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198. SORGHUM Moench, Methodus, 207. 1794, nom. cons., not *Sorgum* Adanson (1763).

高粱属 gao liang shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Andropogon subg. *Sorghum* Hackel.

Perennial or annual, with or without rhizomes. Culms usually robust, erect. Leaf blades linear to linear-lanceolate; ligule a ciliate membrane. Inflorescence a large terminal panicle with elongate central axis; primary branches simple or branched, bearing short dense racemes of paired spikelets; racemes fragile (tough in cultivated species); rachis internodes and pedicels slender, ciliate. Sessile spikelet dorsally compressed; callus obtuse, bearded, inserted into internode apex; lower glume usually leathery, shallowly convex, rounded on flanks, becoming 2-keeled and winged upward, usually hairy, apex membranous; upper glume boat-shaped, keeled upward; lower floret reduced to an empty hyaline lemma; upper lemma 2-toothed, awned from sinus or infrequently awnless; awn bigeniculate, glabrous. Lodicules ciliate. Pedicelled spikelet well developed or reduced to a glume, usually much narrower than sessile spikelet, awnless.

About 30 species: tropics and subtropics of the Old World, one species endemic to Mexico, otherwise introduced in America; five species (three introduced) in China.

The genus includes species of agricultural importance, including the tropical cereal sorghum, and several species grown for forage.

1a. Nodes of culm conspicuously bearded; panicle branches simple ..... 1. *S. nitidum*
1b. Nodes of culms glabrous or shortly pubescent; panicle branches subdivided.
2a. Plants with rhizomes; wild.
3a. Culms slender, 0.5–1.5 m tall; panicle lanceolate, 20–40 cm; sessile spikelet elliptic; lower glume apex clearly 3-denticulate ..... 2. *S. halepense*
3b. Culms robust, 1.5–3 m tall; panicle ovate, 30–55 cm; sessile spikelet ovate; lower glume apex apiculate or obscurely denticulate ..... 3. *S. propinquum*
2b. Plants without rhizomes; usually cultivated.
4a. Panicle rather lax; racemes usually tardily fragile at maturity; sessile spikelets elliptic, 6–7.5 mm; grain enclosed by the glumes ..... 4. *S. sudanense*
4b. Panicle often dense; racemes tough at maturity; sessile spikelets ovate to subrotund, 3.5–6 mm; grain large, exposed between the gaping glumes ..... 5. *S. bicolor*

1. Sorghum nitidum (Vahl) Persoon, Syn. Pl. 1: 101. 1805.

光高粱 guang gao liang

Holcus nitidus Vahl, Symb. Bot. 2: 102. 1791; *Andropogon nitidus* (Vahl) Kunth; *A. serratus* Thunberg var. *nitidus* (Vahl) Hackel; *Holcus fulvus* R. Brown; *H. fulvus* var. *nitidus* (Vahl) Honda; *Sorghum fulvum* (R. Brown) P. Beauvois; *S. nitidum* var. *fulvum* (R. Brown) Handel-Mazzetti.

Perennial forming loose tufts. Culms erect, 0.6–2 m tall; nodes bearded with pale spreading hairs. Leaf sheaths glabrous or pilose; leaf blades linear, 10–40(–50) × 0.4–1 cm, glabrous to hispid, bearded at base; ligule 1–1.5 mm. Panicle lanceolate in outline, 15–30 cm, glabrous but with soft hairs at the nodes; primary branches whorled, simple, flexuous, 2–5 cm, lower part bare; racemes borne at branch ends, fragile, composed of 2–4 spikelet pairs; internodes and pedicels brown-ciliate. Sessile spikelet ovate-lanceolate, 3.5–5 mm; lower glume leathery, black-brown at maturity, glossy, glabrous below middle, upper part and margins hispid with brown hairs; upper lemma awnless or awned; awn 1–1.5 cm. Pedicelled spikelet usually staminate, elliptic, 3–3.7 mm, papery, light brown. Fl. and fr. summer–autumn. $2n = 10, 20$.

Meadows, grassy hillsides; 300–1400 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Korea, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand; NE Australia, Pacific Islands].

This is a distinctive species not closely related to others found in China. It is easily recognizable by its conspicuously bearded nodes and small, blackish, glossy spikelets. It occurs in both awned and awnless forms.

2. Sorghum halepense (Linnaeus) Persoon, Syn. Pl. 1: 101. 1805.

石茅 shi mao

Holcus halepensis Linnaeus, Sp. Pl. 2: 1047. 1753; *Andropogon halepensis* (Linnaeus) Brotero; *A. sorghum* (Linnaeus) Brotero subsp. *halepensis* (Linnaeus) Hackel.

Perennial with vigorous spreading rhizomes. Culms 0.5–1.5 m tall, 4–6 mm in diam.; nodes puberulous. Leaf sheaths glabrous; leaf blades linear or linear-lanceolate, 25–80 × 1–4 cm, glabrous; ligule 0.5–1 mm, glabrous. Panicle lanceolate to pyramidal in outline, 20–40 cm, soft white hairs in basal axil; primary branches solitary or whorled, spreading, lower part bare, upper part branched, the secondary branches tipped by racemes; racemes fragile, composed of 2–5 spikelet pairs. Sessile spikelet elliptic, 4–5 mm; callus obtuse, bearded; lower glume

subleathery, often pale yellow or yellowish brown at maturity, shortly pubescent or glabrescent, 5–7-veined, veins distinct in upper part, apex 3-denticulate; upper lemma acute and mucronate or 2-lobed and awned; awn 1–1.6 cm. Pedicelled spikelet staminate, narrowly lanceolate, 4.5–7 mm, often violet-purple. Fl. and fr. summer–autumn. 2*n* = 40.

Introduced. Streams, valleys, waste ground, a weed in fields. Anhui, Fujian, Guangdong, Hainan, Sichuan, Taiwan, Yunnan [India, Kazakhstan, Kyrgystan, Nepal, Pakistan, Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, S Europe].

This species is thought to have originated in the Mediterranean region, but is now widely distributed as a serious weed in warm-temperate regions of the world. The forage known as Johnson Grass is a selection of *Sorghum halepense*. It introgresses with grain sorghum (*S. bicolor*) where both species grow together.

3. Sorghum propinquum (Kunth) Hitchcock, Lingnan Sci. J. 7: 249. 1931 ["1929"].

拟高粱 ni gao liang

Andropogon propinquus Kunth, Enum. Pl. 1: 502. 1833; *A. halepensis* (Linnaeus) Brotero var. *propinquus* (Kunth) Hackel; *A. sorghum* (Linnaeus) Brotero var. *propinquus* (Kunth) Hackel.

Perennial, loosely tufted with a few stout rhizomes. Culms 1.5–3 m tall, up to 1 cm in diam., many-noded; nodes puberulous. Leaf sheaths glabrous, ciliate at mouth and margins; leaf blades yellowish green, linear or linear-lanceolate, 40–90 × 3–5 cm, glabrous, midvein robust, margins ciliolate; ligule 0.5–1 mm, puberulous. Panicle open, ovate or broadly ovate, 30–55 cm; primary branches in whorls of 3–6; lower part bare, upper part branched, branches tipped by racemes; racemes fragile, composed of 3–7 spikelet pairs. Sessile spikelet ovate, 3.8–4.5 mm; callus obtuse, pubescent with pale hairs; lower glume subleathery, pale or purple-tinged, thinly pilose, 9–13-veined, veins distinct in upper part, apex acute to apiculate or tridenticulate; upper lemma acute or emarginate, awnless, rarely with short awn. Pedicelled spikelet staminate, linear-lanceolate, 4–5.5 mm, yellowish to pale purple. Fl. and fr. summer–autumn. 2*n* = 20.

Streamsides, moist places. Fujian, Guangdong, Hainan, Sichuan, Taiwan, Yunnan (Funing, Hekou) [S India, Indonesia, Malaysia, Philippines, Sri Lanka].

This species is closely related to *Sorghum halepense*, but is diploid, is larger with a more profuse panicle, and has a different geographic distribution. It is sometimes used for fodder. A form with larger (4.5–5 mm) sessile spikelets, *S. propinquum* var. *siamense* (Piper) Snowden, occurs from S India to Thailand, but has not been found in China.

4. Sorghum sudanense (Piper) Stapf in Prain, Fl. Trop. Africa 9: 113. 1917.

苏丹草 su dan cao

Andropogon sorghum subsp. *sudanensis* Piper, Proc. Biol. Soc. Washington 28(4): 33. 1915; *A. sudanensis* (Piper) Leppan & Bosman; *Sorghum vulgare* Persoon var. *sudanense* (Piper) Hitchcock.

Annual. Culms 1–2.5 m tall, 3–6 mm in diam. Leaf sheaths glabrous or pilose at mouth and base; leaf blades linear or linear-lanceolate; 15–30 × 1–3 cm, glabrous; ligule brown. Panicle lax, 15–30 × 6–12 cm; branches slender, branched; racemes usually tardily fragile at maturity, composed of 2–5 spikelet pairs. Sessile spikelet elliptic, 6–7.5 mm; callus hairy; lower glume leathery, thinner upward, thinly strigillose, distinctly 11–13-veined; upper lemma ovate or ovate-elliptic, apex 2-lobed, awned; awn 10–16 mm. Pedicelled spikelet male or barren, linear-lanceolate, persistent. Caryopsis elliptic or obovate-elliptic, 3.5–4.5 mm, enclosed within glumes. Fl. and fr. Jul–Sep. 2*n* = 20.

Naturalized. Anhui, Beijing, Fujian, Guizhou, Heilongjiang, Henan, Nei Mongol, Ningxia, Shaanxi, Xinjiang, Zhejiang [native to Africa; now widely cultivated for forage].

This taxon is a cultivated selection (Sudan Grass) from *Sorghum* ×*drummondii* (Steudel) Millspaugh & Chase. It originated in Africa, but is widely grown for forage and is now naturalized in China. *Sorghum* ×*drummondii* is a general name given to the wide variety of weedy forms that have arisen in Africa by hybridization between the cereal *S. bicolor* and its wild progenitor *S. arundinaceum* (Desvaux) Stapf.

5. Sorghum bicolor (Linnaeus) Moench, Methodus, 207. 1794.

高粱 gao liang

Holcus bicolor Linnaeus, Mant. Pl. 2: 301. 1771; *Andropogon bicolor* (Linnaeus) Roxburgh; *A. sorghum* (Linnaeus) Brotero; *A. sorghum* var. *technicus* Körnicke; *Holcus cernuus* Arduino; *H. dochna* Forsskål; *H. sorghum* Linnaeus; *Sorghum cernuum* (Arduino) Host; *S. dochna* (Forsskål) Snowden; *S. nervosum* Besser ex Schultes; *S. technicum* (Körnicke) Roshevitz; *S. vulgare* Persoon, nom. illeg. superfl.

Annual. Culms erect, robust, 3–5 m tall, 2–5 cm in diam.; nodes glabrous or pubescent. Leaf sheaths glabrous or slightly farinose; leaf blades linear or linear-lanceolate, 40–70 × 3–8 cm, glabrous; ligule subrounded, ciliate. Panicle very variable, lax or dense, cylindrical or pyramidal to obovate in outline, up to 60 cm, main axis elongate to very short; primary branches ascending or spreading, lower branches sometimes almost as long as panicle, stiff or pendulous; racemes tough at maturity, composed of 2–6 spikelet pairs. Sessile spikelet variable, broadly obovate to subglobose, 3.5–5.5 mm; callus hispid; lower glume leathery to papery, glabrous to pilose, pale creamy-green to dark brown or blackish at maturity, upper lemma usually awned; awn 0.4–1.5 cm. Pedicelled spikelet male or barren, linear-lanceolate, persistent or deciduous. Caryopsis large, often exposed between the gaping glumes. Fl. and fr. Jun–Sep. 2*n* = 20.

Cultivated in China [native to Africa; widely cultivated in the tropics].

Sorghum bicolor is the important, tropical cereal sorghum. Originating in Africa, its cultivation for both grain and fodder spread throughout the tropics and subtropics of the Old World. It was introduced with the slave trade to America, including warm parts of the United States. It is now cultivated throughout most of China.

There is a multiplicity of forms of cultivated sorghum, derived by human selection and all fully interfertile. Some forms have sweet culms. Many species names have been proposed in the past in an attempt to categorize this variation, but they represent no more than intergrading

cultivars within the common species pool.

The name *Holcus saccharatus* Linnaeus (*Sorghum saccharatum* (Linnaeus) Moench) has been identified as this species, but its application is uncertain (see Davidse & Turland in Taxon 50: 577–580. 2001) and the name has been formally rejected.

The principal races grown in China are as follows.

‘bicolor’

高粱 gao liang

Panicle loose with long branches, to 40 cm. Sessile spikelets broadly obovate; glumes leathery, glossy. Grain relatively small, enclosed within the glumes or only the top protruding.

Cultivated for grain; a primitive type.

‘cernuum’

弯头高粱 wan tou gao liang

Panicle elliptic or ovate-elliptic, dense, 8–20 cm, curved or erect. Sessile spikelets broadly ovate, whitish; glumes thin, papery, transversely wrinkled, densely white-villous to glabrescent. Grain pale, subrotund to orbicular, usually much flattened, protruding beyond the glumes.

Cultivated in Xinjiang for grain and forage.

‘dochna’

甜高粱 tian gao liang

Culms with sweet juice. Panicle elongate, to 50 cm; branches racemose or corymbose, the lower ones half as long as panicle or more. Sessile spikelets broadly elliptic to obovate; glumes crustaceous, striately veined above middle. Grain elliptic or elliptic-oblong, enclosed by the glumes or only slightly protruding.

Cultivated for grain and forage throughout most of China, including forms used for making brooms.

‘nervosum’

多脉高粱 duo mai gao liang

Panicle elongate, dense, elliptic in outline, to 40 cm. Sessile spikelets elliptic to broadly elliptic; glumes papery, prominently veined ± throughout. Grain broadly elliptic, protruding beyond the glumes.

Cultivated for grain, mainly in N China.

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