

Tropical Forages

Bothriochloa ischaemum

Scientific name



Bothriochloa ischaemum (L.) Keng

Subordinate taxa:

Bothriochloa ischaemum (L.) Keng var. *ischaemum*

Bothriochloa ischaemum (L.) Keng var. *songarica*
(Rupr. ex Fisch. & C.A. Mey.) Celarier & J.R. Harlan

Synonyms

var. *ischaemum*: *Andropogon ischaemum* L.;
Dichanthium ischaemum (L.) Roberty

var. *songarica*: *Andropogon ischaemum* var.
songaricus Rupr. ex Fisch. & C.A. Mey.

Family/tribe

Family: *Poaceae* (alt. *Gramineae*) subfamily:
Panicoideae tribe: *Andropogoneae*.

Morphological description

Perennial, with foliage 30–80 cm and fertile culms 75–150 cm at maturity. Plants usually caespitose (matted or tufted), occasionally stoloniferous or almost rhizomatous under close grazing or cutting. Stems slender, erect (sometimes decumbent at the base), simple or sparingly branched, naked at the top, solid, grooved on one side, light green turning yellowish at maturity; nodes brown-purple. Leaves glaucous, largely basal; blades linear, flat to folded, 5–25 cm long, 2–4.5 mm wide, glabrous, or scabrous to thinly pilose or with long, scattered papilla-based hairs, particularly on the upper surface, near the collar; ligule a fringed membrane 0.5–1.5 mm long. Inflorescence a subdigitate, terminal panicle, purplish in colour, comprising (1–) 2–10 racemes, each 2.5–9 cm long; rachis and pedicels silky-ciliate with long, soft hairs. Spikelets in pairs, one sessile and perfect (3–4.5 mm long, narrowly ovate, lower glumes hirsute below, with about 1 mm hairs, lacking a dorsal pit, giving rise to a geniculate, twisted awn, 9–17 mm long), and the other pedicellate, as large or slightly larger, and sterile. 1–1.2 million seed units (sessile spikelet + pedicellate spikelet + awn) and about 3 million caryopses/kg.

var. *ischaemum*: stems erect, simple to much-branched at maturity, 75–130 cm tall; nodes glabrous or very minutely pubescent. Leaves glabrous or with a few scattered hairs on the upper surface, linear, with a ligule 1 mm or less. Inflorescence somewhat digitate, primary axis essentially glabrous, shorter than racemes, with the ratio of the length of lowest raceme to length of primary axis >2; second-order branching of racemes infrequent. Sessile spikelets oblong or somewhat elliptic; callus densely bearded with hairs. Glumes membranous; lower glume 5–9 nerved, back lightly long-haired on lower half, usually round but occasionally with a slight dimpling. Lower lemma oblong to obtuse, usually sparsely ciliate, occasionally glabrous. Upper lemma stipiform and awned; the ratio of awn length: spikelet <3.6. Anthers three. Pedicellate spikelet subequal to the sessile, glabrous or occasionally a few short hairs, smooth on the back.

var. *songarica*: similar to var. *ischaemum* with the following exceptions. Plants decumbent in general growth habit, somewhat more robust, 100–150 cm or more tall; nodes with a distinct ring of hairs. Leaves much more hairy, especially near the ligule, and underside of the leaf often pubescent. Primary axis of the inflorescence longer, with the ratio of lower racemes to the axis between 1.0 and 2.0; second-order branching of the racemes common and tertiary branching frequent. Lower glume of sessile spikelets seldom smooth on the back, usually with slight dimpling to strong dishing, but never pitted. The mean awn : spikelet ratio >3.6. Lower glume of the pedicellate spikelet often with long hairs on lower half of back and with occasional dimpling or dishing.

Based on Celarier and Harlan (1958).



Perennial tussock Halhale, Eritrea (cv. Iron Master)



Flowering



Inflorescence a subdigitate panicle comprising mostly 2-10 racemes.



Inflorescence raceme at anthesis



Seed units



Flowering at Charleville, S Qld. (CPI 99869)

Common names

var. *ischaemum*

English: bearded finger grass, dogstooth grass, plains bluestem, Turkestan bluestem, yellow bluestem

Europe: feng (Albania); tupa vaska (Croatia); vousatka prstnatá (Czech); andropogon ischème, barbe-de-dieu, barbon, barbon ischème, bothriochloa ischème, brosière, chiendent à balai, chiendent à balai, pied-de-poule (French); Bartgras, Europa-Bartgras, Fadenhirse, Fadenfingerhirse, gemeines Bartgras, gewöhnliches Bartgras (German); fenyérfű (Hungary); barboncino digitato, barbone digitato, erba trebbia, gramigna sanguinella, pie di pollo (Italian); palczatka kosmata (Polish); fúzatka prstnatá (Slovak); navadni obrad (Slovenia); isquemo, diente de perro, tallo azul de Kingranch (Spanish); sakalotu (Turkey)

var. *songarica*

English: King Ranch bluestem, Texas yellow beard grass

Variety unspecified

Latin America: capim-cola-de-zorro-amarelo (Brazil)

China: 百阳草 bai yang cao

English: East Indies bluestem

Distribution

var. *ischaemum*

Native:

Africa: Algeria

Asia: Afghanistan; Armenia; Azerbaijan; China; Georgia; India; Iran; Iraq; Japan; Kazakhstan; Korea; Kyrgyzstan; Lebanon; Nepal; Pakistan; Russian Federation (Altay, Dagestan, Ciscaucasia); Syria; Tajikistan; Turkey, Turkmenistan; Uzbekistan

Europe: Austria; Bulgaria; Croatia; Czech Republic; France; Germany; Greece; Hungary; Italy; Moldova; Poland; Portugal; Romania; Serbia; Slovakia; Slovenia; Spain; Switzerland; Ukraine

var. *songarica*

Native:

Asia: China; Myanmar; Taiwan

Naturalized:

Naturalized elsewhere, including North America

Uses/applications

Forage

Mostly used as permanent pasture, but can produce good hay.

Environment

Good for soil conservation and reseeding eroded soils, producing excellent ground cover, even on infertile soils, and possessing an extensive root system. However, it can also have adverse environmental effects. *Var. ischaemum* can crowd out native grasses and has negative effects on ecosystem biodiversity. *Var. songarica* is an alternative host for a disease vector in sugar cane (see Agronomy).

Ecology

Soil requirements

Adapted to well-drained sandy soils (not deep sands), loams and clays. Prefers fine-textured, calcareous soils, and has some tolerance to low available iron. Has some salt tolerance, growing naturally onto saline solonetz soils. In Texas, said to prefer disturbed mesic, upland soils.

Moisture

Annual rainfall over its natural distribution ranges from 350 to 500 mm, and it is naturalized in areas receiving up to 1,000 mm. It is drought resistant, but has no tolerance of flooding.

Temperature

Occurs naturally between about 35 and 50° N in Asia and Europe, with outliers at about 24° N in Taiwan. Naturalized between about 30 and 38° N in USA at c. 300 m asl and at 10° N at 1,500–1,800 m asl in Costa Rica. This distribution suggests best adapted to areas with an average annual temperature of between 10 and 17 °C, extending to about 20 °C in some cases. Extremely cold winters are experienced over most of its distribution.

Light

No information available.

Reproductive development

Flowers from June/July to September/October in the northern hemisphere.

Defoliation

First growth appears by late spring, but a major portion of the growth occurs in summer and autumn. Tolerant of heavy grazing and can be grazed throughout the winter.

Fire

Tolerant of fire.

Agronomy

Guidelines for establishment and management of sown forages.

Establishment

There is some post-harvest dormancy, so seed should be kept for 6–7 months before planting. Establishes well from seed broadcast onto a good, clean, firm seedbed in early summer at 1–3 kg/ha, or up to 15 kg/ha if seed is cheap and a rapid cover is required. This is a fluffy seed, so there may be benefit in hammer-milling to de-awn the seed, and pelleting to make it easier to pass through planting equipment. The un-pelleted, de-awned seed is still "fluffy" and can be mixed with fertilizer before sowing through a drill or fertilizer spreader. Surface sown seed should be covered lightly and the area rolled. Excellent seedling vigour.

Fertilizer

Although tolerant of low fertility, it responds well to fertilizer, and is normally sown with a light dressing of mixed fertilizer. The average dry matter response is about 30 kg/kg N applied. Dry matter yield, protein, and N uptake response to applied N are linear up to about 200 kg/ha N.

Compatibility (with other species)

No information available.

Companion species

No information available.

Pests and diseases

Bothriochloa ischaemum is subject to infection by leaf rust disease caused by two different fungi, *Puccinia cesatii* and *Puccinia pseudocesatii*. Smut diseases caused by *Sporisorium andropogonis* (*Sphacelotheca andropogonis*) and *Ustilago amadelpa* have also been recorded. It is also a host to the red-streaked leafhopper (*Balclutha rubrostriata*), a vector for the phytoplasma that causes the serious Sugarcane White Leaf Disease (SCWL). The association between King Ranch Bluestem (*B. ischaemum* var. *songarica*) and the red-streaked leafhopper is of considerable concern with sugar cane producers in the southern USA.

Ability to spread

Volunteers readily from seed.

Weed potential

Both varieties listed as weedy in many areas. Large literature on control of the species in USA (e.g. Oklahoma).

Feeding value

Nutritive value

CP values of 7–10% in leafy growth, and about 5% in stemmy growth with IVDMD about 50% and P level of 0.08%.

Palatability/acceptability

Grazed fairly readily by cattle and sheep.

Toxicity

No toxicity has been reported.

Production potential

Dry matter

DM yields are mostly of the order of 2–5 t/ha/yr with little or no fertilizer N, and up to 10 t/ha with addition of 200 kg/ha N.

Animal production

Animal gains per hectare during the growing season are 4–8 times those from unimproved rangeland, largely due to increased carrying capacity. In short-term trials, young steers gained 0.24–0.66 kg/day (average 0.45 kg/day) over a 10-week period. Beef gain response to N fertilization may result from higher forage production and higher forage quality.

Genetics/breeding

An obligate pseudogamous apomict (varieties not specified); $2n = (20, 30), 40, 50, 60$.

var. *ischaemum*: $2n = 40$, sometimes $2n = 60$.

var. *songarica*: $2n = 50$ or 60 .

Seed production

Yields of pure live seed of usually range from 20 to 40 kg/ha. Crops do not mature uniformly and harvesting is difficult due to fluffiness of the seed. A light harvest is possible from the early summer crop, but the main crop is harvested in autumn. Seed crops are best established in 60–90 cm rows. Each crop should be preceded by a cleaning cut to 10–15 cm 6–8 weeks prior to harvest, accompanied by an application of 50–60 kg/ha N. Lodging may result if crops are started too early or if excessive N is applied.

Herbicide effects

Susceptible to metsulfuron methyl and triasulfuron as a pre-emergent application, but tolerant as a post-emergent at 2–3-leaf stage. Susceptible to imazapic as pre- and post-emergent.

Strengths

- Winter hardiness.
- Palatability.
- Stable ground cover.
- Adapted to low fertility soils.

Limitations

- Intolerant of flooding or waterlogging.
- Low production.
- Adverse effect on biodiversity.
- Alternative host for disease vector.

Internet links

http://www.forages.css.orst.edu/Topics/Species/Grasses/Grass_Varieties/B.html#Bothriochloaischaemum

Selected references

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Cultivars

var. *ischaemum*

'**El Kan**' (KG-495) Released in USA in c. 1937. Exact origin unknown, but thought to have come in with cattle or hay from Texas. Moderately palatable bunchgrass of medium leafiness and forage production. Easily established and spreads well from seed. Adapted where annual precipitation is 380 mm or more. Less productive than 'King Ranch' and other cultivars, but more winter-hardy in cooler environments. Grows on sandy, medium-textured, and clay soils. Used alone as summer pasture and for stabilisation of earth structures, diversions, and critical areas.

'**Ganada**' (PI 107017, A-1407, NSL 102252) Released in USA in 1979. From Tajikistan. An erect plant 200–1,500 mm tall tending to form large saucer-shaped clumps with stems curving upward from the perimeter. More productive than 'Plains'. Used for range reseeding, dryland pasture and revegetation of disturbed areas.

'**Plains**' (PI 477958) Released in USA in 1970. Composite of 30 morphologically similar lines from Pakistan, Iran, Iraq, India, Turkey and Afghanistan. Higher yielding and more resistant to foliar disease than 'King Ranch'; somewhat less productive but more palatable than Caucasian bluestem (*B. bladhii* (*caucasica*)). More winter-hardy than 'King Ranch'. Used for forage.

'**WW-Iron Master**' (PI 301535, WW-535) Released in USA in 1987. Introduced from Afghanistan. Later in maturity and more robust than other cultivars. Selected for persistence, spring vigour, leafiness, and productivity on high pH iron-deficient soils (less chlorosis than other cultivars). High crude protein content. Used to improve pasture and rangeland, for hay, and soil stabilisation. Later maturity, more and larger cauline leaves, and a darker green leaf blade colour than 'WW-Spar', and more robust with higher leaf-to-stem ratio than 'Ganada'.

'**WW-Spar**' (PI 301573, WW-573) Released in USA in 1982. Introduced from Pakistan, one of the original 30 accessions used to produce 'Plains'. Selected for persistence, spring vigour, and drought tolerance, maintaining production longer into a drought cycle than other cultivars. Used for grazing and hay, and for soil stabilisation.

var. *songarica*

'**King Ranch**' (T.O. 144, T-3487, PI 315673, PI 44096, PI 476987, BN-4419-60) Released in USA in 1941. Thought to have been introduced to the California Agricultural Experiment Station from Amoy (Xiamen), Fujian, China (24.5° N, 140 m asl, rainfall 1,180 mm) in 1917, but not noticed until 1937 on the King Ranch in Texas. Very vigorous, prostrate, forming dense sward; seeds heavily and volunteers aggressively. Adapted best to clay or rocky limestone. Less productive than 'Plains' and less winter-hardy than 'El Kan'. Considered a weed with little production value by many. However, does persist under poor management, and has the benefit of providing erosion control.

Promising accessions

None reported.

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