

## Significance of Floral Diversity of Ethnobotanical Importance in Indian Thar Desert

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### ABSTRACT

The Thar Desert lies between 24° to 28° N latitude and 68° to 71° E longitude occupying an area of about 35126km<sup>2</sup>. Physically the desert stretches over the eastern districts of the Sindh Province. The Sindh province occupies the southeast of Pakistan, limited on the east by the Indian border of Rajasthan, in the south by Rann of Kutch and the Arabian Sea, in the west by the arid rocky mountains of Baluchistan and in the north by the irrigated plains of Punjab. About 60% of the area of Sindh Province is arid (some 88,000 km<sup>2</sup>). The arid zone of the Sindh province can further be divided into Kohistan, on the western side and Thar on the eastern side of the Indus Valley. Thar is traditionally subdivided into the Nara Thar region in the north and Parkar Thar in the south. The extreme south of the Thar Desert is the broad sandy salt marsh Rann of Kutch, whereas the western border runs along the eastern side of Nara Canal. Its entire eastern boundary is Rajasthan, India.

The Thar bio-region supports a fascinating and resilient vegetation, that is rooted as much in the harsh terrain as in its culture and everyday traditions. We look at the sub-regions in this seemingly uniform landscape, and its wide variety of hardy desert trees, shrubs and grasses that survive and thrive in the arid climatic conditions. The prevalent flora has strong cultural and sociological connections with the communities living in the region, and this is reflected in the daily rituals, dress, religious beliefs and folklore.

**KEYWORDS:** Thar, ethnobotanical, floral, desert, diversity, Indian, Rajasthan, region

### INTRODUCTION

Ethno-botany is a distinct branch of natural science dealing with various aspects such as medicine, religious, cultural, agriculture instruments, household implements and several other disciplines.[1,2]



**Acacia nilotica**

**How to cite this paper:** Mukesh Kumar Meena | Dr. J. B. Khan "Significance of Floral Diversity of Ethnobotanical Importance in Indian Thar Desert"

Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-6 | Issue-3, April 2022, pp.219-224,  
www.ijtsrd.com/papers/ijtsrd49504.pdf



URL:

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The tribal's who depend on forest (mostly their surrounding vegetation) wealth are the real custodians that safeguard the medicinal floral diversity till now . Rapid deforestation caused by over harvesting and exploitation trade of medicinal floral diversity has significantly reduced the availability of the medicinal plants in Thar desert region. [3,4]



**Tribals in the Thar desert**



**Prosopis cineraria**

Ethno-botanical approaches are significant in highlighting locally important plant species, particularly for new crude drug sources. The use of floral diversity as medicine is slowly increasing in the developed world because they have minor or no side effects. Today the field of ethno-botany requires a variety of skills. Botanical training for the identification and preservation of plant specimens, anthropological training to understand the cultural concepts around the perception of plants, linguistic training, at least enough to transcribe local terms and understand native morphology, syntax and semantics. Native healers are often reluctant to accurately share their knowledge to outside. [5,6] The system of medicine practiced by the traditional folk healers and medicine men has been called as the “Folklore Medicine” which is also a part of the “Traditional Medicine” practiced in India in the name of “Ayurveda” and “Sidha” and in other names in various part of world. Thar Desert is unique both from floristic and climatic point of view. It assumes special significance since the biodiversity in this zone survives in a very fragile ecosystem under a highly hostile environment. The medicinal plants of the region are utilized by the local inhabitants as well as in indigenous system of medicine. In last few decades, there is growing demand of medicinal floral diversity by pharmaceutical companies. This increasing demand if properly utilize can help in boosting the village economy as well as will open new avenues of employment. The per hectare income generated from growing medicinal plant is much more than any other crop. However it depends upon the quality and market demand of the concerned species.[7,8]

### **Methodology**

Intensive exploration trips will be conducted to document plants and to know prevailing biodiversity. Plants samples will be collected randomly from different area in Thar desert and kept in polythene and prepare Herbarium sheet with labeled. The collected specimens will identify taxonomically with the help of the flora of India and monograph and also with the help of standard keys. The plant species will be collected in their flowering, fruiting or at their fully mature stage. The field survey will be done in every month. Plant species will be also identified with the help of herbarium of Rajasthan University, Jaipur, and also by local inhabitants. Medicinal plants will be identified by meeting and contacting, discussion and interviews with villagers, folk, healers, vaid, hakims, homeopath and other practitioner in traditional medicine and also by questionnaires with surrounding people of Thar desert. [9,10]

### **Discussion**

Permanent features of the vegetation of the Thar Desert include trees and shrubs like *Acacia nilotica*, *Prosopis cineraria*, *Tamarix aphylla*, *Lycium barbarum*, *Salvadora oleoides*, *Zizyphus numularia*, *Capparis deciduas*, *Acacia jacquemontii*, *Calligonum polygonoides* and *Leptadenia phytotechnica*. Herbs and shrubs like *Inula grantioides*, *Cymbopogon javarancusa*, *Blepharis scindica* (Bhangari), *Vernonia cinerascens*, *Commiphora wightii*, *Grewia tenax*, *Aerva javanica*, and *Euphorbia caducifolia* can generally be observed on the rocks and sandy ridges. Water scarcity has limited agricultural practices in the desert. The only source of water for human beings and livestock are from dug wells and natural ponds, in which the water is stored during the monsoon. [11,12] The livelihood of people is largely dependent on their livestock (goats, cows and camels) and economic utilization of plant resources. The herbaceous communities and ephemeral species may not emerge

every year, depending upon the availability of rain water. Such species are well adapted to survive the drought periods and respond quickly in case of rain. This floral diversity emerge with the first showers, grow very quickly, produce seeds and complete their life-cycle in a span of seven to eight weeks. Their seeds remain dormant throughout the dry period.[13,14]



**Ziziphus mauritiana**

The use of plants in medicine is booming up. Use of traditional medicine is the mainstay of primary health care, virtually in all developing countries. The use of herbal medicine in developed countries is also expanding rapidly. [15,16] It seems that people are turning towards alternative medicine, which they wish to be less harmful and with fewer side effects than western medicine. The World Health Organization estimated that some 80% of the developing world relies on traditional medicine and of these 85% use plants or their extracts as the active substances. In the Thar Desert the dependency of people on plant medicine however reaches up to 95%. Though all the desert trees are under anthropogenic stress, *Prosopis cineraria* is over exploited for the purpose of making coal. This practice has diminished the tree from most of its natural habitat.[17]

Common diversity of flora were *Diospyros melanoxylon*, *Sterculia urens*, *Mitragyna parviflora*, *Butea monosperma*, *Acacia ctechu*, *Embllica officinalis*, *Boswellia serrata*, *Bridelia squamosa*, *Hardwickia binata*, *Buchanania lanzan*, *Cassia fistula*, *Schrebera swietenoides*, *Pterocarpus marsupium*, *Holoptelea integrifolia*, *Terminalia tomentosa*, *Terminalia bellirica*, *Adina cordifolia*, *Schleichera oleosa*, *Careya arborea*, *Madhuca indica*, *Syzygium cumini*, *Bridelia retusa*, *Miliusa tomentosa* *Ougeinia oojeinensis*, *Lagerstroemia parviflora* and *Kydia calycina*, *Mangifera indica*, *Mallotus philippensis*, *Cochlospermum religiosum*, *Flacourtia indica*, *Bauhinia racemosa*, *Albizia procera*, *Albizia leback*, *Albizia odoratisima*, *Aegle*

*marmelos*, *Acacia leucophloea*, *Ziziphus xylopyrus*, *Ziziphus mauritiana*, *Capparis zeylanica*, and *Ficus religiosa*, *Ficus benghalensis*, *Ficus semicordata*, *Ficus rumphii*, *Ficus arnottiana*, *Dichrostachys cinerea*, and *Ziziphus mauritiana*. A few climbers of this area include species of *Cryptolepis buchanani*, *Ichnocarpus frutescens*, *Rhynchosia minima*, *Atylosia scarabaeoides*, *Cocculus hirsutus*, *Cissampelos pareira*, *Ipomoea*, *Pergularia daemia*, *Pueraria tuberosa*, *Tinospora cordifolia*, *Asparagus racemosus* and *Ceropegia bulbosa*.

## Results

The Indian desert, the Thar Desert, has its own importance and specific characteristics with respect to endemic and medicinal plants. [18,19]



**Capparis zeylanica**

Forty-five plant species are considered to be rare and/or endangered. The desert has a large number of plants of economic importance and medicinal use. The Thar Desert is thickly populated in comparison to other hot deserts of the world. 17.44 million people and 23.33 million livestock are recorded from the region. These populations exert pressure on the biological resources of the Thar Desert causing a lack of sustainability and necessitate conservation of biodiversity actions.[20,21]

The Indian Institute of Technology-Jodhpur has launched a new initiative to conserve and restore the Thar desert, its minerals and medicines, and its flora and fauna by carrying out ecosystem phenomics through a transdisciplinary framework of medical, engineering, environmental, and life sciences.

Called Thar Desert Ecosystem Sciences Guided by Nature and Selection (Thar DESIGNS), the initiative has been launched under the aegis of the Jodhpur City Knowledge and Innovation Cluster.

The Thar is characterized by high maximum temperature with large diurnal variations, scanty rainfall, extreme aridity, and intense UV radiations.

This has been one of the largest natural laboratories for evolving systems that ensure the adaptation and survival of its constituent species, their interdependencies, and the conservation of the entire ecosystem.[22]

The impact of any loss of natural deserts will be immense as these habitats are rich in flora and fauna as well as minerals and medicines that nurture and maintain different life forms on earth. Often considered as wastelands, deserts are crucial for the stabilisation of climate. Any shift in climate or anthropogenic activity can lead to maladaptations for organisms that live at the ebb of physiological extremes, loss of diversity through extirpations, and ultimately an ecosystem collapse. This threatens the lives and livelihood of the native inhabitants.



**Asparagus racemosus**

To address this, the Jodhpur City Knowledge and Innovation Cluster (JCKIC) has brought together organizations that are engaged in activities ranging from engineering, space research, medicine, agriculture, zoology, and forestry, which have carried out focused efforts in tackling diverse aspects of the Thar desert. This collaboration includes projects that address the complex and networked issues of the desert in an integrative framework.

Prof. Mitali Mukerji, Head of the Department of Bioscience and Bioengineering at IIT-Jodhpur, said, “Thar DESIGNS’ aims to disseminate knowledge and encourage participation through a citizen science approach and inculcate design thinking across the entire collaborative network.”

Under the initiative, the researchers will use IOT enabled devices and big data analytics framework to crowd source observations from the local ecosystem to the regional level keeping the cultural context and traditional medicine knowledge in perspective.

Researchers would also integrate computer vision and machine learning along with domain knowledge to infer links between environment, phenotype, and genotype at geo-spatiotemporal scales and identify early actionable intervention strategies. The knowledge generation will result in providing a ‘Desert Ecosystem Knowledge Grid’ that could foster the cycle of engineering- research-development-commercialization.[23,24]



**Cassia fistula**

This will, among other things, help find solutions for the management of diseases common and endemic to desert regions and the generation of novel bioprospecting opportunities and innovative bio-inspired engineering designs. It could also help evolve unique strategies for ecological conservation and restoration that ensure sustained livelihood for its inhabitants.

Thar DESIGNS is likely to propel the growth of new industry and capacity building for next-generation tech-savvy social and eco-entrepreneurs. An AI-assisted recommendation engine for the sustenance of desert ecosystems based on the interacting principles of desert ecology, evolutionary biology, and culture would also be of enormous utility for policymakers and diverse stakeholders.



**Ficus religiosa**

## Conclusions

Human well-being depends on biological diversity and ecosystems and the goods and services they provide. Unprecedented loss of biodiversity and degradation of ecosystems over the past few decades pose new and urgent challenges.[24]



**Aegle marmelos**

Addressing these challenges necessitates the strengthening of existing models of biodiversity governance and formulating new ones. The strategic goals like preventing the extinction of endangered species, halving the loss of forests and natural habitats and also reclaim 15 per cent of degraded lands, move from conservation to restoration as well. The desert region is considered more sensitive to changing climate. A concerted effort is required to mainstream desert biodiversity and coordinate actions between all government sectors. The practices related to conservation, restoration and sustainable use with a blend of traditional knowledge and modern scientific interventions will lead to sustainable agriculture in the region. Some of the larger grasslands and Orans in this region should be put under multiple use protected areas alongwith traditional but controlled grazing and avoiding canal irrigation to these areas will be required for sustainable floral diversity in future as well. The better deployment of floral diversity in this region will be essential to improve productivity, enhance ecosystem functions and adaptability.[25]

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