

52. ACHNATHERUM P. Beauvois, Ess. Agrostogr. 19, 146. 1812.

芨芨草属 *ji ji cao shu*

Lasiagrostis Link; *Stipa* sect. *Lasiagrostis* (Link) Hackel; *Timouria* Roshevitz.

Perennials, usually tussocky. Leaf blades linear to setaceous, flat or rolled. Inflorescence an open or contracted panicle, sometimes almost spikelike. Spikelets with 1 floret, bisexual, disarticulating above glumes; rachilla extension absent; glumes lanceolate to elliptic-oblong, subequal or slightly unequal, a little longer than floret, membranous, 1–3(–5)-veined, apex obtuse to acuminate; callus short, obtuse or acute, not pungent, shortly bearded; lemma lanceolate, terete, usually papery, sometimes becoming somewhat indurate at maturity, 3–5-veined, pilose, margins typically approximate, sometimes overlapping, apex shortly 2-toothed, awned from between teeth; awn persistent or deciduous, straight or 1(or 2)-geniculate with twisted column, scabrid throughout or column minutely hairy; palea midline often exposed between lemma margins. Lodicules 3, lanceolate. Stamens 3, anthers often with hair tufts at apex. Stigmas 2.

About 50 species: N Africa, Europe eastward to Japan, North America; 18 species (six endemic) in China.

Achnatherum is sometimes included within a more broadly defined *Stipa*, mainly because of the difficulty in placing the group of species around *A. sibiricum*, which are intermediate in their characteristics. Some species, including *A. inebrians*, are poisonous to livestock.

- 1a. Awn straight or slightly curved, without obvious column, very indistinctly twisted below, usually falling early.
 - 2a. Leaf blades 1–2 cm wide; glumes 7–9-veined 1. *A. coreanum*
 - 2b. Leaf blades 0.1–1 cm wide; glumes 1–3-veined.
 - 3a. Culms usually more than 1 m; ligule of culm leaves 5–17 mm.
 - 4a. Lemma pilose throughout; awn 0.5–1.2 cm 2. *A. splendens*
 - 4b. Lemma pilose along lateral veins; awn 0.2–0.4 cm 3. *A. breviaristatum*
 - 3b. Culms less than 1 m; ligule of culm leaves 0.2–1 mm.
 - 5a. Panicle spikelike, 4–7 cm; glumes keeled; awn ca. 0.4 cm 4. *A. saposhnikovii*
 - 5b. Panicle open or contracted, 7–30 cm; glumes rounded on back; awn 0.4–2 cm.
 - 6a. Lemma pubescent below, a conspicuous tuft of longer hairs below apex; awn 1.5–2 cm 5. *A. inaequiglume*
 - 6b. Lemma evenly pubescent; awn 0.4–1.2 cm.
 - 7a. Ligule 0.5–1 mm 6. *A. caragana*
 - 7b. Ligule 0.1–0.2 mm or absent.
 - 8a. Densely tufted, without rhizome; leaf blades 1–2 mm wide; branches of panicle 2 per node; awn 0.4–0.8 cm 7. *A. chinense*
 - 8b. Loosely tufted, shortly rhizomatous; leaf blades 3–10 mm wide; branches of panicle 3–4 per node; awn 0.8–2 cm 8. *A. henryi*
 - 1b. Awn clearly geniculate with twisted column, persistent (caducous in *A. psilatherum*).
 - 9a. Culms slender, less than 1 m tall, 1–1.5 mm in diam.; leaf blades usually rolled, 0.5–2(–4) mm wide.
 - 10a. Spikelets 7.5–14 mm; lemma pilose below middle; awn with pubescent column.
 - 11a. Anthers 2–2.5 mm, often glabrous 9. *A. chingii*
 - 11b. Anthers 2.8–4.5 mm, bearded 10. *A. duthiei*
 - 10b. Spikelets 5–7 mm; lemma pilose throughout; awn scabrid throughout.
 - 12a. Panicle contracted, branches suberect, spiculate to base.
 - 13a. Awn 2–3 cm, persistent; anthers 2.8–3.5 mm 11. *A. Jacquemontii*
 - 13b. Awn 1.5–1.8 cm, caducous; anthers 2–2.5 mm 12. *A. psilatherum*
 - 12b. Panicle lax, branches spreading, bare in lower part; awn 1–1.5 cm 13. *A. nakaii*
 - 9b. Culms fairly robust, up to 1.5 m tall, 1.5–4 mm in diam.; leaf blades often flat, 2–10 mm wide.
 - 14a. Lemma 4–4.2 mm; panicle densely contracted, spikelike 14. *A. inebrians*
 - 14b. Lemma 4.5 mm or more; panicle open or contracted.
 - 15a. Leaf sheaths scabrid; culms scabrid below panicle; leaf blades pubescent; glumes puberulous 15. *A. pubicalyx*
 - 15b. Leaf sheaths smooth; culms smooth; leaf blades smooth or scabrid; glumes glabrous, smooth or asperulous.
 - 16a. Panicle densely contracted, branches with spikelets to base; leaf blades often convolute, 0.3–0.7 mm wide; callus acute, 0.5–1 mm 16. *A. sibiricum*
 - 16b. Panicle open or loosely contracted, branches often bare below middle; leaf blades flat, up to 1 cm wide; callus obtuse, 0.3–0.5 mm.
 - 17a. Awn 20–25 mm 17. *A. pekinense*
 - 17b. Awn 10–18 mm 18. *A. brandisii*

1. *Achnatherum coreanum* (Honda) Ohwi, J. Jap. Bot. 17: 404. 1941.

大叶直芒草 da ye zhi mang cao

Stipa coreana Honda, Koryo Shikerin No Ippan: 80. 1932; *Orthoraphium coreanum* (Honda) Ohwi; *Orthoraphium grandifolium* (Keng) Keng ex P. C. Kuo; *Patis coreana* (Honda) Ohwi; *Stipa grandifolia* Keng.

Perennial from a short knotty rhizome. Culms solitary or few, stiffly erect, up to 1 m tall, 2–3 mm in diam., 7–8-noded. Leaves all cauline; leaf sheaths usually longer than internodes, scabrid or puberulous, pilose at collar; leaf blades linear-lanceolate, flat, 10–35 × 1–2 cm, scaberulous or puberulous especially on abaxial surface, base attenuate, apex finely acuminate; ligule 0.5–2 mm, truncate, erose. Panicle linear, 20–35 cm; branches single or paired, simple, puberulous. Spikelets gray-green or dark-green; glumes lanceolate, subequal, 13–15 mm, herbaceous, 7–9-veined with transverse veinlets, apex acuminate; callus obtuse, ca. 1 mm; lemma 1–1.2 cm, indurate at maturity, evenly pubescent, margins overlapping, apex shortly 2-toothed, teeth minutely hairy; awn persistent, 2.5–3.5 cm, scabrid, slightly twisted with lateral grooves below, upper part flexuous. Lodicules 2, lanceolate, ca. 1.8 mm. Anthers 5–7 mm. Ovary villous below styles. Fl. and fr. Aug–Oct.

Hillsides, forests in mountain valleys, grassy places in gullies, near roads; 400–1500 m. Anhui, Hebei, Hubei, Jiangsu, Jiangxi, Shaanxi, Zhejiang [Japan, Korea].

This species has firmer glumes with more veins than usual, only 2 lodicules, and a distinctive hairy ovary. It has been placed in the genus *Orthoraphium*, but appears to have very little affinity with the single Himalayan member of that genus. It is also rather anomalous in *Achnatherum*, but is placed here until generic limits in *Stipeae* are better understood.

2. *Achnatherum splendens* (Trinius) Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 4: 224. 1937.

芨芨草 ji ji cao

Stipa splendens Trinius, Neue Entdeck. Pflanzenk. 2: 54. 1821; *S. altaica* Trinius; *S. schlagintweitii* Mez; *Lasiagrostis splendens* (Trinius) Kunth; *Stipa kokonorica* K. S. Hao.

Perennial, forming large dense tussocks; roots thick, tough, coated with sand; old basal sheaths fibrous. Culms stiff, erect, 0.5–2.5 m tall, 3–5 mm in diam., 2–3-noded. Leaf sheaths glabrous; leaf blades convolute, tough, 30–60 cm, 5–6 mm wide, abaxial surface smooth; ligule triangular, 5–10(–17) mm, acute. Panicle pyramidal, (15–)30–60 cm; branches 2–6 per node, ascending or spreading, 8–17 cm, lower part bare. Spikelets 4.5–7 mm, gray-green with purple-brown base; glumes unequal, elliptic, lower glume 4–5 mm, 1-veined, upper glume 6–7 mm, 3-veined, scabrid, apex acute or denticulate; callus obtuse, 0.3–0.6 mm; lemma 4.8–5.7 mm, scaberulous-puberulous, also evenly pilose with longer hairs, apex 2-toothed; awn 0.5–1.2 cm, caducous, straight or slightly curving and indistinctly twisted below, scabrid. Anthers 2.5–3.5 mm, bearded at apex. Fl. and fr. Jun–Sep.

Dry mountain slopes, grassy places on slightly alkaline, sandy

soil; 900–4500 m. Gansu, Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, N India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

This species tolerates high levels of salinity and is used for improving saline and alkaline land. It is also a good forage grass and a source of fiber.

3. *Achnatherum breviaristatum* Keng & P. C. Kuo, Fl. Tsinling. 1(1): 442. 1976.

短芒芨芨草 duan mang ji ji cao

Perennial, shortly rhizomatous; rhizomes clothed in smooth yellowish green scales. Culms erect, ca. 1.5 m tall, 2–3-noded. Leaf sheaths smooth or scaberulous, longer than internodes; leaf blades convolute, up to 50 cm, abaxial surface smooth, margins setosely scabrid; ligule oblong-lanceolate, up to 14 mm. Panicle contracted, ca. 30 cm; branches several per node, suberect, short, with spikelets to base; pedicels 2–10 mm, setulose. Spikelets 6–6.5 mm, yellowish green becoming purplish at base; glumes subequal, lanceolate-elliptic, lower glume ca. 6 mm, 5–7-veined at base, upper glume ca. 6.5 mm, often 5-veined at base, glabrous, apex acute; callus obtuse; lemma ca. 5 mm, pilose along lateral veins with long white hairs, apex shortly 2-toothed; awn 0.2–0.4 cm, straight. Anthers 3.5–4 mm, bearded at apex. Fl. Jun.

• Grassy places on mountain slopes, dry river valleys; ca. 2100 m. Gansu (Minxian).

4. *Achnatherum saposhnikovii* (Roshevitz) Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 4: 224. 1937.

钝基草 dun ji cao

Timouria saposhnikovii Roshevitz in B. Fedtschenko, Fl. Aziatsk. Ross. 12: 174. 1916; *Stipa saposhnikovii* (Roshevitz) Kitagawa.

Perennial, forming small tufts. Culms erect, 25–50 cm tall, 1–1.5 mm in diam., 2–3-noded. Leaf sheaths shorter than internodes, tightly overlapping, smooth; leaf blades convolute, setaceous, 5–15 cm, 1–2.5 mm wide, abaxial surface smooth; ligule 0.2–0.7 mm. Panicle linear, spikelike, dense, 3–7 × 0.6–0.8 cm; branches appressed to axis, 0.5–2 cm, scabrid, with spikelets to base. Spikelets 5–6 mm, yellowish green; glumes keeled, lanceolate, slightly unequal, lower glume 5–6 mm, upper glume 4.5–5 mm, prominently 3-veined, keel scabrid, apex finely acuminate; callus obtuse, ca. 0.3 mm, lemma elliptic, 2.5–3.5 mm, back pilose, apex 2-toothed, teeth ca. 0.2 mm; awn ca. 0.4 cm, caducous, straight or slightly twisted at base, scabrid. Anthers 1.6–2 mm, glabrous at apex. Fl. and fr. Jul–Sep.

Dry stony slopes, steppe regions; 1500–3500 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Uzbekistan].

This grass is distinctive in the genus on account of its keeled, prominently 3-veined glumes. It is sometimes placed in the separate genus *Timouria*, but resembles *Achnatherum* in its elliptic floret and 2-toothed lemma.

5. *Achnatherum inaequiglume* Keng, Fl. Tsinling. 1(1): 443. 1976.

异颖芨芨草 *yi ying ji ji cao*

Perennial, densely tufted. Culms erect or geniculately ascending, 30–65 cm tall, 0.8–1 mm in diam., 2–3-noded. Leaf sheaths shorter than internodes, glabrous or upper part often puberulous; leaf blades filiform, up to 20 cm, abaxial surface smooth; ligule 0.5–1 mm, truncate or toothed. Panicle contracted, oblong in outline, moderately dense, 7–13 cm; branches ascending, 0.5–3 cm, with spikelets to base; pedicels scaberulous-puberulous. Spikelets greenish or grayish; glumes lanceolate, unequal, lower glume 7–8 mm, upper glume 5–6 mm, membranous, 3-veined, scabrid especially along midvein, lower margins sometimes sparsely pilose, apex acuminate; callus obtuse, ca. 0.3 mm; lemma 3–4 mm, densely pubescent, a conspicuous brush of longer 3–4 mm hairs below apex, apex shortly 2-toothed; awn 1.5–2 cm, lower 1/4–1/3 curved and obscurely twisted, scabrid. Anthers 2–2.5 mm, glabrous at apex. Fl. and fr. Jul–Sep.

- Dry mountain slopes; 900–2200 m. Gansu, Sichuan.

6. *Achnatherum caragana* (Trinius) Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 4: 337. 1937.

小芨芨草 *xiao ji ji cao*

Stipa caragana Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 1: 74. 1831; *Lasiagrostis caragana* (Trinius) Trinius & Ruprecht; *Oryzopsis asiatica* Mez.

Perennial, densely tufted; roots sometimes coated in sand. Culms erect, 50–90 cm tall, 1.5–3 mm in diam., 3–5-noded. Leaf sheaths shorter than internodes, smooth or scabrid; leaf blades gray-green, flat or convolute and setaceous, 15–30 cm, 1–2.5 mm wide, abaxial surface smooth except toward apex; ligule truncate, 0.5–1 mm. Panicle open, lax, 15–30 cm; branches 2–5 per node, ascending to divaricate, 5–13 cm, bare in lower part, spikelets crowded above. Spikelets 4.2–5.5 mm, pale green; glumes subequal, elliptic, membranous becoming hyaline upward, lower 1–3-veined, upper 3-veined, apex acute; callus obtuse, 0.2–0.3 mm; lemma narrowly elliptic, 3–4 mm, densely appressed-pilose, apex minutely 2-toothed; awn caducous, 0.7–1.2 cm, flexuous or almost straight, indistinctly twisted below, scabrid. Anthers 1.5–2 mm, apex bearded or glabrous. Fl. and fr. Jun–Aug.

Dry rocky or stony slopes; 900–1200 m. Xinjiang [Afghanistan, Kazakhstan, Pakistan, Russia, Tajikistan; SW Asia (Caucasus, Iran, E Turkey)].

7. *Achnatherum chinense* (Hitchcock) Tzvelev, Rast. Tsentr. Azii 4: 40. 1968.

中华芨芨草 *zhong hua ji ji cao*

Oryzopsis chinensis Hitchcock, Proc. Biol. Soc. Washington 43: 92. 1930; *Piptatherum parviflorum* Roshevitz.

Perennial, usually densely tufted. Culms erect, 30–80 cm tall, ca. 1 mm in diam., 2–4-noded. Leaf sheaths glabrous or ciliolate along mouth and margins, shorter than internodes; leaf

blades mainly basal, usually rolled, filiform, 10–30 cm, 1–2 mm, abaxial surface smooth or scabrid along veins, adaxial surface and margins scabrid; ligule 0.1–0.2 mm. Panicle open, ovate in outline, sometimes nodding, 12–15 cm; branches usually 2 per node, distant, slender, 5–7 cm, spikelets clustered toward apices. Spikelets 3.3–4.5 mm, green; glumes subequal, lanceolate, hyaline, 3–5-veined, lateral veins not extending to apex, apex acute or denticulate; callus obtuse, ca. 0.15 mm; lemma elliptic, 2–3 mm, leathery, dark brown at maturity, densely pubescent, margins overlapping at least toward apex, apex shortly 2-toothed; awn caducous, 0.4–0.8 cm, very weakly geniculate column slightly twisted. Anthers ca. 1.8 mm, minutely bearded at apex.

- Dry mountain slopes, grassy roadsides, forest fringes; 500–2400 m. Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi.

8. *Achnatherum henryi* (Rendle) S. M. Phillips & Z. L. Wu, Novon 15: 475. 2005.

湖北芨芨草 *hu bei ji ji cao*

Perennial, loosely tufted from a short knotty rhizome. Culms erect or slightly geniculate, 40–95 cm tall, 3–4-noded. Leaf sheaths ciliolate at abaxial junction with blade, shorter or lower longer than internodes; leaf blades linear, usually flat, 6–30 cm, 3–10 mm wide, abaxial surface smooth, adaxial surface and margins scaberulous, base narrowed, apex slenderly acuminate; ligule ca. 0.2 mm or absent. Panicle open to loosely contracted, 15–20 cm; branches 3–4 per node, capillary, 5–8 cm. Spikelets yellowish with green veins; glumes ovate-oblong, 3–4.5(–6) mm, hyaline, scabrid, 3-veined, veins prominent, distinct to apex, indistinct transverse veinlets present, apex apiculate or denticulate; callus thinly pilose; lemma elliptic-oblong, 2.5–3.5(–4) mm, subleathery, pallid, 3–5-veined, appressed pubescent, apex entire or emarginate; awn persistent, stout, flexuous, 0.8–1.2(–2) cm, very slightly twisted toward base. Anthers 1.5–2 mm, minutely bearded or glabrous at apex. Fl. Apr–Jun.

- Mountain slopes, forests, shady roadsides, moist places; 100–2500 m. Gansu, Guizhou, Henan, Hubei, Shaanxi, Sichuan, Yunnan.

The 3 prominent, green veins of the glumes are an obvious feature of the spikelet. They are linked above the middle by inconspicuous, transverse veinlets. The species has 3 lodicules (not 2, as given in the protologue), which sometimes have hairy tips.

- 1a. Glumes apiculate or denticulate, 3–4.5 mm; awn 0.8–1.2 cm 8a. var. *henryi*
- 1b. Glumes acuminate, 5–6 mm; awn 1.5–2 cm 8b. var. *acutum*

8a. *Achnatherum henryi* var. *henryi*

湖北芨芨草(原变种) *hu bei ji ji cao* (yuan bian zhong)

Stipa henryi Rendle, J. Linn. Soc., Bot. 36: 382. 1904; *Oryzopsis henryi* (Rendle) Keng ex P. C. Kuo.

Glumes 3–4.5 mm, apex apiculate or denticulate; lemma 2.5–3.5 mm, apex emarginate or entire; awn 0.8–1.2 cm. Anther apex bearded or glabrous. Fl. Apr–Jun.

• Forests on mountain slopes, shady roadsides, among rocks; 100–2300 m. Gansu, Hubei, Shaanxi, Sichuan.

8b. *Achnatherum henryi* var. *acutum* (L. Liu ex Z. L. Wu) S. M. Phillips & Z. L. Wu, *Novon* 15: 475. 2005.

尖颖芨芨草 jian ying ji ji cao

Oryzopsis henryi var. *acuta* L. Liu ex Z. L. Wu, *Acta Phytotax. Sin.* 19(4): 435. 1981; *Oryzopsis acuta* (L. Liu ex Z. L. Wu) L. Liu.

Glumes 5–6 mm, apex acuminate; lemma ca. 4 mm, apex entire; awn 1.5–2 cm. Anther apex slightly bearded. Fl. May.

• Moist places; ca. 2500 m. Yunnan.

9. *Achnatherum chingii* (Hitchcock) Keng, *Fl. Tsinling*. 1(1): 152. 1976.

细叶芨芨草 xi ye ji ji cao

Stipa chingii Hitchcock, *Proc. Biol. Soc. Washington* 43: 94. 1930.

Perennial, densely tufted. Culms erect, 40–70 cm tall, ca. 1.5 mm in diam., 2–3-noded. Leaf sheaths shorter than internodes, smooth; leaf blades filiform, convolute, soft, up to 25 cm, 0.5–1 mm wide, scabrid; ligule lanceolate, 2–4 mm, often 2-lobed or obtuse. Panicle open or loosely contracted, 10–20 cm; branches often paired, laxly ascending or lower spreading, lower part bare, upper part with few spikelets. Spikelets 7–12 mm, yellowish green or purple at base; glumes subequal, lanceolate-oblong, membranous, lower 7–8 mm, 1–3-veined, upper 8–10 mm, 3-veined, apex obtuse; callus obtuse or acute, 0.5–1 mm; lemma 6–8 mm, lower back pubescent, apex 2-toothed; awn persistent, 1–1.8 cm, 1(–2)-geniculate, column twisted, pubescent, bristle glabrous; palea slightly shorter than lemma. Anthers ca. 2 mm, glabrous or with a few hairs at apex. Fl. and fr. Jul–Sep.

• 2200–4000 m. Gansu, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan.

This taxon appears to differ from *Achnatherum duthiei* only in its shorter anthers. An examination of a sufficient quantity of specimens may show them to be the same species.

10. *Achnatherum duthiei* (J. D. Hooker) P. C. Kuo & S. L. Lu, *Fl. Reipubl. Popularis Sin.* 9(3): 322. 1987.

藏芨芨草 zang ji ji cao

Stipa duthiei J. D. Hooker, *Fl. Brit. India* 7: 232. 1896 [“1897”]; *Achnatherum chingii* var. *laxum* S. L. Lu.

Perennial, densely tufted. Culms erect, 50–80 cm tall, 1–2 mm in diam., 3–4-noded. Leaf sheaths smooth or scaberulous; leaf blades narrowly linear to setaceous, thin, flat or convolute when dry, 10–30 × 0.1–0.25 cm, abaxial surface smooth; ligule of culm leaves oblong, 2–2.5 mm. Panicle open or loosely contracted, 10–25 cm; branches paired, 3–10 cm, pairs distant, laxly ascending or lower spreading, few spiculate, bare in lower part. Spikelets 9–14 mm, pale yellowish, base brownish purple; glumes subequal, lanceolate, membranous, lower 3–5-veined, upper 5-veined, apex hyaline, acuminate; callus acute, 0.5–0.8 mm; lemma 7(–9) mm, back loosely pilose below middle, gla-

brous or sparsely pubescent above, apex 2-toothed, teeth 0.5–1 mm; awn 1.4–1.8 cm, persistent, delicate, weakly 1-geniculate, column loosely twisted, pubescent, bristle scabrid; palea as long as lemma. Anthers 3–4.5 mm, bearded at apex. Fl. and fr. Jul–Sep.

Mountain shrubland and in coniferous forest; 2500–4500 m. Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [N India, Kashmir, Nepal].

11. *Achnatherum jacquemontii* (Jaubert & Spach) P. C. Kuo & S. L. Lu, *Fl. Reipubl. Popularis Sin.* 9(3): 323. 1987.

干生芨芨草 gan sheng ji ji cao

Stipa jacquemontii Jaubert & Spach, *Ill. Pl. Orient.* 4: 60. 1851; *Lasiagrostis jacquemontii* (Jaubert & Spach) Munro ex Boissier; *Stipa sibirica* Linnaeus var. *pallida* J. D. Hooker.

Perennial, densely tufted from tough rootstock. Culms wiry, 30–70 cm tall, 1–1.5 mm in diam., 2–4-noded. Leaf sheaths glabrous, lower longer than internodes; leaf blades setaceous, convolute, 10–25 cm, ca. 0.8 mm wide, abaxial surface smooth, adaxial surface pubescent; ligule truncate, ca. 0.3 mm. Panicle contracted, narrow, 10–20 cm; branches 2 to several per node, laxly suberect, delicate, 2–7 cm, with spikelets to base. Spikelets 5–7 mm, greenish or purplish; glumes subequal, elliptic-lanceolate, 3-veined, membranous, smooth, apex acute; callus obtuse, 0.3–0.4 mm; lemma 4–5 mm, membranous, pilose throughout, apex 2-toothed, teeth 0.3–0.4 mm; awn persistent, 2–3 cm, very fine, weakly 2-geniculate, column twisted, scabrid throughout; palea 2/3 length of lemma. Anthers 2.8–3.5 mm, bearded at apex. Fl. and fr. Jul–Sep.

Dry mountain slopes, especially in rock crevices; ca. 3300 m. Xizang [E Afghanistan, NW India, Kashmir, N Pakistan].

This is a well-defined species from rocky places in the W Himalayas. *Achnatherum duthiei* has a similar but wider distribution. Besides the key characters, *A. jacquemontii* can also be distinguished from *A. duthiei* by its short ligule, whorls of panicle branches bearing more spikelets, and shorter palea.

12. *Achnatherum psilanthrum* Keng ex Tzvelev, *Rast. Tsentr. Azii* 4: 41. 1968.

光药芨芨草 guang yao ji ji cao

Perennial, densely tufted. Culms erect, 40–100 cm tall, 1–1.5 mm in diam., 2–3-noded. Leaf sheaths smooth, shorter than internodes; leaf blades filiform, to 12 cm, to 0.5 mm wide, surfaces smooth or scaberulous; ligule truncate, 0.1–0.5 mm, often toothed. Panicle loosely contracted, narrowly oblong in outline, 5–15 cm; branches 2 to several per node, suberect or slightly spreading, delicate, up to 2.5 cm. Spikelets 6–7 mm, purple with pale hyaline apices; glumes subequal or lower glume slightly shorter, lanceolate, 3-veined, apex acuminate to a fine point; callus subacute, ca. 0.3 mm; lemma 3.8–4.5 mm, densely pubescent, apex subentire; awn caducous, 1.5–1.8 cm, 1-geniculate, scabrid, column weakly twisted; palea as long as lemma. Anthers 2–2.5 mm, glabrous at apex. Fl. and fr. Jun–Sep.

• Grassy and rocky mountainsides, river banks, floodlands; 2000–4100 m. Gansu, Qinghai, Sichuan.

13. *Achnatherum nakaii* (Honda) Tateoka ex Imzab in Ma et al., Fl. Intramangol. 7: 196. 1983.

朝阳芨芨草 chao yang ji ji cao

Stipa nakaii Honda, Rep. First Sci. Exped. Manchoukuo, Sect. IV, 4: 104. 1936; *S. roerichii* Keng.

Perennial, densely tufted; roots sometimes coated with sand. Culms erect, 40–60 cm tall, 1–1.2 mm in diam., 2–3-noded. Leaf sheaths smooth or sparsely pubescent, lower longer than internodes; leaf blades setaceous, 10–30 cm, 1–4 mm wide, smooth or scabrid along margins; ligule truncate, 0.5–1 mm, lacerate. Panicle fairly loose, 12–25 cm; branches 2–3 per node, ascending or widely spreading at maturity, scabrid, lower part bare. Spikelets 5–6.5 mm, yellowish green or brownish purple; glumes oblong-lanceolate, subequal or lower glume slightly shorter, 3-veined, puberulous, acute; callus obtuse, ca. 0.5 mm; lemma firm, 4.5–5 mm, densely pubescent; awn persistent, 1–1.5 cm, weakly 1(or 2)-geniculate, scabrid throughout. Anthers 3–4 mm, glabrous or with a few hairs at apex. Fl. and fr. Jul–Sep.

Grassy places on mountain slopes, floodlands; 1200–1700 m. Hebei, Liaoning, Nei Mongol, Shanxi [Mongolia].

This species appears to be a small-spiculate member of the *Achnatherum sibiricum-pekinense* complex. The type has not been seen.

The combination *Achnatherum nakaii* has usually been attributed to Tateoka (J. Jap. Bot. 30: 208. 1955), but it was not validly published there because Tateoka made no reference to Honda's basionym.

14. *Achnatherum inebrians* (Hance) Keng ex Tzvelev, Rast. Tsentr. Azii 4: 40. 1968.

醉马草 zui ma cao

Stipa inebrians Hance, J. Bot. 14: 212. 1876.

Perennial, tussocky. Culms erect, (40–)60–100 cm tall, 2.5–4 mm in diam., 3–4-noded, nodes dark, puberulous below. Leaf sheaths smooth; leaf blades linear, flat or convolute at margins, 8–15(–30) cm, 2–5(–10) mm wide, abaxial surface granular-scaberulous, apex finely acuminate; ligule truncate, 0.5–1.2 mm. Panicle densely contracted, almost spikelike, narrowly oblong in outline, interrupted below, 10–25 cm; branches up to 5 per node, erect, densely clothed with spikelets. Spikelets 5–6 mm, gray-green or purplish, tinged bronze at maturity; glumes subequal, lanceolate, 3-veined, asperulous, midrib scabrid, apex acute or obtuse and denticulate; callus acute, ca. 0.5 mm; lemma 4–4.2 mm, firm, dark brown at maturity, pilose, hairs slightly longer upward, increasing to 1.1–1.3 mm around awn base, apex shortly 2-toothed; awn tardily deciduous, stiff, 1–1.3 cm, 1-geniculate, column minutely pubescent, bristle scabrid. Anthers ca. 2 mm, bearded at apex. Fl. and fr. Jul–Sep.

Upland steppes, grassy mountainsides, roadside bordering fields, floodlands; 1700–4200 m. Gansu, Nei Mongol, Ningxia, Qinghai, Sichuan, Xinjiang, Xizang [Mongolia].

This grass is reported to cause intoxication in cattle.

15. *Achnatherum pubicalyx* (Ohwi) Keng, Fl. Tsinling. 1(1): 153. 1976.

毛颖芨芨草 mao ying ji ji cao

Stipa pubicalyx Ohwi, J. Jap. Bot. 17: 401. 1941; *Achnatherum pekinense* subsp. *pubicalyx* (Ohwi) T. Koyama.

Perennial, loosely tufted, scaly buds at base. Culms erect, 60–100 cm tall, scabrid under panicle, 3–4-noded. Leaf sheaths scabrid, lower longer than internodes; leaf blades flat, often involute at margins, up to 40 cm, 3–5 mm wide, adaxial surface densely pubescent, abaxial surface scabrid, apex finely acuminate; ligule truncate, ca. 1 mm. Panicle slightly contracted, 15–25 cm; branches 2–4 per node, ascending, with spikelets to base. Spikelets 8–9 mm, purple or brownish; glumes subequal or upper glume slightly longer, elliptic-oblong, 3-veined, appressed-puberulous, apex acute or obtuse; callus subacute, ca. 0.8 mm; lemma narrowly lanceolate, 6–7 mm, leathery, pilose, margins overlapping and enclosing palea, apex very slightly lobed; awn persistent, 2–2.5 cm, 1-geniculate, column twisted, minutely hispidulous, bristle scabrid. Anthers 4–5 mm, bearded at apex. Fl. and fr. Jul–Sep.

Grassy mountain slopes, forests; 600–2700 m. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol, Qinghai, Shaanxi, Shanxi, Xinjiang [Korea].

This taxon is a pubescent variant of the *Achnatherum sibiricum-pekinense* complex and is sometimes included within *A. pekinense*.

16. *Achnatherum sibiricum* (Linnaeus) Keng ex Tzvelev, Probl. Ekol. Geobot. Bot. Geogr. Florist. 140. 1977.

羽茅 yu mao

Avena sibirica Linnaeus, Sp. Pl. 1: 79. 1753; *Achnatherum avenoides* (Honda) Y. L. Chang; *A. confusum* (Litvinov) Tzvelev; *A. sibiricum* var. *qinghaiense* Y. J. Wang; *Stipa avenoides* Honda; *S. confusa* Litvinov; *S. sibirica* (Linnaeus) Lamarck.

Perennial, loosely tufted, scaly buds at base. Culms erect, 60–150 cm tall, 1.7–3 mm in diam., smooth, 3–4-noded. Leaf sheaths smooth, lower longer than internodes; leaf blades usually convolute, occasionally flat, 20–60 cm, 3–7 mm wide, abaxial surface smooth, adaxial surface scaberulous, sometimes also pilose, apex finely acuminate; ligule truncate, 0.5–2 mm. Panicle contracted, often dense, 10–30(–60); branches 3 to several per node, suberect or narrowly ascending, with spikelets to base. Spikelets 7–10 mm, yellowish green or purple; glumes subequal, elliptic-oblong, 3-veined, smooth or scaberulous, often scabrid-spinulose on midvein, apex acute or denticulate; callus acute, 0.5–1 mm; lemma narrowly lanceolate, leathery, 5–8 mm, densely pilose, hairs slightly longer upward, 1–2 mm at awn base, margins overlapping and enclosing palea, apex entire; awn persistent, 1.5–2.5 cm, 1(or 2)-geniculate, column twisted, minutely hispidulous, bristle scabrid. Anthers ca. 4 mm, bearded at apex. Fl. and fr. Jul–Sep.

Grassy mountain slopes, forest fringes, roadsides; 600–3400 m. Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan; [Mongolia, Kazakhstan, Kyrgyzstan, Russia, Uzbekistan; SW Asia (Caucasus)].

Achnatherum sibiricum, *A. brandisii*, *A. pekinense*, *A. pubicalyx*, and probably *A. nakaii* form a complex of rather ill-defined, intergrading species. The complex lies on the boundary between *Stipa* and

Achnatherum. The leathery, convolute lemma enclosing the palea and almost entire lemma apex are typical of *Stipa*, whereas the short glumes scarcely exceeding the floret, non-pungent callus, and persistent awn are characters of *Achnatherum*. The poisonous properties reported for some members of this complex are due to the presence of cyanogenic glycosides.

Besides the key characters, typical *Achnatherum sibiricum* is distinguished from *A. pekinense* by the entire lemma apex and the slightly longer lemma hairs around the base of the awn. *Achnatherum sibiricum* var. *qinghaiense* is said to be distinguished by obtuse glumes and an obtuse callus. The type has not been seen.

17. *Achnatherum pekinense* (Hance) Ohwi, Bull. Natl. Sci. Mus. 33: 66. 1953.

京芒草 jing mang cao

Stipa pekinensis Hance, J. Bot. 15: 268. 1877; *Achnatherum effusum* (Maximowicz) Y. L. Chang; *A. extremiorientale* (H. Hara) Keng; *A. pekinense* subsp. *effusum* (Maximowicz) T. Koyama; *S. extremiorientalis* H. Hara; *S. japonica* (Hackel) Hackel; *S. sibirica* (Linnaeus) Lamarck var. *effusa* Maximowicz; *S. sibirica* var. *japonica* Hackel.

Perennial, loosely tufted, scaly buds at base. Culms erect, 60–150 cm tall, 1.8–3 mm in diam., 3–4-noded. Leaf sheaths smooth, lower longer than internodes; leaf blades linear or broadly linear, flat or margins inrolled, 20–50 cm, 4–10 mm wide, abaxial surface smooth, adaxial surface and margins scabrid, apex finely acuminate; ligule truncate, 1–1.5 mm. Panicle open, sometimes effuse, 12–40 cm; branches 2–4 per node, bare below middle. Spikelets 8–13 mm, yellowish green or purplish; glumes subequal or lower glume slightly longer, elliptic-oblong, 3-veined, smooth, glabrous, apex of lower glume acuminate, of upper glume acute or denticulate; callus obtuse, 0.3–0.5 mm; lemma narrowly lanceolate, 5–7 mm, leathery, pilose, hairs slightly longer upward, 0.6–1.2 mm at awn base, margins overlapping and enclosing palea, apex very shortly toothed; awn persistent, stiff, 2–3 cm, 1-geniculate,

column twisted, minutely hispidulous, bristle scabrid. Anthers 4–6 mm, bearded at apex. Fl. and fr. Jul–Oct.

Open forest, among shrubs, roadsides; 300–3600 m. Anhui, Gansu, Hebei, Heilongjiang Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Yunnan [Japan, Korea, E Russia].

This species is often confused with *Achnatherum sibiricum*, and intermediates appear to be common.

18. *Achnatherum brandisii* (Mez) Z. L. Wu, Acta Phytotax. Sin. 34: 154. 1996.

展序芨芨草 zhan xu ji ji cao

Stipa brandisii Mez, Repert. Spec. Nov. Regni Veg. 17: 207. 1921; *Stipa subeffusa* Ohwi.

Perennial, loosely tufted. Culms erect, 70–150 cm tall, 3–4-noded. Leaf sheaths smooth, lower longer than internodes; leaf blades usually flat, up to 40 cm, 4–10 mm wide, abaxial surface smooth, adaxial surface smooth or scabrid, apex finely acuminate; ligule truncate, up to 1 mm. Panicle open, 10–30 cm; branches usually 2 per node, laxly ascending to widely spreading at maturity, lower part bare or with spikelets to base. Spikelets 7–10 mm, pallid or green; glumes subequal, elliptic-oblong, 3-veined, midvein scabrid, apex acute or denticulate; callus obtuse, 0.3–0.5 mm; lemma narrowly lanceolate, 5.5–7.5 mm, leathery, pilose, hairs slightly longer below awn, margins overlapping and enclosing palea, apex rounded, not lobed; awn persistent, 1–1.8 cm, 1(or 2)-geniculate, column twisted, scabrid throughout. Anthers 4–5 mm, bearded at apex. Fl. and fr. Jul–Sep.

Forest fringes, grassy mountain slopes, riverine floodplains; 1500–3800 m. W Gansu, Qinghai, Sichuan, Xizang, Yunnan [Afghanistan, Bhutan, NW India, Nepal, Pakistan].

This species differs from *Achnatherum pekinense* in little more than its shorter awn and more westerly distribution. Further work may show that subspecific rank under *A. pekinense* is more appropriate. It is reputed to be poisonous to livestock.

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