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# A Study on Ethnomedicinal Uses and Phenological Patterns of Plants in Sardarshahar Region, Churu District, Rajasthan

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**ABSTRACT:** The present study documents the ethnomedicinal uses and phenological patterns of plant species occurring in the Sardarshahar region of Churu District, Rajasthan, situated in the western semi-arid zone of India. Field surveys were conducted to record plant species used in traditional medicine along with information on their flowering, fruiting, and leafing periods. Ethnomedicinal data were collected through interactions with local inhabitants, traditional healers, and elderly community members who possess indigenous knowledge of plant-based healthcare practices. The study revealed that a wide range of native plant species are used to treat common ailments such as fever, gastrointestinal disorders, skin diseases, respiratory problems, and wounds.

**KEYWORDS:** Ethnomedicine, Phenology, Sardarshahar, Traditional, Healthcare.

## I. INTRODUCTION

The natural vegetation of Rajasthan, although restricted and dispersed, exemplifies the state's biological richness and resilience. Various forest types, influenced by temperature and topography, sustain biodiversity and are essential for the livelihoods of local communities (Verhelst et al. 2023). However, challenges such as declining forest productivity, fragmented distribution, and increasing anthropogenic pressures underscore the urgent need for effective conservation strategies and sustainable forest management practices. In this context, the conservation of natural vegetation gains added significance due to its close association with traditional knowledge systems, particularly the use of plants for indigenous healthcare. Traditional medicinal practices remain widely preferred in both rural and urban populations across countries such as China and India because of their accessibility, affordability, effectiveness, and perceived safety (Upadhyay and Kapoor, 2023). The World Health Organization (WHO) has recently recognized the importance of traditional medical systems globally, cataloging more than 4,000 plant species utilized in various herbal therapies (Cotton, 1996). Nonetheless, the precise identification of these crude drugs in botanical terminology has not been undertaken or remains disputed, as some studies assign varying plant sources to diverse crude pharmaceuticals (Sanghi and Kumar, 2000).

Furthermore, numerous complex problems related to vitality, diabetes, and cognitive decline may be effectively managed with herbal remedies, which are often unattainable by allopathic treatments. However, there is no systematic documentation of this information. Medicinal plants are present in several settings and locations. Previous studies demonstrated that a higher percentage of acknowledged medicinal plants are located in dry and wet deciduous ecosystems compared to evergreen or temperate environments (Jhakar et al., 2004). The WHO identified around 21,000 plant species utilized for diverse medicinal purposes worldwide. India is rich in several medicinal plants and is considered a reservoir of such flora. The dataset comprises 7,434 species of algae, 15,447 species of fungi, 2,786 species of bryophytes, 1,307 species of pteridophytes, 82 species of gymnosperms, and 18,800 species of angiosperms (Mao et al., 2020).

Rajasthan is a botanical region distinguished by a diverse array of plant species and is a habitat for numerous medicinal herbs. Local healers primarily employed flora from the Apiaceae and Fabaceae groups, as these families had a unique significance in traditional medicine. Numerous plants have been historically utilized to address various health issues and diseases, both in India and worldwide, presumably owing to the availability of strong phytochemicals. Healers

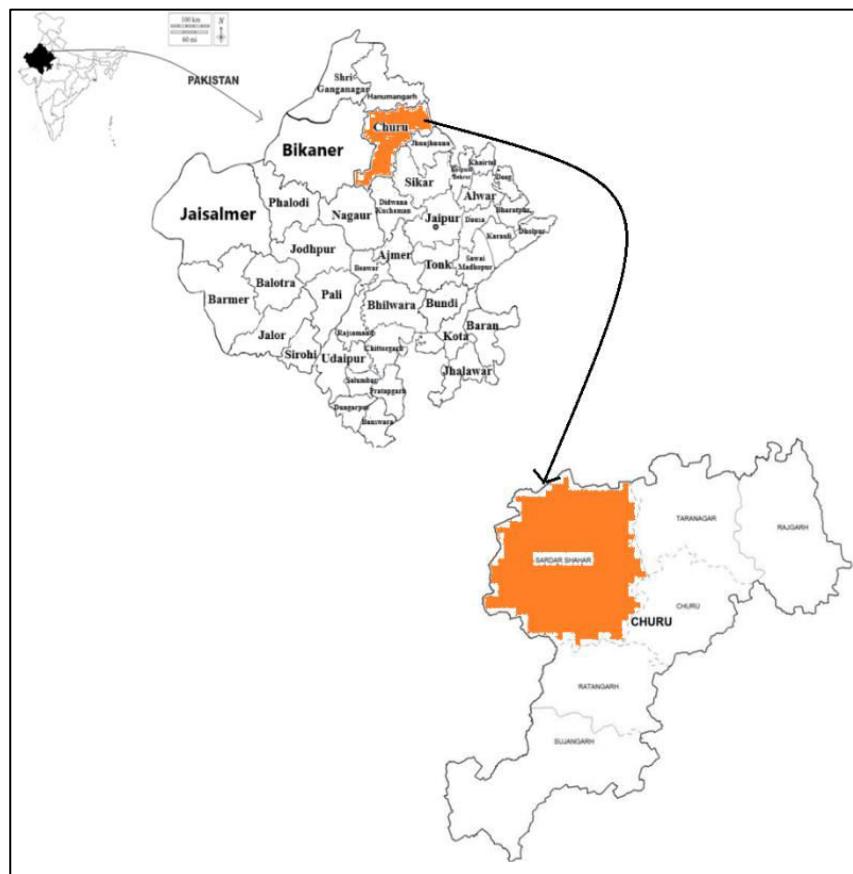
utilize Poaceae and Asclepiadaceae following Apiaceae and Fabaceae (Sharma and Khandelwal, 2010). Typically, either fresh plant material or, occasionally, dried powder is utilized for medicinal preparation.

Traditional healers utilize diverse plant components in remedy preparation, with leaves and seeds being the most frequently utilized. Different parts of a same plant can be amalgamated and utilized for a particular ailment. The likely explanation for this phenomenon is the increased concentration of soluble metabolites, such as alkaloids, glycosides, phenolics, terpenoids, and flavonoids (Sharma, 2002). Hence, a detailed survey of plant species with particular focus on their ethnobotanical uses is necessary in Churu district, especially in Sardarshahar tehsil, which forms the main objective of this study. The region was selected due to its rich traditional knowledge of plant use and the limited research attention it has received, making it an important yet underexplored area for vegetation and ethnobotanical documentation.

## II. METHODS

**Study Area:** The present study focuses on Sardarshahar tehsil, situated in Churu district of Rajasthan, India, which lies in the northeastern part of the Indian Thar Desert. The district extends over an area of approximately 13,835 square kilometers.

**Fig 1: Map of Study Area**



**Ethnomedicinal Uses of Plant Species:** Information regarding ethnomedicinal applications of recorded plant species was obtained through a participatory and community-based documentation approach. The survey focused on traditional knowledge holders such as village elders, local healers, shepherds, and women familiar with household remedies. Prior informed consent was obtained before conducting interviews, ensuring respect for cultural knowledge and ethical research practices as per the International Society of Ethnobiology (ISE) Code of Ethics. Semi-structured interviews

and focus group discussions were organized in local dialects to encourage detailed narration of plant uses and to avoid linguistic barriers.

For each species, data were systematically documented on the local name and ailments treated. The reliability of reported uses was verified through cross-checking among multiple informants and triangulation with published ethnobotanical literature. Photographs and field notes were maintained to support the recorded information. Special attention was given to plants used in treating common ailments such as fever, cough, wounds, digestive disorders, and skin infections. The compiled ethnomedicinal data were subsequently correlated with botanical diversity observations to assess how ecological distribution influences traditional plant use patterns across different habitats in the study area.

### III. RESULTS

The phenological assessment of the 81 recorded plant species reveals a well-defined seasonal rhythm that corresponds closely with the climatic characteristics of the arid and semi-arid zones of the study area. Overall, the data indicate that most species exhibit strong synchrony with temperature fluctuations, the onset of summer, and the limited monsoonal rainfall, with several xeric species adopting strategies that enable survival and reproduction under moisture-stress conditions. A prominent observation of the study is the concentration of leaf fall during the winter and early summer months, particularly between December and April, as seen in species such as *Aegle marmelos*, *Cordia myxa*, *Ficus benghalensis*, *Ficus religiosa*, *Dalbergia sissoo*, and *Emblica officinalis*. This pattern reflects a drought-avoidance strategy where species shed leaves before the onset of high temperatures to minimize water loss. Similarly, many desert shrubs including *Capparis decidua*, *Balanites aegyptiaca*, and *Ziziphus mauritiana* also shed leaves during late winter or early summer, aligning with the physiological need to conserve moisture in the root zone.

In contrast, several herbaceous and succulent species such as *Achyranthes aspera*, *Bryophyllum pinnatum*, *Calotropis procera*, *Euphorbia hirta*, *Cestrum nocturnum*, and *Catharanthus roseus* maintain year-round foliage, indicating their adaptive mechanisms such as high water-use efficiency, deep or fibrous root systems, or succulence. The presence of year-round greenness in species like *Aloe barbadensis*, *Ocimum sanctum*, and *Tinospora cordifolia* further highlights the role of morphological and physiological adaptations in supporting perennial activity even under water-limited conditions.

Flushing (new leaf emergence) shows a clear dominance of activity during the pre-monsoon and early monsoon period, with most species producing new foliage between February and June. Species such as *Albizia lebbeck*, *Cassia fistula*, *Pongamia pinnata*, *Leucaena leucocephala*, and *Hardwickia binata* demonstrate flushing during the warm season, which coincides with increasing day length and temperature. The widespread flushing during this period indicates that rising temperature is a more decisive trigger than rainfall. Notably, several xeric shrubs such as *Leptadenia pyrotechnica* and *Senna alexandrina* begin flushing immediately after leaf fall, demonstrating a rapid turnover strategy that ensures maximum photosynthetic gain when moisture becomes available.

The flowering behaviour of plants in the study area also exhibits pronounced seasonality, with peak flowering occurring between February and June. This pattern is particularly evident in tree species such as *Azadirachta indica*, *Cassia fistula*, *Ficus religiosa*, *Ficus benghalensis*, *Acacia nilotica*, and *Acacia senegal*, which begin flowering in early summer when pollinator activity is generally high. Many annual and herbaceous species including *Calotropis procera*, *Artemisia scoparia*, *Chenopodium album*, *Cleome gynandra*, and *Momordica balsamina* bloom around the onset of summer or early monsoon, aligning their reproductive cycle with the availability of moisture and the increased presence of insects. A few species such as *Datura stramonium*, *Cestrum nocturnum*, and *Evolvulus alsinoides* exhibit extended or year-round flowering, highlighting their opportunistic growth and reproductive strategies that take advantage of favourable microclimatic conditions.

Fruiting patterns closely follow the flowering phase and generally fall within the period of March to September, with species such as *Carissa congesta*, *Cucumis melo*, and *Cordia myxa* showing fruit maturation during early monsoon, an ecologically favourable time for seed dispersal and germination. Major fruit-bearing trees like *Ziziphus mauritiana*, *Syzygium cumini*, *Psidium guajava*, *Punica granatum*, and *Phoenix dactylifera* also follow this pattern, producing fruits during the warm and humid months that are conducive for seed establishment. Meanwhile, species with extended fruiting—such as *Asparagus racemosus*, *Tinospora cordifolia*, and *Evolvulus alsinoides*—reflect

perennial growth habits and resilience under fluctuating environmental conditions.

Another significant finding of the study is the year-round phenological activity displayed by species like *Achyranthes aspera*, *Carica papaya*, *Euphorbia hirta*, *Hibiscus rosa-sinensis*, and *Cynodon dactylon*. Their continuous leafing, flowering, and fruiting cycles indicate a high degree of ecological plasticity and opportunistic resource utilization, enabling them to survive under both favourable and harsh climatic conditions. These species typically occupy disturbed habitats or open areas where moisture availability is intermittent but adequate for short periods. Overall, the phenological data suggest that the vegetation of the study area exhibits a coherent ecological strategy shaped by seasonality, water scarcity, high temperatures, and erratic rainfall typical of the region. Trees and shrubs generally synchronize their growth and reproductive phases with the pre-monsoon and monsoon seasons, while herbs and drought-resistant species maintain more flexible or extended cycles. The observed patterns not only reflect the adaptive traits of individual species but also highlight the broader ecological functioning of the arid landscape, where phenology plays a crucial role in survival, reproduction, and ecosystem stability.

**Table 1: Phenology of observed plant species of study area**

S. No.	Botanical Name	Leaf Fall	Flushing	Flowering	Fruiting
1	<i>Acacia nilotica</i> (L.) Delile	March–May	January–December	August–November	September–November
2	<i>Acacia senegal</i> (L.) Willd.	April–June	January–December	August–November	September–November
3	<i>Achyranthes aspera</i> L.	Year-round	Year-round	Year-round	Year-round
4	<i>Aegle marmelos</i> (L.) Correa	December–January	December–January	March–May	May–June
5	<i>Ailanthus excelsa</i> Roxb.	June–July	July–August	August–September	September–October
6	<i>Albizia lebbeck</i> (L.) Benth.	February–April	April–May	May–June	June–August
7	<i>Aloe barbadensis</i> Mill.	December–January	January–February	February–March	March–April
8	<i>Argemone mexicana</i> L.	November–December	December–January	January–February	February–March
9	<i>Aristolochia bracteolata</i> Lam.	Year-round	Year-round	August–November	September–December
10	<i>Artemisia scoparia</i> Waldst. & Kit.	December–January	January–February	February–April	March–May
11	<i>Asparagus racemosus</i> Willd.	June–August	June–October	October–November	September–January
12	<i>Azadirachta indica</i> A. Juss.	Year-round	Year-round	March–May	March–May
13	<i>Balanites aegyptiaca</i> (L.) Delile	January–March	March–April	April–June	July–September
14	<i>Barleria prionitis</i> L.	November–December	December–January	September–December	October–January
15	<i>Bauhinia variegata</i> L.	November–January	January–February	February–April	April–June
16	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Year-round	Year-round	September–December	October–January
17	<i>Calotropis procera</i> (Aiton) W.T. Aiton	November–December	January–February	February–May	May–August
18	<i>Capparis decidua</i> (Forssk.) Edgew.	January–March	March–August	March–April	April–July
19	<i>Carica papaya</i> L.	Year-round	Year-round	Year-round	Year-round

20	<i>Carissa congesta</i> Wight	January–March	March–May	February–May	March–June
21	<i>Cassia fistula</i> L.	October–November	November–December	January–March	February–May
22	<i>Catharanthus roseus</i> (L.) G. Don	Year-round	Year-round	Year-round	Year-round
23	<i>Cestrum nocturnum</i> L.	Year-round	Year-round	March–October	April–November
24	<i>Chenopodium album</i> L.	December–January	January–February	February–March	March–April
25	<i>Citrullus colocynthis</i> (L.) Schrad.	April–May	May–June	July–August	August–September
26	<i>Citrus limon</i> (L.) Osbeck	February–March	March–April	April–June	June–August
27	<i>Cleome gynandra</i> L.	April–June	June–July	July–September	August–October
28	<i>Cordia myxa</i> L.	January–February	March–April	April–June	June–August
29	<i>Crinum latifolium</i> L.	February–March	March–April	April–June	June–August
30	<i>Cucumis melo</i> L.	March–April	April–May	May–June	June–July
31	<i>Cynodon dactylon</i> (L.) Pers.	May–July	June–September	Year-round	Year-round
32	<i>Cyperus triceps</i> Rottb.	August–September	September–October	October–December	November–January
33	<i>Dalbergia sissoo</i> Roxb.	January–February	January–February	February–May	February–May
34	<i>Datura stramonium</i> L.	May–July	June–September	Year-round	Year-round
35	<i>Delonix regia</i> (Bojer) Raf.	September–October	November–December	January–February	March–April
36	<i>Emblica officinalis</i> Gaertn.	December–January	February–March	March–April	October–February
37	<i>Enicostemma hyssopifolium</i> (Willd.)	April–May	May–June	June–September	July–October
38	<i>Eucalyptus obliqua</i> L'Her.	Year-round	Year-round	December–February	January–March
39	<i>Euphorbia hirta</i> L.	Year-round	Year-round	Year-round	Year-round
40	<i>Evolvulus alsinoides</i> (L.) L.	Year-round	June–September	Year-round (peak Oct–May)	November–July
41	<i>Ficus benghalensis</i> L.	January–March	March–April	April–May	May–July
42	<i>Ficus religiosa</i> L.	January–March	March–April	April–May	May–July
43	<i>Hardwickia binata</i> Roxb.	February–March	March–April	April–May	August–October
44	<i>Hibiscus rosa-sinensis</i> L.	Year-round	Year-round	Year-round	Year-round
45	<i>Jatropha pandurifolia</i> Andr.	November–December	December–January	January–March	February–April
46	<i>Lagenaria siceraria</i> (Molina) Standl.	August–September	September–October	October–November	November–December
47	<i>Lawsonia inermis</i> L.	November–December	December–January	January–February	February–March
48	<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	October–November	November–December	December–January	January–February
49	<i>Leucaena leucocephala</i> (Lam.) de Wit	March–April	April–May	May–July	July–September
50	<i>Momordica balsamina</i> L.	May–June	June–July	July–September	August–October

51	<i>Moringa oleifera</i> Lam.	December–February	February–March	March–April	April–June
52	<i>Morus alba</i> L.	November–December	January–February	February–March	March–June
53	<i>Murraya koenigii</i> (L.) Spreng.	March–April	April–May	May–July	July–September
54	<i>Nerium indicum</i> Mill.	January–February	February–March	March–April	April–May
55	<i>Ocimum sanctum</i> L.	July–September	August–November	February–March	March–April
56	<i>Parkinsonia aculeata</i> L.	April–June	June–July	July–September	August–October
57	<i>Phoenix dactylifera</i> L.	December–January	January–February	February–April	June–August
58	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	January–March	March–May	April–June	June–August
59	<i>Pongamia pinnata</i> (L.) Pierre	February–April	April–May	May–June	June–August
60	<i>Prosopis cineraria</i> (L.) Druce	January–February	February–March	December–April	March–June
61	<i>Prosopis juliflora</i> (Sw.) DC.	January–February	February–March	December–April	March–June
62	<i>Psidium guajava</i> L.	February–March	March–April	April–June	July–September
63	<i>Punica granatum</i> L.	January–February	February–March	March–May	June–September
64	<i>Quisqualis indica</i> L.	March–April	April–May	May–August	June–October
65	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	January–February	February–March	March–June	June–August
66	<i>Ricinus communis</i> L.	June–August	October–December	January–February	March–April
67	<i>Saccharum munja</i> Roxb.	December–January	February–March	March–April	April–June
68	<i>Salvadora persica</i> L.	November–December	December–January	January–February	February–March
69	<i>Sansevieria cylindrica</i> Bojer ex Hook.	Year-round	Year-round	July–September	August–October
70	<i>Senna alexandrina</i> Mill.	September–October	October–November	November–February	January–March
71	<i>Syzygium cumini</i> (L.) Skeels	March–April	April–May	June–July	July–August
72	<i>Tabernaemontana divaricata</i> (L.) R.Br. ex Roem. & Schult.	Year-round	Year-round	April–October	May–November
73	<i>Tamarindus indica</i> L.	February–March	March–April	April–June	October–December
74	<i>Tamarix aphylla</i> (L.) Karst.	January–March	March–April	April–June	June–August
75	<i>Tecoma stans</i> (L.) Juss. ex Kunth	February–March	March–April	April–September	May–October
76	<i>Tecomella undulata</i> (Sm.) Seem.	June–July	July–August	August–September	September–October
77	<i>Tinospora cordifolia</i> (Willd.) Miers	July–September	August–November	January–February	March–April
78	<i>Tribulus terrestris</i> L.	August–November	July–September	January–February	March–May

79	<i>Tylophora indica</i> (Burm.f.) Merr.	December–January	January–February	February–April	April–June
80	<i>Withania somnifera</i> (L.) Dunal	July–August	August–September	January–February	March–April
81	<i>Ziziphus mauritiana</i> Lam.	July–September	August–November	February–March	April–May

The ethnobotanical observation of the present study reveals that a total of 81 plant species belonging to different families were recorded for their traditional medicinal, nutritional, and utilitarian uses. These species are integral to local healthcare practices, domestic needs, and ecological sustainability. The observations emphasize that the flora of the study area possesses diverse ethnomedicinal importance, ranging from treatment of common ailments such as cough and fever to chronic diseases like diabetes, hypertension, and cancer. A major observation from the table is that the majority of recorded plants are used in traditional medicine. Several species exhibit multi-purpose therapeutic properties, being used to treat more than one ailment. For instance, *Achyranthes aspera* is utilized for cough, asthma, piles, kidney stones, and snake bite, while *Azadirachta indica* serves as a multipurpose medicinal plant with antibacterial, antifungal, antiviral, and antiparasitic properties. Similarly, *Catharanthus roseus* provides valuable alkaloids—vincristine and vinblastine—used in cancer treatment, highlighting the pharmacological significance of the local flora. A large group of plants shows medicinal use in metabolic and infectious diseases. Species like *Cassia fistula*, *Citrullus colocynthis*, *Momordica balsamina*, *Senna alexandrina*, and *Aegle marmelos* are used for digestive and hepatic disorders, while *Tinospora cordifolia*, *Ocimum sanctum*, *Withania somnifera*, and *Emblica officinalis* are recognized for their immunity-boosting and adaptogenic properties. These plants are rich in bioactive compounds, antioxidants, and vitamins, reflecting their relevance in maintaining health and preventing diseases.

Plants such as *Calotropis procera*, *Rauvolfia serpentina*, *Prosopis cineraria*, and *Tecomella undulata* are traditionally used for skin, liver, and respiratory ailments, indicating their wide therapeutic application in traditional systems like Ayurveda and folk medicine. *Rauvolfia serpentina* is particularly notable as the natural source of the alkaloid reserpine, used in managing hypertension and mental disorders. Similarly, *Calotropis procera* and *Tecomella undulata* are used for inflammatory and hepatic conditions, respectively, demonstrating the presence of bioactive phytochemicals with medicinal potential.

Many species are valued for nutritional and dietary benefits. Edible fruit-bearing plants like *Phoenix dactylifera*, *Ziziphus mauritiana*, *Punica granatum*, *Carica papaya*, *Cucumis melo*, and *Moringa oleifera* are rich in vitamins, minerals, and antioxidants, supporting the dual role of plants as both food and medicine. These species contribute to local nutrition security, particularly in semi-arid environments where resources are limited. A number of aromatic and tonic plants are documented for improving general health and vitality. For example, *Asparagus racemosus* is a well-known female reproductive tonic and galactagogue, while *Tribulus terrestris* acts as a rejuvenator and aphrodisiac. *Withania somnifera* (Ashwagandha) is used as an adaptogen and stress reliever, showing its importance in promoting physical and mental wellness. Plants like *Leucaena leucocephala* and *Saccharum munja* have agro-industrial and ecological uses—the former as a green manure and fodder crop, and the latter for soil erosion control and handicraft material. *Prosopis juliflora* and *Balanites aegyptiaca* are similarly utilized for fuelwood, erosion control, and local utility items, signifying their importance in rural livelihood and environmental sustainability.

Several species serve important cultural, religious, and ornamental roles in the community. *Ocimum sanctum* (Tulsi), *Ficus religiosa* (Peepal), and *Prosopis cineraria* (Khejri) hold sacred value in Hindu tradition and are often associated with temples and rituals, reflecting the spiritual connection between people and plants. Ornamental species such as *Polyalthia longifolia*, *Delonix regia*, *Tecoma stans*, *Cestrum nocturnum*, and *Hibiscus rosa-sinensis* enhance the aesthetic and environmental quality of the region through urban and rural plantation. Additionally, certain plants like *Eucalyptus obliqua* and *Ricinus communis* are industrially valuable, used in soap making, biofuel production, and pharmaceutical applications. *Ricinus communis* provides castor oil, a widely used medicinal and cosmetic product, while *Pongamia pinnata* is a source of biofuel and antiseptic oil. These examples illustrate how traditional plant knowledge extends beyond medicine to include economic and environmental applications.

The study also records several toxic or potent species such as *Datura stramonium*, *Argemone mexicana*, and *Nerium indicum*, which are therapeutically valuable in small doses but poisonous if misused. Their inclusion in traditional

medicine demonstrates a deep understanding of dosage and preparation methods among local practitioners. Overall, the ethnobotanical data show that the vegetation of the study area supports a multifunctional plant resource system encompassing medicinal, nutritional, cultural, and ecological values. The dominant uses revolve around the treatment of digestive, respiratory, dermatological, and metabolic disorders, as well as in personal care, ritual purification, and rural livelihood. The observations highlight that indigenous people possess a rich traditional knowledge of plant utility, reflecting a long-standing interaction between humans and their natural environment. Furthermore, the ethnobotanical observations reveal that the study area is not only floristically diverse but also ethnopharmacologically rich, containing a wide array of species with curative, preventive, and utilitarian significance that form an essential part of local health traditions and sustainable resource use.

**Table 2: Ethnobotanical uses of observed plant species in study area**

S. No.	Botanical Name	Ethnobotanical Uses
1	<i>Barleria prionitis</i> L.	Used in toothache, cough, and skin disorders; exhibits antimicrobial properties.
2	<i>Achyranthes aspera</i> L.	Used for cough, asthma, piles, kidney stones, and snake bite; acts as diuretic and expectorant.
3	<i>Chenopodium album</i> L.	Rich in calcium, iron, and protein; used for stomach ailments and immunity.
4	<i>Crinum latifolium</i> L.	Used in inflammation, prostate ailments, and pain relief.
5	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	Ornamental; used in fever, skin diseases, and as shade tree.
6	<i>Calotropis procera</i> (Aiton) W.T. Aiton	Used for bone fractures, leprosy, skin ailments, and arthritis; contains anticancer cardenolides.
7	<i>Carissa congesta</i> Wight	Used for anaemia, skin infections, and as a digestive tonic; fruit rich in iron and vitamin C.
8	<i>Catharanthus roseus</i> (L.) G. Don	Source of vincristine and vinblastine; used in diabetes and cancer treatment.
9	<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	Valuable forage for camels and goats; decoction used for cough, asthma, and digestive issues.
10	<i>Nerium indicum</i> Mill.	Used in epilepsy, asthma, and skin ailments; ornamental; toxic in excess.
11	<i>Rauvolfia serpentina</i>	Used in hypertension, insomnia, and snakebite; source of reserpine alkaloid.
12	<i>Tabernaemontana divaricata</i>	Used in fever, eye diseases, and skin disorders; ornamental shrub.
13	<i>Tylophora indica</i> (Burm.f.) Merr.	Used in asthma, bronchitis, and allergic disorders.

14	<i>Phoenix dactylifera</i> L.	Edible fruits rich in iron; restorative tonic and energy food.
15	<i>Aristolochia bracteolata</i> Lam.	Treats intestinal worms, skin irritation, and insect bites; used externally for ulcers and wounds.
16	<i>Asparagus racemosus</i> Willd.	Used as a female reproductive tonic, galactagogue, and adaptogen; strengthens immunity.
17	<i>Sansevieria cylindrica</i> Bojer ex Hook.	Ornamental; used for indoor air purification.
18	<i>Aloe barbadensis</i> Mill.	Used for burns, skin rejuvenation, digestion, and as a laxative; possesses anti-inflammatory and wound-healing properties.
19	<i>Artemisia scoparia</i> Waldst. & Kit.	Used to treat jaundice, fever, gallbladder problems; essential oils possess antibacterial, vasodilator, and anticancer potential.
20	<i>Tecoma stans</i> (L.) Juss. ex Kunth	Used for diabetes and inflammation; ornamental plant.
21	<i>Tecomella undulata</i> (Sm.) Seem.	Used as blood purifier, for hepatitis, and liver ailments; national tree of Rajasthan deserts.
22	<i>Cordia myxa</i> L.	Used for cough, sore throat, and urinary infections.
23	<i>Capparis decidua</i> (Forssk.) Edgew.	Edible; used for digestive ailments; leaves rich in proteins; feeds birds and cattle.
24	<i>Carica papaya</i> L.	Used as digestive aid, for liver disorders and wound healing; fruit rich in vitamin A and enzymes.
25	<i>Cleome gynandra</i> L.	Used in Ayurveda for ear and skin problems; rich in proteins and amino acids.
26	<i>Quisqualis indica</i> L.	Used for intestinal worms and digestive disorders; ornamental climber.
27	<i>Evolvulus alsinoides</i> (L.) L.	Used for mental disorders, asthma, bronchitis, and reproductive health; improves memory and nerve function.
28	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Used for kidney stones, wounds, and ulcers; acts as diuretic and wound healer.
29	<i>Citrullus colocynthis</i> (L.) Schrad.	Used for diabetes, constipation, and skin infections; strong purgative.
30	<i>Cucumis melo</i> L.	Used as food flavor enhancer; helps in digestion.
31	<i>Lagenaria siceraria</i> (Molina) Standl.	Low-calorie food; used for weight loss, urinary and digestive disorders; shell used for utensils and musical instruments.
32	<i>Momordica balsamina</i> L.	Used for diabetes, stomach disorders, and skin diseases; possesses antioxidant and antibacterial properties.

33	<i>Cyperus triceps</i> Rottb.	Cooling, astringent, and antidiarrheal; used for stomach disorders.
34	<i>Euphorbia hirta</i> L.	Used for asthma, hypertension, and skin disorders. Flowers mixed with sugar act as brain tonic.
35	<i>Jatropha pandurifolia</i> Andr.	Used as purgative and in skin diseases; latex applied to wounds. Ornamental.
36	<i>Ricinus communis</i> L.	Castor oil used as laxative and for hair; leaves applied on swellings.
37	<i>Acacia nilotica</i> (L.) Delile	Used for treating cough, diarrhoea, asthma, and skin diseases; antibacterial, antioxidant, antidiabetic, and anti-inflammatory properties.
38	<i>Acacia senegal</i> (L.) Willd.	Gum used for burns, wounds, cough, leprosy, gonorrhoea; soothing agent in sore throat and urinary infections.
39	<i>Albizia lebbeck</i> (L.) Benth.	Used in asthma, eczema, skin allergy, eye infections; acts as anti-inflammatory and anti-allergic.
40	<i>Bauhinia variegata</i> L.	Used in ulcers, piles, and diarrhoea; flower buds are edible.
41	<i>Cassia fistula</i> L.	Used in jaundice, gout, and bronchitis; laxative and antimicrobial properties.
42	<i>Dalbergia sissoo</i> Roxb.	Used in leprosy, sore throat, and syphilis; durable timber.
43	<i>Delonix regia</i> (Bojer) Raf.	Ornamental; bark and leaves have anti-inflammatory properties.
44	<i>Hardwickia binata</i> Roxb.	Bark used for skin diseases and wound healing; wood valued for timber and agricultural implements.
45	<i>Leucaena leucocephala</i> (Lam.) de Wit	Used as green manure, fodder, and soil enricher; seeds contain protein but toxic in excess.
46	<i>Parkinsonia aculeata</i> L.	Used as fodder and for wound healing; ornamental thorny tree.
47	<i>Prosopis cineraria</i> (L.) Druce	Treats asthma, leprosy, and dysentery; pods edible; considered sacred in Rajasthan.
48	<i>Prosopis juliflora</i> (Sw.) DC.	Used for fuelwood and erosion control; bark used in ulcers and skin diseases.
49	<i>Pongamia pinnata</i> (L.) Pierre	Oil used as biofuel and antiseptic; used in skin diseases and rheumatism.
50	<i>Senna alexandrina</i> Mill.	Used as laxative and in constipation; purgative properties.

51	<i>Tamarindus indica</i> L.	Used in digestion, fever, and wound healing; fruit rich in vitamin C.
52	<i>Enicostemma hyssopifolium</i>	Used in malaria, leprosy, skin diseases, and diabetes. Exhibits hypoglycemic, antioxidant, and hepatoprotective effects.
53	<i>Ocimum sanctum</i> L.	Sacred medicinal herb; used for cough, cold, fever, and stress; antioxidant and antimicrobial.
54	<i>Lawsonia inermis</i> L.	Used as natural dye and coolant; treats burns, wounds, and fungal infections.
55	<i>Punica granatum</i> L.	Used for anaemia, diarrhoea, and heart health; antioxidant-rich.
56	<i>Hibiscus rosa-sinensis</i> L.	Used for hair growth, menstrual regulation, and blood pressure; ornamental plant.
57	<i>Azadirachta indica</i> A. Juss.	Antibacterial, antifungal, antiviral, and antiparasitic; used for skin, dental, and blood purification; key in pest management.
58	<i>Tinospora cordifolia</i> (Willd.) Miers	Used for fever, diabetes, and immunity; AYUSH-recommended herb during COVID-19.
59	<i>Ficus benghalensis</i> L.	Used for diarrhoea, diabetes, ulcers, and wound healing. Exhibits antioxidant and antimicrobial properties.
60	<i>Ficus religiosa</i> L.	Used in asthma, ulcers, diabetes, and infertility. Antidiabetic and antioxidant; sacred tree in Hinduism.
61	<i>Morus alba</i> L.	Used for diabetes, anaemia, and sore throat; leaves fed to silkworms.
62	<i>Moringa oleifera</i> Lam.	Rich in vitamins and antioxidants; leaves used as tonic and antidiabetic; bark used in rheumatism.
63	<i>Eucalyptus obliqua</i> L'Her.	Antiseptic, antimicrobial, and insecticidal; used in respiratory ailments, wound healing, and soap making.
64	<i>Psidium guajava</i> L.	Used for diarrhoea, wounds, and oral health; fruits rich in vitamin C.
65	<i>Syzygium cumini</i> (L.) Skeels	Used in diabetes, diarrhoea, and ulcers; antioxidant and astringent.
66	<i>Argemone mexicana</i> L.	Used in skin diseases, eczema, and wounds; latex used in traditional eye ailments. Poisonous in high doses.
67	<i>Emblica officinalis</i> Gaertn.	Rich in vitamin C and antioxidants; used for immunity and digestion.
68	<i>Cynodon dactylon</i> (L.) Pers.	Used in epilepsy, asthma, cough, and bleeding disorders; purifying agent in rituals.
69	<i>Saccharum munja</i> Roxb.	Used for making mats, ropes, and baskets; controls soil erosion.
70	<i>Ziziphus mauritiana</i> Lam.	Sweet edible fruit; used for indigestion, fever, and wounds; rich in vitamins and carbohydrates.

71	<i>Aegle marmelos</i> (L.) Correa	Used for diarrhoea, constipation, and diabetes; fruit acts as a digestive and cooling tonic.
72	<i>Citrus limon</i> (L.) Osbeck	Used in digestion, vitamin C source, and as an antiseptic and preservative.
73	<i>Murraya koenigii</i> (L.) Spreng.	Used for indigestion, diabetes, and hair health; antioxidant and antimicrobial.
74	<i>Salvadora persica</i> L.	Used as natural toothbrush; treats gum disease, gonorrhoea, and digestive disorders.
75	<i>Ailanthus excelsa</i> Roxb.	Used for bronchitis, dysentery, piles, and fever; acts as antimicrobial and anti-leukemic.
76	<i>Cestrum nocturnum</i> L.	Ornamental; aromatic; sometimes used for asthma and cough.
77	<i>Datura stramonium</i> L.	Used in asthma and cough; narcotic and analgesic; toxic in high doses.
78	<i>Withania somnifera</i> (L.) Dunal	Used as adaptogen, tonic, anti-stress, and rejuvenator; prevents oxidative stress and fatigue.
79	<i>Tamarix aphylla</i> (L.) Karst.	Used in skin diseases, syphilis, leprosy, and hepatitis; leaves used for fever.
80	<i>Balanites aegyptiaca</i> (L.) Delile	Used for jaundice, malaria, wounds, and constipation; antimicrobial and anti-inflammatory.
81	<i>Tribulus terrestris</i> L.	Used as aphrodisiac, diuretic, and cardiotonic; ingredient in Ayurvedic "Dashmool" drugs.

#### IV. DISCUSSION

Ethnobotanical analysis revealed that all 81 plant species possess medicinal, nutritional, or utilitarian value, underscoring the deep-rooted traditional knowledge of local communities. These plants are widely used in indigenous healthcare systems, cultural practices, and household applications. Several plants serve medicinal purposes, treating ailments like fever, cough, asthma, diabetes, and skin disorders. *Catharanthus roseus* provides anticancer alkaloids (vincristine and vinblastine), *Rauvolfia serpentina* yields reserpine for hypertension, and *Azadirachta indica* is known for its antibacterial and antifungal activity. Edible plants such as *Phoenix dactylifera*, *Punica granatum*, *Carica papaya*, and *Moringa oleifera* are rich in vitamins and antioxidants, contributing to both nutrition and traditional medicine. Plants like *A. racemosus*, *T. terrestris*, and *W. somnifera* are used as tonics and adaptogens, while culturally sacred species such as *Ocimum sanctum*, *Ficus religiosa*, and *Prosopis cineraria* symbolize the spiritual relationship between humans and nature. Ornamental species like *Polyalthia longifolia*, *Delonix regia*, and *Hibiscus rosa-sinensis* enhance the aesthetic and ecological value of the environment. Economically important plants such as *Ricinus communis*, *Eucalyptus obliqua*, and *Pongamia pinnata* are used for biofuel, soap making, and traditional medicine, while *Saccharum munja* supports handicrafts and soil conservation. Some species like *Datura stramonium* and *Argemone mexicana* are medicinally valuable but toxic in high doses, reflecting the community's precise traditional understanding of dosage and preparation. Overall, the ethnobotanical findings highlight that the flora of the study area serves multiple functions — medicinal, nutritional, cultural, and ecological — establishing a sustainable link between biodiversity and human livelihood.

Kumar (2024) also reported high plant diversity and ethnobotanical significance in Churu district, highlighting 56 endemic medicinal plants thriving under extreme temperature conditions. His findings emphasized the same key species such as *Ficus religiosa*, *Azadirachta indica*, *Ricinus communis*, and *Jatropha curcas*, which are also

documented in the present study. Similar to Kumar's work, the current findings affirm the importance of native flora in traditional medicine and local livelihoods, while also expanding the documented diversity to 81 species, suggesting greater floristic richness and wider ecological coverage.

Tripathi et al. (2023) emphasized the use of plants for medicinal purposes such as asthma, rheumatism, and skin diseases, based on indigenous knowledge. The ethnomedicinal species recorded in their study—*Acacia senegal*, *Balanites aegyptiaca*, *Argemone mexicana*, *Calotropis procera*, *Citrullus colocynthis*, *Withania somnifera*, *Leptadenia pyrotechnica*, and *Tribulus terrestris*—are also included in the present findings. Both studies highlight the dominance of xerophytic and drought-tolerant medicinal plants, typical of arid and semi-arid regions. However, the present study reports a larger number of families and species, covering not only medicinal but also ornamental, nutritional, and ecological categories, thereby offering a more comprehensive view of the vegetation composition.

The results of the present study also correspond with Purohit et al. (2008), who documented 16 medicinally important species from Churu district, including *Cassia fistula*, *Withania somnifera*, *Asparagus racemosus*, *Ricinus communis*, *Dalbergia sissoo*, *Ocimum sanctum*, and *Phyllanthus emblica*. These species are common in both studies, reaffirming their therapeutic relevance and ecological adaptability. However, the present study extends beyond Purohit's limited list by recording a broader range of plant families and morphological types, including herbs, climbers, shrubs, and grasses, thereby presenting a more diverse and representative floristic profile of the region.

In the study by Pareek et al. (2024), 20 medicinal tree species were documented from the Sardarshahar tehsil of Churu, highlighting the use of bark, leaves, roots, and seeds for medicinal purposes. The present research supports these observations, particularly regarding tree species such as *Azadirachta indica*, *Cassia fistula*, *Prosopis cineraria*, and *Tamarindus indica*, which were also found to have multiple ethnomedicinal applications. Both studies emphasize the importance of tree species in local healthcare practices and their role in maintaining ecological balance and livelihood support in arid landscapes.

The ethnobotanical observations in the present work are in agreement with Parveen (2007), who reported 68 commonly used medicinal plants in Churu district. Both studies highlight that leaves are the most frequently used plant part, followed by roots, bark, and fruits. The current findings reinforce Parveen's conclusion that traditional plant knowledge is concentrated among elderly community members, and such knowledge is at risk of erosion unless systematically documented and preserved.

Similarly, Solanki et al. (2021) studied medicinal Asteraceae species in Taranagar and documented plants like *Artemisia scoparia* and *Eclipta alba*, which are also recorded in the present research. Their study highlighted the tribal use of these plants for respiratory, skin, and liver ailments, which aligns with the ethnomedicinal applications reported here. However, while Solanki's study was family-specific, focusing only on Asteraceae, the present study provides a broader perspective covering 39 families, reflecting a more diverse and inclusive ethnobotanical inventory.

The findings also show similarities with Jeph (2017), who investigated the ethno-medicinal flora of Sujangarh Tehsil in Churu and reported species like *Aegle marmelos*, *Albizia lebbeck*, *Aloe barbadensis*, *Achyranthes aspera*, and *Azadirachta indica*. The overlap of these species between both studies confirms their consistent ethnobotanical importance across different regions of Churu district. Jeph's emphasis on the economic potential and pharmaceutical applications of medicinal plants is also reflected in the present results, which document numerous species used in biofuel production, cosmetics, and herbal formulations. In conclusion, the findings of the present study are broadly consistent with previous ethnobotanical and ecological studies conducted in Churu district and surrounding areas.

**Conclusion:** The present study highlights the rich ethnomedicinal knowledge and distinct phenological patterns of plant species in the Sardarshahar region of Churu District, Rajasthan. Despite the harsh semi-arid climatic conditions, the region supports a diverse range of medicinally important plants that play a vital role in the primary healthcare practices of local communities. The continued reliance on plant-based remedies reflects the deep-rooted traditional knowledge passed down through generations. Phenological observations reveal that flowering, fruiting, and leafing stages of plants are closely synchronized with seasonal variations, particularly rainfall and temperature, indicating well-developed adaptive strategies to semi-arid environments. These phenological patterns not only influence plant survival

and regeneration but also determine the availability and harvesting periods of medicinal plant resources. The study underscores the need for systematic documentation and conservation of ethnomedicinal plants and indigenous knowledge, both of which are increasingly threatened by environmental stress and changing socio-economic conditions.

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