

Pennisetum purpureum



Home Glossary Factsheets Information & Help Search forage references

Scientific name

Pennisetum purpureum Schumach.

Pennisetum purpureum Schumach. x *Pennisetum glaucum* (L.) R. Br.

Synonyms

Pennisetum benthamii Steud.

Family/tribe

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

Common names

elephant grass, merker grass, napier grass , (English); napier, herbe éléphant, fausse canne àt; sucre (French); Elefantengras (German); capim-elefante (Portuguese); pasto elefante (Spanish); gigante (Costa Rica); mfufu (Africa); co voi (Vietnam); 'erepani (Cook Islands); acfucsracsra (Kosrae); bokso (Palau); puk-soh (Pohnpei); vao povi (Samoa).

Morphological description

Robust perennial forming large, bamboo-like clumps, with culms usually 2-3.5 m high (up to 7.5 m) and branched towards the top; stems to 3 cm diameter near the base. Leaf blades glabrous or hairy, 30-120 cm long and 1-5 cm wide; leaf-sheaths glabrous or with stiff hairs. Spreads by short rhizomes, rooting from lower nodes or falling stems rooting at nodes creating a stolon. Inflorescence a bristly false spike 10-30 cm long, 1.5-3 cm wide (excluding bristles) dense, usually yellow-brown in colour, more rarely greenish or purplish. Extensive root system penetrating to 4.5 m. About 3 million fertile spikelets or 'seeds'/kg.

Distribution

Native to:

Africa: Kenya, Tanzania, Uganda, Ethiopia, Angola, Malawi, Mozambique, Zambia, Zimbabwe, Côte D'Ivoire, Ghana, Guinea, Liberia, Nigeria, Sierra Leone, Togo, Cameroon.

Generally found along rivers and forest margins on more fertile soils.

Introduced to most tropical and subtropical countries where it has become naturalised.

Uses/applications



Mostly planted for cut and carry systems, and not for long-term grazed pastures. Also used for hedgerows and living fences, although roots compete with adjacent crop. Young growth makes good hay, which can be fed as hay or pellets. Coarse stems in older growth make it unsuitable for hay. Makes good silage, although inferior to maize and sorghum. Old growth becomes too coarse to be of value for anything other than soil conservation. Bana grass is commonly used as a windbreak in horticultural crops and orchards.

Ecology

Soil requirements

Grows on a wide range of soil types provided fertility is adequate. Grows best in deep, well-drained friable loams with a pH of 4.5-8.2 (mean 6.2). No readily available data on tolerance of salinity or high levels of Al and Mn.

Moisture

In the wild, normally only found in areas with rainfall >1,000 mm, and on river banks in areas of lower rainfall. Although extremely drought tolerant by virtue of deep root system, needs good moisture for production. Does not tolerate prolonged flooding or waterlogging .

Temperature

Produces best growth between 25 and 40°C, and little growth below about 15°C, with growth ceasing at 10°C. Tops killed by frost, but re-grows with onset of warm, moist conditions. Grows from sea level to 2,000 m altitude.

Light

Moderate shade tolerance, about equivalent to that of *Setaria sphacelata* and *Brachiaria decumbens* .

Reproductive development

An obligate quantitative short-day plant, with a critical photoperiod of 12-13 hours, flowering under a relatively wide range of photoperiods e.g. flowers January to June in South Africa. There is some variation among ecotypes in flowering time. Seed set is usually poor, possibly due to low pollen viability .

Defoliation

Normally cut at 15 cm above ground, although difficult to maintain constant cutting height. Cattle eat mostly leaf. Proportion of leaf decreases, and stem increases, with age and height. Should not be allowed to grow >1.5 m before cutting, to ensure cut material is mostly leaf.

Fire

Recovers well following fire, and can dominate fire-adapted savannah communities. Seldom dry enough to burn under normal



Top



Top

circumstances.

Agronomy

Guidelines for the establishment and management of sown pastures.

Establishment

Can be established from seed (no post-harvest dormancy), although almost invariably planted from setts or cuttings (pieces of cane) or splits (rooted pieces of clump). Setts are taken from the basal 2/3 of moderately mature stems and should contain at least 3 nodes. These are pushed into the soil at 45°, basal end down, with 2 nodes buried. Cuttings can also be planted horizontally into a furrow, to a depth of 5-10 cm. Normally planted in rows 0.5-2 m apart, and 0.3-1 m apart within rows. Close spacing is required for soil conservation contour hedgerows and for high rainfall environments. More open spacing is used in drier environments.

Fertiliser

Should be planted into fertile soil. Once established, requires, 150-300 kg/ha/yr N, together with other nutrients as indicated by soil tests. Responses at much higher levels of applied N have been obtained. Yields decline rapidly if fertility is not maintained.

Compatibility (with other species)

Competes vigorously with other species with adequate fertility and moisture. Weeds invade if fertiliser regime relaxed.

Companion species

Grasses: Not sown with other grasses.

Legumes: Normally not sown with legumes, but will grow with vigorous twining legumes such as *Pueraria phaseoloides*, *Neonotonia wightii* and *Centrosema molle* (*pubescens*), or with the shrub/tree legume, *Leucaena leucocephala*.

Pests and diseases

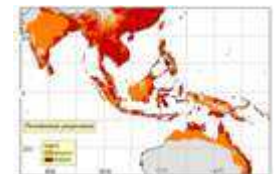
Many fungal diseases reported, the most common being leaf spots caused by *Helminthosporium sacchari* (syn. *Bipolaris sacchari*), *Helminthosporium ocellum* and *Pyricularia grisea*. Some varieties are resistant. Also attacked by the bacterium, *Pectobacterium carotovorum*, other diseases including Pseudo- Fiji Disease, chlorotic streak, a disease of sugarcane, and leaf mottle virus, and by nematodes (*Aphelenchus avenae*, *Meloidogyne incognita acrita*, *M. javanica* and *Pratylenchus brachyurus*).

Work in Florida is investigating the use of the pathogenic fungi, *Drechslera* and *Exserohilum*, to control *P. purpureum*.

Ability to spread

Spreads by seed, usually into disturbed areas, but mostly by short rhizomes and tall stems that fall and root at the nodes.

Weed potential



Top

Listed as an invasive species in the Pacific Islands and USA (Florida). Can be controlled by regular mowing or herbicide.

Feeding value

Nutritive value

Top

Varies greatly with age of regrowth (leaf:stem ratio), and fertility, particularly nitrogen e.g. 6 week regrowth 10% CP, 10 week regrowth 7.6% CP. Can give up to 2-fold difference in CP level. CP and IVDMD levels of leaf range from 9.5-19.7%, and 68-74% respectively.

Palatability/acceptability

Extremely palatable to all classes of stock when provided young and leafy.

Toxicity

Can cause nitrate poisoning in cattle if sole component of diet. Oxalate levels of 2.5-3.1% of DM, but no problems recorded.

Production potential

Dry matter

Yields depend on fertility, moisture, temperature and management. DM yields of 10-30 t/ha/yr common, (and up to 85 t/ha/yr) if well fertilised; 2-10 t/ha/yr if unfertilised. More frequent cuts (up to 45 days) give less dry matter, but better leaf production than infrequent cuts.

Animal production

Top

As with dry matter, animal production from *P. purpureum* depends on growing conditions for the grass. Liveweight gains of 1 kg/hd/day during the growing season and 480 kg/ha/yr, and milk yields of >11 kg/day (4% fat) are achievable. Capable of carrying 2-7 beasts/ha in a grazed system.

Genetics/breeding

P. purpureum : cross pollinating, also apomictic, $2n = 27$, $4x = 28$, $8x = 56$

P. purpureum x *P. glaucum* hybrids: $2n = 20, 21$.

Seed production

Seed rarely harvested.

Herbicide effects

Atrazine at 6 kg /ha can be used for establishment. Controlled with glyphosate.

Strengths

- High dry matter yields.
- Very palatable, high quality forage .
- Drought tolerant.
- Frost susceptible.

Top

Limitations

- Needs high fertility.
- Matures rapidly, becoming stemmy.
- Usually needs to be planted vegetatively.

Other comments

Selected references

Bogdan, A.V. (1977) *Tropical Pasture and Fodder Plants*. (Longman: London and New York).

't Mannetje, L.(1992) *Pennisetum purpureum* Schumach. In: 't Mannetje, L. and Jones, R.M. (eds) *Plant Resources of South-East Asia No. 4. Forages*. pp. 191-192. (Pudoc Scientific Publishers, Wageningen, the Netherlands).

Internet links

<http://www.fao.org/ag/AGP/AGPC/doc/Gbase/data/pf000301.htm>

Cultivars

Cultivars *	Country/date released	Details
'Cameroons'		Merker type (i.e. numerous relatively thin stems, narrow largely glabrous leaves, good yields, resistant to <i>Helminthosporium</i> sp.).
'Capricorn'	Australia (1962)	Selected from CPI 7838, a Merker type, to provide a late flowering, leafy grazing type of medium height with thick succulent stems, strong crowns and vigorous stooling. Leaves are relatively broad.
'Merkeron 534' ('Costa Rica 534')	USA/Puerto Rico (1955)	Selection from 'Merkeron' (bred in Georgia, USA), a high yielding, F1 hybrid between outstanding tall, selection No. 1 and a very leafy dwarf type, No. 208. Leafy, many tillered, late maturing, resistant to <i>Helminthosporium</i> eye-spot.
'Mineiro'	Brazil	Many tillered, high yielding type with slow stem lignification.
'Mott' ('Tift N75')	USA (1988)	Bred in Georgia, USA. Best of a number of dwarf selfed progeny of 'Merkeron'. Used as a pasture grass in tropics and subtropics. High leaf:stem

		ratio, maintaining high forage quality over a wider range of maturities than is characteristic of most tropical grasses. Excellent drought tolerance. Heterozygous and does not breed true from seed, so must be propagated vegetatively.
--	--	---

* There are numerous ecotypes used in various countries e.g. Anão, Chad, Congo, Cubano, French Cameroons, Ghana (Gold Coast), Madagascar, Merker, Napier, Pioneiro, Puerto Rico, Roxo, Taiwan 143, 144, 146, 148, Uganda, Vrukwna. There are undoubtedly more, many of which will have significant morphological differences from one another, and some of which will simply be alternative names for other varieties. However, with the possible exception of 'Mott', which is a dwarf, leafy type, the greatest gains in the use of *P. purpureum* will come from fertiliser use and defoliation management, rather than from cultivar selection.

King Grass (<i>P. purpureum</i> x <i>P. glaucum</i>)	Latin America, southeast Asia.	Tall, leafy type used in cut-and-carry systems.
Bana Grass, Babala Napier Hybrid (<i>P. purpureum</i> x <i>P. glaucum</i>)	South Africa.	Now in Brazil, Australia, and other countries. Tall stemmy variety. Not favoured for forage, but commonly used for windbreaks.
'Florida' (<i>P. purpureum</i> x <i>P. glaucum</i>)	Philippines.	Similar to King Grass.
'Pusa Giant' (<i>P. purpureum</i> x <i>P. glaucum</i>)	India.	Stems less fibrous, leaves larger, softer, less persistent hairs than on <i>P. purpureum</i> . Numerous tillers, rapid growth. Higher yield potential than <i>P. purpureum</i> when fertilised adequately. More nutritious, succulent, palatable and responsive to nitrogen than Napier

		Grass . Susceptible to <i>Helminthosporium</i> sp.
NB-5, NB-6, NB-21, NB-35 (<i>P. purpureum</i> x <i>P. glaucum</i>)	India.	NB-21 used in Sri Lanka.
PBN-83 (<i>P. purpureum</i> x <i>P. glaucum</i>)	India (1989).	Bred by Punjab Agricultural University.
PBN-233 (<i>P. purpureum</i> x <i>P. glaucum</i>)	India (1999).	Bred by Punjab Agricultural University. Succulent, palatable and highly digestible fodder when cut at the right stage. Unlike NB 21 and PBN 83, flowers only in winter at Ludhiana (30°N) in India, thus remaining vegetative throughout the year, except in winter, when it is dormant. Slower decline in quality with age of regrowth than with other hybrids. Higher yielding than earlier hybrids, NB 21 and PBN 83.

Promising accessions

[Top](#)

Promising accessions	Country	Details
None reported.		