Desmanthus virgatus

Scientific name

*Desmanthus virgatus* (L.) Willd.

Turner (1950) regarded *Desmanthus virgatus* as an all-encompassing species, comprising *D. virgatus*, *D. pubescens*, *D. pernambucanus*, *D. glandulosus* and *D. leptophyllus*. Despite taxonomic revision by Luckow (1993) that resolved the complex to distinct species, many authors continued to refer to all species as *D. virgatus* in the literature until the late 1990s. Correct nomenclature is now generally used.

Synonyms

*Acacia angustisiliqua* (Lam.) Desf.
*Acacia virgata* (L.) Gaertner
*Acuan depressa* (Willd.) Kuntze
*Acuan depressum* (Willd.) Kuntze
*Acuan texanum* Britton & Rose
*Acuan tracyi* Britton & Rose
*Acuan virgatum* (L.) Medikus
*Desmanthus depressus* Willd.
*Desmanthus pratorum* Macfad.
*Desmanthus tenellus* DC.
*Desmanthus virgatus* (L.) Willd. var. *depressus* (Willd.) B. Turner
*Mimosa angustisiliqua* Lam.
*Mimosa depressa* (Willd.) Poiret
*Mimosa virgata* L.

Family/tribe


Common names

adormidera, brusca prieta, dwarf koa, frijolillo, ground tamarind, guajillo (Mexico); guashillo, huarangillo, langalet, petit acacia, petit cassin, petit mimosa, virgate mimosa, dwarf koa (Hawaii); desmanthus (English).

Morphological description

Prostrate, decumbent or erect herbaceous perennial shrub, typically to 0.7 m, occasionally to 1.5 m tall; strongly branched from the base, with a taproot to 0.5 m depth and 1-2 cm in diameter. Young stems green and hairless (or with sparse white hairs), angular with golden corky ridges. Older stems hairless, shiny red or brown.

Bipinnate leaf 2.4-8.0 cm long, with 2-5 pairs of pinnae 11-30 mm long and 11-23 pairs of leaflets/pinnae, 2.4-7.0 mm long and 0.7-1.6 mm wide. Persistent stipules 2-9 mm long.

Small flowering heads (condensed spikes) 0.5-0.9 cm long, occur singly in leaf axils on short peduncles (to 4.0 cm long). Heads contain 3-22 flowers that may be perfect, functionally male or sterile. Sterile flowers 0-8 occur at the base of the head. Male flowers usually absent, occasionally 1, occur towards the base of the head above the sterile flowers, but below the perfect flowers. Perfect flowers 3-14 occur apically. Fruiting stalks 1.0-5.2 cm long bear 1-11 pods.

Pods are linear, 5.5-8.5 cm long and 3.2-4.9 mm wide, opening along both margins. Reddish-brown to nearly black at maturity. Seeds 11-26/pod, 2.4-3.1 x 1.7-2.4 mm, flattened and ovate in shape and reddish-brown or golden-brown in colour.

Distribution

Native to:

Natural distribution ranges from Texas and Florida in southern USA, Veracruz and Chiapas in Mexico, south throughout Central America and the Caribbean islands to most countries of South America.

Occurs naturally in coastal thickets and on beaches, roadsides and in other heavily disturbed areas at altitudes from sea level to 1,900 m, but primarily at low altitudes.

Uses/applications

Grazed by herbivores in the native range. Exotic component of improved permanent pastures in northern Australia. Grown in alley farming systems as a hedgerow species in India.

Ecology

Soil requirements

Occurs on a range of soil types from sandy and gravelly soils to calcareous soils and rocky clays. In exotic locations, *Desmanthus* spp. are generally selected for their persistence on duplex podzolics and cracking clays, including alkaline and sodic soils, but will grow productively on lighter soils of neutral to alkaline reaction.
Moisture

Occurs naturally in a wide range of rainfall environments from continually wet to those with extended dry seasons. Well-adapted to 550-1,000 mm average rainfall environments in exotic locations.

Temperature

Occurs over a wide temperature range from coastal to sub-montane environments and from the equator to 31°N, including environments receiving regular frosts. Defoliated by heavy frosts but will regrow from crowns in spring given adequate moisture.

Light

Poor tolerance of medium to heavy shade. Low DM production under shade of Acacia leucophloea.

Reproductive development

Will flower and fruit year round in the tropics, given sufficient soil moisture. Generally flowers and fruits in spring and summer in subtropical locations.

Defoliation

Very tolerant of regular cutting and grazing by ruminants. One of the forage legumes most tolerant of heavy grazing in pastures on clay soils in subhumid, northern Australia.

Fire

Will regrow from the crown after moderate fire. Fire can be useful in breaking seed dormancy. Germination of some accessions of Desmanthus virgatus was increased from <18% to as high as 80% after being subjected to temperatures commonly occurring in grass fires, providing seed is buried at 0.5-3.0 cm. Grass fire temperatures killed seed located on the soil surface.

Agronomy

Guidelines for the establishment and management of sown pastures.

Establishment

Sow 2 kg/ha of scarified seed at a depth of 0.5-2.0 cm into moist soil with at least 50-60 cm depth of good moist soil to ensure establishment. Deeper planting depths may prevent or delay emergence. Surface broadcasting onto a well-prepared seed-bed, followed by rolling; planting using a "crocodile" seeder; sod-seeding into slashed back pasture treated with glyphosate to suppress grass growth; or planting into cultivated strips; have also given satisfactory results. Fresh seed is extremely hard-seeded and should be scarified, either abrasively (eg, using a rice polisher) or by hot water treatment (4-10 seconds in boiling water), to raise the germination to a minimum of 50-70%. It is important to achieve good establishment from the plant crop, as seed produced from paddock plants will remain hard-seeded for 5-6 years.

In Australia, Desmanthus has previously been sown as cv. Jabiru, a mix of Desmanthus virgatus (cv. Marc), D. leptophyllus (cv. Bayamo) and D. pubescens (cv. Uman).

Fertiliser

May respond to S, Mo, P, Cu and Mn on clay soils. A critical leaf tissue concentration of 0.2 % S is required for optimum productivity. Highest DM yields at a P-deficient site were achieved with the addition of 50 kg/ha at Maharashtra, India, and 80 kg/ha P2O5 at Texas, USA. Higher rates of P-fertiliser decreased DM yields at both sites.

Compatibility (with other species)

In northern Australia, cv. Marc has persisted and increased in buffel grass (Cenchrus ciliaris) pastures and in pastures dominated by Queensland bluegrass (Dichanthium sericeum). Recruitment from high soil seed levels is irregular but successful in favourable seasons.

Companion species

Grasses: Buffel grass (Cenchrus ciliaris), Bambatsi panic (Panicum coloratum var. makarikariense), Queensland bluegrass (Dichanthium sericeum).

Pests and diseases

Occasional, minor damage by psyllid insects (Accizia spp.) was reported in northern Australia. The psyllids cause more serious damage in seed crops. Several seed-eating bruchid beetles (S Acanthoscelides spp. and 1 Stator sp.) are known to infest Desmanthus. Recorded as a host for alfalfa mosaic virus. No other reports of serious pests and diseases were cited.

Ability to spread

Being early flowering and producing large seed crops, cv. Marc will spread under grazing given reasonable rainfall conditions.

Weed potential
Has potential to become a minor weed of disturbed areas. Its low growth habit limits its ability to dominate companion species.

**Feeding value**

**Nutritive value**

Evaluations generally do not distinguish between species of *Desmanthus*, and are based on cvs. Marc, Bayamo and Uman. Crude protein content of the entire plant ranged from 10.5-15.5%, with leaves averaging 22.4% and stems 7.1%. A study of 18 accessions grown in India reported an average CP content of 21% (range 15-27%), and average NDF and ADF contents were 42 and 35%, respectively. *In sacco* DMD and N concentration of CPI 78382 were 65% and 3.5% respectively.

**Palatability/acceptability**

Palatable to grazing ruminants and grazed by beef cattle throughout the growing season. *Desmanthus* has been observed to be less palatable than leucaena (*Leucaena leucocephala*) but more readily eaten than *Stylosanthes scabra* cv. Seca. Accession Q 9153 was of higher palatability to grazing cattle than other *Desmanthus* accessions evaluated in Queensland, Australia.

**Toxicity**

No toxicities to ruminant livestock were reported in the literature. *Desmanthus* spp. do not cause bloat in ruminants because they contain 2-3% (of total DM as tannic acid equivalent) condensed tannins.

**Production potential**

**Dry matter**

Produced 7.6 t/ha DM in a 2,000 mm rainfall environment in the humid tropics and 7.1 t/ha DM under irrigation in a sub-humid environment. At 8 sites in Queensland, Australia, the best accessions of *D. virgatus* produced an average 2.0-2.4 t/ha/year in rain-fed, 600-750 mm rainfall environments. In low-rainfall (300-400 mm/year), drought prone environments in northern Australia, *D. virgatus* was one of the very few species that persisted under grazing over a 14 year period. Presentation yields of *D. virgatus* CPI 78382 and cv. Marc in grazed pastures in Australia ranged from 100-600 kg/ha DM over 6 below-average rainfall years and contributed between 3 and 20% of total DM yield.

**Animal production**

In a pen feeding experiment where a Mitchell grass (*Astrebla* spp.) basal diet was supplemented with *D. virgatus* accessions CPI 78382 and CPI 79653, DM intake of Merino wethers increased from 580 to 752 and 753 g/head/day, respectively, and wool growth increased from 0.48 to 0.69 and 0.73 g/day/cm², respectively.

No grazing trials assessing animal liveweight gains from *D. virgatus* are reported in the literature. The contribution of *D. virgatus* to pasture yield increases with the severity of the environment, so that it is relatively more valuable on soils of moderate fertility in strongly seasonally dry environments. In harsh environments, its contribution to yield can be significant, whereas in highly favourable environments its contribution to pasture yield may be relatively low.

**Genetics/breeding**

Taxonomic confusion within the genus has led to a vast range of accessions from *D. pernambucanus*, *D. leptophyllus*, *D. pubescens* and *D. virgatus* being evaluated as *D. virgatus*. However, there is considerable genetic and morphological diversity within *D. virgatus* that may have potential for cultivar development. Accessions from the northern Caribbean are very different from other provenances. Accessions of *D. virgatus* have been evaluated for their agronomic potential in India, southern USA and northern Australia. No breeding work has occurred to date. Chromosome number 2n=28.

**Seed production**

Cv. Marc and several other accessions are prolific, early seed producers. Seed yields of 400-500 kg/ha are achieved from direct-headed crops, but considerable seed losses occur due to uneven ripening and early seed fall. The potential seed yield using a suction harvester is in excess of 1,000 kg/ha, however the suction required to collect the dense *Desmanthus* seed can result in large quantities of small stones in the sample.

A psyllid insect (*Accizia* spp.) can cause severe damage to seed crops in Australia and may need to be controlled using insecticides. In Jhansi, India, seed production was increased by adding 60 kg/ha P2O5.

**Herbicide effects**

No information available.

**Strengths**

- High rates of seed production.
- Tolerant of heavy grazing.
- Very persistent in low rainfall environments.
- Combines well with grass pastures in sub-humid, moderate fertility environments.
- Tolerant of alkaline, sodic, saline and heavy clay soils.
Limitations

- Recruitment in the years following planting is limited by hardseededness.
- Relatively low DM productivity in vigorous grass pastures.
- Limited potential as a ley legume species due to low DM yields, high seed yields and early seed production.
- Highly specific in its rhizobium requirements (CB3126).

Other comments

Recruitment from seed in grass-legume pastures will not occur until hardseededness has been overcome by weathering. This will require several seasons to occur. A half-life for breakdown of hard seed of 60-70 months was reported under field conditions. Therefore, it is necessary to achieve a good initial strike rate from the plant crop (for which seed must be scarified).

Selected references


Internet links


Cultivars

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Country/date released</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Marc'</td>
<td>Australia</td>
<td>A low growing, spreading, early flowering, cultivar growing to a height of 30-60 cm. Has been more persistent than D. leptophyllus cv. Bayamo and D. pubescens cv. Uman in permanent pasture systems in northern Australia because of its ability to produce heavy seed crops and recruit from seed. Not suitable as a ley legume because of low growing habit and lower DM production c.w. other Desmanthus spp.</td>
</tr>
</tbody>
</table>

Promising accessions

<table>
<thead>
<tr>
<th>Promising accessions</th>
<th>Country</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q 9153</td>
<td>Queensland, Australia</td>
<td>Agronomically similar to Marc, but with higher DM yield and palatability to grazing cattle, and a higher proportion of soft seed.</td>
</tr>
<tr>
<td>CPI 78372</td>
<td>Queensland, Australia</td>
<td>Short-medium height accession from Argentina, very similar to cv. Marc. Prolific early seed production, persistence and moderate productivity under heavy grazing during 6 dry years in northern Australia. Also performed strongly in agronomic trials at 8 sites.</td>
</tr>
<tr>
<td>CPI 85178</td>
<td>Queensland, Australia</td>
<td>Decumbent/prostrate, short, accession from Mexico. Prolific, early seed production. Persistent and moderate productivity under heavy grazing during 6 dry years in northern Australia.</td>
</tr>
<tr>
<td>CPI 91326</td>
<td>Queensland, Australia</td>
<td>Productive and persistent in plot trials at 5 sites in southern and central Queensland.</td>
</tr>
<tr>
<td>CPI 79653</td>
<td>Queensland, Australia</td>
<td>Caribbean provenance that differs morphologically from &quot;typical&quot; D. virgatus.</td>
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</tbody>
</table>
Closeup of inflorescence (condensed spike).

Foliage (bipinnate leaves), pods (dehiscent when ripe) and seeds.

Inflorescence, flowers and pods - the flowers (left to right) and the pods (top to bottom) are *D. virgatus* cv. Marc, *D. leptophyllus* cv. Bayamo and *D. pubescens* cv. Uman.

Foliage and immature pods.

Decumbent form.

Semi-erect perennial shrub with strong basal branching.

Semi-erect perennial shrub with strong basal branching.