

Anthropogenic Influences on the Vegetation of Western Rajasthan with Special Reference to the District Nagaur

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ABSTRACT: Nagaur is a city in the Indian state of Rajasthan .

Nagaur is the administrative center of the district of the same name . The city is 200 km west of Jaipur . The national highways NH 65 (Jodhpur - Hisar) and NH 89 (Bikaner - Ajmer) intersect in Nagaur. In the 2011 census, the population was 102,872. In Nagaur there is an old fortress from the early 12th century.

Nagaur is a district of the Indian state of Rajasthan . The district has 2,773,894^[1] inhabitants (2001) and an area of 17,718 km². Nagaur district is famous for its vegetation like khejari, ber, ker, sangari and anar (promegrante) The district forms a part of the Thar desert and is situated in the western part of Rajasthan.

KEYWORDS-western,Rajasthan,Nagaur,population,vegetation,desert,district

I. INTRODUCTION

Thorny shrubs and sandy dunes are the basic characteristics of this region. Kikar(Acacia), Aak(Calotropis procera), Khejari (Prosopis cineraria), Khimp (Leptadenia pyrotechnica), Lathiya, Laana and Booiin (Aervato mentosa), Tumba(Citrullus colocynthis) make natural vegetation of this area. According to experts Rawla area is enriched with fertile soil for crops. [[Gypsum/Chuna]] rocks are assets of this region. The waters of Ignp canal has brought changes to flora and fauna and agriculture of wheat, mustard, cotton, Guar, pulses and Jawar has given a composite form of sandy dunes and green fields. Average annual rainfall has fallen dramatically in the last few years. Since key source of irrigation is canal-water, water supply is inadequate for agriculture. Now many farmers are moving to a new trend of irrigation by tubewells. **Nagaur District** is one of the 50 districts of the state of Rajasthan in western India.[1,2] Panchayati Raj was introduced here. It is the fifth largest district in Rajasthan and the area of the district is 17,718 km² (6,841 sq mi). The city of Nagaur is the district headquarters. Nagaur District is between 26°25' & 27°40' north latitude & 73°10' & 75°15' east longitude. The district is bounded by Bikaner District to the northwest, Churu District to the north, Sikar District to the northeast, Jaipur District to the east, Ajmer District to the southeast, Pali District to the south, and Jodhpur District to the southwest and west. The district lies in the Marwar region of Rajasthan, in the Northwestern thorn scrub forests belt surrounding the Thar Desert. The Aravalli Range extends across the southeastern portion of the district, and the saline Sambhar Lake, India's largest salt lake and Rajasthan's largest lake, lies at the southwestern corner of the district, straddling the boundary with Jaipur District. Kheduli is a historic palace where pupil of Khawaja Moiniddin Chisti Hamiduddin Nagouri lived for 10 years and located on the railway line[3,5] of Jaipur-Jodhpur.

- **Luni River**

The only river that flows through the Nagaur district is the Luni which is of ephemeral nature. This river originates from the Aravallis, near Pushkar in Ajmer district and follows a WSW course into the Kutch. The river Luni enters into Nagaur district near Ladpura (about 2.5 to 3 km (1.6 to 1.9 mi) southwest of Ladpura) and drains the villages of Alniawas, Jhintia etc. finally crossing the village Kekind to enter into the Jaitaran area of Pali district. Although it has a number of tributaries all but one join it from the south. None of these drain any water into the main river but for a few days during the monsoon. The wide beds of these rivers have been considerably filled by alluvial and aeolian sediments and in places they have almost been choked by aeolian sand. The river Luni also acts as an barrier against the eastward spread of aeolian sand.

- **Soil**

The study area is greatly influenced by strong winds and the soil is wind-modified to a varied degree. The effect of arid condition is reflected in the lack of horizonation of the soils. The soil material appears to have been formed from mixed sources of igneous, metamorphic and vindhyan systems. The following soil profile is a typical pedon which occupies more than 70 percent of the area.

- **Dunes of Nagaur**

The main sandy tract of the area lies to the west of the Luni river. The northern and western parts of the district have scattered dunes, these being mostly parabolic, longitudinal barchans and obstructed dunes, oriented in NNE-SSW to NE-SW directions.

- **More Vegetation**

The vegetation consists of a sparse cover of thorny woodland with distinct variations in different topographical areas. The principal trees found on sand dunes are *Prosopis cineraria*, *Acacia senegal*, *Tecomella undulata*, *Gymnosporia* and *Aerva*. Physiographically the district is marked by a low and gentle relief interspersed with the isolated hills and knolls of the Aravallis. The major part of the district is characterised by stabilised sand dunes. Climatologically the area experiences a semi-arid climate with sparse thorn and scrub type of vegetational cover. [7,8]

II. DISCUSSION

Khejri (Prosopis cineraria) is one of the most common tree species found in western Rajasthan especially Nagaur. It plays a vital role in preserving the ecosystem of arid and semi-arid areas, mainly in the Thar Desert. The tree is frost and drought resistant and tolerates extreme temperature ranging from 40–45 °C in summer to less than 10 °C in winter. It is capable of growing in areas of rainfall ranging from 100–600 mm. The tree can withstand the hottest winds, the driest season and stay alive where other plants cannot survive.

It can be safely said that khejri is a tree of the desert. The tree grows on a variety of soil but prefers alluvial, consisting of various mixtures of sand and clay. It can tolerate moderate salinity of soil but dries up in very high salinity. It also acts as an effective soil binder and is a great stabilising agent in sandy soils. Khejri though is rarely seen in hilly areas. When it grows on hilly soil in high rainfall zones, its growth is stunted and fruiting is poor.

Khejri is known by many local names in zonal districts of Rajasthan, popularly it is called khejri or *khejra*. It is also called *jant* or *janti* in areas other than Nagaur viz. Alwar, Sikar, Jhunjhunu, Churu, Jaipur, Bharatpur, Karoli, Dholpur, Samal village in Udaipur, and Banswara and Dungarpur districts of Rajasthan. [9,10]

Propagation

Khejri mainly propagates through seed germination. Regeneration through seeds is confined to moist climate; in places that are dry, the tree regenerates itself using root suckers, which are also produced on removal of the main trunk. The trees can also be successfully raised by sowing, in conjunction with field crops in irrigated lands. The root system of khejri is long and well-developed and penetrates deeper and deeper for subsoil water. Growth above the ground is slow. Very deep roots help in securing firm footing and in obtaining moisture from deep soil layers.

The trees produce new leaves before summer—the leaves are bi-pinnate; 3–4 cm long. Small conical compressed spines are present on the branches. The flowers—small in axillary spikes, yellow to creamy white in colour—appear from March to April. Khejri is a summer fruiting tree. Its fruit is cylindrical and the multi-seeded pod grows up to 20 cm long; pendulous and pointed at the apex, it is initially green but turns yellow or dull brown on maturity. The crown of the tree is dense, spherical and shady.

Self-fencing phenomena

Khejri is highly prone to browsing, yet despite the presence of many cattle and wild herbivorous animals, it can successfully grow in nature. This is possible due to a self-fencing behaviour of the plant. A ‘baby’ khejri grows horizontally in all directions, making a big circular flat bush. The leading shoot remains in the centre. When a browsing animal approaches the bush, it is restricted to peripheral branches; thus side branches help



to keep away the browsing animals from the central leading shoot. The protected central leading shoot keeps on growing. As it grows longer, peripheral branches are withdrawn and only the single trunk remains.

III. RESULTS

Role of regeneration of peepal and bargad

Peepal (*Ficus religiosa*) and *bargad* (*Ficus bengalensis*) start their life cycles as epiphytes on rough-barked old trees like khejri. Seeds of peepal and bargad are dislodged by the birds from trees on which they perch and rest. The seeds of peepal and bargad begin to germinate in rainy seasons on the branches or stem of the host tree. In due course, they grow to a huge size, and the host trees on which they grow are completely covered and ultimately killed. Thus, Khejri is an important host species in the drier parts of western Rajasthan that helps the natural regeneration of the epiphytic *Ficus* species.

Economic importance

Each part of the tree, from root to pod, finds some use or another. The extent of its importance is highlighted in its recognition as the 'state tree' of western Rajasthan. Since all parts of khejri are useful it is called the '*kalpavriksha* of the desert'. It is also known as the 'king of the desert' and the 'wonder tree'. It is a symbol of socio-economic development in the area. It is a socially preferred tree species and is regarded as the lifeline of desert dwellers. Owing to its multiple uses and services rendered, khejri has been the most common agroforestry species for centuries. The tree is a top-feed species providing nutritious, highly palatable green as well as dry fodder which is readily browsed by camels, cattle, sheep and goats. The leaves have high nutritive value and are locally called 'loong'. Khejri is also much liked as a fodder tree by herbivorous wild animals like black bucks, chinkaras, nilgais and hares. Bees not only feed on the nectar of the flower but also build their hives on the trees. Many species of ants and beetles can be seen living on khejri tree. Cicadas also sing on khejri trees during the summer, while weaver birds prefer to make their nests on them.[8,9,10]

Food value

Khejri is a nitrogen-fixing tree which enhances the fertility of the soil. It supports agricultural crops when sown under and around it. When planted along the boundary of farmland, khejri acts as an effective wind break and protects the plants from the desert winds. It also provides a rich source of bio-matter for the soil when it sheds its foliage. The yield of green foliage from a fully grown tree is expected to be about 60 kg with complete lopping, leaving only the central leading shoot. In addition to providing feed in times of scarcity, loong is highly nutritious, increasing both the quality and quantity of milk-yield in cows, buffaloes and goats; however, these leaves also reduce the strength and life span of the trees.

The unripe pods are green, and locally known as 'sangria' or 'sangar'. The dried green beans of the khejri are stored and used for cooking round the year. It is one of the ingredients of the famous *panchkuta*, a local dish cooked with five vegetables. The dried mature pods, locally called 'kho-kha', have a sweetish pulp and are also edible and much liked by local children. They are used as fodder for livestock. Even the bark having an astringent bitter taste was reportedly eaten during severe famines of 1899 and 1939. The gum of the tree obtained during May and June is nutritive and good to taste.

Medicinal use

Ayurveda and other traditional medicine systems have long been used in curing a variety of ailments. Particularly, the bark extract of this tree is used in symptomatic treatment of scorpion and snake bites. The treatments range from alleviating skin ailments to preventing miscarriage and easy deliveries. It is no exaggeration to say that khejri is a cornerstone species in the fragile ecosystem of Thar. [1,2,3]

Worship

Culturally the tree has a reputed status in the society. Green twigs of khejri are worshipped in homes on *Janmashtami* (the birth day of Lord Krishna as per Hindu traditions). It is a symbol of Krishna in some

districts of western Rajasthan. The tree is honoured and worshipped by the Bishnoi community. Due to the arid climate, the percentage of forest cover in the desert is small. Khejri provides most of the forest cover, especially in traditional *oran* and *gochar* (sacred grooves and pasture lands); but these areas are not protected legally. Hindu epics—the Ramayana and the Mahabharata—mention the use and significance of this tree: Rama worshipped the khejri tree which represents the goddess of power, Shakti, before he led his army to kill Ravana. The worship of this tree is referred to as ‘sampuja’. Pandavas also worshipped this tree and hid their weapons in it during their *Agyatavasa* (exile in disguise). Since the Vedic period, its wood has been used to kindle the flame of sacred *yagyasyajnas* (a devotional and purifying fire ritual).

Threat to conservation

Despite being the most documented tree in the desert with all its importance and services to the community through food, fodder wood and medicine, the tree is struggling for existence. In the past few decades, there has been a change in the ecological conditions of the Thar. These studies have pointed out some major threats to the ecosystem of the desert and some specific to the khejri tree.

Urbanisation: The changing land use pattern of the desert has been affecting the biodiversity and creating pressure on the native flora and fauna. There has been a rapid increase in urban areas as hectares of land are being converted every year to expand cities and build new industries, causing direct loss to the already slow-growing khejri tree. Further, the introduction of many garden tree species in the desert climate has caused these species to replace the khejri in its own ecosystem. Khejri trees are also getting replaced by the plantation of neem (*Azadirachta indica*), gulmohar (*Delonix regia*), *karanj* (*Pongamia pinnata*), sheesham (*Dalbergia sissoo*) and peepal (*Ficus religiosa*).

Canal irrigation: The introduction of water in the desert through the Indira Gandhi Canal Project and deep ploughing of soil by tractors has brought about irreversible change in the ecosystem of the desert. The creation of a conducive environment either artificially or through anthropogenic activities attracts exotic species of plants increasing their overall density in a particular area. These foreign species replace the existing endemic flora which struggle to adapt to change of habitat. New flow of water has sustained many parks, and artificial campuses, thereby inviting several species of destructive pests and fungus like *Alternaria*, which is responsible for mortality of khejri. Similarly, introduction of more and more tube wells in arid regions causes the water table to go deeper, beyond the reach of the tap root system of khejri. At present, around 70 per cent of trees are found to be diseased in Nagaur district of Rajasthan. Other affected areas include Churu, Sikar and Jhunjhunu district. Over the past few years, the number of khejri trees in some villages have decreased from 50 to only five.[5,7,8]

Droughts: The problem of khejri mortality is more pronounced by excessive lopping especially during times of drought. The cut stump of the tree is an ideal place for insects to lay their eggs. The larvae of the insects destroy the tissue of the trees by feeding on the sap of the heartwood. The tree starts to dry up from the top ultimately leading to its death.

IV. CONCLUSIONS

Survival of khejri

There need to be concrete action steps taken to save the khejri in its native ecology to restore its contribution to the ecosystem of the Thar region. The population of khejri in western Rajasthan is decreasing at an alarming rate. The adverse effects of lopping are being amplified by the decreasing underground water table.

1. The excessive lopping and cutting of khejri trees should be stopped by the farmers as it is the primary cause of pests and infections. There should be a gap of at least one year between khejri lopping in order to let the trees recover from injuries made by pests and diseases.
2. The lopped portions/open wounds should be treated with prescribed chemicals to check the fungal infection and eggs lying near the shoot borer.
3. Severely infected and dried trees should be uprooted and felled trees should be removed from the area immediately.



4. The trees showing partial symptoms of decline and dieback should be provided proper treatment on priority in order to check the spread of disease.

The government of Rajasthan needs to formulate a well-defined policy to prevent the invasion of non-desert vegetation so as to reduce the pressure of co-existence and replacement. Continuous monitoring for infestation should be carried out by the government by identifying the risk zones of infestation, distribution pattern and season of shoot borers, because once invasion has occurred, its eradication is not easily possible. Thus, a massive control programme needs to be initiated.[9,10]

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