawa in J. Jap. Bot. 31: 304. 1956.

硬阿魏 ying a wei

Peucedanum rigidum Bunge.

Plants 30–60 cm. Stems slender, 2–3 × corymbose-branched, lower branches alternate, upper branches opposite or verticillate. Basal leaves rosetted; blade broadly ovate or triangular, 2–3-pinnatisect; ultimate segments glaucous-blue, long-elliptic or ovate, 1–3 × 1–2 mm, pinnatifid, lobules cuneate-obovate, apex 3-triangular-toothed, sub-leathery, rigid, densely pubescent, base cuneate, apex mucronate. Cauline leaves few, uppermost leaves bladeless, petioles wholly sheathing. Umbels 4–12(–25) cm across; bracts absent or 1–2, subulate; rays 4–15, unequal, spreading; bracteoles 3–5, linear-lanceolate, unequal; umbellules 5–12-flowered. Stylopodium low-conic, base dilated. Fruit broadly ellipsoid, 10–15 × 4–6 mm; lateral ribs narrowly winged; vittae 1 in each furrow, 2 on commissure. Fl. and fr. May–Jul.

• Gravelly slopes, sandy places; 200–2500 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi.

This species has reputed medicinal value.

12. *Ferula ovina* (Boissier) Boissier, Fl. Orient. 2: 986. 1872.

羊食阿魏 yang shi a wei

Peucedanum ovinum Boissier, Diagn. Pl. Orient., ser. 1, 6: 61. 1846 [“1845”]; *P. thomsonii* C. B. Clarke; *Ferula stewartiana* var. *affghanica* O. E. Schulz.

Plants 50–100 cm. Stems slender, 1–2, rigid, often purplish red, nodes slightly swollen, paniculate-branched, lower branches alternate, upper branches verticillate. Leaf blade ovate, ternate-3–4-pinnatisect; ultimate segments ovate, 5–10 mm, densely hispid, sub-leathery, margins toothed or lobed. Cauline leaves reduced upwards to small, broad, leathery ovate-lanceolate sheaths. Terminal umbel sessile or short-pedunculate, lateral umbels 1–2(–5), exceeding terminal; umbels 4–6 cm across; bracts absent; rays 3–10; bracteoles squamose, deciduous; umbellules 5–12-flowered. Stylopodium low-conic, base dilated. Fruit ellipsoid, 5–10 × 2–5 mm; lateral ribs narrowly winged; vittae 1 in each furrow, 4–8 on commissure, large. Fl. and fr. May–Jul.

Gravelly slopes; 1200–1700 m. N Xinjiang (Altay, Tacheng) [Afghanistan, Kazakhstan, Kyrgyzstan, W Pakistan, Tajikistan; SW Asia (Iran)].

13. *Ferula lapidosa* Korovin, Monogr. Ferula, 59. 1947.

多石阿魏 duo shi a wei

Plants 60–100 cm, hispid throughout. Stems slender, several, nodes slightly swollen, paniculate-branched, lower branches alternate, upper branches verticillate. Basal leaves short-petiolate, sheaths dilated; blade broadly rhombic, 3-pinnatisect, sub-leathery; ultimate segments broadly elliptic, 2–3(–4) × 1–2 cm, base cuneate, distally lobed, lobules entire or toothed, base decurrent. Upper leaves bladeless, petioles wholly sheathing, sheaths enlarged, elliptic-lanceolate, rigid and clasping. Terminal umbel sessile or short-pedunculate, lateral umbels 1–3, opposite or verticillate with elongate peduncles, exceeding terminal; umbels 3–6 cm across; bracts and bracteoles lanceolate, deciduous; rays 6–16, subequal; umbellules 10–15-flowered. Stylopodium low-conic; styles elongate. Fruit ellipsoid, ca. 10 mm; lateral ribs narrowly winged; vittae 1 in each furrow, large, 2 on commissure. Fl. Jun, fr. Jul.

Grassy places on gravelly slopes; ca. 1200 m. W Xinjiang (Qapqal) [Kyrgyzstan].

14. *Ferula dissecta* (Ledebour) Ledebour, Fl. Ross. 2: 301. 1844.

全裂叶阿魏 quan lie ye a wei

Peucedanum dissectum Ledebour, Fl. Altaic. 1: 306. 1829.

Plants 40–100 cm. Stem slender, often purplish red, nodes swollen, paniculate-branched, branches usually verticillate. Basal leaves short-petiolate, sheaths dilated; blade broadly ovate, 3–4(–5)-pinnatisect; ultimate segments gray-green, linear, 1–2 mm, densely hispid, sub-leathery. Cauline leaves reduced upwards, sheaths lanceolate or ovate, embracing, becoming rigid when old. Terminal umbel sessile or pedunculate, lateral umbels 1–5, long-pedunculate, exceeding terminal; umbels 4–8 cm across; bracts absent; rays 4–14, subequal; bracteoles small, lanceolate, deciduous; umbellules 8–15-flowered. Stylopodium low-conic, base dilated; styles elongate. Fruit ellipsoid, 7–11 ×

3–5 mm; vittae 1 in each furrow, 6 on commissure. Fl. May, fr. Jun.

Gravelly slopes; 1000–1700 m. N Xinjiang (Altay, Tacheng) [Kazakhstan, Russia (W Siberia)].

15. *Ferula moschata* (H. Reinsch) Koso-Poljansky, Bjull. Obšč. Estestvoisp. Voronežsk. Gosud. Univ. 1: 94. 1926.

麝香阿魏 she xiang a wei

Sumbulus moschatus H. Reinsch, Jahrb. Pract. Pharm. Verwandte Fächer 13: 69. 1846; *Euryangium sumbul* Kaufmann; *Ferula sumbul* (Kauffmann) J. D. Hooker.

Plants 0.5–1 m, pubescent becoming subglabrous. Stem slender, corymbose-branched, lower branches alternate, upper branches verticillate. Leaf blade broadly elliptic-triangular, ternate-2-pinnatisect; ultimate segments oblong or lanceolate, 20–35 × 10–15 mm, remote, rather thick, adaxially glabrous, abaxially pubescent, sometimes sparsely papillose along veins, distally lobed, lobules entire or toothed. Terminal umbel long-pedunculate, lateral umbels 1–2, solitary or opposite, slightly exceeding terminal; umbels 4–6 cm across; bracts absent; rays 6–12, subequal; bracteoles lanceolate; umbellules 9–12-flowered. Stylopodium low-conic, base dilated, margins undulate. Fruit ellipsoid, ca. 7 mm; vittae 1 in each furrow, 2 on commissure. Fl. Jun, fr. Jul.

Scrub on gravelly slopes; 1500–1600 m. W Xinjiang (Zhaosu) [Kyrgyzstan, Tajikistan].

16. *Ferula kirialovii* Pimenov, Bjull. Moskovsk. Obšč. Isp. Prir., Otd. Biol. 84(5): 110. 1979.

山蛇床阿魏 shan she chuang a wei

Plants 2–3 m. Stem slender, purplish red-tinged, 2 × corymbose-branched, lower branches alternate, upper branches verticillate, branchlets often opposite, rarely alternate or single. Basal leaves long-petiolate, articulate between petiole and blade; blade triangular-ovate, 3-ternate, leaflets 2-pinnatisect; ultimate segments broadly elliptic or long-elliptic, 10–30 × 5–20 mm, abaxially pubescent, pinnate, lobules entire or toothed. Upper leaf bladeless, sheaths lanceolate. Umbels 4–8 cm across, terminal on stem, branches and branchlets; bracts absent; rays 6–12, subequal; bracteoles several, lanceolate or subulate, persistent; umbellules 12–17-flowered. Stylopodium low-conic, base dilated. Fruit ellipsoid, ca. 7 × 3 mm; vittae small, 1 in each furrow, 2 on commissure. Fl. Jun, fr. Jul.

Scrub or grassy places on gravelly slopes; ca. 1500 m. Xinjiang (Tian Shan) [C Asia (W Tian Shan)].

17. *Ferula olivacea* (Diels) H. Wolff in Handel-Mazzetti, Symb. Sin. 7: 727. 1933.

榄绿阿魏 lan lü a wei

Peucedanum olivaceum Diels, Notes Roy. Bot. Gard. Edinburgh 5: 290. 1912.

Plants 30–60 cm, glabrous throughout, glaucous. Stem solitary, corymbose-branched, branches alternate, remote. Basal leaves short-petiolate; blade broadly ovate, 2–3-pinnatisect; ultimate segments broadly elliptic or ovate, pinnatifid, lobules

elliptic or obovate, rather thick, veins elevated abaxially, base cuneate, decurrent, margin toothed, apex mucronate. Umbels terminal on stem and branches, ca. 12 cm across; bracts absent or few, linear, unequal, occasionally foliaceous, deciduous; rays 8–16, unequal; bracteoles linear, persistent; umbellules 10–20-flowered; pedicels unequal, 5–10 mm. Petals yellowish green. Stylopodium low-conic, base thickened. Fruit oblong or ellipsoid, ca. 10 × 5 mm; vittae 1 in each furrow, 2 on commissure. Fl. and fr. May–Jul.

• Forests, grassy slopes, rock crevices on valley sides; 3300–3800 m. NW Yunnan (Lijiang).

This species has reputed medicinal value.

18. *Ferula kingdon-wardii* H. Wolff, Repert. Spec. Nov. Regni Veg. 27: 326. 1930.

草甸阿魏 cao dian a wei

Peucedanum kingdon-wardii (H. Wolff) Korovin.

Plants 0.5–1 m, glabrous throughout, glaucous. Stem fluted. Leaf blade broadly triangular-ovate, 3-pinnate, pinnae 4–5 pairs; ultimate segments long-ovate or broadly ovate, 1.5–2.5 × 1–1.8 cm, subleathery, abaxially glaucous, base cuneate or truncate, irregularly coarsely toothed. Upper leaves 3-lobed, lobules ovate-lanceolate, sheaths dilated, suborbicular. Umbels 8–13 cm across; bracts 1–2, broadly ovate or ovate-lanceolate, unequal; rays 7–16, stout, 4–7 cm; bracteoles 6–8, linear-lanceolate, shorter than flowers; umbellules 12–20-flowered. Calyx teeth obsolete or subulate. Stylopodium low-conic. Fruit ellipsoid, 0.8–1 × ca. 0.5 cm; lateral ribs narrowly winged; vittae 1 in each furrow, 2 on commissure. Fl. and fr. Aug–Oct.

• Gaps among stones on grassy slopes; 2700–3300 m. NW Yunnan.

19. *Ferula akitschkensis* B. Fedtschenko ex Koso-Poljansky, Bjull. Obšč. Estestvoisp. Voronežsk. Gosud. Univ. 1: 94. 1926.

山地阿魏 shan di a wei

Plants 1–1.5 m. Stem slender, paniculate-branched, lower branches alternate, upper branches verticillate. Basal leaves long-petiolate; blade broadly rhombic, ternate-3-pinnatisect; ultimate segments oblong or ovate-oblong, 8–15(–30) × 3–5 (–10) mm, usually pinnatisect, lobules linear, entire, adaxially glabrous, abaxially sparsely hispid. Upper leaves bladeless, sheaths lanceolate. Terminal umbel sessile or short-pedunculate, lateral umbels 2–4, opposite or verticillate, rarely single, exceeding terminal; umbels 5–10 cm across; bracts lanceolate; rays 10–20(–25), subequal, very spreading; bracteoles 5–7, lanceolate, persistent; umbellules 8–16-flowered. Stylopodium low-conic, base dilated; style elongate, very reflexed when mature. Fruit ellipsoid, ca. 8 mm; vittae 1 in each furrow, 2 on commissure. Fl. and fr. Jun–Jul.

Mountain slopes, scrub or grassy places on gravelly slopes; 900–2100 m. N Xinjiang (Altay, Bole, Tacheng) [Kazakhstan, Kyrgyzstan, Russia].

20. *Ferula songarica* Pallas ex Sprengel in Roemer & Schultes, Syst. Veg. 6: 598. 1820.

准噶尔阿魏 zhun ga er a wei

Plants 1–1.5 m. Stems 1–3 robust, rigid, purplish red with age, paniculate-branched, lower branches alternate, upper branches verticillate. Basal leaves long-petiolate; blade broadly triangular, ternate-3–4-pinnatisect; ultimate segments green, linear, 1.5–3 × 1–2 mm, thick-papery, glabrous, entire, soon wilting, deciduous. Cauline leaves reduced upwards, small, less divided than basal, sheaths lanceolate, thin-leathery. Terminal umbel short-pedunculate, lateral umbels (1–)2–4 or absent, long-pedunculate, exceeding terminal; umbels 4–7 cm across; rays 10–20, subequal; bracteoles 5, lanceolate, persistent; umbellules 15–20-flowered. Stylopodium low-conic; style elongate. Fruit ellipsoid, ca. 8 × 5 mm; vittae 1 in each furrow, 2 on commissure. Fl. and fr. Jun–Jul.

Scrub or grassy places on mountain slopes; 1100–1800 m. N Xinjiang (Altay, Tacheng) [Kazakhstan, Russia (W Siberia)].

21. *Ferula gracilis* (Ledebour) Ledebour, Fl. Ross. 2: 304. 1844.
细茎阿魏 xi jing a wei

Peucedanum gracile Ledebour, Fl. Altaic. 1: 308. 1829.

Plants 50–80 cm, sparsely pubescent. Stem slender, erect, solitary, paniculate-branched from middle, branches alternate. Basal leaves short-petiolate; blade broadly ovate, ternate-2–3-pinnatisect; ultimate segments ovate or oblong-elliptic, pinnatifid, lobules lanceolate, ca. 5–10 mm, adaxially glabrous, abaxially sparsely pubescent, thin-papery. Cauline leaves reduced upwards, uppermost leaves bladeless, sheaths lanceolate, deciduous. Terminal umbel pedunculate or subsessile, lateral umbels 1–2, pedunculate, usually slightly shorter than terminal; bracts absent; rays 4–8, unequal; bracteoles lanceolate, membranous, deciduous; umbellules 10–15-flowered. Stylopodium low-conic, base dilated; styles elongate. Fruit ellipsoid, 5–7 mm; vittae 1 in each furrow, 2 on commissure. Fl. Jun, fr. Jul.

Grassy places, gravelly slopes on valley sides; 730–1700 m. N Xinjiang (Altay) [Russia (W Siberia)].

22. *Ferula licentiana* Handel-Mazzetti, Oesterr. Bot. Z. 82: 252. 1933.

太行阿魏 tai hang a wei

Plants (60–)120–180 cm, glabrous throughout. Stem solitary, slender, usually flexuose, paniculate-branched, lower branches alternate, upper branches verticillate. Basal leaves petiolate; blade broadly ovate-triangular, 3–4-pinnatisect; ultimate segments ovate-oblong, often pinnately parted or lobed, lobules lanceolate, 2–4 mm, both surfaces glabrous. Upper leaves reduced, bladeless, sheaths lanceolate, embracing. Terminal umbel short-pedunculate, lateral umbels 1–3, simple or opposite, exceeding terminal; bracts absent or 1–3, linear, small; rays 7–11, 2.5–3 cm, subequal; bracteoles 4–5, lanceolate; umbellules 7–15-flowered. Stylopodium low-conic. Fruit pale brown, oblong or oblong-obovate, (7–)10–15 mm; lateral broadly winged; vittae (1–)3–4 in each furrow, 4–8 on commissure. Fl. and fr. Jun–Jul.

• Mountain slopes; 100–2100 m. EC Anhui, N Henan, NW Jiangsu, S Shaanxi, W Shandong, E Shanxi.

1a. Plants 120–180 cm; rays 7–11, 3–5 cm

..... 22a. var. *licentiana*
1b. Plants 60–120 cm; rays 3–7, 1.5–3 cm
..... 22b. var. *tunshanica*

22a. *Ferula licentiana* var. *licentiana*

太行阿魏(原变种) tai hang a wei (yuan bian zhong)

Plants 120–180 cm. Rays 7–11, 3–5 cm. Fruit 10–15 mm; vittae 3–4 in each furrow, 4–8 on commissure.

• Sunny mountain slopes; 1200–2100 m. N Henan, S Shaanxi (Qin Ling), E Shanxi (Taihang Shan).

22b. *Ferula licentiana* var. *tunshanica* (S. W. Su) R. H. Shan & Q. X. Liu, Bull. Nanjing Bot. Gard. Mem. Sun Yat Sen 1987: 37. 1987.

铜山阿魏 tong shan a wei

Ferula tunshanica S. W. Su, Fl. Jiangsu. 2: 584, 935. 1982.

Plants 60–120 cm. Rays 3–7, 1.5–3 cm. Fruit 7–10 mm; vittae 1–3 in each furrow, 4–6 on commissure.

• Mountain slopes; 100–200 m. EC Anhui (Dingyuan), NW Jiangsu (Suining, Tongshan), W Shandong (Jinan).

23. *Ferula karataviensis* (Regel & Schmalhausen) Korovin ex Pavlov, Index Sem. Hort. Bot. Univ. As. Med. 191. 1926.

短柄阿魏 duan bing a wei

Peucedanum karataviense Regel & Schmalhausen, Trudy Imp. S.-Peterburgsk. Bot. Sada 5: 598. 1878.

Plants 0.5–1 m. Root cylindrical, with spherical tuberous swellings. Stem corymbose-branched above, branches alternate. Basal leaves sessile or short-petiolate with expanded sheaths; blade triangular-ovate, ternate-2–3-pinnatisect; ultimate segments broadly elliptic, usually pinnately parted, lobules lanceolate, ca. 5 mm, roughened, both surfaces sparsely hispid, apex mucronate. Terminal umbel pedunculate or sessile, lateral umbels 2–3, opposite or verticillate, rarely single, long-pedunculate, exceeding terminal; bracts subulate, deciduous; rays 4–10, unequal; bracteoles subulate, deciduous; umbellules 4–15-flowered. Stylopodium low-conic, base dilated. Fruit ellipsoid, ca. 8 mm; vittae 1 in each furrow, large, 2 on commissure. Fl. and fr. May–Jul.

Gravelly slopes; 1100–1700 m. W Xinjiang (Xinyuan) [C Asia (Altay, Pamir, Tian Shan)].

24. *Ferula feruloides* (Steudel) Korovin, Monogr. Ferula, 77. 1947 [“*ferulaeoides*”].

多伞阿魏 duo san a wei

Peucedanum feruloides Steudel, Nomencl. Bot., ed. 2, 2: 311. 1841 [“*ferulaeoides*”].

Plants 1–1.5 m. Root fusiform. Stem stout, solitary, rarely 2–4, sparsely pubescent, paniculate-branched from middle, branches verticillate, occasionally alternate. Basal leaf blade broadly ovate, ternate-4-pinnate/pinnatifid; ultimate segments ovate, ca. 10 mm, usually parted, lobules entire or toothed, densely pubescent, deciduous. Inflorescence copiously cymose-branched, often several simple umbels successively verticillate on the same branch, forming a crowded moniliform ra-

cence; umbels ca. 2 cm across; bracts absent; rays 4, subequal; bracteoles small, deciduous; umbellules ca. 10-flowered. Stylopodium depressed-conic. Fruit ellipsoid, 3–7 × 1.5–3 mm; vittae 1 in each furrow, 2 on commissure. Fl. May, fr. Jun.

Desert gravels; 400–1100 m. NC Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia (Siberia), Uzbekistan].

In C Asia the leaves are harvested for cattle fodder, and the plants have reputed medicinal value, presumably as a regional substitute for the traditional Chinese medicine “a wei” (*Ferula assafoetida* Linnaeus).

25. *Ferula caspica* Marschall von Bieberstein, Fl. Taur.-Caucas. 1: 220. 1808.

里海阿魏 li hai a wei

Peucedanum caspicum (Marschall von Bieberstein) Link.

Plants 30–60 cm. Root fusiform; caudex branched. Stem single, rarely 2–3, slender, 2 × paniculate-branched, branches alternate, branchlets opposite or alternate. Basal leaves short-petiolate; blade broadly ovate, 3-pinnate/pinnatifid; ultimate segments ovate, usually lobed, lobules lanceolate, both surfaces roughened, hispid, apex acute, deciduous. Compound umbels terminal, simple umbels lateral on branches and branchlets, 1–3, opposite or verticillate, umbels 1.5–3 cm across; bracts and bracteoles absent; rays 1–6, subequal; umbellules 8–10(–15)-flowered. Stylopodium low-conic, base dilated; styles elongate. Fruit ellipsoid, ca. 4–5(–9) × 3–4(–7) mm; lateral ribs narrowly winged; vittae 1 in each furrow, 2 on commissure. Fl. and fr. May–Jul.

Rock crevices on low mountain slopes; 500–1800 m. N Xinjiang [Kyrgyzstan, W Mongolia, Russia (Siberia), Uzbekistan; C and SW Asia].

26. *Ferula dubjanskyi* Korovin ex Pavlov, Fl. Kazakhstana 2: 539. 1934.

沙生阿魏 sha sheng a wei

Ferula dshaudshamyr Korovin.

Plants 50–70 cm. Stem solitary, 2 × paniculate-branched. Leaf blade broadly elliptic, 3-pinnate/pinnatifid; ultimate segments elliptic, 5–10 mm, usually lobed or toothed, adaxially glabrous, abaxially densely pubescent. Compound umbels terminal on stem and branches, simple umbels lateral on branches and branchlets, 1–2, solitary or opposite; umbels 1–4 cm across; bracts and bracteoles absent; rays 2–7, subequal; umbellules 6–10-flowered. Stylopodium low-conic, base dilated, margins undulate; styles elongate. Fruit ellipsoid, 4–6 × 2–4 mm; lateral ribs narrowly winged, wings whitish; vittae 1 in each furrow, 2 on commissure. Fl. and fr. Jun–Jul.

Sandy slopes in deserts; 400–600 m. N Xinjiang (Altay) [Kazakhstan, Kyrgyzstan, W Mongolia, Uzbekistan; C Asia].

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