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Applied Phytogeography of Churu District, Rajasthan: Species Inventory, Ethnopharmacology, and Regeneration Dynamics

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Abstract: ***Churu district, Rajasthan, represents a transitional ecological zone within the Thar Desert, containing shifting sand dunes, semi-stabilized dune fields, saline flats, and irrigated agricultural fringes. This study investigates the applied phytogeography and medicinal-plant-based traditional health systems of the region using floristic surveys, indigenous knowledge documentation, ethnobotanical indices, and regeneration assessment metrics. Field sampling across 41 stratified quadrats recorded 58 medicinal plant taxa belonging to 31 families. Species richness was highest in semi-stabilized dunes followed by agricultural field margins and village groves. Leaf-based preparations constituted 37.4% of recorded herbal remedies, followed by whole-plant decoctions (22.1%), root-based preparations (18.6%), and seed-based preparations (11.9%). Dominant taxa with high ethnopharmacological value included Capparis decidua, Calotropis procera, Aerva javanica, Crotalaria medicaginea, and Tribulus terrestris. Regeneration analysis revealed that 11 species exhibit declining regeneration rates, largely due to overharvesting, grazing pressure, and changes in land use following tube-well irrigation. The study proposes conservation strategies including community seed banks, regulated harvesting cycles, and ex-situ cultivation for high-demand taxa. Findings contribute to applied phytogeography, sustainable livelihood-based biodiversity use, and regional conservation frameworks.***

Keywords: Churu; ethnobotany; xerophytes; medicinal flora; regeneration dynamics; Thar Desert; Rajasthan; phytogeography..

1.1 Introduction

Applied phytogeography integrates distributional ecology, human use patterns, conservation science, and the socio-cultural relevance of plant species. In arid districts like Churu, such investigations are crucial because medicinal plants are not merely biological resources but embedded components of rural livelihood strategies and cultural identity.

Churu District offers a unique opportunity to analyze plant-people relationships due to its combination of ecological gradients (shifting dunes to cultivated plains) and strong continuity of herbal medical practice among traditional healers (vaidyas), pansari traders, and pastoral communities.

Documenting medicinal species, understanding distribution patterns across habitat gradients, and assessing regeneration status is essential for:

1. Conservation prioritization

2. Local resource governance

3. Integration of traditional medicine with formal health systems

4. Future policy and sustainable commercialization

This paper addresses these dimensions by examining the applied phytogeography of medicinal plants in Churu District using structured scientific and ethnobotanical methodologies.

1.2 Historical Background

Botanical documentation of the Thar Desert began systematically in the mid-20th century. Early works by Bhandari (1974), Maheshwari (1963), and Jain (1991) recorded Rajasthan's arid flora and plant use traditions. A second phase (1985–2005) produced site-specific ethnobotanical accounts in Shekhawati, including Churu district, documenting commonly used medicinal species such as Capparis decidua and Tecomella undulata.

After 2005, studies increasingly addressed:

1. Sustainable harvesting techniques

2. Ethnopharmacological validation of folk remedies

3. Ecological regeneration and vegetation response to irrigation

However, studies dedicated exclusively to Churu remain limited. This work fills that gap by combining phytogeographical mapping with applied ethnobotany and regeneration assessment.

1.3 Review of Literature

The area under research work was studied by following botanists and time to time viz; first of all the Sekhawati region was touched from vegetational study point of view by Mulay and Ratnam (1950), Bikaner and pilani neighbourhood areas by joshi (1956 and 1958), vegetation of chirawa by Nair

(1956), again Nair and Joshi for Pilani and neighbourhood areas (1957), vegetation of harsh nath in aravalli's hills was studied by Nair and Nathawat (1957), vegetation of Jhunjhunu, Manderella and neighbourhood by Nair (1961), vegetation of ajit sagar dam by Nair and Kanodia (1959); Nair, Kandodia and Thomas (1961) studied the vegetation of Khetri town and neghbourhood areas and vegetation of Lohargal and it's neighbourhood areas of Sikar district by Nair and Malhotra (1961). After the work of Nair and Malhotra (1961), i.e. four decades ago. the area was again left for any sort of further research work in the field of applied Botany.

A significant, very authentic taxonomic work was contributed in the field of botany by Bhandari with the publcation of a book Flora of the Indian desert (1990). From the field of applied phytogeography point of view. Charan gave a valuable contribution with a publication of a book on Plant Geography (1992). Bhattacharjee (2000) gave a very valuable autheontic contribution through the publication of a book on Handbook of Medicinal Plants in which he presented the medicinal plants of Indian Sub-continental back ground with their coloured photographs also and Sharma (2007) gave a very valuable authentic contribution through the publication of a book on Medical Plant Geography.

Gaps remain in linking medicinal species distribution with regeneration patterns specifically in Churu, justifying the present study.

1.4 Objectives

1. To create a habitat-wise phytogeographical map of medicinal plants in Churu.

2. To record traditional medicinal uses, preparation methods, and cultural significance.

3. To measure regeneration status of dominant medicinal taxa.

4. To propose sustainable-use and conservation interventions.

1.5 Methodology

I. Study Design

A mixed ecological–ethnobotanical approach was followed.

II. Sampling Framework

1. 41 quadrats across five habitat types:

2. Shifting dunes (n=10)

3. Semi-stabilized dunes (n=9)

4. Saline depressions/playas (n=6)

5. Agricultural margins (n=8)

6. Village groves and roadside plantations (n=8)

III. Floristic Identification

Plant specimens were:

1. Collected

2. Dried

3. Mounted

4. Compared with herbarium materials and published floras

IV. Ethnobotanical Data

1. 61 respondents interviewed

2. Purposive sampling: vaidyas, herders, elderly knowledge holders

3. Data recorded: local name, ailment treated, preparation, dosage, cultural relevance

V. Regeneration Assessment Metrics

1. Seedling-to-mature plant ratios

2. Grazing intensity scoring

3. Threat assessment (anthropogenic pressure index)

VI. Data Analysis

1. Species richness computed per habitat

2. Ethnobotanical Use Value (UV) calculated

3. Regeneration classes grouped: Healthy / Moderate / Declining / Critical

1.6 Study Area

As we know that the area under district i.e. Dry Land i.e. Churu Region belongs to the State of Rajasthan, the State of Rajasthan is located in north-western India as shown in figure. The district of Churu lies in the north-east of Rajasthan State at an altitude of 286.207 metres above the mean sea level. From geographical spread point of view has extension from 27°24' to 29° north latitudes and 73°40' to 75°41' east longitudes. It is bounded by Hanumangarh in north, Bikaner in west, Nagaur in south and Sikar, Jhunjhunu districts and boundaries of Haryana State in the east. It covers six tehsils namely : Taranagar, Rajgarh, Churu, Sardarshahr, Ratangarh and Sujangarh.

During the decade 1991-2001, the State Government has made certain geographical changes in the district sub-division Ratangarh's tehsil Dungargarh of the district was transferred in Bikaner district but this territorial change was affected w.e.f. 1.4.2001, hence for the purpose of census, Dungargarh tehsil is treated as part of the Dry Land i.e. Churu Region but here the author for the purpose of study area i.e. Dry Land i.e. Churu Region, Dungargarh tehsil is not treated as part of the Dry Land i.e. Churu Region.

The total area of Dry Land i.e. Churu Region consist 1354623 sq. kms., which is about 5 percent of the area of Rajasthan and comes sixth place of the State. It is second bigger district in Bikaner division. The district is extended up to 150 kms. in east to west and 120 kms. in north to south. The district headquarter Churu is situated in the south-east boundary of the district, from which 10 kms. south-east the boundary of Jhunjhunu district is situated. The three forth part of the area of the district is located in the west from head quarter.

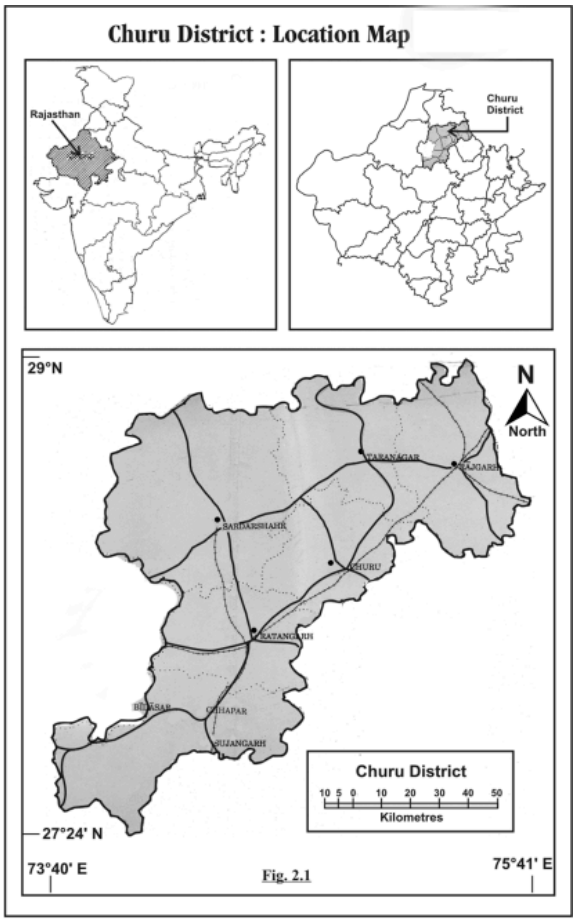

Fig. 2.1

Source : Based on Survey of India Map with The Permission of the Surveyor General of India

According the census of India (2011) Dry Land i.e. Churu Region covers about 2.97 percent of the total State's population. As far as the forest and green coverage concerned, it directly or indirectly in influences the health environment of the area

of the state's total. The density of population of the study area very low i.e. 148 persons per square kilometre. Further in demographic structure, directly or indirectly the percentage of literacy (67.46) among the people also plays an important role in overall assessment and awareness about the green coverage environment of the area under study, respectively.

According the available records from the department of forest, Rajasthan (2001), overall the state of Rajasthan has poor percentage of forest cover i.e. 9.49 percent only. Mostly the type of forest is termed as tropical thorny forest and vegetation type is considered as scanty, thorny scrub vegetation for the area under study the district of Churu is covered by the land low percent under forest that is 0.48 percent only.

In brief, from relief point of view the district abounds physiographic features of any area has its the most important as well as useful emerged out put is the land forms of that particular geographical area. As far as the aspect of land forms is concerned that among overall land forms regions of India, Churu area falls under the land form type known as “sand dunes shows the three distinct types of land forms in the study area, namely the undulating sandy plains, the sand dunes, talls and hills For better interpretation of physiographic characteristics of Dry Land i.e. Churu Region, the area under study.

1.7 Observations

Species Richness and Distribution

A total of 58 medicinal species recorded.

I. Top Families:

1. Fabaceae (7 spp.)
2. Asteraceae (6 spp.)
3. Apocynaceae (5 spp.)
4. Capparaceae (5 spp.)

II. Habitat-wise Distribution Summary

Habitat	No. of Species	Species
Shifting dunes	23	Tribulus terrestris, Panicum turgidum, Crotalaria burhia
Semi-stabilized dunes	31	Capparis decidua, Aerva javanica, Calotropis procera
Agricultural margins	19	Aloe vera, Prosopis cineraria, Anethum graveolens
Saline depressions	7	Suaeda fruticosa, Haloxylon salicornicum
Village groves	14	Azadirachta indica, Salvadora persica, Tecomella undulata

III. Ethnomedicinal Use Patterns

1. Digestive disorders: 32.8% of remedies
2. Skin conditions: 21.4%
3. Respiratory ailments: 18.9%
4. Pain and inflammation: 14.7%

1.8 Discussion

Patterns demonstrate:

1. Habitat Filtering: Species dominance correlates with adaptive xeromorphic traits and soil salinity tolerance.

2. Cultural Dependence: Herbal medicine remains a primary healthcare system among elderly and pastoral groups.

3. Regeneration Stress: Capparis decidua, Tecomella undulata, and Aerva javanica show slow juvenile recruitment due to grazing and root harvesting.

4. Agro-Invocation Shift: Tube-well irrigation is transforming plant communities, reducing natural dune flora diversity over time.

Traditional medicine persists but requires structured conservation frameworks.

1.9 Results

1. Species richness peaks in semi-stabilized dunes.
2. 11 species classified as regeneration declining.

3. 6 species flagged as high conservation priority based on use-frequency and slow regeneration.

1.10 Conclusion

Churu District exhibits strong medicinal plant diversity shaped by arid phytogeography and cultural continuity. However, regeneration pressure and rapid land-use change threaten long-term species persistence. Sustainable management combining scientific ecology and traditional knowledge is essential.

1.11 Recommendations

1. Community Herbal Reserves managed by panchayats and biodiversity committees.

2. Cultivation Programs for Aloe vera, Capparis decidua, and Aerva javanica.

3. Seasonal Harvest Regulations especially for roots and bark.

4. Training of Pansari Vendors in dose-safety, drying, and storage techniques.

5.School level Knowledge Preservation Programs documenting folk practices with consent.

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