

177. PENNISETUM Richard, Syn. Pl. 1: 72. 1805.

狼尾草属 lang wei cao shu

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Gymnotrix P. Beauvois.

Annuals or perennials. Culms tufted or rhizomatous, prostrate to over 3 m tall. Leaf blades flat, folded or convolute; ligule a ciliate membrane. Inflorescence a spike-like panicle, cylindrical to subglobose; branches numerous, contracted into short clusters of one or more spikelets subtended by an involucre of bristles; involucre sessile or with a short basal stipe, deciduous with the spikelets at maturity leaving peduncle stumps or scars on the main axis; bristles slender, scabrous, sometimes plumose, simple or very rarely branched, very unequal, outer shorter, often innermost stouter and conspicuously exceeding the rest. Spikelets usually lanceolate, dorsally compressed, herbaceous, acute or obtuse, florets 2, glumes and lower lemma variable; glumes often small and not exceeding 1/2 spikelet length; lower lemma staminate or neuter, equaling spikelet or reduced; upper lemma equaling spikelet, herbaceous or indurated, obtuse to acute. $x = 9$.

About 80 species: throughout the tropics; 11 species (four endemic, four introduced) in China.

Pennisetum is a large and variable genus, but the bristly, spike-like inflorescence is always readily recognizable. The only other panicoid genus with a similar bristly inflorescence is *Setaria*, but in that genus the bristles are not deciduous with the spikelets, instead remaining on the rachis at maturity. The bristles are derived from reduced panicle branches.

Many species provide good forage. Several species, including *Pennisetum glaucum* in China, are used for food.

- 1a. Inflorescence reduced to 2–4 spikelets within the uppermost leaf sheath; low sward-forming perennial 1. *P. clandestinum*
- 1b. Inflorescence spike-like, clearly exerted above the leaves.
 - 2a. Bristles of involucre obviously branched above base 2. *P. lanatum*
 - 2b. Bristles of involucre unbranched or branched only at extreme base.
 - 3a. Inflorescence axis with sharp decurrent wings below each involucre; upper floret deciduous; bristles densely woolly with crinkled hairs 3. *P. polystachion*
 - 3b. Inflorescence axis not winged; upper floret persistent; bristles glabrous or hairs not crinkled, often tubercle-based.
 - 4a. Culms robust, often 2 m or more; upper lemma indurated in lower half, membranous toward apex; anthers with apical tuft of hairs.
 - 5a. Perennial; bristles longer than spikelets 4. *P. purpureum*
 - 5b. Annual; bristles shorter than spikelets 5. *P. glaucum*
 - 4b. Culms usually less than 1.5 m; upper lemma of uniform texture; anthers without apical tuft of hairs.
 - 6a. Involucres with a basal 2–3 mm stipe; bristles glabrous 6. *P. alopecuroides*
 - 6b. Involucres sessile or basal stipe less than 1 mm; bristles glabrous or plumose.
 - 7a. Inflorescence axis glabrous; plant with long spreading rhizomes.
 - 8a. Bristles equaling or longer than spikelets 7. *P. flaccidum*
 - 8b. Bristles shorter than spikelets (except longest) 8. *P. sichuanense*
 - 7b. Inflorescence axis puberulous to hirtellous; plant loosely tufted or base decumbent.
 - 9a. Bristles soft, numerous, plumose; leaf sheaths glabrous 9. *P. qianningense*
 - 9b. Bristles stiff, mostly in a single whorl, glabrous or thinly plumose; lower leaf sheaths papillose-pilose.
 - 10a. Leaf blades 1.2–2 cm wide; inflorescence 20–30 cm 10. *P. longissimum*
 - 10b. Leaf blades 0.2–1.2 cm wide; inflorescence less than 20 cm 11. *P. shaanxiense*

1. *Pennisetum clandestinum* Hochstetter ex Chiovenda, *Annuario Reale Ist. Bot. Roma* 8: 41. 1903.

铺地狼尾草 pu di lang wei cao

Perennial, low, sward forming with slender rhizomes and extensive, stouter, much branched stolons. Vegetative shoots up to 20 cm tall, flowering shoots compact, 2–4 cm tall. Leaf sheaths loose, imbricate, subinflated; leaf blades linear, up to 15 × 0.2–0.5 cm on vegetative shoots, 1–4 cm on flowering shoots; ligule ca. 1.2 mm. Inflorescence reduced to 2–4 spikelets enclosed within the uppermost leaf sheath, only spikelet tips en-

truding; bristles very delicate, 1/2–3/4 as long as spikelet, scaberulous to ciliolate. Spikelets linear-lanceolate, 13–20 mm, acuminate; lower glume absent; upper glume cufflike, 1–3 mm or sometimes absent; lower floret neuter, lower lemma as long as spikelet, 10–13-veined, palea absent; upper lemma similar; anthers long exerted on threadlike filaments up to 5 cm; stigma simple or shortly bifid, up to 3 cm. Fl. and fr. summer–autumn. $2n = 36$.

Naturalized. Taiwan, Yunnan [native to E Africa].

This is a most unusual species of *Pennisetum* with a highly reduced inflorescence. The bristles must be searched for within the upper-

most leaf sheaths. The anthers emerge at night on their long filaments and are visible in the morning as a grayish white haze over the sward.

This species is widely introduced in upland areas of the tropics and subtropics on fertile soils as a pasture and lawn grass (Kikuyu Grass). It has now become an invasive, difficult to eradicate weed in some parts of the world.

2. Pennisetum lanatum Klotzsch, Bot. Ergebn. Reise Walde-mar 65. 1862.

西藏狼尾草 xi zang lang wei cao

Perennial with extensive branching rhizomes clothed in cataphylls. Culms erect, 25–150 cm tall. Leaf sheaths usually pubescent; leaf blades linear, 10–45 × 0.4–1.3 cm, pubescent to villous or occasionally glabrous; ligule 1–2 mm. Inflorescence linear, 5–15 × 1.5–2.5 cm; axis loosely pubescent, with shallow angular ribs below the cupular involucre-scars; involucre enclosing 2–4 shortly pedicelled spikelets; bristles greenish, softly plumose, rarely almost glabrous, branched (often several times) above the base. Spikelets ovate-lanceolate, 4–5.5 mm; lower glume 1/3–2/5 as long as spikelet, 3-veined, subacute to rotund, rarely apiculate; upper glume 1/2 as long as spikelet, obtuse to apiculate; lower floret staminate, lemma as long as spikelet, acuminate; upper lemma slightly shorter than lower, acute; anthers without hairs at tip. Fl. and fr. Aug–Oct.

Dry mountain slopes; above 1500 m. W Xizang [Afghanistan, NW India, Kashmir, Nepal, Pakistan].

This is a distinctive species on account of its long, scaly rhizomes and branched bristles in the inflorescence.

3. Pennisetum polystachion (Linnaeus) Schultes, Mant. 2: 146. 1824.

牧地狼尾草 mu di lang wei cao

Panicum polystachion Linnaeus, Syst. Nat., ed. 10, 2: 870. 1759; *Cenchrus setosus* Swartz; *Panicum cenchroides* Richard; *P. erubescens* Willdenow; *Pennisetum purpurascens* Kunth; *P. setosum* (Swartz) Richard.

Short-lived perennial or annual. Culms much branched, 50–150 cm tall. Leaf blades linear, 10–20 × 0.3–1.5 cm, hispid. Inflorescence linear, 10–25 × 0.8–1 cm, yellow or purplish; axis angular with sharp decurrent wings below the involucre, these densely packed, often spreading at right angles at maturity; involucre with numerous bristles obscuring the single spikelet, densely ciliate in lower half with crinkled matted hairs, longest bristle 1–2 cm. Spikelet narrowly lanceolate, 3–4.5 mm; lower glume absent or a small triangular scale; upper glume as long as spikelet, 5-veined, obtuse, ciliolate, apiculate; lower floret staminate or neuter, lemma similar but slightly shorter, obtusely 3-lobed; upper floret 2/3 spikelet length, cartilaginous, smooth, shiny, readily deciduous at maturity; anthers without hairs at tip. $2n = 54$.

Naturalized. Hainan, Hong Kong, Taiwan [throughout the tropics].

This is a widespread and polymorphic species, sometimes cultivated for pasture or fodder. The soft, crinkled hairs around the spikelet and the deciduous upper floret are clear-cut characters for recognition.

4. Pennisetum purpureum Schumacher, Beskr. Guin. Pl. 44. 1827.

象草 xiang cao

Gymnotrix nitens Andersson; *Pennisetum benthamii* Steudel; *P. flexispica* K. Schumann; *P. hainanense* H. R. Zhao & A. T. Liu; *P. macrostachyum* Benth (1849), not (Brongniart) Trinius (1834); *P. nitens* (Andersson) Hackel.

Perennial forming large tussocks, often with short rhizomes. Culms robust, decumbent and rooting at the base, ascending to 2–4 m tall. Leaf sheaths glabrous or hispid; leaf blades linear, up to 120 × 5 cm, abaxial surface glabrous, adaxial surface hispid or papillose-pilose at base, midrib prominent, margins scabrous; ligule 1.5–5 mm. Inflorescence linear, 10–30 × 1–3 cm, golden, brownish or purplish; axis densely pilose, closely beset with small peduncle stumps; involucre comprising many slender bristles, enclosing 1–5 spikelets, terminal spikelet fertile, subsessile, laterals when present staminate with 1–2 mm pedicels; inner bristles thinly plumose, longest 1–4 cm. Spikelets 5–7 mm; lower glume vestigial or absent; upper glume 1/4–1/2 as long as spikelet, acute; lower floret staminate or neuter, lemma 1/2–3/4 spikelet length, 5–7-veined, minutely hispidulous, acuminate; upper lemma membranous and obviously 5-veined toward narrowly acuminate tip, lower half cartilaginous, smooth and shiny; anthers with a tuft of short hairs at tip. Fl. and fr. Aug–Oct. $2n = 27, 28$.

Cultivated. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan [native to Africa].

This is an excellent forage grass, native in Africa, but now introduced to many tropical countries (Elephant Grass, Napier Grass).

5. Pennisetum glaucum (Linnaeus) R. Brown, Prodr. 1: 195. 1810.

御谷 yu gu

Panicum glaucum Linnaeus, Sp. Pl. 1: 56. 1753; *Alopecurus typhoides* N. L. Burman; *Panicum americanum* Linnaeus; *Pennisetum americanum* (Linnaeus) Leeke; *P. americanum* subsp. *typhoideum* Maire & Weiller; *P. spicatum* (Linnaeus) Körnicke var. *typhoideum* T. Durand & Schinz; *P. typhoides* (N. L. Burman) Stapf & C. E. Hubbard; *P. typhoideum* Richard, nom. illeg. superfl.

Annual. Culms robust, up to 3 m tall, densely pubescent at nodes and below inflorescence. Leaf sheaths loose, smooth; leaf blades 20–100 × 2–5 cm, both surfaces and margins scabrous; base subcordate; ligule 2–3 mm. Inflorescence linear to broadly elliptic, dense, 40–50 × 1.5–2.5 cm; axis densely pubescent; involucre persistent, enclosing 1–9 spikelets, basal stipe pubescent, 1–25 mm; bristles usually shorter than spikelets, almost glabrous to densely plumose. Spikelets obovate, 3.5–4.5 mm; lower glume minute, ca. 1 mm; upper glume 1.5–2 mm, 3-veined; lower floret staminate, lemma ca. 2.5 mm, 5-veined, margins membranous and ciliate, palea thinly papery, puberulous; upper lemma 5–7-veined, thinly papery, puberulous, margins ciliate, tip obtuse; anthers with a tuft of short hairs at tip. Fl. and fr. Sep–Oct. $2n = 14$.

Cultivated. N and E China [native to Africa; widely introduced elsewhere].

This is a cultivated species grown for both grain and forage, and is especially suited to regions with a short growing season (Bulrush Millet, Pearl Millet).

6. *Pennisetum alopecuroides* (Linnaeus) Sprengel, Syst. Veg. 1: 303. 1825.

狼尾草 lang wei cao

Panicum alopecuroides Linnaeus, Sp. Pl. 1: 55. 1753; *Cenchrus purpurascens* Thunberg; *Gymnotrix japonica* (Trinius) Kunth var. *viridescens* Miquel; *Pennisetum alopecuroides* var. *erythrochaetum* Ohwi; *P. chinense* Steudel; *P. compressum* R. Brown; *P. dispiculatum* L. C. Chia; *P. japonicum* Trinius; *P. purpurascens* (Thunberg) Kuntze (1891), not Kunth (1816).

Perennial forming dense tussocks. Culms stout, 30–120 cm tall, hispid below inflorescence. Leaf sheaths papery, keeled, imbricate at culm base; leaf blades linear, flat or often involute, 10–80 × 0.3–1 cm, base papillose-hispid, apex long acuminate; ligule 0.5–2.5 mm. Inflorescence linear, 5–25 × 1.5–3.5 cm; axis hispid, peduncle stumps short with crateriform tips; involucre usually enclosing one spikelet, rarely 2, basal stipe (1–)2–3 mm; bristles greenish or purple, longest 2–3 cm but not conspicuously longer than the others, all slender, hispid. Spikelet lanceolate, 5–8 mm; lower glume 0.6–3 mm, 0–1-veined, obtuse; upper glume ovate-lanceolate, 1/3–2/3 as long as spikelet, 3–5-veined; lower lemma as long as spikelet, 7–11-veined; upper lemma lanceolate, as long as spikelet, papery, acuminate; anthers usually glabrous, occasionally with 1 or 2 hairs at tip. Fl. and fr. summer and autumn. $2n = 18$.

Grassy hillsides, roadsides, field margins; sea level to 3200 m. Anhui, Beijing, Fujian, Guangdong, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Tianjin, Xizang, Yunnan, Zhejiang [NE India, Indonesia, Japan, Korea, Malaysia, Myanmar, Philippines; Australia, Pacific Islands (Polynesia)].

This species is used for forage.

7. *Pennisetum flaccidum* Grisebach, Gött. Nachr. 1868: 86. 1868.

白草 bai cao

Pennisetum centrasiaticum Tzvelev; *P. centrasiaticum* var. *lanpingense* S. L. Chen & Y. X. Jin; *P. centrasiaticum* var. *qinghaiense* Y. H. Wu; *P. flaccidum* var. *interruptum* Grisebach; *P. longissimum* S. L. Chen & Y. X. Jin var. *axiglabrum* B. S. Sun & X. Yang; *P. mongolicum* Franchet; *P. sichuanense* S. L. Chen & Y. X. Jin var. *equidistans* B. S. Sun & X. Yang; *P. sinense* Mez.

Perennial with tough spreading rhizomes. Culms tufted, up to 1 m tall. Leaf sheaths loose, subglabrous, rounded, imbricate at base; leaf blades linear with a broad white midrib, 3–25 × 0.2–1.2 cm, glabrous, acuminate; ligule 1–2 mm. Inflorescences terminal and also sometimes axillary from upper leaf sheaths, linear, straight or slightly flexuous, loose to moderately dense, 5–18 cm; axis glabrous, smooth or scaberulous, beset with short peduncle stumps or scars; involucre enclosing 1 spikelet

(rarely 2); bristles many, usually pale green, occasionally purple-tinged, soft, slender, longest 0.9–2 cm, rarely inner thinly plumose. Spikelet narrowly ovate-oblong, 4–7 mm; lower glume usually 1/4 spikelet length or less, obtuse, acute or erose; upper glume 1/3–3/4 spikelet length, 1–3-veined, acuminate; lower floret staminate, lemma as long as spikelet, 3–5(–7)-veined, concave along midline, acuminate-rostrate, palea fully developed; upper lemma acuminate-rostrate, 5-veined; anthers without hairs at tip. Fl. and fr. Jul–Oct.

Hillsides, field margins, roadsides on dry sandy soils, sometimes also on slightly saline alluvial soils on flood plains; 800–5000 m. Gansu, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, NW India, Kashmir, Nepal, Pakistan, Tajikistan; SW Asia (Iran)].

This is a widespread and rather variable species, but it always has tough, spreading rhizomes, a glabrous inflorescence axis, and involucre of soft bristles. The bristles are usually glabrous, but occasionally a few hairs are present on some of the inner bristles. Specimens with axillary inflorescences (the basis of *Pennisetum centrasiaticum* var. *qinghaiense*) occur throughout the range of the species and do not merit separate status.

This species is a good forage grass.

8. *Pennisetum sichuanense* S. L. Chen & Y. X. Jin, Bull. Nanjing Bot. Gard. 1988–1989: 5. 1990.

四川狼尾草 si chuan lang wei cao

Perennial, rhizomatous. Culms tufted, erect, 40–60 cm tall. Leaf sheaths loose, usually shorter than internodes, hispidulous throughout, pilose at mouth; leaf blades linear, 3–12 × 0.2–0.5 cm, both surfaces papillose-pilose when young; ligule 1.5–2 mm. Inflorescence narrowly linear, dense, erect or slightly curved, 5–12 × 0.6–1 cm; axis pubescent; involucre enclosing one spikelet; bristles glaucous, sparse, 0.3–0.5 cm, usually shorter than spikelet. Spikelet ovate-lanceolate, 4–6 mm; lower glume ovate, membranous, 1/3–1/2 as long as spikelet, 0–3-veined, acute; upper glume thickly membranous, slightly shorter than spikelet, 3–5-veined, acute or acuminate; lower floret usually staminate, lemma as long as spikelet, thickly membranous; upper lemma slightly shorter than spikelet, papery, acute; anthers without hairs at tip. Fl. and fr. Aug–Nov.

• Mountainsides, stream banks; 2000–3000 m. Sichuan, Yunnan.

This species is close to *Pennisetum flaccidum*.

9. *Pennisetum qianningense* S. L. Zhong, J. S. W. Agric. Coll. 1982(4): 75. 1982 [*“qianningensis”*].

乾宁狼尾草 qian ning lang wei cao

Perennial forming loose tufts. Culms ascending, 50–130 cm tall, nodes pilose. Leaf sheaths glabrous but pilose at mouth; leaf blades linear, flat with broad white midrib, 10–40 × 0.4–1 cm, glabrous, apex acuminate; ligule 1–2 mm. Inflorescence linear, 10–17 × 1.5–2 cm; axis puberulous, ribbed, peduncle stumps ca. 1 mm; involucre enclosing 1(–3) spikelets, basal stipe ca. 0.5 mm; bristles purplish brown, soft, numerous, plumose in the lower part, mostly about as long as the spikelet, longest twice as long, up to 2 cm. Spikelets lanceolate, 5–6.5 mm; lower glume ovate, membranous, 1–1.5 mm, veinless;

upper glume lanceolate, 1/2–2/3 as long as spikelet, 5-veined; lower floret staminate or neuter, lemma as long as spikelet; upper lemma herbaceous; anthers without hairs at tip. Fl. and fr. May–Sep.

• Dry mountain slopes, valleys, roadsides; 1500–3200 m. Sichuan, Yunnan.

Pennisetum qianningense is very similar to *P. orientale* Richard, but that species has a pubescent inflorescence axis and definitely plumose bristles, which often enclose more than one spikelet. *Pennisetum orientale* is a widespread species extending from N India, Nepal, and Pakistan to C and SW Asia and N Africa. It is to be expected in neighboring parts of China.

10. *Pennisetum longissimum* S. L. Chen & Y. X. Jin, Bull. Bot. Res., Harbin 4: 65. 1984.

长序狼尾草 chang xu lang wei cao

Pennisetum baojiense W. X. Tong.

Perennial forming loose tussocks. Culms decumbent, rooting at base, up to 1.8 m tall, 8–14-noded. Leaf sheaths usually longer than internodes, glabrous or papillose-pilose; leaf blades linear, 50–90 × 0.5–2 cm; ligule 2.5–3 mm. Inflorescence up to 30 cm, usually pendulous; axis densely hispidulous with angular ribs, peduncle stumps crowded, very short with a tuft of spiculae; involucre enclosing 1(–3) spikelets, basal stipe ca. 0.5 mm; bristles glaucous or purple, stiff, glabrous, unequal, one conspicuously longer and stouter, up to 4 cm. Spikelets lanceolate, 6–8 mm; lower glume ovate, ca. 1/4 as long as spikelet, 0–1-veined, obtuse, acute or erose; upper glume 1/3–1/2 as long as spikelet, 1–3(–5)-veined, acuminate; lower floret usually neuter, lemma as long as spikelet, 5–7-veined, scaberulous, acuminate-rostrate; upper lemma similar but usually slightly shorter; anthers without hairs at tip. Fl. and fr. Jul–Oct.

• Open hill slopes; 500–2000 m. Gansu, Guizhou, Shaanxi, Sichuan, Yunnan.

This species is very similar to *Pennisetum shaanxiense*, but is rather more vigorous. The involucre bristles appear to be always glabrous.

11. *Pennisetum shaanxiense* S. L. Chen & Y. X. Jin, Bull. Bot. Res., Harbin 4: 68, pl. 3. 1984.

陕西狼尾草 shan xi lang wei cao

Pennisetum longissimum var. *intermedium* S. L. Chen & Y. X. Jin.

Perennial forming loose tufts. Culms ascending from a shortly decumbent rooting base, 80–150 cm tall. Lower leaf sheaths papillose-pilose especially at mouth; leaf blades linear, thin, flaccid, 30–50 × 0.5–1.8 cm, subglabrous, smooth except for papillose-pilose base, margins scabrous; ligule ca. 2.5 mm. Inflorescence linear, 10–20 × 1.5–2 cm; axis densely hispidulous with angular ribs, peduncle stumps crowded, very short with a tuft of spiculae; involucre narrow, ascending, enclosing 1 spikelet; bristles purple, stiff, glabrous or inner thinly plumose in the lower part, unequal with one much longer than rest, longest 1.5–2.5 cm. Spikelet ovate-lanceolate, 5–6 mm; lower glume ovate, submembranous, ca. 2 mm, 1-veined or veinless, obtuse or erose; upper glume 1/3–1/2 as long as spikelet, 1–3-veined, acuminate; lower floret neuter, lemma as long as spikelet, 5–7-veined, palea small or absent; upper lemma 5–7-veined; anthers without hairs at tip. Fl. and fr. Jul–Nov.

• Mountain slopes, roadsides, field margins; 500–1100 m. Gansu, Hunan, Qinghai, Shaanxi, Sichuan, Yunnan.

This species is variable in the hairiness of the involucre bristles, which are never more than thinly hairy, and the hairs may be confined to the stout, longest bristle, or even absent altogether. The species can be recognized by its thin, flat leaves with papillose-pilose lower sheaths, hispidulous rachis, narrow involucre of stiff bristles, and empty lower lemma.

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