**Cynodon dactylon**

**Scientific name**

*Cynodon dactylon* (L.) Pers.

**Subordinate taxa:**

- *Cynodon dactylon* (L.) Pers. var. *afghanicus* J. R. Harlan & de Wet
- *Cynodon dactylon* (L.) Pers. var. *aridus* J. R. Harlan & de Wet
- *Cynodon dactylon* (L.) Pers. var. *coursii* (A. Camus) J. R. Harlan & de Wet
- *Cynodon dactylon* (L.) Pers. var. *dactylon*
- *Cynodon dactylon* (L.) Pers. var. *elegans* Rendle
- *Cynodon dactylon* (L.) Pers. var. *polevansii* (Stent) J. R. Harlan & de Wet

Other subordinate taxa are suggested by various authors, but are not recognised in the GRIN database. These include:

- *Cynodon dactylon* Steud. var. *affinis* (Caro & Sánchez) C. Romero Zarco
- *Cynodon dactylon* Steud. f. *glabrescens* (Beck) SoÓ
- *Cynodon dactylon* Steud. f. *major* (Beck) SoÓ
- *Cynodon dactylon* Steud. subsp. *nipponicus* (Ohwi) T. Kobayama
- *Cynodon dactylon* var. *longiglumis* Caro & E. A. Sanchez
- *Cynodon dactylon* var. *maritima* (Kunth) Hack.
- *Cynodon dactylon* var. *maritimum* Hack.
- *Cynodon dactylon* var. *pilosus* Caro & E. A. Sanchez
- *Cynodon dactylon* var. *pulchellus* Benth.

**Synonyms**

- *Capriola dactylon* (L.) Kuntze
- *Cynodon coursii* A. Camus
- *Cynodon dactylon* (L.) Pers. var. *densus* Hurcombe
- *Cynodon glabratus* Steud.
- *Cynodon polevansii* Stent

**Family/tribe**


**Common names**

bermuda grass, giant bermuda grass (=var. *aridus*) (English - USA); couch grass, creeping panic grass, green couch (English - Australia); bahama grass, devil's grass, dogtooth grass, harial grass, indian couch grass, kiri-hiri, quick grass, reed grass, scotch grass, scutch grass, serangoon, wire-grass (English); yabith (Israel); kweekgras (Afrikaans); chepica brave, came de niño, pate de perdiz, gramilla blanca (Spanish - Peru), griming, tigriston (Suriname); aruhu, calcutta grass, dhoub grass, doob, durva, haritali, harial (southern Asia); jakut kakawatan, gigirinling, rumput bermuda, rumput grinting, sukit grinting (Indonesia); rumput minyak (Malaysia); kawad-kawad, kapot-kapot, bakbaka (Philippines); mye-sa-myet (Myanmar); smao anchien (Cambodia); hnhaz ph’èd (Laos); ya-phraek (Thailand); cô’chi’, co’ông (Vietnam); manienie, manini (Hawai’i); kabuta (Fiji); motie molulu (Niue).

**Morphological description**

A fine to robust stoloniferous perennial, mostly with rhizomes. Rhizomes can penetrate 40-50 cm in clay soil and 70-80 cm in sand. Foliage dense, 10-40 cm tall (rarely to 90 cm); leaf blades glabrous or sparsely pubescent, often glaucous, with minutely scabrous margins, 3-15 cm long and 2-4 mm wide; ligule a dense row of short hairs on a membranous rim, 0.2 mm long with tuft of longer hairs either end (cf. membranous ligule in *Digitaria*). Inflorescence a digitate panicle, comprising (2-)4-5(-7) racemes (in robust forms up to 10 racemes, sometimes in 2 whorls), 1.5-8 cm long. Spikelets 2-3 mm long; caryopses ovoid, about 1.5 mm long, yellow to reddish; 3-4.5 million seeds/kg.

**Distribution**

Var. *dactylon* is believed to have originated in Turkey and Pakistan, but has been introduced to all tropical and subtropical, and some temperate regions of the world.

Other varieties are native to one or more of the following:
Asia: Afghanistan, India, Israel, Sri Lanka.
Indian Ocean: Madagascar.

Grows in grassland, lawns and pastures and as a weed in cultivation. Locally dominant along roadsides and overgrazed and trampled areas.

Uses/applications
Used in permanent pastures for grazing or cut-and-carry, and for hay or pellets and silage production. Provides useful standover or deferred feed. Valuable for soil conservation, as a turf, and as a cover crop in orchards.

Ecology

Soil requirements
Grows on a wide range of soils, but best in relatively fertile, well-drained soils. Adapted over a broad range of soil pH (4.5-8.5), but grows best when the pH is above 5.5. Good tolerance of salinity, but makes only slow growth under saline conditions (maximum yields up to EC 7 mmhos/cm), 50% of maximum at 15 mmhos/cm, and nil at 22.5 mmhos/cm (1 mmho/cm = 1 dS/m). Can use irrigation water with salinity up to 10.8 dS/cm for plants growing in sand, to 6.1 dS/cm in loam, and to 3.6 dS/cm in clay< /A > . Generally not tolerant of high aluminium saturation, although some varieties appear more tolerant than others.

Moisture
Usually occurs over an average annual rainfall range of 625-1,750 mm, but down to 550 mm, and up to 4,300 mm. Very drought tolerant by virtue of rhizome survival through drought-induced dormancy over periods of up to 7 months. Tolerates at least several weeks of deep flooding.

Temperature
Widely distributed from >50ºN in Europe to 34.5ºS in South Africa, and probably further south outside its native range. It also grows from sea level over much of this latitudinal range to about 4,000 m asl in the Himalayas. This equates to a range in average annual temperature from about 6-28°C. There are large differences among ecotypes in terms of temperature response. However, C. dactylon generally grows best with mean daily temperatures above 24°C or over an optimal range of 17-35°C. Grows very slowly at 15°C. Plants become dormant when night temperatures fall below 0°C, or the average daytime temperature below 10ºC, or cooler than a regime of an 8-hour day at 15°C and a 16-hour night at 5°C. Although foliage and stems are usually killed at temperatures of -2 to -3°C, plants regrow rapidly from rhizomes with the onset of warm conditions.

Light
C. dactylon is not shade tolerant and yields decrease rapidly with increasing shade. It usually dies out under medium to dense shade.

Reproductive development
Flowers throughout the growing season. Wind pollinated.

Defoliation
Extremely tolerant of heavy grazing, but more productive if correctly managed. Regular grazing and nitrogen fertilisation are necessary to maintain quality. Cut for hay or silage when 30-40 cm tall or every 4-6 weeks, usually when in full bloom. 4 cuttings per year are possible. A stubble height of 5-10 cm under grazing or cutting gives good regrowth and maintains sward density. Renovate by ploughing or discing when sod-bound.

Fire
It will stand severe fires due to the extensive rhizome development in most varieties and cultivars.

Agronomy
Guidelines for the establishment and management of sown pastures.

Establishment
Propagated by seed or vegetatively (turfs or stolon/rhizome pieces (sprigs). Normally sown at 5-10 kg/ha dehulled seed, the higher rate being used for more rapid cover. No seed dormancy has been reported. Seed is best sown onto a very well prepared, fine, weed-free seedbed and rolled in. Seedlings usually root down quickly. Improved varieties are usually planted vegetatively due to low seed set or to avoid genetic drift. Turfs or sprigs can be planted at 3.5-7 m²/ha (40-80 bu/ac) or on a 90 cm (or less) grid, into a roughly or well-prepared seedbed, but rolling is still essential. Machinery has been developed to facilitate harvesting and planting of sprigs. Seedlings and sprig-plantings grow vigorously once established.

Fertiliser
Survives at low fertility possibly due to non-symbiotic N fixation in the rhizosphere, measured at 30 kg/ha N in a 100-day period. Responds well to improved fertility, with applications of a minimum of 10 kg/ha/month N and up to 60 kg/ha/month N necessary for moderate to high productivity, particularly in some of the improved hybrids.
Compatibility (with other species)  

*C. dactylon* is very competitive, particularly in fertile soils, and only aggressive legumes are capable of forming an association with it. It suppresses weeds well if kept mown or grazed closely and fertilised.

Companion species

Grasses: Generally not planted with other grasses.


Pests and diseases

Rust (*Puccinia graminis*) and *Helminthosporium* leafspot are the major fungal diseases of *Cynodon dactylon*, although resistant types are available. Other fungal diseases include *Bipolaris*, *Gaeumannomyces*, *Leptosphaeria*, *Marasmius*, and tar spot (*Phyllachora*). Smuts from *Sporisorium*, *Sorosporium* and *Ustilago* can infest seedheads. Also attacked by the bacterium *Xanthomonas cynodontis*, and by barley yellow dwarf virus, lucerne dwarf virus, and viral stripe diseases (which affect corn and rice), as well as by a range of nematodes, the main one being root knot nematode (*Meloidogyne* spp.). Selection for nematode resistance has been important in breeding programs.

Armyworm (*Spodoptera* spp.), tropical grass webworm (*Herpetogramma licarsisalis*), spittlebug (*Prosapia bicinata*) and bermudagrass mite (*Eriophyes cynodonidnsis*) are major pests. The parasitic flowering plants *Cuscuta pentagona*, *Nuytsia floribunda*, *Striga harmonithica*, and *S. lutea* can adversely affect stands.

Ability to spread

*C. dactylon* spreads rapidly by rhizomes and stolons, and also by seed. It can spread over 2 m/month during the growing season, a single plant forming a dense sward up to 25 m across in 2.5 years.

Weed potential

It is difficult to eradicate with chemicals or cultivation, and can become a serious weed in cultivated land. Declared weed in over 80 countries.

Feeding value

Nutritive value

Crude protein varies with age of material and level of nitrogen fertilisation, from about 3 to 9% in old grass, to about 20% in young, well-fertilised grass. IVDMD varies from 40 to 69% with genotype.

Palatability/acceptability

It is very palatable if kept short in growth and fertilized. Excellent grazing for village geese, ducks, goats, cattle and buffaloes if not trampled too much by these latter heavy beasts. The rhizomes are given to horses.

Toxicity

Some varieties have the potential to produce high levels of prussic or hydrocyanic acid (HCN), especially when high levels of nitrogen are applied. However, instances of prussic acid poisoning in cattle grazing *C. dactylon* are rare. Although levels of total oxalate of >1% of the DM have been recorded, there is no experience of detrimental effects on grazing cattle. Frosted *C. dactylon* can cause photosensitization.

Production potential

Dry matter

Productivity depends on the cultivar used, the time of year and the amount of nitrogen available. DM yields of 1,000-3,000 kg/ha per month are possible in summer and 100-1,200 kg/ha in winter. "Coastal" yields up to twice as much as most common ecotypes. Annual DM yields are generally of the order of 5-15 t/ha.

Animal production

Liveweight gain of cattle ranges from 200-300 (500) kg/ha/yr, or over 700 g/hd/day, when moderate rates of N and other fertilisers are applied and at stocking rate of about 2 or more beasts/ha. Silage made from heavily fertilized, properly ensiled young grass can produce as much milk as corn silage and at a cheaper cost.

Genetics/breeding

Commonly 2n = 18, 36; also 2n = 27, 30, 40.

- var. dactylon (2n = 36)
- var. aridus (2n = 18)
- var. afghanicus (2n = 18, 36)
- var. coursii (2n = 36)
var. elegans (2n = 36)
var. polevansii (2n = 36)

*Cynodon dactylon* is wind-pollinated, and generally self-incompatible, suffering from inbreeding depression when genotypes are self-pollinated. Quantitative traits such as seed yield and forage yield can be dramatically negatively affected. Breeding programs have traditionally selected for DM yield, digestibility, disease and nematode resistance, and winter hardiness, and are now seeking to increase aluminium tolerance.

**Seed production**

Strains show considerable variation with respect to seed set, and in general, seed production is relatively low. One or two crops per season - mid- and late growing season. The crop is mowed into windrows, picked up and threshed by combines. Seed yields may range from about 100 kg/ha to as high as 350 kg/ha.

**Herbicide effects**

Herbicides that can be used to control *Cynodon dactylon* include the aryloxyphenoxy-propionates (fenoxaprop-P-ethyl, haloxyfop, propa-quizafop, quizalofo-P-ethyl), dinitroanilines (endimethalin, prodiamine, trifluralin), glyphosate, 2,4-D, 2,2-DPA, clomazone, and sulfonylureas (imazapyr, sulfometuron, and thiazopyr). Sulfometuron and metribuzin are more effective than thiazopyr and imazapyr, and glyphosate gives variable results.

**Strengths**

- Widely adapted to soils and climate.
- Palatable.
- High nutritive value when young.
- Excellent ground cover for soil conservation.
- Tolerant of heavy grazing.
- Makes useful hay and silage.
- Tolerant of salinity.
- Tolerant of flooding.

**Limitations**

- Low production unless well fertilised.
- Can become a weed in cultivation.
- Difficult to eradicate.

**Selected references**


**Internet links**

http://floridaturf.com/bermuda/origins.htm
http://www2.ctahr.hawaii.edu/sustainag/covercrops/bermuda_grass.asp
http://www.hort.purdue.edu/newcrop/duke_energy/Cynodon_dactylon.html
http://www.fao.org/ag/aga/agp/arfis/Data/60.HTM
http://www.intlseed.com/documents/info_bermudagrass.htm
http://edis.ifas.ufl.edu/AA221
http://www.cpes.peachnet.edu/fat/bermudagrass.htm
http://www.forages.css.orst.edu/Topics/Species/Grasses/Bermudagrass/Cultivars.html

**Cultivars**

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Country/date released</th>
<th>Details</th>
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<tbody>
<tr>
<td>'Alicia'</td>
<td>Texas, USA (1967)</td>
<td>From South Africa. Spreads and becomes established more rapidly, but is less winter hardy and less resistant to diseases, and has lower quality than 'Coastal'. Susceptible to rust.</td>
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<tr>
<td>'Brazos'</td>
<td>Texas, USA (1982)</td>
<td>F1 hybrid (‘Guymon’ X 9558) x (X-820). Has larger leaves, stems and rhizomes than 'Coastal'. Slower to establish but higher forage quality (dry matter digestibility) and better gain per animal than 'Coastal'. Equal or superior to 'Coastal' in stand density, persistence under grazing, and winter hardiness. The larger stems do not favour hay drying, but do resist lodging in contrast to 'Coastal'. Better animal performance than 'Tifton 44'; an improved winter-hardy cultivar.</td>
</tr>
<tr>
<td>'Callie'</td>
<td>Mississippi, USA</td>
<td>Selected from introductions from South Africa. Probably a hybrid, but exact origin unknown. A tall-growing type, with large stolons and wide...</td>
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Promising accessions

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<th>Promising accessions</th>
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