

Tropical Forages

Dichanthium annulatum

Scientific name



Dichanthium annulatum (Forssk.) Stapf

Subordinate taxa:

Dichanthium annulatum (Forssk.) Stapf var. *annulatum*

Dichanthium annulatum (Forssk.) Stapf var. *papillosum* (Hochst. ex A. Rich.) de Wet & J.R. Harlan

Synonyms

var. *annulatum*: Basionym: *Andropogon annulatus* Forssk.; *Dichanthium nodosum* Willemet

var. *papillosum*: Basionym: *Andropogon papillosus* Hochst. ex A. Rich.; *Dichanthium papillosum* (Hochst. ex A. Rich.) Stapf

Family/tribe

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

Morphological description

Perennial tussock with short rhizomes, sometimes stoloniferous; surface rooted (>90% of roots in top 1 m soil); tillers geniculately ascending to 80 cm and culms to about 1 m (rarely 1.8 m); nodes with pronounced annulus of radiating, 3–5 mm long white hairs. Leaf sheath lax, terete, 3–4 cm long, glabrous except finely pubescent on margins near throat; ligule membranous, to 4 mm long; leaf blade linear, to about 30 cm long and 2–7 mm wide, margins slightly thickened, sparsely pubescent, scaberulous. Inflorescence a sub-digitate panicle, comprising (1–) 2–9 (–15) pale green or purplish racemes, each 3–7 cm long; peduncles glabrous; awn geniculate, twisted, 8–25 mm long arising from the upper lemma of the sessile spikelet. Caryopsis oblong to obovate, dorsally compressed, ca. 2 mm long (1.9 million/kg); seed units (sessile + pedicellate spikelet) about 500,000/kg.

Four ecotypes have been described based on distribution and plant morphology (plant structure, raceme length and thickness, and hairiness characteristics of the lower glume of the sessile spikelet: '**Tropical**' (moderately robust, decumbent with thick racemes; the glumes are broad, blunt and conspicuously covered with long bulbous-based hairs); '**South African**' (var. *papillosum*; large, erect, robust plant with very broad racemes; glumes blunt and equipped with a conspicuous fringe of long, bulbous-based hairs); '**Mediterranean/Desert**' (erect, fine stemmed with narrow racemes; glumes more pointed than the Tropical type, bulbous-based hairs rather sparse); and '**Senegal**' (an extreme form of the Desert ecotype).



Perennial tussock with short rhizomes (CPI 22482)



Prostrate, stoloniferous naturalized ecotype, Raceview, S Qld, Australia



Productive selection, Central Queensland, Australia (CPI 84146B)



Mature plants (CPI 84146B)



Annulus of radiating white hairs around nodes (distinguishing feature)



Inflorescence a sub-digitate panicle, comprising mostly 2 - 9 pale green or purplish racemes



Maturing seed head



Shedding seed



Dispersal unit (seed) comprising pedicellate spikelet (top) and awned sessile spikelet (below)



Dichanthium annulatum (Forssk.) Stapf - 1, flowering plant; 2, ligule; 3, spikelet; 4, caryopsis.

Line illustration

Similar species

D. annulatum: peduncle nodes with annulus of long hairs; peduncle internodes glabrous.

D. aristatum: peduncle nodes glabrous or shortly pubescent; short, dense pubescence on peduncle immediately below lowest raceme.

D. caricosum: peduncle nodes glabrous or shortly pubescent; peduncle internodes glabrous.

Bothriochloa insculpta: spreading hairs on the nodes; strongly aromatic inflorescence.

Common names

Africa: vleivingergras (var. *papillosum*) (Afrikaans); hemeira, abu qasaba (Arabic); ebastan (Mali); aiyah macareh, aus guran, darer adili, domar, jebin (Somalia); lukh (Sudan)

Asia: □□□ shuang hua cao (China); קקניט הטהבות (Israel); alabang grass, lindi (Philippines); ya hindi, ya waen; หญ้าเขด้า ya cheda (Thailand); song tha'o to, song hoa thảo to, cỏ hai gai bẹ tròn (Vietnam)

Caribbean: ti fwen, petit foin

English: bluestem, diaz bluestem, hindi grass; Santa Barbara grass, sheda grass, ringed dichanthium, vuda blue grass, kleberg blue-stem (USA); two-flowered golden-beard (Hong Kong)

Indian subcontinent: ■■■■■■ ■■■■ (Bengali); karad (Rajasthan); apang (Hindi); chhijhavo (Gujarati); bansi, bara, belia marwel, bharo-bheru, daroya, dthrow, donda, dunda, delhi grass, ganjala garike hullu, gavat, gawat, ginja, guhar marwel, handi daroya, janewa, jarga, jargu grass, jaunera, jergi, jinjva, kail, kared, karr, khel (scandent form), khulairia khel, lahan marwel, loari, machhari, maliyar, mara vale hullu, marvalyan hullu, marvel, miniyar, nalli, nilon, palain, palmaha, palvaan hullu, palvan, palwal, palwan, phulaira, sam payen, sheda, turmurgah, urukan hullu, zingo, zinjoo, zinjvo, zinsma, zinzāna (India); marvel, palwan (Pakistan)

Latin America: pitilla, pitilla pinareña (Cuba); climacuna (Colombia); zacate angleton pretoria, zu-uc (Mexico); pajón, yerba de vias, yerba de las traviesas (Puerto Rico)

Distribution

var. *annulatum*:

Native:

Africa: Algeria; Angola; Botswana; Canary Islands; Cape Verde; Egypt; Eritrea; Ethiopia; Kenya; Libya; Madeira Islands; Malawi; Mali; Morocco; Mozambique; Namibia; Niger; Senegal; Somalia; Tanzania; Tunisia

Asia-Temperate: Afghanistan; Bahrain; Egypt (Sinai); Iran; Iraq; Israel; Jordan; Oman; Saudi Arabia; Turkey; Yemen

Asia-Tropical: India; Indochina; Indonesia; Malaysia; Myanmar; Nepal; Pakistan; Papua New Guinea; Thailand

Naturalized:

Northern America: Mexico; USA (Texas)

Central America: Costa Rica

South America: Argentina

var. *papillosum*

Native:

Africa: Angola; Botswana; Ethiopia; Kenya; Malawi; Mozambique; Namibia; Niger; Senegal; South Africa (Cape Province, Transvaal); Tanzania; Uganda; Zambia; Zimbabwe

Naturalized:

Australasia: Australia

Uses/applications

Forage

Perennial pasture for grazing or cut-and-carry. Suitable for silage and hay if cut before flowering.

Environment

Shows promise for re-seeding degraded grasslands and for rough lawns. Forms a stable ground cover for erosion control.

Ecology

Soil requirements

Adapted to most soil textures, from coralline sands to heavy black clays (cotton soils). Although not particularly fertility-demanding, it is often found on fertile soils. Prefers neutral to alkaline (to pH 9) conditions, occasionally down to pH 5.5. While there are types that have been demonstrated to be tolerant of at least moderate salinity, there may well be a spectrum of salt tolerance among the various ecotypes and genotypes.

Moisture

D. annulatum is found in moderately dry to moist areas, mostly with annual summer rainfall from 700 to 1,400 mm, but to as low as 300 mm and as high as 2,600 mm, sometimes with a 6–8 month dry season. Tolerates poor drainage, but not permanently waterlogged situations.

Temperature

Most collections have come from the tropics. Good warm season growth. Cut by frosts, but recovers with onset of warm conditions. Occurs naturally at altitudes from sea level to >600 m asl.

Light

It is mostly found growing in pasture land, roadsides, fallow fields, weedy lawns, sand dunes and open wasteland, and is not considered shade tolerant.

Reproductive development

Flowers throughout the growing season.

Defoliation

Stands very heavy grazing, forming an open turf.

Fire

Withstands seasonal burning.

Agronomy

Guidelines for establishment and management of sown forages.

Establishment

Can be established vegetatively from rooted slips, being planted 60 cm apart in staggered rows 60 cm apart. Commercial seed is rarely available. Optimum temperature for germination is 32 °C, although germination can be achieved between 15 and 40 °C.

Fertilizer

Not normally fertilized but responds to low to moderate levels of nitrogen.

Compatibility (with other species)

Competes aggressively once established, often suppressing other species.

Companion species

Grasses: *Bothriochloa insculpta*, *Dichanthium aristatum*, *D. caricosum*.

Legumes: *Desmanthus* spp., *Medicago sativa*, *Stylosanthes hamata*, *S. seabrana*.

Pests and diseases

Although many fungal diseases have been reported, none seems to cause major damage: *Balansia sclerotica*, *Cerebella andropogonis*, *Chaetostroma atrum*, *Cochliobolus cymbopogonis*, *Curvularia andropogonis*, *C. lunata*, *C. robusta*, *Ellisiella caudata*, *Jamesdicksonia obesa*, *Phyllachora ischaemi* (tar spot), *Physoderma dichanthicola*, *Pithomyces graminicola*, *Puccinia cesatii*, *P. duthiae*, *P. propinqua*, *Sclerospora dichanthicola*, *Sphacelotheca annulata*, *S. andropogonis-annulati*, *Tolyposporella obesa*, *Uredo susica*, *Uromyces andropogonis-annulati*, *U. clignyi* and *Ustilago duthiei*. It is also parasitised by *Striga lutea*. Ergot (*Claviceps* sp.) may present a significant seed production impediment in at least some accessions. A phytoplasma has been detected in white leaf disease of *D. annulatum* in India.

Ability to spread

Although some types are stoloniferous, spread is mainly by seed, usually requiring some disturbance, e.g. cultivation, roadside maintenance (mowing or grading).

Weed potential

D. annulatum is regarded as an environmental weed in the Northern Territory, Australia, where it is highly invasive in arid wetlands competing aggressively with important native grasses. It is also regarded as being invasive in Texas, USA, where it escapes from pastures and outcompetes native grasses in bluestem coastal grassland communities. It is generally not considered to be a serious weed of cultivation.

Feeding value

Nutritive value

Crude protein levels are usually low ranging from 2.6 to 10.4% (mostly 4–6%), largely reflecting the low nitrogen status of the soil. CP digestibility 28–47%.

Palatability/acceptability

Readily eaten by small and large ruminants.

Toxicity

No problems reported.

Feedipedia link

<https://www.feedipedia.org/node/463>

Production potential

Dry matter

Mostly of the order of 2–6 t/ha DM, although up to 17 t DM when irrigated grass in dry environment.

Animal production

Can support up to 7 sheep/ha in semi-arid environment.

Genetics/breeding

Pseudogamous and facultative apomicts, with varying levels of sexual reproduction. $2n = 20, 40, 60$, tetraploids being the most common. Diploids may be completely sexual and are predominantly wind-pollinated. The Indian tetraploids cross relatively easily among themselves, and crosses with *D. aristatum* and *D. caricosum* ($2n = 40$) have been obtained. Considerable work has been done with intra- and interspecific as well as intergeneric (*Bothriochloa*) hybridization.

The '**Tropical**' ecotype is the most common in India and eastward in humid to wet regions, the diploid ($2n = 20$) form being much smaller than the tetraploid ($2n = 40$) form, but otherwise very similar. The '**South African**' ecotype hexaploid ($2n = 60$) originates from South and East Africa. The '**Mediterranean**' ecotype tetraploid ($2n = 40$) is mainly from desert regions, ranging from the eastern edge of the Indian desert in Rajasthan westward across Pakistan, Afghanistan, Iran, Iraq, Saudi Arabia, Egypt, Tunisia, and Algeria to Morocco. Two very similar forms of the '**Senegal**' ecotype have been found in desert or near desert areas, one from Senegal ($2n = 40$) and the other from NW India ($2n = 20$).

Seed production

Can be harvested either by direct heading, or swathing and feeding through the header; 2 harvests per year being possible, one in early to mid-summer, and the other in autumn. Hand harvesting is laborious and expensive.

Herbicide effects

Susceptible to glyphosate.

Strengths

- Tolerant of poor drainage .
- Tolerant of salt.
- Withstands heavy grazing.
- Drought-hardy.

Limitations

- Relatively low production.
- Restricted to alkaline (or near neutral) soils.
- Relatively low quality.
- Fluffy seed difficult to sow.

Selected references

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Cultivars

'Kleberg' Released in USA (1944). Naturalized strain from King Ranch, Texas. Slender stems growing to 75 cm at maturity. Excellent drought tolerance, good seed producer, some salinity tolerance, relished by cattle. Performs well on sandy clay loam and clay loam sites in the >625 mm rainfall areas of southern Texas.

'Pretoria 90' (PI 188926, BN-6730, T-20090) Released in USA (1954). Selected for seedling vigour, rapid growth, yield. Stems to 1.5 m at maturity. Little stolon development. Good drought tolerance, leafy; used for pasture, hay and silage. Low seed production. Commercial seed no longer produced in Texas.

'T 587', 'PMT-587' Released in USA (1981). Derived from a composite of 80 accessions, mostly *Dichanthium*, initially established in the 1950s. The mixture originally also contained *D. aristatum*, *Bothriochloa bladhii* and *B. insculpta*, although some accessions have been lost with time. Suitable for pasture, hay, revegetation of disturbed areas and salt scalds, erosion control, and range reseeding. More cold tolerant than 'Gordo', 'Medio', and 'Kleberg'. Leafier than 'King Ranch', leaves longer and wider. Resistant to leaf rust. High forage producer. Grows from late winter/early spring through late fall. Performs well on sandy clay loam and clay loam sites in the >625 mm rainfall areas of southern Texas.

'Marvel 8' (CPI 106073) Released in India (1961). Tetraploid type, 40–100% better DM yields than local strain.

Promising accessions

IGFRI-495-1, IGFRI-495-5 Selected in India. Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh.

CPI 84146 B Selected in Queensland, Australia. Institutional collection from Rahuri, Andhra Pradesh, India. Ergot susceptible; more productive than naturalized ecotype in central Queensland.

CAZRI-485, CAZRI-490, Marvel 7, Marvel 93, GMG 1, GMG 2 Selected in India.

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