



A OVERVIEW ON PROSOPIS CINERARIA; CHEMICAL CONSTITUENT AND THERAPEUTIC USES

Sanket Sadashiv Landkar*¹ and Dr. Komal Sadashiv Landkar²

¹Kasturi Shikshan Sanstha College of Pharmacy, Pratimanagar, Pune-Nagar Road At. Shikrapur, Tal. Shirur Dist. Pune 412208 (MS).

²S.D.K Dental College And Hospital Hingna Road, Wanadongri, Nagpur (MS).

***Corresponding Author: Sanket Sadashiv Landkar**

Kasturi Shikshan Sanstha College of Pharmacy, Pratimanagar, Pune-Nagar Road At. Shikrapur, Tal. Shirur Dist. Pune 412208 (MS).

Article Received on 28/04/2020

Article Revised on 18/05/2020

Article Accepted on 08/06/2020

ABSTRACT

Prosopis Cineraria is a plant belonging to family Fabaceae. It is deep rooted, nitrogen fixing, multipurpose plant present in the hot desert area of the India. The plant contains about 44 different types of species. The tree mostly grows on alluvial soils consisting of various mixtures of sand and clay. The plant contains patuletin glycoside patulitrin, 10 sitosterol, spicigerine, Flavone derivatives Prosogerin A, Prosogerin B, Prosogerin C, Prosogerin D, Prosogerin E, 3-benzyl-2hydroxy-urs-12-en-28-oic acid. The Prosopis cineraria shows various activities like Antibacterial, anti-depressant and skeletal muscle relaxant, hypercholesterolemic, hypolipidemic and antiatherosclerotic, spasmodic and bronchodilator, nootropic activities, antitumour. This plant is also called as the "Queen of Desert".

KEYWORDS: Prosopis Cineraria, Prosogerin, Kalptaru, leukoderma etc.

INTRODUCTION

Prosopis cineraria is a small moderate sized evergreen thorny tree, with slender branches armed with conical thorns and with light bluish-green foliage. The leaflets are dark green with thin casting of light shade. It coppices profusely. The tree is evergreen or nearly so. It produces new flush leaves before summer. The flowers are small in size and yellow or creamy white in colour; appear from March to May after the new flush of leaves. The pods are formed soon thereafter and grow rapidly in size attaining full size in about two months' time. Historically Prosopis cineraria has played a significant role in the rural economy in the northwest arid region of Indian sub-continent. It is small to moderate sized tree commonly called as "Queen of Desert". It is an important tree (Khejri- a local name in Rajasthan) for the Thar Desert with hard climatic adaptation and one of the lifelines in desert habitat as mentioned in ancient literature. It is distributed in the arid and semi-arid regions of India, Afghanistan, Pakistan, Iran and Arabia. Since all parts of the tree are useful, it is called 'Kalptaru'. The plant contains patuletin glycoside patulitrin, 10 sitosterol, spicigerine, Flavone derivatives ProsogerinA, Prosogerin B, Prosogerin C, Prosogerin D, Prosogerin E, 3-benzyl-2hydroxy-urs-12-en-28-oic acid.

It is used to treat various diseases. The flowers are pounded mixed with sugar and used during pregnancy as a safeguard against miscarriage.^[1] The bark is dry, acrid, bitter, with sharp taste; cooling anthelmintic, tonic; cures

leprosy dysentery, asthma, leucoderma, piles tremors of the muscle, wandering of the mind. Extract of crushed pods is used for earache, toothache, pain relief from fractured bones.^[2] Aqueous extract of bark and leaves applied externally to treat skin disease disinfects wounds and promotes healing.^[3] Extensive research has revealed that the plant has a wide range of pharmacological activities. Antibacterial^[4], anti-depressant and skeletal muscle relaxant^[5], hypercholesterolemic, hypolipidemic and antiatherosclerotic^[6], spasmodic and bronchodilator^[7], nootropic activities^[7], antitumour.^[8]



Fig. 1: Prosopis Cineraria.

Plant Profile

South Asia: खेजड़ी (khejri), जांट (jand), जाती (jandi), सांगरी (sangri), loong [Hindi/Rajasthan/Haryana]; जंड (jand) [Punjabi], कांडी (kandi) [Sindh]; वणिण (vanni) [Tamil]; शमी (shami), सुमरी (sumari) [Gujarati]; జమ్మి (jammi) [Telugu]; جند (jund) [Urdu]
 Arabic: ر غاف (ghaf)
 Hindi: Khejri
 English : Prosopis Cineraria
 Marathi: Saundad

Taxonomical classification

Kingdom: Plantae – Plants
 Subkingdom: Tracheobionta – Vascular plants
 Superdivision: Spermatophyta – Seed plants
 Division: Magnoliophyta – Flowering plants
 Class: Magnoliopsida – Dicotyledons
 Subclass: Rosidae
 Order: Fabales
 Genus: Prosopis L. – mesquite
 Family: Fabaceae – Pea family
 Species: Prosopis cineraria (L.)
 Druce – khejri



Fig. 2: Prosopis Cineraria Leaf.

Religious Significance

This tree is highly revered among Hindus and worshiped as part of Dusshera festival.^[9] This tree takes importance during the tenth day of Dasara Festival when it is worshiped in various parts of India. Historically among Rajputs, the ranas – who were the high priest and the king – used to conduct the worship and then they used to liberate a jay which was considered the sacred bird of Lord Rama.^{[10]:[29–30][11]} In the Deccan, as part of the tenth day ritual of Dussahera, the marathas used to shoot arrows onto the leaf of the tree and gather the falling leaf into their turbans as a custom.^{[10]:[36–37][11]}

The tree is known by different names across the western and northern regions of India, e.g. Shami in Maharashtra, Jammi in Telangana, Khijro in Gujarat, Khejri in Rajasthan, Janti in Haryana, and Jand in Punjab.

In Karnataka, Acacia ferruginea has also been locally referred to as Banni mara in place of the accepted Khejri tree and erroneously accepted as the tree where the Pandavas hid their weapons during exile.^[12] There are also some unconfirmed references which consider Acacia ferruginea as the tree which is revered and worshiped on Vijay Dashami day.^[13] However as per historical references, Prosopis cineraria is the tree which is known as the Banni mara^{[14][15][16][17][18][19][20]} and is also the tree which holds a special place in the Mysore Dasara where its worshiped on the Vijay-dashami day.^{[13][14][15][17][19][21][22]}

In the Mahabharata, the Pandavas are known to have spent their thirteenth year of exile in disguise in the kingdom of Virata. Before going to Virata, they are known to have hung their celestial weapons in this tree for safe keeping for a year. When they returned after a year, they found their weapons safe in the branches of the Shami tree. Before taking the weapons, they worshipped the tree and thanked it for keeping their weapons safe.^{[23][10][22][13][19][24]}

Distribution

Prosopis cineraria originated from the Thar Desert of India and Pakistan. It spread southwards to Tamil Nadu, eastwards to West Bengal, and westwards to Afghanistan and Iran. Isolated populations are found in Oman,

Yemen, United Arab Emirates, and Saudi Arabia, and it has been introduced to Abu Dhabi and Somalia (Pasicznik *et al.*, 2004; Mahony, 1994). It is often found scattered in agricultural fields and is an important part of dry zone agroforestry systems in India (Pasicznik *et al.*, 2004).

Prosopis cineraria grows more slowly than other *Prosopis* species. It performs poorly outside its native range and it is not known to have become naturalised (Pasicznik *et al.*, 2004).

Prosopis cineraria is found from sea level, up to 600 m altitude. It grows well where annual rainfall is in the range of 400-800 mm but it is also adapted to very dry conditions (down to 75-250 mm) that prevail on dunes or sandy plains. It can survive drought periods of 6-8 months. Thanks to its deep taproot, the tree is able to extract the water from the water table (Orwa *et al.*, 2009; Pasicznik *et al.*, 2004; Mahony, 1994).

Trees older than 7 years were reported to be able to grow under rainfed management in the United Arab Emirates (AAI News, 1998). However, the sudden death of mature trees has been reported in India, which may have been caused by the overexploitation of ground water for irrigation (Pasicznik *et al.*, 2004). In arid areas, *Prosopis cineraria* will preferentially grow on dune lows, followed by sandy plains and dune tops.

Prosopis cineraria grows better where average daily temperatures range from 4°C to 28°C. It is slightly frost hardy (-6°C) and tolerates daily temperatures up to 50°C. It naturally grows on coarse sandy soils but cannot survive a long time on pure sandy soils.

It can adapt to a variety of soils provided they allow the taproot to go deep in the soil layers and the soil is well-drained (Orwa *et al.*, 2009; Pasicznik *et al.*, 2004; Mahony, 1994). Some ecotypes of *Prosopis cineraria* can grow on very saline soils (Sandison *et al.*, 1991). Its adaptation to soil salinity (up to 11.5 dS/m) could be attributed to a mechanism of ion exchange between roots and leaves (Ramoliya *et al.*, 2006). It does well on (very) alkaline soils as well (Afifi *et al.*, 2018). *Prosopis cineraria* is a full sunlight species (Orwa *et al.*, 2009).

Climate And Soil

It has ability to grow in semi-arid and arid marginal environments receiving low rain fall of 250-500 mm/annum and yet it produces profuse flowering and fruiting. The soil with 2:2:1 ratio of sand: clay: FYM is best for plant growth and increasing biomass. Soil mixture with 50% clay is preferred.

Phytochemical Constituents

Prosopis has been found to contain 5hydroxytryptamine, apigenin, isorhamnetin-3-digluconide, 1- arabinose, quercetin, tannin and tryptamine.^[25,26,27,28] In 1964 R.C.

Sharma *et al.* reported the isolation of a flavone glycoside Patulitrin 3, 5, 6, 3, 4- pentamethoxy-7-hydroxy flavone from flowers of *Prosopis cineraria*. The fruits of *Prosopis juliflora* D.C. (leguminosae) were found to contain the same compound.

Iches and co-workers in 1973 found that patulitrin showed significant activity against the Lewis lung carcinoma *in vivo*. Seeds contain non-glycosidic polyphenolics, gallic acid, patuletin, luteolin, and a new compound named prosogerin -E (6, 7-dihydroxy-3', 4', 5'-trimethoxyflavone). other compounds are glycosidic polyphenolics, patulitrin, and rutin. Seeds also contain fixed oils (4.5%), fatty acid such as palmitic acid, stearic acid, oleic acid & linoleic acid, Sterols like Campesterol, Stigmasterol, β - Sitosterol, Stigmasterol- 5, 24(28)-dien-3 β -ol, Stigmasterol, 1,3,5-triene, Stigmasterol-4,6-dien-3-one etc.^[29]

Amino acids isolated from leaves and pods are Aspartic acid, Glutamic acid, Serine, Glycine, Histidine, Threonine, Arginine, Alanine, Proline, Tyrosine, Valine, Methionine, Cysteine, Isoleucine, Leucine, Phenylalanine and Lysine.^[30]

Therapeutic importance

Prosopis cineraria flower is pounded, mixed with sugar and used during pregnancy as safeguard against miscarriage. The wood ash which contains 31 percent of soluble potassium salts may be used as a source of potash. The bark of this plant has a sweetish taste. It is reported that during severe famine of rajputana in 1868-69, many lives were saved by the use of bark as a source of food. It was ground in to flour and made in to cakes.

The bark of the tree is dry, acrid, bitter with a sharp taste; cooling anthelmintic; tonic, cures leprosy, dysentery, bronchitis, asthma, leucoderma, piles and tremors of the muscles.^[31] The bark is also used for tanning. Mesquite pollen serves as a dietary source for mice. Leaf paste of *P. cineraria* is applied on boils and blisters, including mouth ulcers in livestock and leaf infusion on open sores on the skin.^[32] The smoke of the leaves is good for eye troubles.

The fruit is dry and hot, with a flavour, indigestible, causes biliousness, and destroys the nails and the hair. The pod is considered astringent in Punjab. Recently processing composition, nutritional evolution and utilization of mesquite (*prosopis* spp.) pods as a raw material for food industry had been reported. The bark is used as a remedy for rheumatism, in cough colds, asthma. The plant is recommended for the treatment of snakebite.

The bark is prescribed for scorpion sting.^[33] The bark is used for medicine. Bark is dry, acrid, bitter with sharp taste. It has anthelmintic property and prescribed in treatment of bronchitis, asthma, piles etc. The pods are rich source of protein and carbohydrate and eaten by animals as fodder. It is also eaten as vegetable and pickle

by local people. The leaves are palatable and nutritious feed for livestock in desert.

Pharmacological reports

An alkaloid mixture (1 mg/kg) of *Prosopis cineraria* was given to dogs caused decrease in blood pressure and immediate mortality. Extensive damage to liver, spleen, kidney, lung and heart was observed on histological examination of mice given the alkaloid mixture. Tapia A & coworkers reported the "Biologically active alkaloids and a free radical scavenger^[34] from *Prosopis* species" in this study. The biological activity of extracts from the aerial parts of five Argentinian *Prosopis* species and the exudate of *P. flexuosa* were assessed for DNA binding, beta-glucosidase inhibition and free radical scavenging effect using the DPPH decoloration assay. DNA binding effect was found mainly in the basic fraction.^[35]

Aqeel A & coworkers reported the "Antimicrobial activity of julifloricine isolated from *Prosopis juliflora*" Antimicrobial activity of julifloricine, an alkaloid isolated from *Prosopis juliflora*, was studied in vitro against 40 microorganisms which included 31 bacteria, two *Candida* species, five dermatophytic fungi and two viruses. Significant inhibitory effect was noted against Gram positive bacteria.^[36] Vaithyanathan S & coworkers reported the "Effect of feeding graded levels of *Prosopis cineraria* leaves on rumen ciliate protozoa, nitrogen balance and microbial protein supply in lambs and kids" The investigation was carried out to assess the effect of feeding graded levels of tannincontaining *Prosopis cineraria* leaves in a complete feed mixture (CFM) on the rumen ciliate protozoa, nitrogen metabolism, microbial protein supply and wool yield (in lambs only).

It is concluded from the results that *Prosopis* tannins could be included in the diets of lambs and kids at 23 and 45 g/kg DM, respectively to have higher microbial protein supply.^[37] Ali A. Al-jeboory and Wesal A.H. Alhusainy in 1984 reported the cardiovascular studies on *Prosopis farcta*. Alcoholic extract of leaves of this plant has shown a dual action of increase and decrease in blood pressure in vivo and increase in contraction of heart in vitro studies.^[38]

CONCLUSION

Prosopis cineraria (khejri) holds an important place in the rural economy in the northwest region of Indian subcontinent. Studies by Gupta and Saxena (1978)²⁰ and Shankar et al (1976)²¹ shows higher biomass and soil moisture status under the canopy of the Khejri. According to Mann & Muthana (1984),²² this tree enhances herbaceous plants and crop yield. Singh and Lal (1969)²³ reported better growth of the plant in its vicinity due to high organic matter, total nitrogen, available Potassium and soluble Calcium. Aggarwal (1980)²⁴ concluded that the status of available micronutrients generally improved under *P. cineraria* plantation. The crop improving effect of tree legumes,

especially khejri, is generally ascribed to the input of microbial fertilizers in the soil through nodulation (Basak and Goyal, 1975).²⁵ Considering the many medicinal purpose for which it is used, there is enormous scope for future research on *Prosopis cineraria*, and further pharmacological investigation is warranted.

REFERENCES

1. Kirtikar KR, Basu BD, 1982. Indian Medicinal Plants. Dehradun: International Book Distributors, 1982; 2: 910-911.
2. Rastogi RP, Malhotra BN. Compendium of Indian Medicinal Plants, CDRI/PID CSIR, 1995; 4: 597-599.
3. Nagori B P, Solanki R. Role of medicinal plants in wound healing. Res J Med Plants, 2011; 5(4): 392-405. DOI: 10.3923/rjmp.2011.392.405.
4. Sharma R, Jodhawat N, Purohit S, Kaur S. Antibacterial activity and phytochemical screening of dried pods of *prosopis cineraria*, Ruchika Sharma*, Nandini Jodhawat, Sanju Purohit and Swarnjeet Kaur, Int. J. Pharm. Sci. Rev. Res., 2012; 14(1): 15-17.
5. George M, Joseph L, Sharma A. Antidepressant and skeletal muscle relaxant effects of the aqueous extract of the *Prosopis cineraria*, Brazilian Journal of Pharmaceutical Sciences, 2012; 48(3): 577-581. DOI: 10.1590/S1984-82502012000300025.
6. Purohit A, Ram H. Hypolipidemic and antiatherosclerotic effects of *Prosopis cineraria* bark extract in experimentally induced hyperlipidemic rabbits, Asian J Pharm and Clin Res, 2012; 5(3): 106109.
7. Feo VD, Janbaz KH., Haider S., Imran I, Martino LD. Pharmacological Evaluation of *Prosopis cineraria* (L.) Druce in Gastrointestinal, Respiratory, and Vascular Disorders. Evidence-Based Complementary and Alternative Medicine, 2012. DOI: 10.1155/2012/735653.
8. Bithu SN, Reddy NR, Prasad SK, Sairam K, Hemalatha S, *Prosopis cineraria*: A potential nootropic agent, 2012; 50(10): 1241-1247. DOI: 10.3109/13880209.2012.666253
9. Robertson S., Narayanan N., Kapoor BR. Antitumour activity of *Prosopis cineraria*(L.) Druce against Ehrlich ascites carcinoma induced mice, Natural Product research, 2011; 25(8): 857-862. DOI: 10.1080/14786419.2010.536159.
10. Edwards, S.M. (March 1922). "Tree-worship in India". Empire Forestry Journal, 1(1): 78-86. JSTOR 42594479.
11. Crooke, W. (1915). "The Dasahra: An Autumn festival of Hindus" (PDF). Folklore, 26(1). doi:10.1080/0015587X.1915.9719701.
12. Gandhi, Maneka; Singh, Yasmeen (1989). Brahma's hair – Mythology of Indian plants. New Delhi: Rupa & Co. pp. 29-32. ISBN 978-81-7167-005-5.
13. Babu N.M. Ganesh (2 May 2017). "Tree that hid Pandavas' weapons when they were in exile". The New Indian Express.

14. S.G. Neginhal (2011). Forest Trees of the Western Ghats. S.G. Neginhal, 133. ISBN 9789350671733.
15. S. Sivapriyananda (1995). Mysore Royal Dasara. Abhinav Publications, 51, 55.
16. L. Krishna Anantha Krishna Iyer (Diwan Bahadur); Nanjundayya Hebbalalu Velpanuru (Diwan Bahadur); H.V. Nanjundayya (1935). The Mysore tribes and castes. Mysore University, 68.
17. Fuller, Christopher John (2004). The Camphor Flame: Popular Hinduism and society in India. Princeton University Press, 121. ISBN 978-0691120485.
18. Claus, Peter; Diamond, Sarah; Mills, Margaret (2003). South Asian Folklore: An encyclopedia. Special Reference. p. 536. ISBN 978-0415939195.
19. Parsons, Constance (1930). Milford, Humphrey (ed.). Mysore City. Oxford University Press. p. 184.
20. "Quarterly Journal of the Mythic Society". Mythic Society, 1941; 32(1): 309.
21. Milton, Lawrence. "Why Dasara procession culminates at Bannimantap". Times of India.
22. Thurston, Edgar; K. Rangachari (1909). Castes and Tribes of Southern India, 147.
23. Smaranananda Swami (2001). Prabuddha Bharata: Or awakened India, 106: 49.
24. Bharata Prabuddha. "Mysore Dasara - a living tradition". Archived from the original on 7 March 2007.
25. Rastogi RP and Mehrotra BN, Compendium of Indian Medicinal Plants, Publication and Information Directorate, CSIR, New Delhi, 1993; (Vol I): 328.
26. Rastogi RP and Mehrotra BN, Compendium of Indian Medicinal Plants, Publication and Information Directorate, CSIR, New Delhi, 1993; (Vol II): 561.
27. Rastogi RP and Mehrotra BN, Compendium of Indian Medicinal Plants, Publication and Information Directorate, CSIR, New Delhi, 1993; (Vol III): 531.
28. Rastogi RP and Mehrotra BN, Compendium of Indian Medicinal Plants, Publication and Information Directorate, CSIR, New Delhi, 1993; (Vol IV): 597.
29. Bhardwaj DK, Gupta AK, Jain RK and Sharma GC, Chemical Examination of *Prosopis spicigera* seeds, J. Nat. Prod, 1981; 44(6): 656-659.
30. Mazzuca M and Balzaratti VT, Fatty acids, sterols and other steroids from seeds of Pantagonian *Prosopis* species, J Sci Food Agric, 2003; 83: 1072-1075.
31. Kirtikar KR and Basu BD, Indian medicinal plants, Leader road, Allahabad, India, 1984; (Vol. II): 910.
32. Nandkarni KM, Indian material medica, Popular prakashan, Mumbai, 2000; (Vol. I): 1011.
33. Chopra RN, Nayar SL and Chopra IC, Glossary of Indian Medicinal Plants, CSIR, New delhi, 1956: 204.
34. Rastogi RP and Mehrotra BN, Compendium of Indian Medicinal Plants, Publication and Information Directorate, CSIR, New Delhi, 1993; (Vol III): 531.
35. Tapia A, Feresin GE and Bustos D, Biologically active alkaloids and a free radical scavenger from *Prosopis* species, Journal of Ethnopharmacology, 2000; 71: 241-246.
36. Aqeel A, Khursheed AK, Vigaruddin A and Sabiha Q, Antimicrobial activity of julifloricine isolated from *Prosopis juliflora*, Arzneimittelforschung, 1989; Jun 39(6): 652-5.
37. Vaithiyathan S, Bhatta R and Mishra AS, Effect of feeding graded level of *Prosopis cineraria* leaves on rumen ciliate protozoa, nitrogen balance and microbial protein supply in lambs and kids, Animal Feed Science and Technology, 2007; 1: 133.
38. Al-Jeboory AA and Alhusainy WAH, Cardiovascular studies on *Prosopis farcta*, Fitoterapia, 1984; 55: 137-142.