

# Tropical Forages

## *Stylosanthes humilis*

### Scientific name



*Stylosanthes humilis* Kunth

### Synonyms

*Stylosanthes figueroae* Mohlenbr.

### Family/tribe

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

### Morphological description

Much-branched, prostrate to erect, herbaceous annual 5–50 (–70) cm tall, usually with short white hairs along one side of the stem and scattered small bristles on stem and nodes. Leaves trifoliolate, leaflets lanceolate or elliptical, acute, terminal leaflet 5–24 mm long, 1.8–5 mm wide, laterals smaller; both surfaces more or less glabrous or with short bristly hairs; petioles 2–5 mm long, shortly hairy and often with scattered bristles; stipules bidentate, adnate to base of petiole with bristles 3–5 mm long on both sheath and teeth. Inflorescence comprises several short, ovoid, crowded hirsute spikes, with 3–5 (–15) flowers in each spike; flowers not subtended by axis rudiment, one inner and one outer bracteole at base; calyx tube 4–5 mm long, lobes 1.5 mm long; corolla bright yellow; standard 3–4 mm × 3–4 mm. Fruit a 2-segmented pod (loments), hairy with two articulations; the upper articulation beaked, 7–10 mm long (including the beak), fertile; the lower much reduced, mostly sterile; beak strongly uncinately coiled, 2–7 mm long (to 70% of total fruit length). Seeds fawn to brown and black. 275,000–300,000 seeds-in-pod and 400,000–500,000 dehulled seeds per kg.

### Similar species

***S. humilis* (2n = 20)**: obligate annual; abundant bristles on stems, stipules and bracts; stipules forming a fused sheath around the stem; loment usually with only one fertile article; axis rudiment absent.

***S. hamata* s. str. (2n = 20)**: perennial; absence of bristles on stems; loment often with two fertile articles; each flower subtended by axis rudiment; terminal bristle on tips of stipules and bracts absent.

***S. hemihamata* nom. nud. ≡ "tetraploid *S. hamata*" (2n = 40)**: short-lived perennial; absence of bristles on stems; loment often with two fertile articles; only lower flowers subtended by axis rudiment; presence of a long terminal bristle on tips of stipules and bracts.

### Common names

Asia: magsaysay lucerne, magsaysay stylo (Philippines); thua-satailo (Thailand)

English: annual stylo, long-beak pencil-flower, Townsville



Young plant pre-flowering



Inflorescence a spike with mostly 3-5 flowers.



Inflorescence; conspicuous bristles on leaf stipule.



Maturing seed heads



Pod segments and seed of black-seeded accession: upper segment with coiled beak (left); mostly sterile, hairy lower segment (right). Well-developed lower segment as shown is atypical.



Upper pod segment and seed of brown-seeded accession



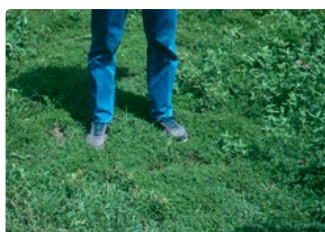
Habit.

Scale: between points = 1 cm. (Drawn from N. Sousa Costa 3091.)



A leaf; B

inflorescence; C bract; D keel; E wing; F standard; G bracteoles; H unfolded calyx; I pod; J androecium and gynoecium; K seed. Scale: between points = 2 mm. (Drawn from N. Sousa Costa 3091). Well-developed lower pod segment as shown is atypical.



Prostrate habit of Khon Kaen stylo



Sown pasture, 1967, before advent of anthracnose disease, Northern Territory Australia

stylo, Townsville lucerne, wild lucerne

*Europe:* luzerne de Townsville (French); Townsvilléluzerne (German)

*Latin America:* alfafinha-do-nordeste, alfafa do nordeste, erva de coelho, erva-de-ovelha, alfalfa de townsville, alfalfa selvagem (Brazil); alfalfa estilosa, stylo pequeño (Spanish)



Sown pasture, Northern Territory  
Australia



Growing on cracking clay, Venezuela

## Distribution

### Native:

*Northern America:* USA (Arizona (Cochise Co.)); Mexico (Chiapas, Colima, Guerrero, Jalisco, Mexico, Michoacán, Oaxaca, Veracruz)

*Caribbean:* Cuba

*Central America:* Belize; Costa Rica; El Salvador; Guatemala; Honduras; Nicaragua; Panama

*South America:* Bolivia; Brazil (Amazonas, Bahia, Ceará, Goiás, Maranhão, Mato Grosso do Sul, Minas Gerais, Para, Paraíba, Pernambuco, Piauí); Colombia; Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Carabobo, Cojedes, Guárico, Monagas, Portuguesa, Zulia)



Dense seedling development at  
beginning of the growing season



Spontaneous soil cover by native *S. humilis* in disturbed savannah in E Venezuela.

### Cultivated/naturalized:

*Africa:* Côte d'Ivoire; Kenya; Tanzania

*Asia:* Indonesia; Malaysia; Philippines

*Australasia:* Australia (Northern Territory, Queensland, Western Australia), Papua New Guinea

## Uses/applications

### Forage

Mainly used as a source of leguminous protein in humid and sub-humid tropical native pastures dominated by early-maturing clump grasses such as *Heteropogon* and *Hyparrhenia* spp. It was mainly used in grazing systems prior to the advent of anthracnose disease (see Agronomy). Taller types make quite good hay, particularly if the stand has been fertilized with phosphorus, and is not too badly affected by anthracnose. It is generally too low-growing for cut-and-carry systems.

### Other

Like a number of *Stylosanthes* spp., *S. humilis* plays a role in reducing cattle tick (*Rhipicephalus microplus*, formerly *Boophilus microplus*) populations.

## Ecology

### Soil requirements

Occurs over a wide range of soil textures from gravel to clay but predominantly on lighter soils. In cultivation, prefers sands and sandy loams, but will grow on hard setting and heavier soils, not necessarily well drained. pH range at collection sites varies from 5.0 to 6.5. Mostly naturalized on at least slightly acid soils. Nodulates effectively down to pH 4.5, or pH 4.0 if the calcium supply is adequate. Has tolerance of high levels of available Al and Mn, and fair tolerance of salinity.

### Moisture

Occurs in tropical areas with 400 mm annual rainfall and pronounced dry season, to areas with rainfall >3,000 mm and a short dry season. Adventive populations have developed in areas with rainfall varying from about 500 to 1,500 mm, although many of the populations in more humid areas have succumbed to the disease anthracnose, caused by *Colletotrichum gloeosporioides*. Although it persists, it does not add significantly to animal production in lower rainfall areas below about 800 mm. Relatively insensitive to dry conditions once established. Survives drought through being annual and setting copious amounts of mostly hard seed, and developing a large bank of soil seed. Survives short periods of waterlogging but cannot withstand flooding. Prostrate stems in contact with moist soil sometimes develop adventitious roots away from the taproot.

### Temperature

In its native or naturalized range in the Americas, *S. humilis* extends from about latitude 3 to 23°, and from near the equator to 28° elsewhere. Altitudinal range extends from near sea level in the tropics and subtropics to 1,500 m asl in the tropics. This represents an

average annual temperature range of 14–28 °C, in frosted and non-frosted environments. Temperatures for optimum growth range between about 27 °C and 33 °C day temperature. Dry-matter production is reduced with night temperatures below 25 °C and day temperatures below 30 °C. Plants are killed by frost, but ripe seed is normally set before frost.

## Light

Grows best in full sunlight; should not be grown with tall grass or under trees. Yield reduced by 47% at 74% daylight; at 38% daylight, one third of plants die.

## Reproductive development

Has short-day flowering response with a critical photoperiod of 12–14 hours, and peak flowering at 8–10 hours. This is genetically controlled, the shorter daylength response being dominant. After commencement of flowering, the main stem often tends to become prostrate. Can flower within 35 days of sowing. Flowering is negatively correlated with latitude and positively with rainfall, and is completely inhibited when night temperatures fall below 10 °C.

## Defoliation

Management should be based on *S. humilis* being an annual with low tolerance of reduced light. End-of-season management must favour seed set. In particular, grazing management must recognise that heavy grazing late in the season reduces seed production. Seedlings must be given an opportunity to develop with adequate light and exposed soil. Heavy grazing in the early wet season, reduces the vigour of the perennial grasses, and allows the legume plants to develop.

Grazing management should aim to avoid mature plants being shaded by grasses. Growth habit is more typically erect or semi-erect, but the population may become dominated by prostrate forms under heavier grazing pressure. Populations also become more prostrate with decreasing daylength below about 10 hours.

## Fire

Plants are killed by fire, although fire is mostly only an issue during the dry season after plants have completed their life cycle. Fire helps to soften hard seed thus stimulating germination. Burning of pastures should take place before the break of season, as fire-susceptible seedlings will be present after the early rains.

## Agronomy

Guidelines for establishment and management of sown forages.

### Establishment

Fresh seed can have >90% embryo dormancy, which lasts about 4 months. It also has up to 100% hard seed, which, under natural conditions, is softened by fire or soil surface temperatures >50 °C. Seed does not soften during normal storage. Germination of commercial seed can be improved by mechanical scarification, hot water (80 °C for 10–15 minutes, then cool and dry), or one of the various dry heat treatments (85° C for 1–2 hours, or heated for 15–20 seconds at 155 °C in a rotating drum, in each case cooling rapidly to ambient temperature). Sown just before the rainy season at 2–3 kg/ha. Hulled or de-hooked seed gives freer flow through machinery. *S. humilis* is fairly promiscuous in its rhizobial requirements, but seed can be inoculated with CB 82, CB 756 *Bradyrhizobium*, or their equivalents, to ensure best results. Establishes best on a well-prepared seedbed (essential on heavy clays), but can also be sown into heavily grazed pasture or into the ash following a fire. While the latter is less expensive, it is also much slower and may take up to 3 years to obtain good cover. Seedlings are only moderately vigorous, but rapid root development provides tolerance of dry, and favours competition with associated species.

### Fertilizer

One of the most efficient of the tropical legumes in extracting its calcium and phosphorus from the soil. Grows in soil with available phosphorus levels as low as 3–10 ppm. Although it establishes in most soils without additional P, performs better with 20 kg/ha P at planting, with an occasional follow-up dressing. Tolerant of high manganese and aluminium.

### Compatibility (with other species)

Grows well with other species provided sufficient access to light. Shaded out by taller grasses and significant tree canopy.

### Companion species

Grasses: *Bothriochloa pertusa*, *Cenchrus ciliaris* (low forms), *C. setiger*, *Dichanthium annulatum*, *Digitaria eriantha*, *Heteropogon contortus*, *Urochloa mosambicensis*.

Legumes: *Aeschynomene falcata*, *Chamaecrista rotundifolia*, *Listia bainesii*, *S. hamata*, *S. scabra*.

### Pests and diseases

Commonly susceptible to anthracnose disease caused by type A *Colletotrichum gloeosporioides* and *C. dematium*, although resistant strains have been identified, e.g. 'Khon Kaen'. Naturalized *S. humilis* in Australia was all but destroyed by anthracnose following appearance of the disease about 1973, although stands still persist in the seasonally dry north of the country. Other diseases recorded

are blight caused by *Corticium solani*, *Sclerotium rolfsii*, and bacterial wilt caused by *Pseudomonas solanacearum*. Root knot nematode (*Meloidogyne javanica*) and burrowing nematode (*Radopholus similis*) attack *S. humilis*, but rarely cause losses.

### Ability to spread

Readily spread by virtue of hooked seed adhering to livestock, seed being ingested and passing through livestock, and water movement.

### Weed potential

Although widespread, it is rarely considered a significant weed. Anthracnose disease has acted as a biological control of *S. humilis* in Australia. *S. humilis* was present in dense populations in the tropics and subtropics of northern Australia until the inadvertent introduction of anthracnose disease in 1973. There are still vestigial populations in some areas, significant in some seasons, but markedly reduced compared with the pre-disease peak.

### Feeding value

#### Nutritive value

CP level from 10 to 18%, and P levels from 0.04 to 0.20%. IVDMD of young material of the order of 60–70% declining to 40% with age.

#### Palatability/acceptability

Relatively less palatable than associated grass in the young stage, but assumes increasingly high proportions in the animal diet as pasture matures. Cattle raised on *S. humilis*, and familiar with it, will graze it when green. The seed, which is about 60% digestible, improves forage quality.

#### Toxicity

No record of toxicity.

#### Feedipedia link

<https://www.feedipedia.org/node/250>

### Production potential

#### Dry matter

Dry matter yields range from as little as 1 t/ha to a high of 7 t/ha, depending on soil and climatic conditions. Yields are depressed by the presence of taller grasses.

#### Animal production

Can support up to 2.5 beasts/ha, although 0.5–1 beasts/ha is more realistic, increasing carrying capacity of unimproved pasture considerably. A verage liveweight gain of 0.3–0.5 kg/hd/day achievable.

### Genetics/breeding

Largely self-pollinating;  $2n = 20$ . Colchicine induced tetraploids have been produced. *S. humilis* has been identified as the probable maternal parent of both *S. sympodialis* and the allotetraploid, *S. hemihamata* nom. nud. (see *S. hamata*).

### Seed production

Average yield, about 330 kg/ha but yields up to 1,100 kg/ha have been obtained under good conditions. Frosts limit the options for seed production in the subtropics.

### Herbicide effects

Tolerates 2,4-D at 125 and 250 g a.i./ha.

### Strengths

- Adapted to low fertility soils.
- Tolerates high soil manganese and aluminium.
- Free-seeding, self-regenerating.
- Tolerates heavy grazing.

### Limitations

- Susceptible to anthracnose disease.
- An annual.
- Low to moderate production.
- Intolerant of shade.

- "Hooked" seed difficult to sow.

## Selected references

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## Cultivars

**'Gordon'** Selected in Australia (1968). Erect type, selected from naturalized population in Northern Territory for late flowering and good production compared with prostrate types. Adapted to tropical areas with an annual rainfall of 1,130 mm or more, and with a marked dry season. Succumbed to anthracnose.

### 'Khon Kaen'

(CPI 61674) Selected in Thailand (1984). Institutional collection from Venezuela. Low growing, prostrate type, with unrestricted height of 30–40 cm. Less productive but more persistent than *S. hamata* cv. Verano (yield about half that of 'Verano'), but still capable of up to 7 t/ha DM. Resistant to anthracnose and tolerant of heavy grazing.

**'Lawson'** Selected in Australia (1968). Erect type, selected from naturalized population in north Queensland for mid-season flowering and good production compared with prostrate types. Adapted to tropical and subtropical areas with an annual rainfall of 890–1,130 mm, and a long dry season. First flowers mid-March extending over 8–10 weeks. Succumbed to anthracnose.

**'Paterson'** Selected in Australia (1969). Erect type, selected for early flowering and good production compared with prostrate types. Distinguished from 'Lawson' and 'Gordon' by its purplish black seeds (versus brown seed for other two cultivars). Immature seeds are brown or brown with purple mottling. Succumbed to anthracnose.

## Promising accessions

None reported.

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