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Managing rangelands: promoting sustainable tree species

Prosopis cineraria: A wonder tree for agroforestry in arid and semi-arid areas

In hot, arid and semi-arid rangelands livestock numbers are growing, putting pressure on grazing lands. In these dryland regions, ICARDA is promoting drought-tolerant species as a crucial means of assisting rangeland rehabilitation efforts, helping to conserve rapidly-depleting water resources, and maintain grazing at sustainable levels. The result: a win-win situation for the agropastoral communities and the environment.

Prosopis cineraria, known as Khejri in Rajasthan in northwest India, is one of the most drought-tolerant tree species and thrives in hot, arid regions with an annual rainfall of less than 500 mm. Native to areas such as the Arabian and Thar Deserts in western Asia and South Asia, it grows best with an average annual rainfall of 250–400 mm. Its roots can reach depths of 30 m accessing water that is unavailable to most other plants and animals. It is the state tree of Rajasthan and the national tree of the United Arab Emirates.

Capable of withstanding a great variation in temperature, *Prosopis cineraria* easily copes with summer temperatures of up to 50°C and winter nights with temperatures around freezing. It is a slow-growing tree taking 10–15 years to reach maturity in the 200–300 mm rainfall zone and up to 20 years where rainfall is less. This slow top growth reflects the fact that the tree first concentrates on establishing a strong root system. In the lower rainfall areas tree density is of the order of 5 trees/ha but may increase to 250 trees/ha in higher rainfall zones.

Prosopis cineraria is a tree of the plains and seldom extends into the hills. Although it grows on soils ranging from sandy loams to clay loams, it grows best on alluvial soils with a mixture of sand and clay. It is common on moderately saline soils but quickly dries out when the soil is very saline.



Scientific name:

Prosopis cineraria (L.) Druce

Common names:

Khejri, Ghaf, Kandi, Gandasein, Sami/Shami, Lunu andara

Location: This tree is native to the arid areas of western Asia and South Asia.

Benefits:

- Drought-tolerant
- Resistant to heat and cold
- Grows in a range of soils from sandy loam to clay loam and from flat plains to sand dunes
- Can be cut for feed once a year or every two years in drier areas
- A medium-sized tree produces 45 kg of dry fodder at each lopping
- Highly nutritious fodder.



Prosopis cineraria tree is found in extremely arid conditions
(Photo credit by L.R. Burdak)



Branches of *P. cineraria* are thorned along the internodes (Photo credit by P. Jeganathan)



Prosopis cineraria is lopped to provide fodder for sick livestock and firewood

Establishment and management

Prosopis cineraria is an important source of good quality fodder during the lean months of December to June. Dry leaf fodder contains 93.2% dry matter, 92% organic matter, 16% crude protein, and 49.3% total digestible nutrients. It coppices readily and withstands heavy lopping or browsing. Lopping takes place during October to December and the lopped trees remain dormant over the winter sprouting by mid-February. This reduces the crown cover allowing sunlight to reach the growing crops. The crops and the tree crown grow together during June and July and the crown assumes its full foliage by the end of September when the crops start maturing. *Prosopis cineraria* not only provides farmers with fodder but also fuelwood and food from the pods.

Prosopis cineraria does not compete with other plants for moisture and nutrients and improves soil fertility by fixing atmospheric nitrogen and by adding organic matter through leaf litter decomposition. The tree boosts the growth and productivity of companion crops. In Rajasthan, rainfed crops (millets, sorghum, mung bean, moth bean, cluster bean) are grown in autumn and irrigated crops (wheat, barley, mustard, cumin) in spring. In the 300–500 mm rainfall zone, yields of rainfed crops growing within a 5–10 m radius of mature trees recorded two to three times more grain yield than crops growing further away. Dry matter yields of range grasses grown under *Prosopis cineraria* were 2.3 tonnes/ha – higher than under other trees.

Recently in Rajasthan, older (over 50 years old) *Prosopis cineraria* trees have been seen to be dying. The cause was found to be boring beetles (*Acanthophorus serraticornis* and *Derolus discicollis*) that damage the older roots that are then attacked by the white rot fungus (*Ganoderma lucidum*). Integrated management is recommended using phorate (20 g/tree) plus *Trichoderma harzianum* pre-incubated in goat manure (1:40 g/tree).



Prosopis cineraria infected with *Ganoderma lucidum* fungus causing mortality

Effective Maintenance:

- Lopping can begin during the eighth year in the 350–450 mm rainfall zone
- Lopping should be done during October and November to obtain better quality leaves
- In the 400–500 mm rainfall zone, lopping can be done every year, while in lower rainfall zones it should be done once every two years

Rangeland Factsheets:

This series of flyers is designed to build awareness of sustainable rangeland management through best practices and well-adapted species among extension workers and those working in the agricultural research and policy sector.

ICARDA's Rangeland Ecology and Management Unit

ICARDA's Rangeland Ecology and Management Unit aims to address the unsustainable use of resources induced by mismanagement, the adverse effects of climate change, and an increasing demand for food and feed in the dry areas. ICARDA programs promote the enhanced quality and productivity of crop, forage, and livestock, and the improved management of water resources through close cooperation with farmers and national researchers.



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