

Tropical Forages

Stylosanthes capitata

Scientific name



Stylosanthes capitata Vogel

Synonyms

None listed in GRIN.

Family/tribe

Family: *Fabaceae* (alt. *Leguminosae*) subfamily:
Faboideae tribe: *Dalbergieae* subtribe: *Stylosanthinae*.

Morphological description

Short-lived perennial, erect, ascendant to decumbent sub-shrub, to 1 m diameter and height, multi-branched, stems often woody at the base, with variable pilosity, sometimes with bristles. Strong tap root. Leaves trifoliolate; leaflets elliptical to oblong, sometimes obovate, very variable to 30 (rarely 40) mm long, 12–15 mm wide, apex acute or mucronate, variable pilosity on both faces; petiole densely pilose. Inflorescence capitata, oblong to obovate, to 7 cm long and 1.5–2 cm wide; bracts oblong, 9–13 mm long including teeth, variable pilosity, bristles sometimes present; inflorescences multi-flowered, borne in dense terminal or axillary clusters. Papilionaceous flowers bright yellow, unstriated, standard to 7 mm diameter. Pod 2-segmented, both segments fertile; each 5–7 mm long, 2.2–2.5 mm wide, the upper segment with a 1 mm long, straight or recurved beak. Seed of variable colour, almost black to yellow, sometimes spotted, 2 mm long. 350,000–530,000 seeds per kg.

Common names

English: capitata

Latin America: estilosantes, meladinha (Brazil); capica, capitata (Spanish)

Distribution

Native:

South America: Bolivia, Brazil (Bahia, Ceará, Federal District, Goiás, Maranhão, Mato Grosso do Sul, Minas Gerais, Para, Paraíba, Pernambuco, Piauí); Venezuela (Anzotegui, Bolívar, Guárico, Monagas)

Cultivated:

South America: Brazil, Colombia, Venezuela

Uses/applications

Forage

Permanent pastures for intensive grazing in grass-legume associations. *S. capitata* has also been used to recuperate degraded *U. decumbens* pastures (undersown into a rice crop). Not suited to cut-and-



Capitate inflorescence with pubescent, green bracts; radiating hairs on young stem in centre of image



Short-lived, erect, ascendant to decumbent, perennial sub-shrub



Trifoliolate leaves with elliptical to oblong leaflets (ILRI 15115F)



Stem puberulent; red pigmentation of stem and inflorescence bracts



Oblong inflorescence



Obovate inflorescence



Seeds and pod segments; lower (left), upper with recurved beak (right)



Variable seed colour



Habit. Scale: between points = 1 cm. (Drawn from N. Sousa Costa 2093.)



A leaf; B

bract; C bracteoles and axis rudiment; D unfolded calyx; E keel; F wing; G standard; H androecium and gynoecium; I pod, axis rudiment and inner and outer bracteoles; J seed. Scale: between points = 2 mm. (Drawn from N. Sousa Costa 2093.)

carry.

Ecology

Occurs in treeless and open woodland savanna habitats often in association with fine-stemmed 'tardío' forms of *S. guianensis* var. *guianensis*.

Soil requirements

Occurs naturally on acid (pH <5), infertile, well-drained, sandy and sandy clay loam soils. Only nodulates effectively at low soil pH; dies on soils of pH >5.5.

Tolerant of low P and high levels of Al and Mn. Requires well-drained, sandy soils.



Prostrate growth habit under continuous grazing, sand soil



Prostrate growth habit under continuous grazing in native *Trachypogon* savanna, E Venezuela

Moisture

Average annual rainfall in the native habitat is 1,500 mm, with a 3–6 month dry season. While best adapted to sub-humid to humid tropics (rainfall 1,000–2,500 mm/yr), can also be grown successfully in the humid subtropics and semi-arid tropics with rainfall down to 500 mm/yr, provided that soil conditions are suitable. Intolerant of flooding or a high water table.

Temperature

Occurs from 21° S in Brazil to 10° N in Venezuela, from lowlands up to 1,000 m asl. Best performance in the hot tropics. Killed by frost.

Light

Optimum production in full sunlight.

Reproductive development

Short-day flowering response. Flowers April/May, with seed maturity late June/early July, in southern hemisphere. In the northern hemisphere, there are marked differences in flowering time among accessions.

Defoliation

Tolerant of low and frequent defoliation. Develops a prostrate growth habit under grazing.

Fire

Being a savanna species, *S. capitata* is able to tolerate light fires. Furthermore, due to free-seeding habit and high levels of soil seed bank, it re-establishes readily.

Agronomy

Guidelines for establishment and management of sown forages.

Establishment

High levels of hardseededness. Scarification with concentrated sulphuric acid for 5 minutes reduces hardseededness and improves germination. Good establishment may be obtained from 2 kg of acid scarified, dehulled seed per hectare. The small seed should be sown no deeper than 1 cm, and the sown area compacted with a roller to increase speed of germination and emergence. Can nodulate effectively with native rhizobia, but best to inoculate with effective *Bradyrhizobium* strains such as CIAT 170 (= CB 3055).

Fertilizer

Tolerant of low fertility situations. A standard fertilizer application on very infertile soils comprising P 20, K 20, Ca 100, Mg 14 and S 22 kg/ha at establishment, and maintenance dressings every two years of half this amount have given consistently good results.

Establishment fertilisation recommendation in Eastern Venezuela: 40–50 kg P₂O₅/ha, 20–30 kg K₂O/ha, 10–20 kg Mg/ha and 10–20 kg S/ha. Lime can have a detrimental effect on nodulation.

Compatibility (with other species)

Compatible with tussock-forming grasses, if shading is reduced by regular defoliation of the grass.

Companion species

Grasses: [Andropogon gayanus](#), [Urochloa decumbens](#), [U. brizantha](#), [U. humidicola](#) cv. Llanero, [Melinis minutiflora](#), [Paspalum atratum](#).
Legumes: [Stylosanthes macrocephala](#), *S. guianensis* var. *guianensis* (tardío type), [Cratylia argentea](#).

Pests and diseases

Forms of anthracnose disease caused by *Colletotrichum gloeosporioides* are a major threat to the use of *Stylosanthes* spp. worldwide, affecting both commercial pastures and seed production. Severe outbreaks of the disease have been reported from all regions where the genus has been established. Plant resistance is the only practical means of control. Significant resistance to the disease can be found in

geographically distinct groups of *S. capitata*. In general, Venezuelan provenances are lower yielding with high levels of anthracnose resistance, while the higher yielding Brazilian provenances are more susceptible to the disease. Breeding programs have been undertaken to obtain the desired recombination of high dry matter and seed yields coupled with anthracnose resistance (see cv. Campo Grande). Depending on genotype, seed yields can be drastically reduced by a stemborer, *Caloptilia* sp., and the budworm, *Stegasta bosqueella*.

Ability to spread

A particularly important characteristic of *S. capitata* is the excellent seedling regeneration in cut and grazed swards. It spreads naturally through seed drop, as well as through ingestion of inflorescences by cattle over the dry season; the seed is protected in the gut due to the high level of hard seed.

Weed potential

Due to its free-seeding habit, high seed yields, hardseededness and a persistent soil seed bank, it can invade cultivated land.

Feeding value

Nutritive value

CP level: about 17.2% in leaf; 9.2% in stem; and 16.5% in inflorescence. IVDMD: about 60% in leaf; 50% in stem; and 64% in inflorescence. P about 0.18%, Ca about 0.75%.

Palatability/acceptability

Well accepted by all classes of animals, including chickens, ducks and pigs.

Toxicity

In Brazil, the occurrence of phytobezoars (trapped mass in the gastrointestinal system that consists of components of indigestible plant material, such as fibres, skins and seeds) in cattle consuming in excess forage of the *S. capitata* (80%)/*S. macrocephala* (20%) multi-line cv. Campo Grande and leading to mortality, has been reported.

Production potential

Dry matter

Up to 12–13 t DM/ha/year under good conditions, but more often 3–6 t DM/ha. Little dry season growth.

Animal production

Reported annual liveweight gains for *Andropogon gayanus* - *S. capitata* are 145–350 kg/ha and 110–200 kg/head in situations where the annual production of the native savanna is only 22 kg/ha. In association with *U. decumbens*, stocked at 0.6–1.4 AU/ha, 7–20% improvement in LWG/ha was achieved, and 10–23% improvement in LWG/hd, over grass alone. With cv. Campo Grande (80% *S. capitata*, 20% *S. macrocephala*) in mixture with *U. decumbens*, 34% higher liveweight production (up to a total of 470 kg/ha/yr) has been obtained in comparison with the grass alone.

Genetics/breeding

Tetraploid ($2n = 4x = 40$), self-compatible with about 20% out-crossing. Evidence suggests it may be an allotetraploid derived from *S. pilosa*, *S. bracteata*, *S. macrocephala*, or *S. ingrata*. Both *S. capitata* and *S. macrocephala* have shown agronomic potential in Brazil, with the latter being found to be highly resistant to anthracnose. Interspecific hybrids between these two species are unlikely as they differ in ploidy levels. The main breeding strategy has entailed the production of synthetic populations by mixing resistant *S. macrocephala* accessions with productive *S. capitata* accessions. It should be possible to transfer genes from *S. macrocephala* to *S. capitata* by crossing *S. macrocephala* and *S. pilosa* to synthesise allotetraploids, and then hybridizing these artificial allotetraploids with those natural *S. capitata* genotypes.

Seed production

The species is a prolific seed producer, different ecotypes producing seed yields ranging from 650 to >1,000 kg/ha under various environmental conditions. Commercial yields of combine-harvested seed in eastern Venezuela: 75–300 kg seed-in- pod/ha.

Herbicide effects

Tolerant of acifluorfen, bentazone, 2,4-D, 2,4-DB, fluazifop-butyl, and sethoxydim. Susceptible to metsulfuron-methyl and glufosinate.

Strengths

- Anthracnose resistance, depending on accession and region.
- Tolerant of low soil fertility.
- Tolerant of moderately heavy grazing .
- Moderate to high quality.

- Free seeding.
- Combines well with competitive bunch grasses.

Limitations

- Limited to very acid and sandy soils.
- Not suited to cut-and-carry.
- May invade cultivated land.
- Specific rhizobium requirement.

Selected references

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Cultivars

'**Campo Grande**': Released in Brazil (2000). A composite of *S. capitata* and *S. macrocephala*. A mass *S. capitata* hybridization scheme of 17 Brazilian (high DM and seed yields) × Venezuelan accessions (anthracnose resistant) led to a desirable recombination of forage traits. Seed from the resultant hybrid is mixed 80:20 with seed of a mix of 6 genotypes of the highly anthracnose resistant *S. macrocephala*, to produce the multi-line cv. Campo Grande, which, with its diverse genetic make-up, has a wide application in acid-soil savannas.

'**Capica**' (CIAT 10280 – a mixture of CIAT 1315, 1318, 1342, 1693, 1728) Released in Colombia (1983). All component accessions originated from Brazil and were productive and anthracnose resistant in Colombia and Venezuela. The accession mix (a multi-line cultivar) was deemed preferable as it provides increased genetic variability basis for providing disease resistance.

'**Alfalfa Criolla**' (CIAT 10280) Released in Venezuela (1998) – see 'Capica'.

Promising accessions

CIAT 1914, CIAT 2261, CIAT 2814, CIAT 2815 and CIAT 2819 Except for CIAT 2261 (origin: Minas Gerais, Brazil), all accessions originated from eastern Venezuela. In Mato Grosso do Sul, Brazil, these five accessions showed they were well adapted to soil and climate of the region, were highly resistant to anthracnose and gave DM yields of between 10 and 12 t/ha.

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