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Ethnomedicinal survey of plants used in home remedies by the local community of the unexplored village Dudday, District Gujrat, Punjab, Pakistan

Khalid Hussain[1*], Iqra Mushtaq[1], Khalid Nawaz[1], Tehreem Riaz[1]

[1]Department of Botany, University of Gujrat, Gujrat, Pakistan

Abstract
Ethnomedicinal survey at village Dudday, District Gujrat, Punjab, Pakistan was conducted during 2024 to document the important species of plants and related information that are used by the local community to cure several diseases. This site has never been explored before in terms of vegetation composition and structure. Indigenous knowledge concerning the medicinal practice was gathered through structured questionnaires during personal interviews made through the field trips. Plants were systematically arranged based on family name, vernacular name, plant part used, and ethnomedicinal home remedies and uses. For botanical nomenclature and classification of plants, Angiosperm Phylogeny Group-IV was used as a reference. All plant specimens collected, identified, preserved and mounted during survey were preserved at the Department of Botany, University of Gujrat, Pakistan for further use. A total of 48 plant species were identified through taxonomic description and information shared by the local people through ethnomedicinal knowledge. *Foeniculum vulgare* and *Sesamum indicum* had higher number of respondents. *Ficus religiosa* had the highest Use Value (0.55). Relative Frequency Consensus (0.506) was noted for *Sesamum indicum*. Most of the wild plants showed highest Use Value than those of cultivated plants. Most common diseases noted in this study were of digestive and skin. The highest Informant Consensus Factor (0.987) was recorded for dental problems, while the highest fidelity level (20%) was recorded for skin issues. It was concluded that most of the people living in that village still depend on plants to cure various diseases through folk knowledge. This folk knowledge can be used for further scientific studies to develop medicines at commercial scale.

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Introduction

Dudday is a village located in the district of Gujrat, Punjab, Pakistan. It is geologically located at 30°50'52" N, 70°10'50" E. The village is about 16 minutes away from Jalalpur Jattan, District Gujrat. The local economy of Dudday is mainly based on agriculture, with main crops including sugarcane and wheat as documented in Jallalpur Jattan (Hussain et al., 2010), a town very near Village Dudday. However, the Village Dudday's vegetation has never been explored before. This site has extreme climatic conditions, summer being too hot and winter relatively colder than that of the other adjoining areas falling towards south.

***CONTACT** Khalid Hussain, khalid.hussain@uog.edu.pk, Department of Botany, University of Gujrat, Gujrat, Pakistan

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Ethno-pharmacology describes how different communities utilize plants in traditional medicine. The goal of ethnopharmacology is to understand the pharmacological properties of these plants, thereby discovering their possible therapeutic benefits (Bhatia et al., 2014). Medicinal plants have been in use as therapeutic agents since ancient times and, to date, they are one of the most important sources of remedies to alleviate human suffering due to various diseases (Dubey et al., 2004; Chaachouay and Zidane, 2024). Medicinal plants have historically formed the basis of modern pharmaceuticals, thus supportingt their importance in health (Salmerón-Manzano et al., 2020). Ahmad et al. (2015) reported 62 plant species in traditional communities to treat snake and scorpion bites, highlighting the use of traditional knowledge in discovering new therapeutic agents.

Since ancient periods, people have been using plants as natural medicines that represent their importance in health and wellbeing. Medicinal plants have always been a source of effective treatment due to their efficacy and fewer side effects (Chaughule and Barve, 2024). Malik et al. (2019) documented 106 plant species belonging to 56 floral families for treatment of skin diseases. This has continued attracting scientists all over the world to research on medicines extracted from plants for their benefits on human health (Shinwari et al., 2014). A wide range of pharmacological interests dominate due to the fact that medicinal plants have a complete spectrum of diversified therapeutically active compounds that range from inflammatory antiviral effects up to antitumor, and analgesic actions (Shinwari and Gilani, 2003). These actions have underscored their significant and critical position in the medical world, which holds a great potential in future for managing new health problems. Medicinal plants are thus invaluable to healthcare not only for their historical contributions, but also to stimulate innovation in modern medicine **(**Balkrishna et al., 2024). Thus, this study intended to document and gather ethnomedicinal information within the traditional tibb paradigm about the wild flora of Village Dudday, District Gujrat, Pakistan. It mainly aimed at saving this ethnobotanical treasure for the next generations and contributing towards its scientific knowledge. Documentation of medicinal flora of Dudday, and subsequent conservation of this diversity would gain more importance in research (Duche-Pérez et al., 2024). This study was undertaken to document the important plants of Dudday village, Gujrat, Pakistan that has not been explored before.

Figure 1: Study area (Dudday Village, District Gujrat)

Materials and Methods

Field surveys were conducted during the year 2024 at Dudday village, Gujrat, Pakistan to document the important medicinal plants and traditional knowledge from the local community. Structured questionnaires and group discussions with local informants had been used during data collection (Figure 1).

Local plant names were used to identify medicinal plants. These names often reflect the cultural significance and regional understanding of the plants. The medicinal use of these plants includes a wide range of traditional treatments for various diseases, where each plant has been used to address specific diseases. The methods of use are different forms of preparation such as decoctions, poultices, or direct consumption depending on the nature of the treatment. Specific parts of the plants, like roots, leaves, stems, or flowers, are used for medicinal purposes, and each part is supposed to have different properties. These practices gave a complete view of the regional traditional uses of medicinal plants. Group discussions and consultation with the local experts further enriched the data, thereby making them correct and reliable, and giving insights into the cultural and medicinal importance of these plants.

Data Analysis

Different formulas/indices were used to quantify the use of plants and traditional knowledge in ethnobotanical surveys. Frequency of listing is a method that was used to calculate the extent of use by a community, while the Use Value (UV) was measured by taking the total number of uses (U) that was assigned to a specific plant species, divided by the total number of informants (N) (Perveen et al., 2024)

$$UV = \Sigma U/N$$

Relative Frequency of Citation (RFC) determines the relative importance or the popularity of a plant based on its citation frequency (Janaćković et al., 2022; Perveen, et al., 2024). It was calculated using the following formula:

$$RFC = FC/N$$

Where FC is frequency of citation; N represents the total number of informants

The Informant Consensus Factor (ICF) is an indicator of the level of consensus among informants regarding the uses of specific plants. It indicates the common cultural knowledge (Zhang et al., 2001; Perveen et al., 2024). ICF was calculated using the following equation:

$$ICF = (Nur-Nt)/(Nur-1)$$

Where Nur is the number of the use-reports per disease or plant-use classification; Nt represents the number of plant species addressing a particular plant-use category.

Fidelity Level (FL) was calculated by the number of informants that have defined specific disease related medicinal species (NP) dividing the sum of informants (N) who employ plant species to cure particular ailments (Kayani et al., 2014).

$$FL (\%) = NP/N \times 100$$

The indices together are the informative about the importance of plant species in the cultural context, indicating their utility in traditional ecological practices and community dependence (Stagg et al., 2022).

Results

During the ethnomedicinal survey the information collected and the results obtained through data analysis are given below:

Family index

Information for family index (FI) is given in Table 1. A total of 28 families were identified from the Dudday village. Higher number of plant species from Fabaceae that was ranked 1st among all the families were documented; it has 5 species that were used in home remedies. Most the families have only one genus (Figure 2).

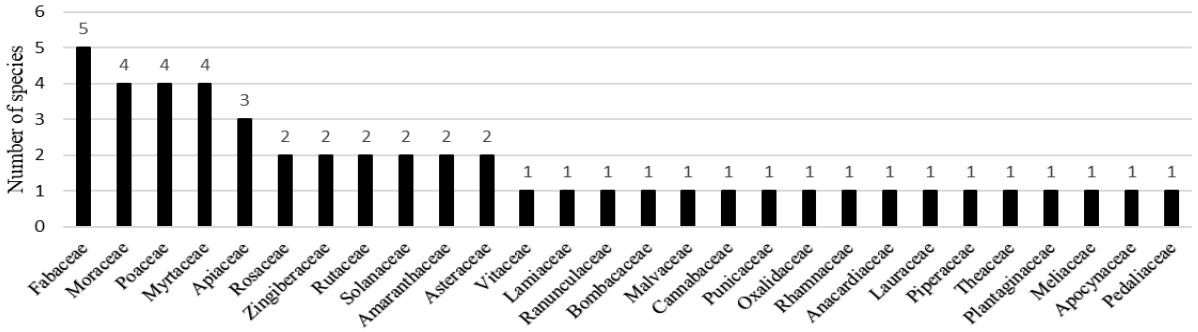

Figure 2: Family index based upon the number of species in the study area

Table 2: Identification of species with uses, method of use, and prescription

Botanical name	Local name	Respo-dents	Parts used	Method of use	Uses	Use value	Relative Citation Frequency
Acacia arabica (Lam.) Willd.	Kikar, Babool	26	Pods, bark, leaves	Decoction, dried powder, fresh paste	Diarrhea, fever, cough, diabetes	0.15	0.173
Albizia lebbeck (L.) Benth.	Shareen	24	Leaves, bark roots, seeds, stem	Juice, infusion, paste	Asthma, bronchitis, snakebite, eye disorders & swelling	0.166	0.16
Azadirachta indica Adr. Juss.	Neem	55	Leaves	Paste made from leaves	Skin diseases, wounds	0.018	0.366
Beta vulgaris L.	Chukandar	22	Roots, leaves	Juice, powder	Anemia, digestive health, skin health, liver health, blood pressure	0.227	0.146
Bombax ceiba L.	Sembal (Cotton tree)	23	Leaves, stem	Decoction	Diarrhea, loose motion, cough, gallstones	0.173	0.153
Broussonetia papyrifera (L.) L'Hérit. ex Vent.	Paper mulberry	9	Roots, bark	Paste, decoction	Cleanser & antipyretic, skin lightening, reduces dark circles	0.333	0.06
Calotropis procera (Aiton) W.T.Aiton	Aak	60	Leaves	Paste	Wound healing, snake bite	0.033	0.40
Camellia sinensis (L.) Kuntze	Sabz Pati	20	Leaves	Boiling in water & mixing with sugar	Indigestion, nausea	0.10	0.133
Cannabis sativa L.	Hemp	23	Leaves & flowers	Juice, powder	Wound healing, dandruff from head	0.08	0.153
Cassia fistula L.	Amaltas	6	Bark & leaves	Paste	Skin infections	0.166	0.04
Cinnamomum verum J.Presl	Dalchini	55	Bark	Bark, powder, decoction	Gastrointestinal disorders, vomiting, diarrhea, skin problem	0.072	0.366
Citrus limonia (L.) Osbeck	Lemon	54	Fruit juice & peel, leaves	Juice extraction	Digestive issues, fever reduction, hair care	0.055	0.36
Citrus sinensis (L.) Osbeck	Orange	30	Leaves , peel, fruit, seeds	Juice	Constipation, cooling agent for cough, cold, vomiting	0.10	0.2
Cuminum cyminum L.	Zeera	30	Seeds	Dried seeds and herbal tea	Digestive issue, relieves bloating & gas, improves digestion, reduces stomach pain	0.133	0.2
Curcuma longa L.	Haldi	69	Rhizome	Powder, paste	cough, cold, digestive issue, skin issues, wound, joint pain	0.08	0.46
Dalbergia sissoo Roxb. ex DC.	Sheesham	44	Bark, leaves	Decoction, tea, leaf juice	Fever, digestive issue, constipation	0.068	0.293
Elettaria cardamomum (L.) Maton	Elachi	45	Seeds	Herbal tea, chewing	Nausea, indigestion, vomiting, cough, cold, bronchitis	0.133	0.3
Eucalyptus globulus Labill.	Safeda	9	Leaves	Decoction, steam inhalation	Asthma, bronchitis	0.222	0.06
Eugenia jambolana Lam.	Jaman	67	Fruit, seeds	Powder	Stomach problem	0.0149	0.446

Ficus benghalensis L.	Banyan Tree	30	Leaves, bark, roots	Paste, powder	Sound healing, skin conditions	0.066	0.2
Ficus religiosa L.	Peepal	9	Bark, leaves	Powder, leaf juice, decoction	Skin diseases, vomiting, wound healing, cough, gastric problem	0.555	0.06
Foeniculum vulgare Mill.	Saunf	72	Seeds	Tea, decoction, seed chewing	Digestion, mouth wash for gum disorder, reduces fat, cough, toothache	0.083	0.48
Helianthus annuus L.	Sunflower	7	Seeds, flowers	Infusion, decoction	Renal pain, kidney inflammation	0.28	0.046
Hibiscus rosa-sinensis L.	Chinese Hibiscus	43	Leaves, roots, flowers	Paste, powder, decoction	Controls hair loss	0.046	0.286
Mangifera indica L.	Mango	24	Leaves, seeds, bark, fruit	Tea, decoction, powder	Vomiting, ear ache, fever	0.125	0.16
Mentha arvensis L.	Mint	55	Leaves	Decoction, tea	Respiratory problems, asthma, bronchitis	0.036	0.36
Morus alba L.	Mulberry	32	Roots, leaves, fruit	Leaf powder, fruit, decoction	Liver protection, kidney disease, fever, improves vision, cough	0.15	0.213
Nigella sativa L.	Kalonji	56	Seeds	Decoction, powder	Respiratory issues, it is mixed in shampoo for hair growth	0.035	0.373
Oryza sativa L.	Rice	72	Seeds	Flour, rice water	Digestive problem, diarrhea, skin inflammation, diabetes	0.055	0.48
Oxalis corniculata L.	Khati Buti	9	Whole plant	Tea, decoction	Constipation, diarrhea, stomach pain	0.333	0.06
Pennisetum glaucum (L.) R.Br.	Pearl millet	25	Seeds	Powder	Constipation, indigestion, anemia, stomach ulcer, energy source	0.2	0.166
Piper nigrum L.	Black pepper	65	Seeds	Powder	Cough, cold, breathing, sore throat, constipation, digestive issue	0.092	0.433
Plantago ovata Forssk.	Ispagol	54	Seeds	Husk	Reduces weight, enhances digestion, controls urinary tract inflammation, constipation, and skin issues	0.092	0.36
Psidium guajava L.	Guava	59	Fruit, leaves	Juice extract, orally	Digestive issue	0.016	0.393
Punica granatum L.	Anar	25	Fruit, peel, leaves, seeds, bark	Juice, tea	Diarrhea, nose bleeding, ulcer, urinary disorders, promotes skin health	0.2	0.166
Pyrus malus L.	Apple	22	Fruit	Eating raw, juice	Constipation, body tonic	0.090	0.1466
Rosa indica L.	Rose	50	Flowers	Extract, rose oil, rose water	Eye infection, skin problems, digestive issues	0.06	0.33
Saccharum officinarum L.	Sugarcane	55	Stem	Juice	Dehydration, kidney disorders, boost immune health, treat sore throat, digestive problems	0.090	0.366
Sesamum indicum L.	Till	76	Seeds, oil, leaves	Powder	Skin problems, dryness, eczema, burns, joint pain, hair tonic, digestive health	0.078	0.506
Solanum nigrum L.	Black nightshade	8	Leaves	Paste	Acne, eczema, wound healing	0.25	0.053
Sonchus asper (L.) Hill	Sontati	9	Whole plant	Paste	Wound healing	0.11	0.06
Sorghum bicolor (L.) Moench.	Jowar	20	Seeds	Flour	Digestive issues, diabetes, heart health, reduces cholesterol	0.25	0.13
Syzygium aromaticum (L.) Merr. & L.M.Perry	Clove	28	Dried buds	Chewing, oil, decoction	Toothache, sore gums pain, dental health, vomiting, cough, cold, asthma	0.25	0.186
Trachyspermum ammi (L.) Sprague	Ajwain	25	Seeds	Tea	Cough, cold	0.08	0.166
Trigonella foenum-graecum L.	Fenugreek	26	Seeds, leaves	Soaked seed, powder, tea	Asthma, hair growth, wound treatment, prevents constipation	0.153	0.173
Vitis vinifera L.	Grapes	42	Fruit, leaves	Juice, extraction	Skin diseases, respiratory issues	0.047	0.28
Withania somnifera (L.) Dunal	Aksan	58	Whole plant	Infusion, paste, powder	Swelling, wound healing	0.034	0.3866
Ziziphus mauritiana Lam.	Indian Jujube	24	Leaves, fruit, seeds	Paste, powder	Skin & eye problem, hepatitis	0.125	0.16

Identification of plants and their uses

A list of all the documented plants in the Dudday village is presented in Table 2. Plants were arranged according to vernacular and botanical names, part used, method of use, and their medicinal properties. For accurate nomenclature, the reference was used from Angiosperm

Phylogeny Group (APG-IV). Plants were arranged alphabetically. Flora of Pakistan was also considered as a reference plant identification. Number of respondents were also counted and presented in Table 2. It was noted that all the plant parts were used to cure various diseases including, fruit, leaves, stem, root, flower, bark, and whole plant. There were different methods of use by the local community. In most of the cases, herbal tea or decoction was the common method. Other methods were paste, powder and juices. *Foeniculum vulgare* and *Sesamum indicum* had higher number of respondents.

Use Value (UV)

Data calculated for Use Value (UV) showed that *Ficus religiosa* had highest UV (0.55) and it is used to cure skin diseases, vomiting, wounds, cough and gastric problems (Table 2). Most of the wild plants showed higher UV than those of cultivated plants. Most common diseases noted in this study were digestive and skin diseases.

Relative Frequency of Citation (RFC)

Highest RFC was calculated for *Sesamum indicum* (0.506) (Table 2). Plants having RFC more than 0.4 include *Calotropis procera*, *Piper nigrum, Eugenia jambolana, Curcuma longa, Foeniculum vulgare, Oryza sativa,* and *Sesamum indicum*.

Informant Consensus Factor (ICF)

To find the ICF, disease categories were made according to similar type of use (Table 3). There were 6 categories of diseases depending upon the uses of plants including digestive, respiratory issues, skin, hair, kidney, and dental problems. Highest ICF was found for dental problems and the lowest for digestives issues.

Table 3: Informant Consensus Factor (ICF) by disease category reported in the study area

Disease Category	Number of use reports (Nur)	Number of species used (Nt)	Nur-Nt	Nur-1	ICF
Digestive issues: indigestion, nausea, gastrointestinal disorders, gas trouble, bloating, diarrhea, constipation, gut health, stomach problem, vomiting	62	29	33	61	0.540
Respiratory issues: asthma, bronchitis, cough, phlegm	66	10	56	65	0.860
Skin problems: cure of wounds, boils, healing, skin care, snake bites, insect bites, acne, eczema, dark circles	49	20	29	48	0.604
Hairs: hair growth, hair loss, removal of dandruff	62	6	56	61	0.918
Kidney problems: kidney inflammation, stones, diabetes	44	4	40	43	0.930
Dental problems: toothache, sore gum pain, dental health, inflammation of mouth	79	2	77	78	0.987

Fidelity Level (FL)

Data for FL presented in Table 4 show that there were six categories based upon diseases. Highest FL (23.25) was found for skin diseases, while the lowest for respiratory problems. In the area, most of the people were using plants for skin rashes, wound healing, and infections.

Table 4: Fidelity Level (FL) value of most reported medicinal plants

Disease/disorder	Local names of plants used	Respondents (Lp)	FL%
Digestive issues	Zeera, Dalchini, Sabz pati, Khati buti, Ispagol,	15	17.44
Respiratory problems	Mint, Saunf, Fenugreek, Safeda, Black pepper	9	10.46
Skin problems	Rose, Black nightshade, Neem, Haldi, Rice	20	23.25
Hair problems	Till, Hemp, Kalonji, Chinese hibiscus, Lemon	16	18.60
Blood pressure/circulations	Apple, Sugarcane, Jowar, Chukandar	8	9.30
Teeth and gum problems	Clove, Saunf	18	20.93

Discussion

An ethnobotanical survey conducted in Dudday, Gujrat, discovered a rich variety of medicinal plant species available in the area. The region's favorable geographical and ecological conditions allow a wide range of plants to grow naturally in places like fields, farmlands (Wade et al. 2008), and home gardens. Of a variety of plants collected and identified from the Dudday area, *Foeniculum vulgare* and *Sesamum indicum* were the plants being frequently used by the inhabitants. Such plants are available to the local community, and their abundance indicates that most of them have powerful medicinal properties (Ramzan et al., 2024). Since the natural extraction of medicines from these plants, they play a crucial role in meeting the healthcare needs of the local population (Rahman et al. 2022). The variety of plant species in this area reflects its ecological richness and its potential as a valuable source of medicinal plants. The local community has rich and extensive knowledge and experience in finding, gathering, and applying medicinal plants to treat different health problems (Singh, 2015; Niazi and Monib, 2024).

The traditional knowledge is transferred from one generation to the other, and this helps individuals know about specific herbs and their usage for general diseases such as abdominal issues, respiratory infections, or skin infections (Cock et al. 2020; Ramzan et al., 2024). Much such knowledge regarding these herbal preparations is orally passed within families and other social setups. This is a very practical approach to healthcare, especially in areas where modern medical facilities are not easily accessible. The support of the community on medicinal plants provides effective healthcare but also preserves traditional knowledge that might be useful for future scientific research (Sheng-Ji, 2001) on herbal medicines (Shakya, 2016). The use of medicinal plants in Dudday is economically, culturally, and geographically ambitious. Many people of this particular area prefer traditional plant-based remedies because modern medical treatments are expensive (Niazi and Monib, 2024).

In addition, access to hospitals and healthcare centers is often difficult due to the distance, making it more practical for people to depend on local medicinal plants. Cultural beliefs and social habits also encourage the use of herbal medicine, as it is seen as safer, more affordable, and more familiar (Pal et al., 2003). As pointed out by Azaizeh et al. (2003), due to such reasons, the use of medicinal plants has been continued for generations. The survey results of Dudday clearly indicate that a vast number of species are used extensively in the community, which clearly proves the efficiency of these remedies and the wealth of local botanical knowledge. This indicates a necessity for more research on the medicinal properties of these plants and the possibility of incorporating traditional remedies into modern health care.

Conclusion

It was concluded from this study that all the documented plants were found important to cure many diseases. Most of the people of this village rely on these plans rather than allopathic medicines.

Author(s), Editor(s) and Publisher's declarations

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Ethical approval
This study does not involve human/animal subjects, and thus no ethical approval is required.

Handling of bio-hazardous materials

The authors certify that all experimental materials were handled with great care during collection and experimental procedures. After completion of the study, all materials were properly discarded to minimize/eliminate any types of bio-contamination(s).

Supplementary material

No supplementary material is included with this manuscript.

Conflict of interest

The authors declare no conflict of interest.

Availability of primary data and materials

As per editorial policy, experimental materials, primary data, or software codes are not submitted to the publisher/Journal management. These are available with the corresponding author (s) and/or with other author(s) as declared by the corresponding author (s) of this manuscript.

Authors' consent

All authors have critically read this manuscript and agreed to publish in IJAaEB.

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Declaration of generative AI and AI-assisted technologies in the writing process

It is declared that the authors did not use any AI tools or AI-assisted services in the preparation, analysis, or creation of this manuscript submitted for publication in the International Journal of Applied and Experimental Biology (IJAaEB).

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