



A survey in ethnomedicinal plants in Karauli District of Rajasthan

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Abstract

Ethnomedicinal knowledge is a valuable component of traditional health care systems and plays an important role in the discovery of novel therapeutic agents. The present study was carried out with an aim to document the medicinal plant diversity and associated indigenous knowledge in Karauli district of Rajasthan, India, where rural and tribal people still depend on herbal remedies for their primary healthcare. The authors have conducted extensive field surveys in different villages and ethnomedicinal information has been collected through semi-structured questionnaires by personal interviews and discussion with traditional healers, elderly villagers and knowledgeable local informants. The plant specimens were identified with the help of standard taxonomic literature and information on botanical name, family, ailments treated and methods of herbal preparation was recorded systematically. The survey recorded a total of 94 species of medicinal plants belonging to 43 families. Fabaceae was the dominant family followed by Malvaceae, Asteraceae, Lamiaceae, Poaceae, Moraceae, Euphorbiaceae and Amaranthaceae. The medicinal plants documented are used traditionally for the treatment of a wide range of ailments like skin diseases, wounds, gastrointestinal disorders, respiratory infections, diabetes, fever, rheumatism, arthritis, urinary disorders, liver diseases and inflammatory conditions. Preparation by decoction was the most frequently used method, followed by paste, powder, juice, oil, and smoke inhalation. Multiple therapeutic applications of several plant species like *Azadirachta indica*, *Ocimum sanctum*, *Tridax procumbens*, *Syzygium cumini*, *Calotropis procera* and *Holoptelea integrifolia* indicated their importance in indigenous healthcare system. The results indicate that Karauli district is a rich reservoir of ethnomedicinal plant diversity and possess rich traditional knowledge which is still used to fulfill the health care needs of local communities. The documented information provides an important baseline for future phytochemical, pharmacological and clinical investigations and emphasizes the dire need for conservation of medicinal plant resources and preservation of indigenous knowledge before it is lost irretrievably.

Keywords: Ethnomedicinal survey, traditional knowledge, ethnobotany, karauli district etc

Introduction

Medicinal plants have been one of the oldest and most reliable sources of health care for human societies since ancient times. The World Health Organization (WHO) states that around 80% of the world's population, particularly in developing countries, rely on traditional herbal medicine for primary healthcare due to its affordability, accessibility, and perceived safety (WHO, 2013). India is one of the twelve mega-biodiversity countries in the world with more than 17000 species of flowering plants, of which about 7500 species are reported to have medicinal value and are used in different traditional healthcare systems such as Ayurveda, Siddha, Unani and folk medicine (NMPB, 2020). India's ethnomedicinal resources are important repositories of the rich floristic diversity of the country and centuries old indigenous knowledge.

Ethnomedicine is an interdisciplinary field that documents the indigenous and local knowledge, beliefs and practices regarding the use of plants for the prevention and treatment of disease. This knowledge has been passed down from generation to generation by word of mouth and forms the basis of many modern pharmaceuticals. Approximately 25-30% of modern medicines are derived from natural products directly or indirectly, these facts highlight the significance of conducting ethnobotanical studies in the search of new therapeutic agents (Fabricant & Farnsworth, 2001). Documentation of indigenous medicinal knowledge is thus

important not only for the preservation of cultural heritage but also for identification of promising plant species for phytochemical and pharmacological research.

Rajasthan, India's largest state, contains a variety of ecological zones ranging from the arid Thar Desert to the semi-arid and forested Aravalli hills. Despite the severe climatic condition, the state possesses a remarkable diversity of medicinal plants which are widely used by tribal and rural communities for curing various ailments. Ethnobotanical studies carried out in different districts of Rajasthan have reported the use of medicinal plants for the management of skin disorders, respiratory infections, gastrointestinal diseases, diabetes, inflammatory conditions and reproductive disorders (Katewa *et al.*, 2004; Jain *et al.*, 2010). However, rapid loss of biodiversity, habitat degradation, urbanization and changing socio-economic conditions threaten the populations of medicinal plants as well as the traditional knowledge associated with them. This calls for urgent systematic documentation and conservation. Karauli district is situated in eastern Rajasthan and is marked by tropical dry deciduous forests, rocky terrain and rich flora. The district comprises a number of rural and indigenous communities that rely on locally available medicinal plants for primary healthcare. Although a number of ethnobotanical studies have been carried out in Rajasthan, the ethnomedicinal flora of Karauli district is not well documented. The traditional knowledge of local healers and

old villagers is disappearing due to modernization and lack of intergenerational transfer, so documenting it is becoming more important.

Therefore, the present study was carried out to document the medicinal plant diversity of Karauli district and to record their traditional therapeutic applications, to identify the plant families and methods of preparations most commonly used by local communities and to provide a scientific database that could help in future phytochemical, pharmacological and conservation studies. The results are expected to contribute to the conservation of indigenous

knowledge and to the promotion of sustainable utilization of medicinal plant resources in the region.

Materials and Methods

Frequent survey had conducted in various villages of Karauli district. Questionnaire method was adopted for survey. Total 89 people (56 females and 33 males) were interviewed. Those include herbal healers, farmers and old age people. The purpose of the survey was explained before interview. Name of plant, their uses and the methods of their use were noted down.

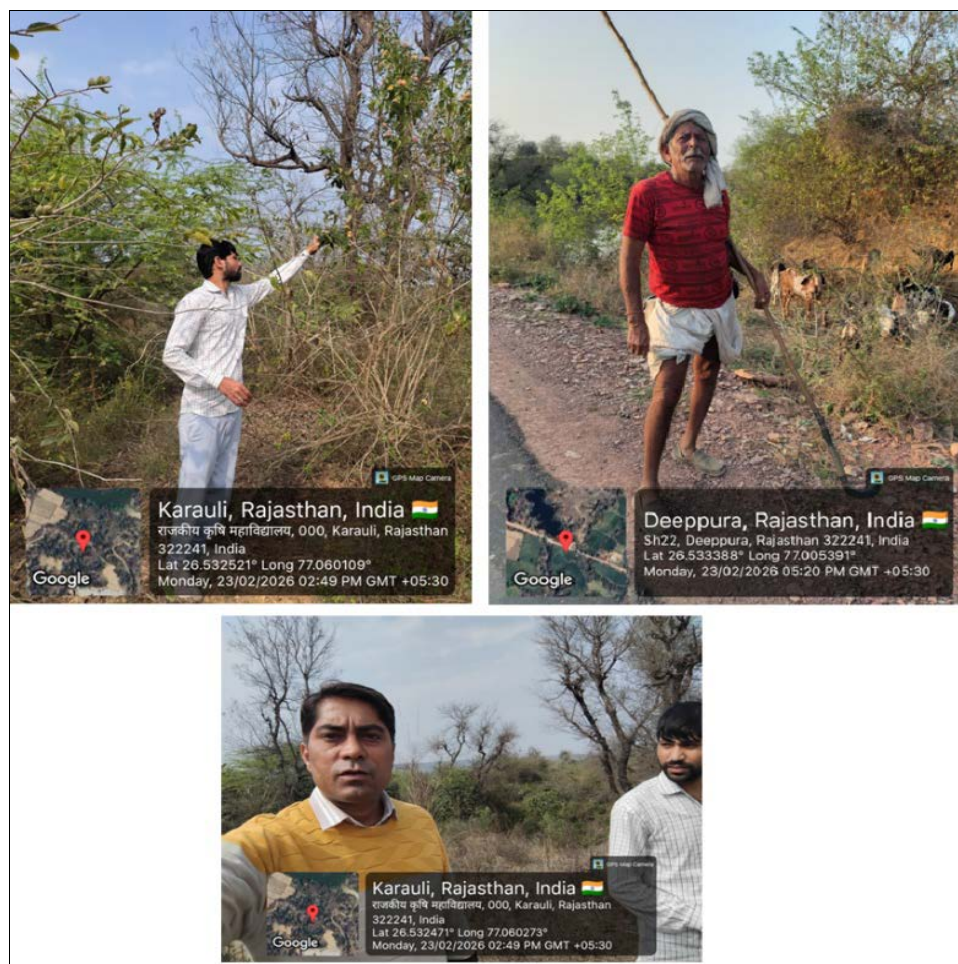


Fig 1: Photographs taken during the survey.

Results

A total of 94 ethnomedicinal plant species belonging to different botanical families were documented from Karauli district of Rajasthan with their traditional therapeutic uses and methods of preparation. The recorded species belonged to a wide range of medicinal taxa, Fabaceae being the most represented family, followed by Malvaceae, Asteraceae, Lamiaceae, Poaceae, Moraceae, Euphorbiaceae, Apocynaceae, Amaranthaceae and Acanthaceae, which indicates the dominance of these families in the traditional health care system of the region. The survey showed that the local communities have rich knowledge on the medicinal plants and still rely on these plant species for the treatment of many common and chronic diseases.

The recorded medicinal plants were used to treat various health problems. The most frequent diseases treated were skin diseases, wounds, cuts, ulcers, burns, boils and leprosy,

demonstrating the importance of herbal remedies for the treatment of dermatological conditions. A large number of plants were used for the treatment of respiratory disorders such as cough, cold, bronchitis, asthma, pneumonia and tuberculosis. Another major therapeutic category that was represented in the survey was gastrointestinal disorders including diarrhea, dysentery, stomach-ache, constipation, indigestion, abdominal pain, vomiting, piles and digestive disorders. The documented flora possessed wide pharmacological significance as many species were reported for the treatment of diabetes, hypertension, liver disorders, kidney stones, urinary tract infections, rheumatism, arthritis, inflammation, fever, malaria, reproductive disorders and neurological conditions.

Analysis of traditional methods of preparation showed that most of the herbal preparations were decoctions followed by paste, powder and juice with few remedies in oil application

or smoke inhalation. The preference for decoctions indicates that boiling of plant materials appears to be still the most common practice of extracting bioactive constituents before administration. Wounds, skin infections, burns and inflammatory conditions were often treated externally with pastes, while internal conditions such as diabetes, digestive disorders and respiratory diseases were usually treated with powders and juices.

Several medicinal plants were reported to have multiple therapeutic uses, which reflects the rich indigenous knowledge of local tribal and rural communities. For example, *Abutilon indicum* was used for urinary diseases, rheumatism, ulcers, jaundice, pulmonary tuberculosis and gonorrhoea. *Calotropis procera*, *Holoptelea integrifolia*, *Ocimum sanctum*, *Syzygium cumini*, *Tribulus terrestris* and *Tridax procumbens* were reported to treat several unrelated

ailments including inflammatory disorders, skin diseases, diabetes, respiratory infections, wound healing and urinary disorders. The multipurpose use indicates the presence of different bioactive phytochemicals and emphasizes the significance of these species for future phytochemical and pharmacological studies.

Ethnomedicinal survey revealed that Karauli district is rich in medicinal plants diversity which plays a vital role in primary health care. The high use of native plants for the treatment of infectious diseases, metabolic disorders, inflammatory conditions and skin diseases shows the dependence of local communities on traditional medicine. These results provide important base line data for biodiversity conservation, validation of traditional knowledge and development of plant based therapeutic agents.

Table 1: Plants identified as having medicinal properties in ethnomedicinal survey at Karauli district of Rajasthan

S No.	Plant name	Family	Ailment name	How to take
1	<i>Abutilon indicum</i>	Malvaceae	Urinary diseases, rheumatism, ulcers, jaundice, pulmonary tuberculosis, gonorrhea	Powder, decoction
2	<i>Acacia nilotica</i>	Fabaceae	Cold, bronchitis, diarrhea, dysentery, bleeding piles	Decoction
3	<i>Achyranthes aspera</i> L.	Amaranthaceae	Wounds, ringworm	Paste
4	<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Fever, nausea, vomiting, dysentery, abdominal pain	Decoction, paste
5	<i>Albizia lebbek</i>	Fabaceae	Cough, bronchitis, skin diseases, eye disorders	Decoction, paste
6	<i>Asparagus racemosus</i> Willd.	Asparagaceae	Ulcers, lactation issues, infertility	Powder, decoction
7	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	Wounds, skin diseases, ulcers, piles	Paste, decoction
8	<i>Calotropis procera</i>	Apocynaceae	Rheumatic pain, paralysis, migraine	Paste, decoction
9	<i>Capparis decidua</i>	Capparaceae	Toothache, arthritis, asthma, cough, inflammation	Decoction, paste
10	<i>Cassia absus</i> L.	Fabaceae	Bronchitis, asthma, conjunctivitis, leucoderma	Powder, paste
11	<i>Cassia tora</i> L.	Fabaceae	Constipation, skin diseases	Powder, paste
12	<i>Catharanthus pusillus</i>	Apocynaceae	Diabetes, hypertension	Decoction
13	<i>Chenopodium murale</i> L.	Amaranthaceae	Digestive disorders, skin diseases	Paste, decoction
14	<i>Commelina forskalaei</i> Vahl.	Commelinaceae	Eye infections, wounds	Paste
15	<i>Cynodon dactylon</i>	Poaceae	Cuts, wounds, fever	Paste, juice
16	<i>Cyperus bulbosus</i> Vahl	Cyperaceae	Diarrhea, stomach ache	Decoction
17	<i>Datura stramonium</i> L.	Solanaceae	Asthma, pain relief	Smoke inhalation, paste
18	<i>Dendrophthoe falcata</i> (L. f.) Ettingsh.	Loranthaceae	Tumors, wounds	Paste, decoction
19	<i>Desmodium repandum</i>	Fabaceae	Fever, cough	Decoction
20	<i>Digitaria pennata</i>	Poaceae	Diarrhea, dysentery	Decoction
21	<i>Echinochloa colona</i>	Poaceae	Digestive disorders	Decoction
22	<i>Eclipta alba</i> (L.) Hassk.	Asteraceae	Liver disorders, hair growth	Juice, oil
23	<i>Eragrostis ciliaris</i>	Poaceae	Fever, skin diseases	Decoction, paste
24	<i>Euphorbia hirta</i>	Euphorbiaceae	Asthma, cough, diarrhea	Decoction, juice
25	<i>Ficus benghalensis</i>	Moraceae	Diabetes, diarrhea	Decoction
26	<i>Ficus religiosa</i>	Moraceae	Asthma, diabetes, wounds	Decoction, paste
27	<i>Grewia tenax</i>	Tiliaceae	Diarrhea, dysentery	Decoction
28	<i>Hibiscus lobatus</i>	Malvaceae	Skin diseases, wounds	Paste
29	<i>Holoptelea integrifolia</i>	Ulmaceae	Skin diseases, rheumatism	Paste, decoction
30	<i>Indigofera cordifolia</i>	Fabaceae	Skin diseases, wounds	Paste
31	<i>Leucas aspera</i>	Lamiaceae	Cough, cold, headache	Decoction, paste
32	<i>Mucuna pruriens</i>	Fabaceae	Parkinson's disease, infertility	decoction
33	<i>Ocimum canum</i>	Lamiaceae	Cold, cough, fever	Decoction, juice
34	<i>Pedaliu murex</i> L.	Pedaliaceae	Urinary disorders, kidney stones	Decoction
35	<i>Portulaca oleracea</i> L.	Portulacaceae	Skin diseases, digestive disorders	Paste, decoction
36	<i>Sida acuta</i> Burm. f.	Malvaceae	Fever, wounds, asthma	Decoction, paste
37	<i>Sida cordifolia</i> L.	Malvaceae	Asthma, rheumatism, nerve disorders	Decoction, paste
38	<i>Solanum nigrum</i> L.	Solanaceae	Liver disorders, ulcers	Decoction, paste
39	<i>Syzygium cumini</i>	Myrtaceae	Diabetes, diarrhea	Powder, decoction
40	<i>Tridax procumbens</i>	Asteraceae	Wounds, cuts, hair growth	Paste, juice
41	<i>Verbesina encelioides</i>	Asteraceae	Skin diseases, wounds	Paste
42	<i>Xanthium strumarium</i> L.	Asteraceae	Skin diseases, malaria	Decoction, paste
43	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Digestive disorders, wounds	Decoction, paste
44	<i>Acacia catechu</i> (L.f.) Willd.	Mimosaceae	Leprosy, skin conditions, and leucoderma are treated	Paste, decoction

			with roots and bark, respectively	
45	<i>Abutilon indicum</i> L.	Malvaceae	The herb is used for earaches, colds, diarrhea, and lung problems.	Decoction, paste
46	<i>Acalypha ciliata</i> Forsk	Euphorbiaceae	Used in respiratory disease, skin infection, fever, jaundice and hypertension	Powder, paste
47	<i>Achyranthes aspera</i> L.	Achyranthaceae	In addition to treating dropsy, the herb is used as a diuretic for leprosy, piles, skin eruption, and painful birth.	Powder, paste
48	<i>Adiantum caudatum</i> L.	pteridaceae	Cuts, boils, wounds, headaches, mouth ulcers, food, and gasoline	Decoction
49	<i>Adathoda vasica</i> L.	Acanthaceae	Using leaf decoction to treat coughing	Decoction
50	<i>Anlangium salvifolium</i> (L.f.)	Cornaceae	Leaves to treat wounds, diabetes, and dog attacks	Paste, decoction
51	<i>Azadirachta indica</i> A. Juss.	Meliaceae	The entire plant is used for immunity development, wound healing, and skin nourishing.	Paste
52	<i>Alysicarpus hamosus</i> Edgew.	Fabaceae	beneficial for stomachaches, asthma, and coughs	Decoction, paste
53	<i>Amaranthus caudatus</i> L.	Amaranthaceae	Atherosclerosis, helminthic and bacterial infections, inflammation, hepatic disorders, diabetes mellitus, cancer, malaria, high cholesterol, and cardiovascular problems	Paste, juice
54	<i>Anisomeles indica</i> (L.)	Lamiaceae	Used in abdominal pain, allergy and inflammation	Decoction
55	<i>Anogeissus pendula</i> Edgew.	Combretaceae	Gastric disorders, skin conditions, coughs, and burns are treated using stem bark, seed, and fruit.	Smoke inhalation, paste
56	<i>Argemone mexicana</i> L.	Papaveraceae	Oil, leaf juice, and root are applied externally to treat skin conditions and slow-growing ulcers.	Paste, decoction
57	<i>Balanites aegyptiaca</i> (L.) Del.	Balanitaceae	Bark is utilized for dog bites and heaps, seeds are useful for earaches and acne.	Decoction
58	<i>Boerhavia erecta</i> L.	Nyctaginaceae	Traditionally used as food and medicinal	Decoction, paste
59	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Diuretics, edema, and burning feelings in the urine are all reduced by using leaves. Night blindness is treated with root.	Decoction, paste
60	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	Leucoderma can be cured using seeds. The menstrual cycle can be corrected by eating fruit. Root is used to poison snakes.	Decoction, paste
61	<i>Callistemon viminalis</i> Cheel	Mytaceae	Used in skin infection and gastrointestinal diseases	Powder, decoction
62	<i>Cassia fistula</i> L.	Caesalpiniaceae	Scabies, psoriasis, and ringworm are among the skin disorders that leaves are used to cure. Pod is purgative.	Paste, juice
63	<i>Cassia tora</i> L.	Caesalpiniaceae	Used in skin diseases, seeds helps in improve eyesight, anti- inflammatory	Paste
64	<i>Commiphora wightii</i> (Arn.) Bhandari	Burseraceae	Guggal gum resin is used to treat skin conditions, arthritis, and excessive cholesterol.	Decoction
65	<i>Corchorus aestuans</i> L.	Malvaceae	Pneumonia and stomachaches can be treated with seeds.	Decoction
66	<i>Calotropis procera</i> (Ait.) R. Br.s	Asclepiadaceae	Whooping cough, asthma, cold, pneumonia, joint pain, boils, cuts, wounds, toothache, and scorching skin	Decoction, paste
67	<i>Capparis decidua</i> (Forssk.) Edgew.	Capparaceae	Tree bark is used as a cough and asthma remedy. It is anti-diabetic to use fruit powder.	Decoction, paste
68	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Kidney stones, constipation, stomachaches, vomiting, diarrhea, nosebleeds, mouth ulcers, and eye conditions	Paste
69	<i>Dendrocalamus strictus</i> (Roxb.)	Bambusaceae	Used in haematemesis, jaundice, leucoderma	Decoction, paste
70	<i>Elytraria acaulis</i> (L.f.) Lindau	Acanthaceae	Ringworm and other skin disorders are treated with it in medicine.	Decoction, paste
71	<i>Ficus racemosa</i> L.	Moraceae	Leucorrhea, mouth ulcers, diarrhea, and sores	Paste
72	<i>Ficus benghalensis</i> L.	Moraceae	Ear boil, toothache, debility, nose bleeding, joint pain, heart problems, cold, brain tonic, and heel cracking	Decoction, juice
73	<i>Ficus religiosa</i> L.	Moraceae	Astringent, antiseptic, anti-diabetes, anti-diarrheal, used in ulcer and wounds	Decoction, paste
74	<i>Glossocardia bosvallia</i> (L. f.) DC	Asteraceae	Decoction of the herb as a febrifuge. Wounds and sores are treated with fresh Pithari plant paste to promote healing.	Paste
75	<i>Grewia asiatica</i> L.	Malvaceae	Aside from stomatitis, hiccough, asthma, spermatorrhea, fevers, diarrhea, anorexia, indigestion, thirst, toxemia, throat, TB, and sexual debility, the fruits are also said to help with liver, heart, and blood issues.	Decoction, paste
76	<i>Heliotropium strigosum</i> Willd.	Boraginaceae	Used to treat vascular diseases, respiratory discomfort, and stomach pain in traditional medicine.	Paste, decoction
77	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Ulmaceae	Skin conditions, leprosy, diabetes, bleeding, rheumatism, obesity, worm infestations, inflammation, and vomiting	Decoction
78	<i>Hibiscus micranthus</i> L. f.	Malvaceae	Twigs, both peeled and unpeeled, are used as chewing sticks to keep teeth clean and to maintain dental	Paste

			hygiene. They also have neuromuscular blocking, antipyretic, and anti-inflammatory properties.	
79	<i>Indigofera cordifolia</i> Heyne ex Roth	Fabaceae	As an antiscorbutic and diuretic, the plant's juice is used to treat burns and epilepsy.	Decoction, juice
80	<i>Indigofera linnaei</i> Ali	Fabaceae	Rheumatism, arthritis, inflammation, liver, and malignancies are all treated with it.	Decoction, paste
81	<i>Ipomoea pes-tigridis</i> L.	Convolvulaceae	The root is purgative, Rheumatism, inflammation, hypertension, skin diseases, burns	Paste
82	<i>Justicia procumbens</i> L.	Acanthaceae	Used in cough and cold	Decoction, paste
83	<i>Lantana camara</i> L.	Verbenaceae	For piles, sprains, and respiratory conditions, leaves are employed.	Decoction, paste
84	<i>Lindernia ciliata</i> (Coolsm.) Pennell	Linderniaceae	To make the skin condition better. -to cure illnesses of the stomach, diabetes, and high fever. - to relieve throat inflammation	Powder, decoction
85	<i>Momordica charantia</i> L.	cucurbitaceae	Ascites, hyperglycemia, ringworm, and intestinal worms	Decoction, paste
86	<i>Nyctanthes arbor-tristis</i> L.	Nyctanthaceae	Respiratory stimulant, bitter tonic, hypotensive, antispasmodic, and anti-inflammatory leaves. It cures rheumatism, fever, and chronic sciatica.	Paste, decoction
87	<i>Ocimum canum</i> Sims	Lamiaceae	For the treatment of many illnesses, including flu, fevers, coughs, and asthma, as an infusion or syrup	Decoction
88	<i>Ocimum sanctum</i> L.	Lamiaceae	Its root is used to treat malarial fever; its seeds are good for the urinary system; and its leaf juice is used to treat bronchitis, colds, earaches, and skin ailments.	Paste
89	<i>Prosopis juliflora</i> (Swartz) DC.	Fabaceae	Leaves used in fever and antimicrobial, worm infection	Paste, decoction
90	<i>Ricinus communis</i> L.	Euphorbiaceae	The root cures malaria, the seeds are helpful for the urinary system, and the leaf juice is good for earaches, colds, bronchitis, and skin ailments.	Decoction
91	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	The bark has astringent properties that help with diarrhea, pneumonia, ulcers, asthma, and sore throats. Diarrhea is also treated with a mixture of goat's milk and fresh bark juice.	Decoction, paste
92	<i>Tridax procumbens</i> L.	Asteraceae	Leaf juice extract has antifungal, wound-healing, and insect-repelling properties.	Decoction
93	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Fever, impotence, kidney stones, diarrhea, rheumatism, ringworm, boils, dysuria, headache, and leucorrhea	Decoction
94	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Cuts, boils, blisters, mouth ulcers, headaches, food, and gasoline	Decoction, juice

Discussion

The present ethnomedicinal survey recorded 94 species of medicinal plants belonging to different families of angiosperms which are traditionally used by rural and tribal communities of Karauli district of Rajasthan in the treatment of various human ailments. The large number of medicinal species reported reflects the rich ethnobotanical heritage of the region and suggests that traditional plant-based healthcare is still an important part of primary healthcare. Similar observations have been reported from eastern Rajasthan where indigenous communities extensively use medicinal plants, due to their easy availability, affordability and cultural acceptance (Katewa *et al.*, 2004; Jain *et al.*, 2010).

Fabaceae was the most important family among the recorded taxa followed by Malvaceae, Asteraceae, Lamiaceae, Poaceae, Moraceae, Euphorbiaceae and Amaranthaceae. The predominance of Fabaceae is consistent with previous ethnobotanical studies conducted in Rajasthan and other semi-arid regions of India (Katewa *et al.*, 2004; Shreya *et al.*, 2023). Fabaceae members are known to contain diverse bioactive metabolites such as flavonoids, tannins, alkaloids and saponins which are responsible for their antioxidant, antimicrobial, anti-inflammatory, antidiabetic and wound healing activities (Wink, 2013). The abundant presence of Fabaceae species in the present survey therefore, may be due to their ecological adaptation to arid environments and their wide therapeutic applicability.

The medicinal plants recorded in present study were mainly used for the treatment of skin diseases, wounds, burns, ulcers, gastrointestinal disorders, respiratory infections, fever, diabetes, rheumatism, arthritis, urinary disorders and inflammatory conditions. Similar therapeutic trends have been observed in earlier ethnomedicinal studies of Rajasthan, where skin diseases and digestive disorders were the most commonly treated ailments by using herbal remedies (Katewa *et al.*, 2004; Jain *et al.*, 2010). The consistent documentation of these disease categories in different regions suggests a high degree of consistency in indigenous medicinal knowledge and supports the reliability of traditional therapeutic practices.

The survey also found that decoction was the most common preparation method, followed by paste, powder and juice. Since boiling improves the extraction of water-soluble phytochemicals like phenolics, glycosides, tannins and polysaccharides, decoctions are usually preferred as they increase their therapeutic efficacy (Heinrich *et al.*, 2018). Pastes were predominantly applied externally for wounds, burns, skin infections and inflammatory conditions. Powders and juices were generally utilized for chronic diseases such as diabetes and respiratory disorders. Similar preparation methods have been described in several ethnopharmacological studies from India (Jain *et al.*, 2010; Heinrich *et al.*, 2018).

In the present study, several reported medicinal plants such as *Azadirachta indica*, *Ocimum sanctum*, *Tridax procumbens*, *Calotropis procera*, *Syzygium cumini*,

Holoptelea integrifolia, *Capparis decidua* and *Butea monosperma* were also widely reported in ethnomedicinal studies of Rajasthan (Katewa *et al.*, 2004; Jain *et al.*, 2010). Many of their traditional uses have been confirmed by pharmacological investigations, showing antimicrobial, antioxidant, anti-inflammatory, antidiabetic, hepatoprotective, immunomodulatory, and wound-healing properties (Ekor, 2014; Heinrich *et al.*, 2018). These results validate traditional medicinal knowledge from a scientific perspective and indicate the therapeutic potential of these plant species.

Many of the recorded medicinal plants were used for several therapeutic purposes, which is probably due to the occurrence of a wide spectrum of biologically active secondary metabolites. *Abutilon indicum*, *Calotropis procera*, *Ocimum sanctum*, *Holoptelea integrifolia* and *Tribulus terrestris* were used for the treatment of various unrelated ailments like inflammatory diseases, skin infections, respiratory ailments, diabetes and urinary disorders. Such multifunctionality has been highlighted in previous ethnopharmacological studies and is believed to be reflective of diverse phytochemical constituents that can interact with multiple biological pathways (Fabricant and Farnsworth, 2001; Heinrich *et al.*, 2018).

The current study also emphasizes the significance of conserving the medicinal plant diversity and the associated indigenous knowledge. Increasing urbanization, habitat degradation, overexploitation of medicinal plants and gradual loss of traditional knowledge among the younger generations are great threats to ethnomedicinal heritage. Similar issues have been raised by ethnobotanical researchers working in Rajasthan and other biodiversity-rich regions of India who emphasized that systematic documentation and scientific validation of indigenous knowledge are critical for biodiversity conservation and future drug discovery (Katewa *et al.*, 2004; Jain *et al.*, 2010; Ekor, 2014).

The results of the present study in general support the previous ethnobotanical studies in Rajasthan and further confirm Karauli district as a significant source of medicinal plant diversity and indigenous healthcare knowledge. The documented medicinal flora provides a useful baseline for future phytochemical studies, pharmacological validation, and conservation strategies and in the development of evidence-based herbal therapeutics.

Conclusion

The present ethnomedicinal survey points out the rich diversity of medicinal plants and rich traditional knowledge in the rural and tribal communities of Karauli district of Rajasthan. Ninety four species of medicinal plants belonging to various botanical families were recorded for the treatment of various ailments. Fabaceae was the most dominant family and decoction was the most frequently used mode of herbal preparation. The extensive use of these plants in the management of skin diseases, GIT disorders, respiratory infections, diabetes, inflammatory disorders, and other common ailments reflects the continued relevance of traditional herbal medicine in primary health care. The results not only confirm the ethnomedicinal importance of the reported plants but also provide a useful scientific basis for future phytochemical, pharmacological and clinical studies. The study also stresses the need to conserve the medicinal plant resources as well as the associated

indigenous knowledge, which is increasingly threatened by habitat degradation, over-exploitation and cultural erosion. Conserving this traditional knowledge and validating it scientifically may greatly aid the conservation of biodiversity and the discovery of new therapeutic agents based on plants.

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