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Research Article

An Ethnobotanical Survey of Foot Hill Village Shah Allah Ditta of Margalla Hills

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Abstract: With the advancement of modern communication technologies and formal education systems, indigenous communities in Pakistan are increasingly being integrated into contemporary services. This development has resulted in improved access to health, education, and information; however, it is simultaneously leading to rapid disintegration of traditional knowledge systems. Traditional practices, specifically those connected with ethnobotany, are slowly being replaced by contemporary practices, which leaves an important vacuum in terms of conserving traditional wisdom. In light of this, this study has been conducted to record the ethnobotanical knowledge of the village of Shah Allah Ditta of Islamabad district, Pakistan. Fieldwork was carried out between October 2022 and January 2023. Data were systematically collected through semi-structured interviews with 100 informants, ensuring representativeness across gender and age groups. Plant specimens were collected, identified, and preserved following standard ethnobotanical protocols, and Use Value Indices (UVI) were calculated as the number of citations per species divided by the total number of informants to quantify their relative importance. The study showed that a total of 104 different plant species from 44 plant families have been used traditionally by the local community to cure a variety of diseases and health disorders in humans. Out of these, three plant families, which include *Asteraceae*, *Fabaceae*, and *Poaceae*, were found to be very important because of their high frequency of use. *Olea ferruginea* Royle turned out to be the most important plant, having the maximum percent of use value (2.64%). Herbs constituted the largest proportion of species (46%) likely due to their proximity and accessibility within household surroundings. These results clearly establish Shah Allah Ditta as a source of indigenous knowledge. Conservation of this indigenous resource is vital for intergenerational knowledge transfer and its potential role in drug discovery.

Keywords: Ethnobotany, Ethnomedicine, Margalla Hills, Shah Allah Ditta, Medicinal Plants.

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1. INTRODUCTION

Pakistan has remarkable plant diversity due to its diverse climate, from deserts to alpine ecosystems [1]. Pakistan possesses about 6,000 species of wild plants, of which nearly 400-600 are considered therapeutically important [2]. Approximately 84% of the population relies on traditional medicines for their healthcare needs, with an estimated 50,000–60,000 hakims and many unregistered practitioners in rural and hilly regions using more than 200 plants as household remedies [2]. In addition, official records indicate that 45,799 Hakims/Tabibs and 537 Vaids are registered with the National Council for Tibb, alongside 28 recognized Tibbia colleges, while about 118,000 homeopaths are registered with the National Council for Homoeopathy [3].

Ethnobotanical research in Pakistan has grown a lot in recent years, especially around Islamabad. In the previous studies, researchers surveyed Bara Kahu, Islamabad, where they identified 34 plant species used in traditional medicine [4]. The most recent findings are from Thanda Pani village in Islamabad in 2025, reporting 66 species across 29 families, with about 35% of them used for medicine, 24% as Fodder, 14% as vegetables, 13% as fruits, 5% as building material and 3% for other uses [5]. These studies collectively showed that Islamabad's peri-urban communities still rely on medicinal plants, but modernization is gradually eroding traditional knowledge.

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Beyond Islamabad, ethnobotanical surveys across Pakistan reinforce the pharmacological potential of native flora. Studies in Harighal, Azad Jammu & Kashmir (2020) documented 150 medicinal plants with high informant consensus for digestive ailments [6]. In Dir Upper, Khyber Pakhtunkhwa, 91 species were catalogued, with Asteraceae emerging as the dominant family used for medicinal, fodder, and fuel purposes [7]. High-altitude studies in Lotkuh, Chitral recorded 150 species, including novel endemic taxa with unique medicinal uses [8]. Collectively, these studies highlight the ethno pharmacological richness of Pakistan's flora and its potential for drug discovery.

Globally, the importance of traditional medicine is very well recognized, according to World health organization around 80% of world population, especially in developing countries, rely on it for their basic health care [9]. Ethnobotanical information thus serves not only as a source of sustaining healthcare practices but also as a foundation for modern drug discovery, given that many pharmaceuticals are derived from plant-based compounds.

Although ethnobotanical surveys have been conducted in several peri-urban areas of Islamabad, Shah Allah Ditta village has received limited attention. Positioned at the interface of rural traditions and urban development, this community represents a unique case where indigenous plant-based knowledge is increasingly threatened by modernization. Documenting the ethnobotanical practices of Shah Allah Ditta is therefore significant not only for preserving local cultural heritage but also for identifying plant species with potential pharmacological applications. This study addresses this gap by providing the first comprehensive inventory of medicinal and multi-use plants in the village, thereby contributing to both conservation efforts and future drug discovery initiatives.

2. MATERIALS AND METHODS

2.1. Study area

Shah Allah Ditta is a centuries-old village located at the foothills of the Margalla Hills, between 33.71N latitude and 72.92E longitude. Meteorologically, the area falls in the far end of the monsoon zone (Figure 1).

The soil is Colluvial, wind deposited, dark brown to yellowish brown in color with a fine texture and well-developed profile. The climate is Sub-Tropical to Semi-Arid. The Average maximum and minimum temperatures of the area are 34.3 °C and 3.4 °C, respectively. The area receives a reasonably thick quantity of Monsoon rainfall up to 1200 mm per year [10].

Vegetation analysis of the study area revealed *Dalbergia sissoo*, *Acacia modesta,* and *Pinus roxburghii* as dominant trees, *Dodonaea viscosa* and *Lantana camar*a as dominant shrubs, and *Cynodon dactylon* as a dominant herb species. Soil is rich in nutrients, therefore most of the inhabitants are farmers by profession.

2.2. Data collection

The information about local names and traditional uses of plants was obtained from indigenous people through direct interviews via a semi-structured questionnaire. Respondents were selected using

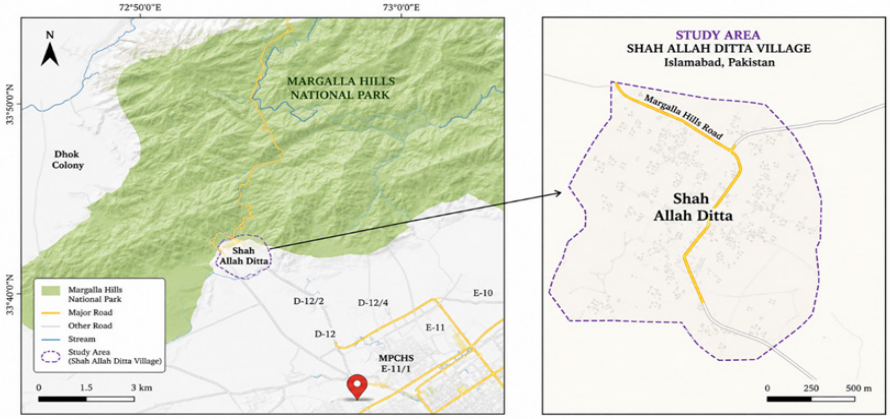


Fig. 1. Map showing the study area.

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stratified random sampling to ensure representation across gender (70 men, 30 women) and age groups (20-70 years). Only permanent residents with knowledge of local flora were included, thereby ensuring cultural relevance and reliability of information. Prior to interviews, informed consent was obtained from all participants. Interviews were conducted in the local language (Pothwari) to ensure clarity and cultural sensitivity. Confidentiality was maintained by recording responses without personal identifiers, and all procedures adhered to the ethical guidelines of Pir Mehr Ali Shah Arid Agriculture University. Field trips were arranged randomly. A questionnaire containing vernacular names of plants, parts used, methods of preparation, and administration was prepared.

Each specimen was preserved following standard herbarium protocols, freshly collected plants were pressed between blotting papers using wooden plant presses, regularly changed to prevent fungal growth, and dried under moderate sunlight or in a ventilated drying room. Once dried, specimens were mounted on herbarium sheets with adhesive strips, labeled with the scientific name, family, locality, collector, and date, and stamped with the institutional logo. The identified voucher specimens were deposited in the Herbarium of Pir Mehr Ali Shah Arid Agricultural University, Rawalpindi, for future record and reference (Figure 2).

2.3. Calculation of Use Value Index and Use Value Percentage

The ethnobotanical importance of each plant species was quantified using the Use Value (UV) Index and Use Value Percentage (UV%), following standard ethnobotanical practices [11].

2.3.1. Use Value Index (UV)

The UV index reflects the relative importance of a species based on the diversity of uses reported by informants. Each distinct use category (e.g., ethnomedicine, fruit, vegetable, fodder, fuel, other) was counted as one use report.

The UV for each species was calculated as:

$$UV = \Sigma Ui \div N$$

where (U_i) = number of use-reports for species *i*, and (N) = total number of informants interviewed. In this study, since the denominator was standardized, the UV index corresponds to the number of distinct uses recorded per species.

2.3.2. Use Value Percentage (UV%)

UV% expresses the relative weight of each species' use value compared to the total use values of all species documented. It was calculated as:

$$UV\% = (UV species \div \Sigma UV\ all\ species) \times 100$$

This allows direct comparison of species within the dataset, highlighting those with the highest ethnobotanical significance.

3. RESULTS AND DISCUSSION

Among 100 people questioned, a significant number of respondents comprised middle-aged



Fig. 2. Herbarium documentation and storage of plant specimens collected from Shah Allah Ditta village, Islamabad. Voucher specimens were pressed, dried, and mounted on herbarium sheets labeled with the institutional logo of Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi. The sheets were systematically organized and stored in herbarium cabinets for long-term preservation and reference.

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participants (30-50 years old), who made up 50% of the population. Respondents aged 20-30 years constituted 15%, while those aged 50-60 years and above 60 years were 35% (Table 1). In other words, it can be concluded that middle-aged people were most actively involved in this research, which is in line with the latest results obtained during ethnobotany studies in Azad Jammu and Kashmir and Gilgit-Baltistan [12, 13].

In total, there were 104 species that belonged to 44 different families (Figure 3). Herbs were dominant (46%), followed by trees (33%), shrubs (14%), and grasses (7%). The dominance of herbs can be explained by the presence of fertile soil in the foothills of Margalla. Likewise, in Sudhnoti District (Azad Jammu and Kashmir) [14] and Kutwal Haramosh Valley (Gilgit-Baltistan) [15], more than 70% of plants consisted of herbs. The predominance of herbs (46%) in Shah Allah Ditta aligns with findings from Harighal village [6], where herbs were also the most frequently cited category due to their accessibility and ease of preparation. However, unlike Thanda Pani [5], where shrubs contributed significantly to medicinal use, our study highlights a stronger reliance on trees and multipurpose species such as *Olea ferruginea* and *Morus alba*. This divergence may reflect the unique ecological setting of Shah Allah Ditta at the urban–rural interface, where traditional practices coexist with modern healthcare access.

Table 1. Age groups of the interviewees during the study.

Age group	Percentage of interviewees
20-30	15
30-40	25
40-50	25
50-60	15
60+	20

These three families were well represented with high ethnobotanical value. They have often been identified as the major families found in many ethnobotanical surveys in Pakistan because of their wide medicinal uses and high use value [1]. The presence of these families in Shah Allah Ditta confirms the national trend of the use of these plant families.

Many species were found to be multi-use plants, among which *Olea ferruginea* Royle had the maximum use value 2.64% (Table S1). Other widely cited plants include *Brassica compestris* L., *Cannabis sativa* L., *Cleome viscosa* L., *Carica papaya* L., *Morus alba* L., *Morus nigra* L., *Ficus carica* L., *Albizia lebbeck* (L.) Bth, *Melia azedarach* L., and *Sapium sebiferum* (L.) Roxb. Plants that belonged to these genera were used for medicines, food, fodder, timber, and fuel purposes. Similar use of multipurpose plants has been observed in Gilgit-Baltistan with species such as *Berberis lyceum* and *Punica granatum* [13].

Of all the documented plant species, 44% were used for medicinal purposes, while 17% served as

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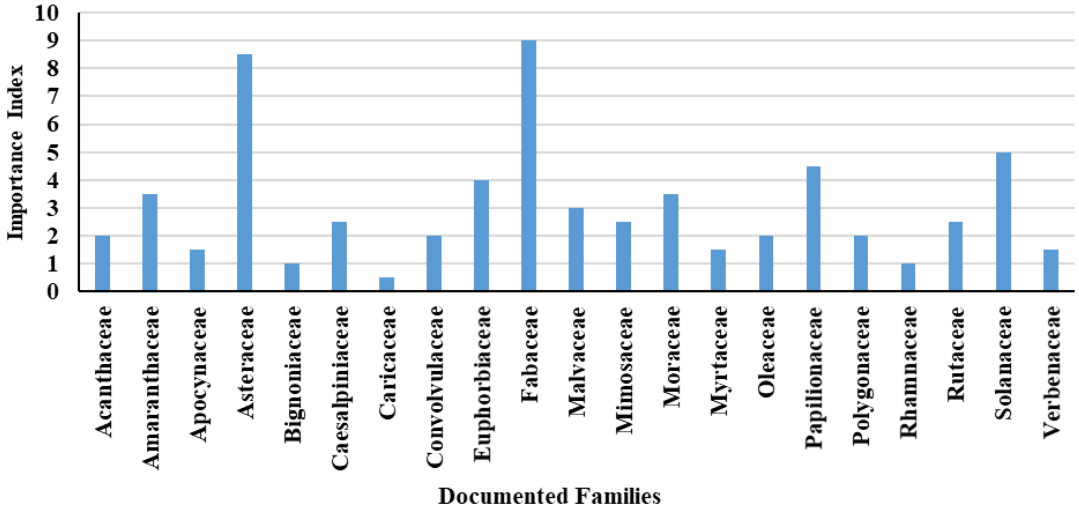


Fig. 3. Family importance index.

food resources. Approximately 26% were utilized as fodder and fuel, and the remaining 13% were employed for other applications. Figure 4 illustrates the proportional distribution of ethnobotanical applications among the documented species. The main illnesses for which these plants were found useful included colds and fever (19%), respiratory problems (12%), wounds (11%), and diseases related to the liver (6.3%) (Figure 5). Decoction was found as the most commonly used processing technique (42%), then extracts (17%), pastes (15%), powders (8%), and oils (6%) (Figure 6). This trend is supported by Shinwari *et al.* [16] and by current surveys highlighting decoction as the prevalent processing technique used in Pakistan.

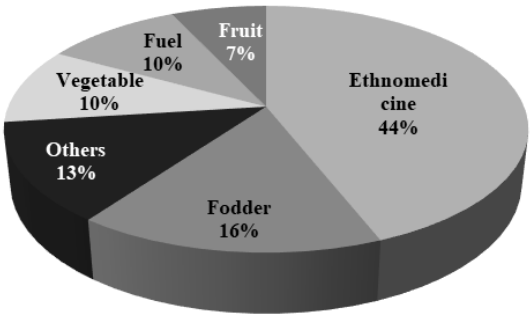


Fig. 4. Percentage of plant species used for different purposes.

Several species documented in Shah Allah Ditta exhibited distinctive medicinal applications. For example, *Justicia adhatoda L.* was uniquely cited for treating chronic asthma and bronchitis, while *Withania somnifera (L.) Dunal* was reported for its use in enhancing vitality and reducing stress. *Calotropis procera (Aiton) Dryand.* was employed in small doses for skin infections and wound healing, reflecting specialized local knowledge. These representative species illustrate the diversity and uniqueness of ethnomedicinal practices in the study area. Leaves constituted the largest percentage of plants used (39.6%), followed by stems (28.7%), roots (18.8%), and flowers (1.96%).

Results of the survey indicated that ethnobotanical knowledge had eroded generationally in the sense that the younger generation used hospitals for their health care needs more than those of the older generation. This is a concern that is common in Pakistan at the national

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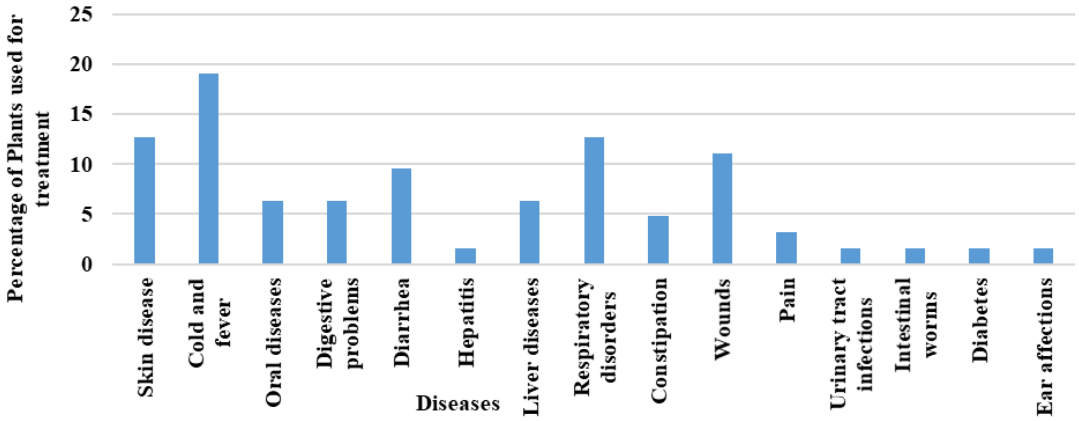


Fig. 5. Percentage distribution of plant species used for treating different health conditions in Shah Allah Ditta village, Islamabad.

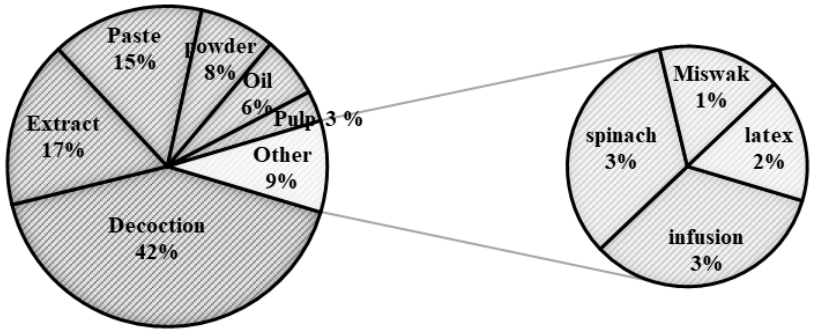


Fig. 6. Methods of usage of different plant parts in traditional medicine in Shah Allah Ditta village, Islamabad.

level, where modernization and change in land use have led to loss of indigenous knowledge [17].

The demographic structure of the respondents revealed that middle-aged people aged between 30 and 50 years constitute the main reservoirs of ethnobotanical knowledge in Shah Allah Ditta, whereas younger respondents reveal relatively lesser involvement in the ethnobotanical activities. This reflects a progressive trend in knowledge inheritance, wherein youth increasingly resort to contemporary medical systems rather than relying upon the ethnobotanical practices of their ancestors. A similar trend was also observed in other ethnobotanical studies conducted in Pakistan, for example, Azad Jammu and Kashmir [12], and Gilgit-Baltistan [18], where younger individuals exhibited relatively less knowledge regarding indigenous medicinal plants than elders.

Moreover, the floristic composition and usage pattern observed in the study site highlight an ethnobotanical dependency on indigenous plant diversity. In this case, herbs comprise 46% of the total flora, which is in line with the ecological settings of the Margalla foothills and is in accordance with the results of other studies in mountainous areas of Pakistan, wherein herbaceous plants prevail because of their availability [19]. The high occurrence of multi-use plant species like *Olea ferruginea* and *Boerhavia procumbens* and their extensive uses for various purposes, including medicinal, food, fodder, fuel, and timber indicate that they have great significance for the people's needs. The largest proportion of plants was used for medicinal purposes (44%), and decoction was the most common way of preparing the herbal remedies in the study area (Table S2). The common usage of plant leaves as the main plant part further highlights the sustainable exploitation of vegetation, as leaves are more easily available and renewable than roots and whole plants. In general, the results are in congruence with the ethnobotanical trends at the national level in Pakistan.

4. CONCLUSIONS

The present study revealed that village Shah Allah Ditta is an important village with rich vegetation and ethnobotanical values. Villagers are mostly farmers and have huge traditional and ethnobotanical knowledge. Traditional knowledge is dwindling rapidly due to alterations towards western culture, other cultural changes within the community, modern agricultural practices, rapid shift towards allopathic medicine, and the establishment of housing colonies. Modern education leads to obliteration of not only the habitats of plants, but also causes the vanishing of indigenous knowledge in the area. One of the major threats to traditional knowledge is less interest of the younger generation. As a result, assembling and collecting indigenous knowledge as written documents would be useful for the community. The government agencies, such as the Ministry of Climate Change, Capital Development Authority (CDA), and Pakistan Environmental Protection Agency (Pak-EPA), together with NGOs including WWF-Pakistan and IUCN-Pakistan, should play significant roles in supporting ethnobotanical and ethnopharmaceutical studies to collect and preserve crucial indigenous knowledge before it disappears. These organizations can give conservation priority to identified threatened medicinal plants and promote both in situ and ex situ conservation strategies to safeguard Pakistan's rich ethnobotanical heritage.

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6. ETHICAL STATEMENT

This study did not involve any human or animal subjects; therefore, ethical approval is not required.

7. CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript. All authors have contributed equally to the study and have no financial or personal relationships that could have influenced the work reported in this paper.

8. FUNDING

No funding was received to conduct this research.

9. AUTHORSHIP CONTRIBUTION STATEMENT

Kulsoom Zahara designed the study, conducted field surveys, collected ethnobotanical data, and contributed to manuscript drafting. Ambreen Najaf assisted in data analysis, interpretation of results, and provided critical revisions to the manuscript. Yamin Bibi supervised the research, guided methodology development, and finalized the manuscript for submission. All results were interpreted solely by the authors themselves; only artificial intelligence-based tools were used for English language refinement. All authors have read and approved the final version of the manuscript.

10. DECLARATION

The authors declare that the results presented in this manuscript are original and that the same material has neither been published previously nor is currently under consideration for publication elsewhere. All authors have approved the final version of the manuscript and agree to its submission for publication. In case the article is accepted for publication, its copyright will be assigned to the Pakistan Academy of Sciences. The authors confirm that, where necessary, permission has been obtained to reproduce copyrighted material from other sources and that no copyrights have been infringed.

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