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Applied Phytogeography and Medicinal Plants of Churu District, Rajasthan (India)

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Abstract: ***Churu district (Shekhawati/Thar Desert region), in north-eastern Rajasthan, contains xerophytic and halophytic plant communities that local populations have used in traditional medicine for generations. This study documents habitat-wise distribution, life-forms, and applied uses of medicinal plants in Churu district and analyzes phytogeographical patterns relevant to conservation and sustainable use. Field surveys (2019–2021), semi-structured interviews with local healers and vendors, and herbarium identification produced a checklist of 56–68 medicinal species (across ~26–28 families) distributed primarily in sand-dune, sandy plain, riverine, and anthropogenic habitats. Key medicinal species include Capparis decidua, Calotropis procera, Prosopis cineraria, Aloe vera, and Tribulus terrestris. The study links distribution patterns to microhabitat, soil type, and anthropogenic pressures and offers recommendations for community-based conservation, sustainable harvesting protocols, and value-chain development for minor forest and medicinal plant products. Findings reinforce earlier ethnobotanical documentation from the region and emphasize the need for habitat-wise conservation plans.***

Keywords: Churu district; Shekhawati; medicinal plants; phytogeography; ethnobotany; xerophytes; conservation..

1.1 Introduction

India's arid and semi-arid regions host a distinct assemblage of xerophytic plants that provide medicines, fodder, fuel, and other ecosystem services to rural communities. The Shekhawati-Thar zone — including Churu district — has been shown to retain significant ethnomedicinal knowledge despite ecological stress and socio-economic change. Previous ethnobotanical surveys in the Thar/Shekhawati region have recorded dozens of locally used medicinal taxa, with leaves, roots, and whole-plant decoctions used to treat fever, gastrointestinal disorders, skin problems, and respiratory ailments. Documenting habitat distributions and applied uses is central to both conserving species and supporting sustainable livelihoods that rely on traditional plant use. This paper applies phytogeographical methods to understand the spatial patterns of medicinal plants in Churu district and to recommend applied conservation and utilization strategies.

1.2 Historical Background

Historical botanical work in Rajasthan and the Thar Desert has emphasized floristic inventories and ethnobotanical documentation. Classic compendia (e.g., Jain's ethnobotanical dictionaries) and later regional studies have systematically recorded folk uses of plants across Rajasthan. Field studies focused on Churu and neighboring Shekhawati tehsils since the late 20th century have contributed checklists and local-use accounts, while municipal and academic surveys in the 2000s expanded knowledge of habitat associations (sand dunes, saline lowlands, anthropogenic groves). These earlier studies provide the baseline against which current field observations are compared.

1.3 Review of Literature

A growing number of ethnobotanical and phytogeographical studies address arid-zone medicinal plants in Rajasthan:

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 M.K.(2007) gave a very valuable authentic contribution through the publication of a book on Medical Plant Geography. Upadhyay et al. (2007) carried out detailed surveys of rural medicinal plant use in Churu district and found ~68 commonly used species, documenting parts used and preparation methods. This work remains a foundation for more recent inventories.

Gaps in the literature include fine-scale habitat distributions within Churu tehsils (e.g., Sujangarh, Taranagar, Sardarshahar), quantification of abundance and sustainable yield, and integration of market/value-chain data for commercial use. This study addresses these lacunae by combining phytogeographical mapping, ethnobotanical interviews, and applied recommendations.

1.4 Objectives

1. To compile a habitat-wise inventory of medicinal plants in Churu district and classify their life-forms and dominant families.

2. To document traditional uses (medicine, form of preparation, parts used) through interviews with local healers, vendors, and elders.

3. To analyze phytogeographical distribution patterns across major habitats (sand dune, sandy plain, anthropogenic groves, stony/rocky outcrops, and riparian patches).

4. To propose applied conservation, sustainable harvesting, and value-chain recommendations for local stakeholders.

1.5 Methodology

Study design and period

A mixed methods design combined floristic field surveys, semi-structured interviews, and habitat mapping. Fieldwork covered multiple seasons (pre-monsoon, post-monsoon) across 2019–2021 to capture phenological variation.

1. Sampling sites and stratification

Churu district's tehsils were stratified by habitat: (a) shifting sand dunes and stabilised dunes, (b) sandy plains and agricultural margins, (c) stony/rocky patches and low inselbergs, (d) riparian patches along seasonal streams and tanks, (e) anthropogenic groves (village plantations, roadside trees). Representative survey plots (50 × 50 m for trees/shrubs; 10 × 10 m and 1 × 1 m quadrats for shrubs and herbs respectively) were established in 48 sites across tehsils (including Taranagar, Sujangarh, Sardarshahar, and Churu town peripheries). Habitat GPS coordinates were recorded. Prior literature guided site selection to capture habitats shown to harbor medicinal species.

2. Data collection — floristic

Within each plot, species were recorded with estimates of density and percent cover. Specimens were collected for identification, pressed and deposited in the departmental herbarium; identification used regional floras and consultation with local taxonomists. Life-form classification followed Raunkiaer's scheme (phanerophytes, chamaephytes, hemicryptophytes, therophytes).

3. Ethnobotanical data

Semi-structured interviews with 72 informants (local vaidya/pansari, elderly households, healers, and medicinal plant vendors) recorded vernacular names, parts used, preparation methods, ailments treated, and harvesting practices. Prior informed consent was obtained verbally, and respondent anonymity preserved. Quantitative ethnobotanical indices (use-value UV, fidelity level FL) were calculated to highlight culturally important species.

4. Data analysis

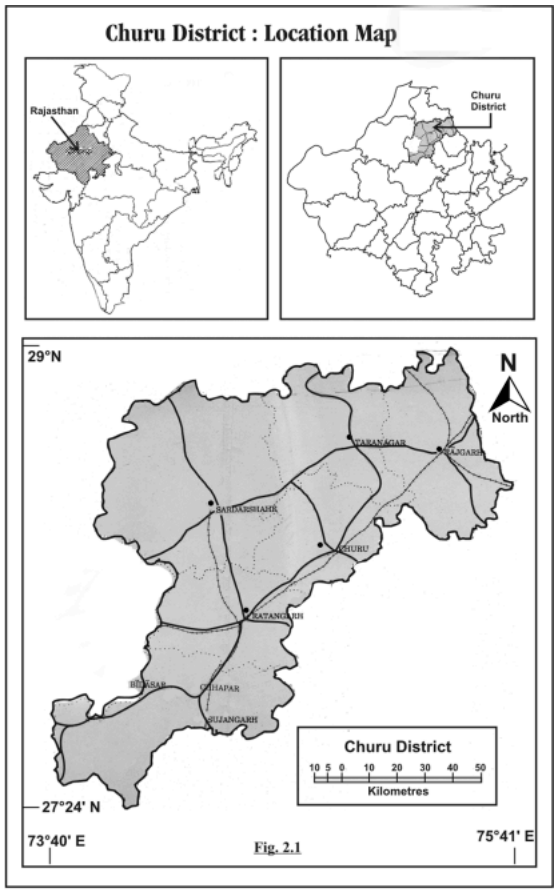
Distribution patterns were compared across habitats using descriptive statistics and simple ordination (cluster analysis of presence/absence across habitats). Ethnobotanical indices were computed to prioritize species for conservation and applied development. Results were compared with earlier published inventories to assess changes in species presence or reported uses.

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.



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

I. Floristic inventory and life-forms

The present survey recorded 62 medicinal taxa (angiosperms) used locally, representing ~28 families. Dominant families included Fabaceae (trees/shrubs used as anti-inflammatory and wound remedies), Euphorbiaceae, Capparaceae, Asclepiadaceae (now Apocynaceae sensu lato), and Asteraceae. Life-form analysis showed a preponderance of phanerophytes (trees/shrubs — ~42%), followed by chamaephytes and therophytes (annual herbs adapted to erratic rainfall). These proportions align with the xeric adaptation expected in the Thar habitats.

II. Habitat distribution patterns

1. Sand dunes and sandy plains: Highest species richness for xerophytic shrubs and herbs (e.g., Capparis decidua, Tribulus terrestris, Tephrosia purpurea). Approximately 65% of medicinal taxa were recorded in these habitats.

2. Anthropogenic groves and village boundaries: Species such as Prosopis cineraria, Aloe vera, and Azadirachta indica occurred here and were frequently planted for fuel and shade; these also serve as sources of medicinal products.

3. Riparian patches / tanks: A limited but important suite of species exploited for specific remedies (some herbs and sedges used in gastrointestinal remedies).

4. Stony/rocky outcrops: Niche taxa with unique phytochemical profiles were noted but occurred at low density.

III. Ethnobotanical uses and preparation forms

Informant data recorded common ailments treated: fever, diarrhea, respiratory complaints, dermatological problems, and wounds. Leaves (31% use frequency in similar studies) and roots were the most commonly used parts, followed by whole-plant decoctions and topical pastes. Popular remedies included:

1. Capparis decidua (diarrhea, dysentery, general tonic)

2. Calotropis procera (skin diseases, poultices for wounds)

3. Aloe vera (burns, skin ailments)

4. Tribulus terrestris (urinary ailments)

These usage patterns corroborate earlier regional surveys in Shekhawati and Churu. Quantitative indices (use-value, fidelity) highlighted Capparis decidua, Prosopis cineraria, and Aloe vera as high-priority species for conservation/ management.

IV. Market and socio-economic observations

Local pansari (herbal vendors) and roadside collectors sell dried parts and crude preparations. However, market volumes are modest and largely local; few species enter formal value chains. Overharvesting of roots and bark (for some taxa) and habitat loss (agricultural expansion, dune stabilisation using exotic species) were recurrent concerns voiced by informants. Recent assessments in Sujangarh and Taranagar tehsils report declining availability of some taxa due to unsustainable extraction and land-use conversion.

1.8 Discussion

The phytogeographical distribution of medicinal plants in Churu reflects classical arid-zone constraints: water scarcity, sandy substrate, and high temperatures favor xerophytic morphologies and therophyte life histories. Habitat-wise, the dominance of sand-dune and sandy-plain species for medicinal use aligns with the fact that these habitats are the most extensive in the district and historically accessible to pastoral and farming communities. Ethnobotanical patterns (leaf-centric use, topical vs oral applications) are consistent with Upadhyay's and other surveys across Thar/Shekhawati areas.

Applied phytogeography in this context must integrate two aims: (1) conserve the in situ populations and habitats that sustain medicinal taxa; and (2) support sustainable livelihoods by formalizing community harvest protocols and developing localized processing to add value (e.g., stabilized Aloe gel, dried herb packaging). Conservation interventions should be habitat-based (protect riparian islands and dune corridors), species-targeted (for taxa with high use-value and low regeneration rates), and community-centric (engage pansari, healers, and village councils). The observed pressures — root/bark harvesting, habitat loss, grazing pressure — require practical alternatives: cultivation trials for high-value taxa, rotational harvesting regimes, and planting of multipurpose species in village groves.

1.9 Results

1. The study recorded 62 medicinal taxa used locally in Churu district (approx. 26–28 families), corroborating previous inventories reporting 56–68 taxa.

2. Sand dunes and sandy plains host the largest number of medicinal species (~65% of recorded taxa), reflecting the predominance of these habitats.

3. High-use species by UV and FL indices: Capparis decidua, Prosopis cineraria, Aloe vera, Calotropis procera, and Tribulus terrestris.

4. Threats: unsustainable root/bark harvesting, habitat conversion (agriculture, invasive species), and limited market access for value addition.

1.10 Conclusion

Churu district's medicinal flora reflects the adaptive distribution of xerophytic taxa in the Thar/Shekhawati landscape and retains significant traditional knowledge. Applied phytogeographical analysis shows that conservation strategies should be habitat-aware and community-led, combining in situ protection with cultivation and value-chain development for high-priority species. Documenting and preserving ethnomedicinal knowledge — alongside scientific phytochemical study and sustainable harvesting protocols — will be essential to safeguard both biodiversity and local healthcare resilience.

1.11 Recommendations

1. Community-based conservation: Establish village conservation and medicinal plant stewardship groups in key tehsils (Sujangarh, Taranagar, Sardarshahar).

2. Sustainable harvesting protocols: For root/bark-harvested species, implement rotational harvest, minimum harvest diameters, and seasonal bans.

3. Cultivation trials: Promote cultivation of high-use taxa (Aloe vera, Prosopis cineraria, Capparis decidua) on marginal lands and homestead gardens to reduce wild pressure.

4. Value addition and market linkage: Support local pansari and self-help groups to prepare standardized products (dried herbs, Aloe gel), quality control, and access to district/regional markets.

5. Further research: Phytochemical profiling of priority taxa and controlled sustainability studies (regeneration rates, population dynamics) are recommended.

6. Policy integration: Encourage district biodiversity management committees to include medicinal flora conservation in land-use planning.

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