



Prosopis cineraria (L.) Druce: The Miracle Plant of the Desert

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Prosopis cineraria is a small to medium-sized tree, reaching heights of 5 to 10 meters, commonly found in the dry and arid regions of Arabia and several Indian states, including Rajasthan, Haryana, Punjab, Gujarat, Western Uttar Pradesh, and the arid zones of the Deccan. Khejri is the sole tree that thrives despite the harsh environmental conditions of the desert. Every part of the tree has its uses, earning it the name Kalptaru. It is also known as the "wonder tree" and is often called the "king of the desert".



The Arid Forest Research Institute, Jodhpur, conducted multiple surveys in 2010 across the districts of Jodhpur, Nagpur, Sikar, Churu, and Jhunjhunu, revealing that Khejri tree mortality rates ranged from 18.08% to 22.67%, with an average mortality of 20.93%. *Prosopis cineraria* (L.) Druce is a deep-rooted, nitrogen-fixing plant, native to the hot deserts of India. New leaves emerge either before or at the same time as the old ones fall during the summer. Small yellow flowers bloom from March to May following the fresh growth of leaves, and pods soon form and quickly increase in size. The pods ripen between June and August, while new foliage, flowering, and fruiting take place during the driest months, from March to June. The plant also possesses antifungal, anthelmintic, antibacterial, anticancer, and antiviral properties. The leaf paste of *Prosopis cineraria* is used to treat boils, blisters, and mouth ulcers in livestock. The smoke from its leaves is believed to be beneficial for eye problems. Additionally, *Prosopis cineraria* can thrive when irrigated with 50% seawater. This tree also thrives in open woodlands on black cotton soils and can grow on dry, stony alkaline land with a pH as high as 9.8. The preservation of Khejri trees is a religious principle upheld by the Bishnoi community of Rajasthan. In 1731, they initiated the Chipko Movement to prevent the cutting of Khejri trees. The gum from the tree is nutritious and tasty, and it is often used by pregnant women during childbirth. Additionally, a paste made from the flowers and twigs acts as an anti-diabetic agent when taken orally.

Prosopis cineraria (L.) Druce

Vernacular names: Sami (Sanskrit), Mesquite (English), Shami, Jhand (Hindi), Khijado (Gujarati), Shemi (Marathi), Jambhi (Telugu), Jhand (Punjabi), Candy (Sindhi), Khejari

Morphological Characters

Plant botanical name: *Prosopis cineraria* (L.) Druce Botanical family: Leguminosae, subfamily Mimosoideae

Classification: (According to Bentham & Hooker)

Kingdom	Plantae
Sub kingdom	Phanerogams
Division	Angiosperms
Class	Dicotyledons
Sub-class	Polypetalae
Series	Calyciflorae
Order	Rosales
Family	Leguminosae (Fabaceae)
Genus	Prosopis
Species	cineraria

The root system of *Prosopis cineraria* is extensive and well-developed. While its above-ground growth is slow, the roots penetrate deeply in search of groundwater, with taproots reportedly reaching depths of up to 35 meters. The stem is erect, branched, solid, and woody, with a diameter of approximately 13-16 cm. The young twigs are characterized by a purplish-green color. The stem is equipped with spines ranging from 0.3 to 0.6 cm in length and has galls present. Annular rings are found within the woody portion, and the stem tissue is rich in tannin sacs and gum passages. The bark is thick, hard, and dark brown. The bark surface is covered with liver-warts and lichens. The leaves are compound, bipinnate, stipulate, with stipules modified into spines. They are alternately arranged and petiolate. The leaflets are ovate with a mucronate apex, unequal base, and entire margins with reticulate venation. Each leaf measures 1-1.5 cm in length and 0.4-0.6 cm in width. The inflorescence is a racemose spike. The flowers are regular, bisexual, bracteate, complete, and zygomorphic, with a hypogenous pentamerous structure. They are small, yellowish, and bloom from March to May after the new leaves have appeared. The calyx has 5 lobed, gamosepalous, yellowish sepals that are valvate. The corolla features 5 gamopetalous, yellowish, valvate petals. The androecium is made up of 10 free stamens. Out of the 10 filaments, 5 are long while the other 5 are short. The anthers are dorsifixed and have two cells. The gynoecium features a monocarpellary superior ovary with a single chamber and marginal placentation. The style is filiform, and the stigma is capitate. The fruit produced is a legume (pod). Fleshy pods, which are sickle-shaped and 10 to 20 cm long, house a sweet, mucilaginous pulp. These pods mature in May and June. The seeds are ovoid, non-endospermic, and dark brown, nestled within the brown pulp. Each fruit contains 10 to 25 seeds.



Prosopis cineraria tree, leaves, flowers, and pod

Pharmacological Activities

Prosopis cineraria is rich in various chemical constituents that contribute to its nutritional value and aid in the prevention and treatment of diseases. The table below outlines these various chemical constituents and their roles in disease prevention.

Name of the plant part	Chemical constituent Present in the plant part
Flower	Patuletin Glycoside patulitrin, luteolin and rutin sitosterol, spicigerine, Flavone derivatives Prosogerin A and Prosogerin B
Leaves	Steroids like campesterol, cholestrol, sitosterol stigmasterol, actacosanol, hentriacontane, methyl docosanoate, Diisopropyl-10,11-dihydroxyicosane 1,20-dioate, Tricosan-1-ol, and 7,24-Tirucalladien-3-one along with a piperidine alkaloid spicigerine
Seeds	Prosogerin C, Prosogerin D, Prosogerin E, Gallic acid, patuletin, patulitrin, luteolin, and rutin
Bark	Hexacosan-25-on-1-ol, a new keto alcohol along with ombuin and a triterpenoid glycoside. vitamin K1, n-octacosyl acetate, the long chain aliphatic acid. Presence of glucose, rhamnase, sucrose and starch is also reported.

Antibacterial activity: The presence of flavonoids and tannins in *Prosopis cineraria* contributes to its antibacterial activity. Methanolic and aqueous extracts from the stem bark show moderate antibacterial effects at 250 µg/ml, with the methanolic extract proving to be significantly active against all pathogens

Antihyperglycemic Activity: Deepika Sharma et al. have indicated that *Prosopis* has significant blood sugar-lowering properties. Studies reveal that *Prosopis* plant extract can normalize both body weight and blood sugar levels in diabetic rats. The extracts of *Prosopis* probably promote the survival of β cells in the islets of Langerhans and decrease blood sugar levels through an insulinogenic effect. .

Antidepressant effect : The leaves of *Prosopis* are traditionally used in aqueous extract form to address various CNS disorders. Phytochemical analysis indicates that *Prosopis* contains saponins, flavonoids, glycosides, alkaloids, and phenolic compounds. M. George et al. utilized two animal models to investigate antidepressant action, employing the forced swim test to assess activity. Their study found that the aqueous extract administered to mice exhibited a significant antidepressant effect, comparable to that of the antidepressant drug Imipramine.

Skeletal Muscle relaxant: To evaluate skeletal muscle relaxant activity, M. George et al. used the rotarod test to determine the impact of the drug on motor function. The study found that *Prosopis cineraria* possesses significant skeletal muscle relaxant properties, which are due to the alkaloids, tannins, and flavonoids in its leaf extract.

Bronchodilator activity: *Prosopis cineraria* is applied in the treatment of respiratory diseases such as asthma, cough, and bronchitis. Khalid Hussain Janbaz et al. tested the bronchodilator activity of a methanolic extract using carbachol and found that it produced a concentration-dependent relaxant effect on both carbachol and K^+ induced contractions. This activity is due to the blockade of Ca^{2+} channels, which also aids in tracheal relaxation associated with respiratory tract hyperresponsiveness.

Anticancer activity: Cancer is a group of diseases characterized by uncontrolled cell division, invasion, and metastasis. The medicinal value of plants in cancer treatment has increased significantly due to their antioxidant properties. The methanolic extract from *Prosopis cineraria* leaves exhibits notable radical scavenging activity. It inhibits cell proliferation by inducing cell death, affecting the extent of cell growth.

Socio economic importance of the *Prosopis cineraria*

Prosopis significantly contributes to the socio-economic development of rural communities by enhancing soil fertility, providing fuel, timber, and vegetables. The following points outline the socio-economic benefits of *Prosopis cineraria*. In the extreme arid regions of western Rajasthan, the pods of *Prosopis* and the flowers of *Caligonum Polygonides* are

utilized as dry fruit. These pods, known as "Sangri," are typically brown to chocolate in color and cluster in groups of up to 12 on the tree. Dried pods, referred to as "Khokha," are used as "Marwarimewa" and contain sucrose (13.16%), protein (9-15%), and carbohydrates (45-55%). The green leaves of *Prosopis cineraria*, known as "Loom," are provided to camels, goats, and sheep. These leaves serve as a nutritious feed for these animals.

In Rajasthan, *Prosopis* has traditionally been used in the human diet for many years. The dry pods, called "Marwari Mewa," help reduce thirst in the summer and are sometimes utilized by farmers in times of scarcity. They also enhance milk production in dairy animals. The *Prosopis* tree is worshipped during occasions like marriages and the birth of a son. For the past 40 to 50 years, numerous communities have been dedicated to ensuring its protection.

Conclusion

Prosopis cineraria, commonly known as Khejri, plays a vital role in the rural economy of the northwest Indian subcontinent. Research by Gupta and Saxena (1978) and Shankar et al. (1976) reveals that the canopy of the Khejri tree supports higher biomass production and improved soil moisture levels. Mann and Muthana (1984) found that this tree boosts the growth of herbaceous plants and increases crop yields. Singh and Lal (1969) observed that plants growing near this tree exhibit better growth, attributed to higher levels of organic matter, total nitrogen, available potassium, and soluble calcium in the soil. According to Aggarwal (1980) the availability of micronutrients in the soil improved under the *P. cineraria* plantation. The positive impact of tree legumes like Khejri on crops is primarily linked to the contribution of microbial fertilizers to the soil through nodulation, as noted by Basak and Goyal (1975). Given its numerous medicinal applications, *Prosopis cineraria* presents significant potential for future research, and additional pharmacological studies are needed.