

Tropical Forages

Prosopis juliflora

Scientific name

Prosopis juliflora (Sw.) DC.

Subordinate taxa:

Prosopis juliflora (Sw.) DC. var. *juliflora*

Prosopis juliflora (Sw.) DC. var. *horrida* (Kunth) Burkart

Synonyms

var. **juliflora**: Basionym: *Mimosa juliflora* Sw.; *Prosopis vidaliana* Naves

var. **horrida**: Basionym: *Prosopis horrida* Kunth

Family/tribe

Family: *Fabaceae* (alt. *Leguminosae*)

subfamily: *Caesalpinioideae* (mimosoid clade*) tribe:

Mimoseae section: *Algarobia*

* Azani, N. et al. [97 authors from 54 institutions] 2017. A new subfamily classification of the Leguminosae based on a taxonomically comprehensive phylogeny. *Taxon* **66**: 44–77.

Morphological description

Evergreen small tree with twisted stem, 3–12 m tall, sometimes shrubby with spreading branches, armed with axillary stipular spines, paired or solitary, 0.5–5 cm long, or sometimes unarmed. Leaves bipinnate, 1–3 (–4) pairs of pinnae, 3–11 cm long; leaflets 6–29, generally 11–15 pairs, per pinna, elliptical-oblong, 6–23 mm long × 1.5–5.5 mm wide. Inflorescence a densely flowered cylindrical raceme, 5–15 cm long; flowers 4–5 mm long, yellow to creamy-brown. Pod straight with incurved apex, sometimes falcate, compressed, 8–29 cm long × 9–17 mm broad × 4–8 mm thick, more or less constricted between the seeds, straw-yellow to brown, indehiscent, containing 10–20 (–30) seeds. Seed broadly ovoid, 6 mm × 4 mm, brownish, embedded in a whitish, slightly sweet pulp. 22,000–29,000 seeds per kg.

Similar species

Very similar to, and often confounded with, *Prosopis pallida* (Humb. & Bonpl. ex Willd.) Kunth, the pair often referred to as the *P. juliflora* - *P. pallida* complex. Two forms have been described within *P. pallida*, and an additional thornless variety of *P. juliflora*, var. *inermis* (H.B.K.) Burkart.

A. Leaves small, 2–8 cm long. Leaflets 2–8 mm long. Inflorescences 3 times longer than the leaves. The edge of the fruit has parallel margins. 1. *Prosopis pallida*

B. Branches without thorns, small when present, 0.5–1.5 cm long. Leaflets pubescent, 3–6 mm long and 1.5–2 mm wide. Fruits large, 16–25 cm long. 2. *Prosopis pallida* forma *pallida*

BB. Branches with large thorns, 2–4 cm long. Leaflets sub-glabrous, 4–8 mm long and 2–3 mm wide. Fruits small, 14–20 cm long. 3. *Prosopis pallida* forma *armata*



Evergreen small tree 3–12 m tall, sometimes shrubby with spreading branches, Ethiopia



Shrub form commonly seen in new or less fertile areas



Inflorescence a densely flowered cylindrical raceme



Fruiting branches



Falcate pods



Straight pods with incurved apex



Seeds



Invading along Gash River, Eritrea



Dense growth in the flood plain of the Gash River, Eritrea

otherwise pass undigested through the animal. Mature foliage of *P. juliflora* and *P. pallida* is largely left unbrowsed, but seedlings, young, green shoots and buds are more palatable. Goats, sheep and wild animals are more likely to browse these species than cattle, horses and camels.

Environment

P. juliflora has had both beneficial and detrimental effects environmentally. It is used in agroforestry, including silvopastoral systems, in windbreaks and shelterbelts to protect areas from wind erosion and for stabilization of dunes, and also for land reclamation. Soil fertility improves to considerable depth under the mesquite stand, by virtue of nitrogen fixation and nutrient cycling from depth. However, it has proved to be particularly invasive and is widely viewed as a serious environmental weed.

Other

In Peru, the long sweet pods have been used for human foodstuffs for centuries. The dense wood can be used for fence posts and is ideal as fuel wood or for charcoal production. The flowers are an excellent bee forage as a source of nectar and pollen.

Ecology

Soil requirements

Adapted to very poor, degraded, saline and alkaline soils with pH as high as 10.5, with textures from sand to cracking clays. Like most *Prosopis* species, it does not grow well on more acid soils.

Moisture

Adapted to arid and semi-arid climates. Rainfall in the species' native habitat (Peru): 250–500 mm/yr. Annual rainfall of about 800 mm required for optimal growth. Tolerates dry season of 6–12 months with <40 mm rainfall. While it is tolerant of short-term seasonal waterlogging, deep, freely draining soils are preferred. It has a deep root system and flourishes where the water table is not far below the soil surface.

Temperature

Altitudinal range: <100–1,500 m asl; mean maximum temperatures of hottest and coldest months are 22–34 °C and 14–22 °C, respectively. Is able to survive light frosts.

Light

Requires full sunlight.

Reproductive development

Depending environmental conditions, flowering may start as early as in 1-yr-old plants to as late as 12-yr-old plants. Pods mature in the dry season. In India, *P. juliflora* flowers twice a year, in February-March and August-September. *Prosopis* species are primarily insect pollinated.

Defoliation

Regrows well after pruning, and will coppice from low cutting.

Fire

As for most trees, young seedlings are fire-sensitive; older plants are protected by their bark.

Agronomy

Note: The inclusion of *Prosopis juliflora* in Tropical Forages is in no way a recommendation for the species. Although it has become a serious environmental weed in some areas, it can also make a positive contribution to production systems in the invaded areas.

Guidelines for establishment and management of sown forages.

Establishment

Seed scarification is recommended. As with all trees, transplants from nurseries is common practice. For pod production, spacings used range from 5 m to 5–10 m. Establishment is initially slow, while the rapidly developing tap root extends seeking moisture.

Fertilizer

Grows moderately well without fertilizer, but thrives on fertile soils. Fixes atmospheric nitrogen, enhanced by mycorrhizal fungi (*Glomus* spp.).

Compatibility (with other species)

Initial slow growth requires weeding to ensure establishment. Once established, there are indications that it might exert an allelopathic effect on some associated species, including *Cenchrus ciliaris*. It often develops into dense thickets.

Companion species

Cenchrus ciliaris, *Megathyrus maximus*, *Opuntia ficus-indica*.

Pests and diseases

Various pests and pathogens reported according to regions; bruchids are a major threat to pods. In South Africa, a number of these pests are being investigated as biological control agents against *Prosopis* species to augment the existing range of species, including, *Algarobius prosopis* and *Neltumius arizonensis* (both Coleoptera: Chrysomelidae: Bruchinae). Potential agents such as a straight-snouted weevil, *Coelocephalopion gandolfoi* (Coleoptera: Brentidae: Apioninae), whose larvae attack seeds within green pods, a flowerbud galler, *Asphondylia prosopidis* (Diptera: Cecidomyiidae), as well as a range of pathogens are being investigated.

Ability to spread

Spread by animals that ingested pods with mature seeds. Mesquite will develop roots from stems if they happen to be covered by drifting sand but distribution is mainly by seeds.

Weed potential

P. juliflora is a very aggressive invader, especially in frost-free arid and semi-arid natural grasslands, both in its native range and in particular where it has been introduced. Improved moisture conditions favour its spread. To prevent *P. juliflora* from becoming a noxious weed, thinning and pruning should be practised. While it is still being planted in some countries, it has been declared an extremely serious environmental weed in others. We strongly recommend against planting this species.

Feeding value

Nutritive value

Range values reported for pods: 10–15% CP; 68–75% digestibility, 16–41% soluble carbohydrates; foliage: 17–24% CP, 55–59% digestibility, 1.9% condensed tannins.

Palatability/acceptability

Whereas foliage is reported to be essentially unpalatable to livestock, pods are highly palatable. However, prolonged feeding of the sugary and sticky pods has led to severe tooth decay, morbidity and death in livestock.

Toxicity

Cytotoxic alkaloids in *P. juliflora* pods are reported; pod proportion in ruminant diets should not exceed 50%. Uncontrolled grazing of mesquite pods as the sole source of food showed deleterious effects on cattle. Consumption of green immature pods reduced appetite and caused weight loss, weakness, alopecia, nervous symptoms, diarrhoea, fever, dehydration and death of cattle and thus only mature pods should be fed.

Feedipedia link

<https://www.feedipedia.org/node/554>

Production potential

Dry matter

Not applicable since only production of pods for fodder is considered here.

Animal production

It has been shown that wheat bran, barley, maize grain, rice polishings and the like, as well as sugarcane molasses can be substituted at a varying ration percentage by *P. juliflora* pods without adversely affecting performance of growing cattle.

Genetics/breeding

$2n = 26, 28, 52, 56$; generally self-incompatible.

With naturally occurring hybridization, which is thought to occur in the overlapping ranges of *P. pallida* and *P. juliflora*, and the great variation within and between varieties, forms and land races, few taxonomists world-wide could claim to be able to differentiate between these two species.

The recent demonstration of fast-growing, erect, thornless individuals with sweet pods of the same Peruvian *Prosopis* families in Haiti, Cape Verde and India suggest much promise for development. Elite trees from the Haitian and Indian trials have been cloned for further use, and work is continuing on the cloning of superior wild trees, assumed to be *P. pallida*, in northern Peru.

The main forage/livestock-related value of this tree lies in the fact that it provides highly nutritious pods in the dry season. The forage potential of spineless provenances might be worth exploring.

Seed production

Annual pod yields: 15–100 kg/tree; per hectare (in USA): 8.7 t.

Herbicide effects

Clopyralid, dicamba, picloram and triclopyr have been shown to kill *P. juliflora* trees.

Strengths

- Extraordinary drought tolerance.
- Tolerance of saline and alkaline soils.
- Multipurpose use potential.
- Highly nutritious pods in the dry season.

Limitations

- High invasive-weed potential.
- Lack of foliage palatability.
- Presence of spines.

Internet links

[https://uses.plantnet-project.org/en/Prosopis_juliflora_\(PROSEA\)](https://uses.plantnet-project.org/en/Prosopis_juliflora_(PROSEA))

<http://www.fao.org/3/AD317E/AD317E02.htm>

https://hort.purdue.edu/newcrop/duke_energy/Prosopis_juliflora.html

http://apps.worldagroforestry.org/treedb/AFTPDFS/Prosopis_juliflora.PDF

<http://apps.worldagroforestry.org/downloads/Publications/PDFS/WP13657.pdf>

<https://www.gardenorganic.org.uk/sites/www.gardenorganic.org.uk/files/resources/international/ProsopisMonographComplete.pdf>

<https://www.ajas.info/upload/pdf/17-118.pdf>

Selected references

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Tewari, J.C., Pasiecznik, N.M., Harsh, L.N. and Harris, P.J.C. (eds). (1998) *Prosopis* species in the arid and semi-arid zones of India. Proceedings of a conference held at the Central Arid Zone Research Institute, Jodhpur, Rajasthan, India, November 21–23, 1993. The *Prosopis* Society of India and the Henry Doubleday Research Association, Jodhpur, Rajasthan, India.

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Van der Maesen, L.J.G. and Oyen, L.P.A. (1997) *Prosopis juliflora* (Swartz) DC. In: Faridah Hanum, I. and van der Maesen, L.J.G. (eds) Plant Resources of South-East Asia No. 11. Auxiliary Plants. Backhuys Publishers, Leiden, the Netherlands. p. 211–214.

edepot.wur.nl/411331

Cultivars

None released.

Promising accessions

None reported.

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