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Phytogeographical Distribution of *Prosopis cineraria* in Bhilwara District, Rajasthan

Dr. Manju Verma
Assistant Professor in Geography
S.R.L. Sahariya Govt. P.G. College, Kaladera, Jaipur

Abstract: Prosopis cineraria, commonly known as Khejri or Ghaf, is a multipurpose tree species widely distributed in arid and semi-arid regions of South Asia and the Middle East. It plays a vital role in ecological stability, soil fertility enhancement, and livelihood support for rural communities. The species is recognized for its drought tolerance, nitrogen-fixing ability, and valuable medicinal properties. Traditionally, various parts of the plant—leaves, pods, bark, and gum—have been used in treating ailments such as respiratory disorders, digestive issues, and skin diseases. This paper reviews the botanical characteristics, ecological significance, ethnomedicinal applications, and socio-economic importance of Prosopis cineraria, highlighting its relevance for sustainable agriculture in dryland regions.

Keywords: Prosopis cineraria; Khejri; arid ecosystems; ethnomedicine; nitrogen fixation; dryland agroforestry; medicinal plants.

1.1 Introduction

The increasing vulnerability of arid and semi-arid regions to climate change has intensified the need for resilient plant species that can sustain ecological functions while supporting rural livelihoods. Prosopis cineraria (L.) Druce is one such keystone species widely distributed in regions of India, Pakistan, Afghanistan, and the Arabian Peninsula. Known locally as Khejri in India and Ghaf in the Middle East, the species is revered for its exceptional drought tolerance and ability to thrive in extreme climatic conditions.

Ecologically, P. cineraria contributes significantly to soil fertility through nitrogen fixation, leaf litter deposition, and microclimate regulation. Agronomically, it is integrated into traditional agroforestry systems, enhancing crop yields even under low-rainfall conditions. Ethnomedicinally, its parts have been used for centuries in traditional healing practices, with reported antimicrobial, anti-inflammatory, and nutritive properties. Its socio-economic relevance extends to fodder, fuelwood, timber, and traditional food products derived from its pods. Given its multifaceted importance, P. cineraria remains a central species in sustainable land-use strategies across dryland regions.

1.2 Vegetation Characteristics

This tree belongs to the member of family Mimosaceae, in nature it is found as a medium sized tree it reaches in height 3 to 10 meters. Some times it is found as a big tall size tree when it is protected. From leaf class classification point of view it falls in the class of Leptophylls. From Xerophytic categorization point of view it falls under the class of spiny and thorny. Its trunk is slightly twisted and it is much branched. Under the classification of life forms it is found under the class ofmicro phyanrophytes. It is gregarious tree with a distinct canopy. Its flowering period ranges from March, April to June. It pods are generally 10-25 cm long brown or yellowish, the tree is also known as mesquite tree.

1.3 Eco-climatic Conditions and Habitat Characteristics

It has wide rang in type of forest also, it ranging from tropical thorn to dry sub tropical thorn, dry forest life zones with little frost, mesquite is reported to tolerate annual rainfall of 2cm to 100cm, annual temperature 5^{o}C mean minimum monthly temperature to 48^{o}C mean maximum monthly temperature. It is found with a profound development in all habitats which has acetic, base and neutral soil. Thus the tree is found in arid, semi-arid, sub-humid and humid climate. The tree has poly-climax in nature from distribution point of view. The tree is observed on wasteland, arid lands, grazing and pasture land, riverine marginal areas, foot hill areas, irrigated or un-irrigated areas and even top of the small hilly areas. It is a poisonous by nature having its toxic contents. It is a perennial, deciduous thorny shrub or small tree. It is found as a weed in cultivated areas and as through distribution in more or less all habitat types. Due to it toxic nature it is dangerous for the local plant species growth. It has encroaching nature in distribution. It is the most distributed tree species which ranks at first place due to its wide range of distribution, with multi-habitats or poly-climax tendency, fast growing in nature and to sustain in harsh condition when other local and native plant species cannot sustained for a long period in comparison to Juliflora species.

1.4 Applied Categorisation

It is also a multipurpose dominant plant species of Bhilwara district. It has three applications out of five applied categories which are fuel, edible and commercial.

1. Fuel -

From fuel point of view the tree species stands at first place in comparison to other species in this aspect. It has high heat

content, burning slowly and holding heat well. The species provides 90% of the fuel wood in many villages of district, it is a natural fuel wood which is easily available to the people living in villages and with in towns also. It has specific gravity 0.70 or higher, the wood has been termed "wooden anthracite". The mesquite tree imparts a sweet, smoky burnishing of flavors and all most. It is the most common fuel more or less observed every where, any where in the district as a whole.

2. Edible–

Its pods are pale yellow in color and after ripen at dry stage it has slightly sweaty in taste. The pods are among the earliest known as foods of prehistoric man in the new world. Pods are eaten eagerly by the sheep's and goats. Today four products made from the pods are still popular; although only sporadically prepared, mostly by Amerindians. Pods are made in to gruels, some times fermented to make a mesquite wine. Providing good bee pasturage also, nectar from mesquite yields a superior honey. Toasted as a seeds as added to coffee, thus the pods of Juliflora is generally used for edible purpose.

3. Commercial–

The wood is used for floors, furniture and turnery items, fence, post, pilings, as a substituted in absence of other good quality of wood. The bark is rich in tannin is used for roofing in Columbia. The gum forms are adhesive mucilage, used as an emulsifying agent, gum is also used in confectionary mending pottery, its branches and stem is one of the easily available fire woods. It is very economic firewood makes a commercial value at local market. The tree is sold from Rs.100-1000 depends on its size and weight. Most of the villagers have firewood at domestic level, its stands at first place in priority of fuel wood. A poor quality of coal is also prepared from its stem.

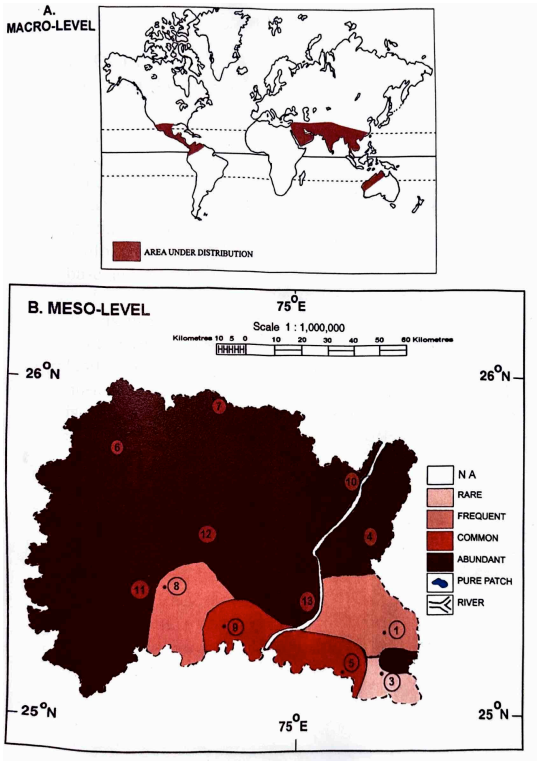
1.5 Phytogeographical Distribution

A. Macro distribution -

It has wide global distribution. Originally center and s. America, in Mexico, common weed in the USA, in Australia, s. Arabia, Iran, Iraq and Indian sub-continent. The tree is observed more or less in all states of India. As shown in **Figure-A.**

B. Meso distribution–

Figure-B shows the district level distribution of Juliflora community. It has abundant distribution in two patches which covers 76% of the area under study it has two patches. The smaller patch of abundant distribution is located in south east part of Bhilwara district, in south east Beejoliya tehsil by including Ganeshpura locality this small patch cover 2% area of the district, another large patch has wide distribution of Bhilwara district which covers Jahazpur tehsil completely including Nathun and Pander localities complete Shahpura tehsil, Hurda tehsil by including Gulabpura locality, Banera tehsil by including Asind locality, 80% Mandal tehsil includes Banera locality, complete Asind tehsil by Asind locality, 80% Mandal tehsil includes Bagor locality, complete Raipur and Sahara tehsil, and 50% western part of Bhilwara tehsil. In this way it stretches east ward to northern and western then spreading towards south areas of Bhilwara district leaving only south eastern part of the district.



In this abundant patch the tree density is observed in between 5,000 to 10,000 trees per sq km area. It covers 76% area of the district total. At the part of common Phytogeographical occurrence it covers 8% area of the district total. It stretches in the south eastern portion from Beejoliya tehsil, Mandalgarh tehsil, Kotri tehsil and Bhilwara tehsil by including Menal and Hameergarh locality. The tree density of Juliflora community is observed in between 2000 to 5000 trees per sq km area. At the part of frequent Phytogeographical occurrence the distribution is divided into two patches that covers 14% area of the district. First frequent patch which covers 7% area of the district is located in south east portion of Beejoliya tehsil.

Another patch of frequent occurrence is located in central part of Bhilwara district. It includes part and portion of three tehsil Banera, Bhilwara and Mandal by including Suras locality. Here the tree density is observed in between 100 to 2000 trees per sq km area. At the part of rare distribution one patch located in south of Beejoliya tehsil by including Govindpura locality in this area the treedensity always below 100 trees per sq km area.

1.6 Conclusion

Prosopis cineraria stands as a crucial species for ecological restoration and sustainable development in arid landscapes. Its ability to withstand harsh environmental conditions, enhance soil fertility, and support diverse livelihood needs underscores its relevance in modern dryland management practices. Continued research and conservation efforts are essential to preserve this culturally and ecologically significant species,

particularly in regions facing land degradation and climate stress. Strengthening traditional agroforestry systems that incorporate P. cineraria can contribute to food security, biodiversity conservation, and long-term environmental sustainability.

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