Indian Journal of Traditional Knowledge
Vol 23(9), September 2024, pp 821-830
DOI: 10.56042/ijtk.v23i9.5643

Utilizing traditional medicinal plants to address health issues and enhance sustainable community wellbeing

Tauseef Anwar[a,*], Huma Qureshi[b], Wajid Zaman[c,*] & Walid Soufan[d]

[a]Department of Botany, The Islamia University of Bahawalpur, Bahawalpur 63100, Pakistan
[b]Department of Botany, University of Chakwal, Chakwal 48800, Pakistan
[c]Department of Life Sciences, Yeungnam University, Gyeongsan 38541, Republic of Korea
[d]Plant Production Department, College of Food and Agriculture Sciences King Saud University, Riyadh 11451, Saudi Arabia
[*]E-mail: tauseef.anwar@iub.edu.pk, wajidzaman@yu.ac.kr

Received 05 September 2023; revised 14 May 2024; accepted 19 June 2024

The practice of using plants in traditional remedies, drawing from age-old knowledge to treat various illnesses, falls under the scope of ethnobotany. The current research aimed to report traditional medicinal herbs that locals used to treat various diseases in Ahmedpur East, Pakistan. GPS data was used to capture the whole survey area. All plant specimens were preserved in the herbarium. The collected data was in demographic form. The native names of the plants, their purposes, parts used and techniques for preparing medicines as well as other pertinent information were gathered. The current study involved interviewing 300 informants (25 females, 275 males). The study identified wild medicinal plants from 15 families with Amaranthaceae and Brassicaceae being the most prevalent. The study revealed that leaves were the primary plant part used medicinally, accounting for 65% of remedies. Informant Consensus Factor (ICF) scores ranged from 0.52 to 0.96, while Fidelity Level (FL) was observed between 66% to 96%, indicating the community's agreement on the plants' medicinal efficacy. Notably, species like *Aerva javanica*, *Melilotus indicus*, and *Cannabis sativa* achieved the highest Use Value (UV) of 0.93. Comparative analysis using the Jaccard Index showed varying plant use patterns across different regions, emphasizing the unique ethnobotanical landscape of each area. The findings highlight local populations' rich traditional plant knowledge, suggesting potential avenues for phytotherapeutic chemical discovery and new treatments.

Keywords: Ethno-flora, Indigenous medicine, Healthcare, Plant-based treatments, Phytotherapeutic

IPC Code: Int Cl.[24]: A61K 36/00

Ethnobotany studies how plants are used locally for food, medicine, construction, etc. Preserving this traditional plant knowledge is crucial for future generations. It requires an interdisciplinary understanding, merging botany and medicine[1]. Plants harbor beneficial secondary metabolites, serving as potential sources for organic medicines and insecticides due to their innate defense mechanisms[2]. Pakistan's diverse plant life is vital for its rural healthcare. Approximately 600-700 plant species are used in the country's traditional medicine system[3].

Throughout history, medicinal plants have offered affordable health solutions, harnessing natural compounds for healing. Despite modern medical progress, traditional plant-based therapies remain essential[4]. Today's pharmaceuticals often have roots in traditional plant sources, leading researchers to investigate herbal remedies further. As the pharmaceutical industry faces high costs and side effects, there is a renewed focus on these ancient treatments, which many people worldwide rely on[5]. Compounds in plants such as alkaloids, flavonoids, and tannins are known for their therapeutic benefits. Apart from their therapeutic values, they also provide essential nutrients[6]. Sacred groves and protected patches of forests play a significant role in preserving such medicinal plants, emphasizing their socio-cultural importance[7]. Sub-Saharan Africa heavily relies on plant-based medicines, with herbalists often surpassing conventional doctors in prominence. Despite considerable research on medicinal plants, a substantial portion remains unexplored, suggesting considerable potential for drug development[8].

For centuries, humans have relied on plants and animals for essential needs. Even in developed nations, a large portion of the population still turns to traditional or alternative treatments. Globally, around

[*]Corresponding author

80% of people rely on traditional medicine for their primary healthcare needs. This highlights the importance of plant-based remedies[9,10]. Countries like Pakistan with a rich diversity of plant species have traditionally relied on herbal treatments for health concerns, particularly in its rural and tribal regions[11,12]. Pakistan is endowed with an abundance of wild plants that are used for medical purposes. While there are claims of over 5,700 medicinal plant species, only about 372 of them are native plant species[13]. There are over 456 medicinal plants in active trade that are used in over 350 traditional formulas to cure several diseases[14]. While Pakistan is home to a myriad of medicinal plant species, there is a need for comprehensive documentation and research to preserve and tap into this rich traditional knowledge, particularly as some of it faces the risk of being lost to time[15].

Traditional usage of medicinal plants encompasses a diverse array of therapeutic applications deeply rooted in local knowledge and cultural practices. For instance, *Chenopodium murale* finds traditional use as an anti-inflammatory agent and remedy for digestive ailments, while *Aerva javanica* is revered for its diuretic properties, often employed to address urinary tract infections and kidney stones. *Cannabis sativa*, is used for pain relief, relaxation, and appetite stimulation, reflecting its longstanding medicinal significance. Similarly, *Melilotus indicus* is sought after for respiratory ailments, leveraging its anti-inflammatory properties. *Azadirachta indica* stands out for its multifaceted medicinal uses, ranging from skincare to combating infections. These examples emphasize the rich tradition of harnessing plant-based remedies within local healthcare systems, highlighting the importance of preserving and further exploring such ethnobotanical knowledge for the benefit of future generations[16].

In this research, some important wild ethnomedicinal plant species and their novel uses were reported in Ahmedpur East. Following, were the objectives of this study: 1. To identify the plants that are used by locals for medicinal purposes: 2. To determine the association of the occurrence of plants with ethnobotanical data by using various quantitative ethnobotanical indices. 3. To compare the documented data in the current study with published literature from adjoining areas. 4. To compare data with published literature to determine the novel species of Ahmedpur East.

Materials and Methods

Study area

Ahmedpur East, located in Punjab, Pakistan, boasts a rich historical and cultural heritage. It lies in the southern part of Punjab, adjacent to the Cholistan Desert. Its arid climate features scorching summers exceeding 40°C and mild winters, with minimal rainfall, mostly during the monsoon season. Despite these harsh conditions, the region hosts a diverse flora adapted to desert life. These resilient plants play a vital role in traditional medicine, highlighting the close relationship between Ahedpur East's environment and its people. This unique blend of nature, culture, and challenging climate makes Ahmedpur east an ideal location for ethnobotanical research (Fig. 1).

Field surveys and medicinal plants' collection

Weekly visits were undertaken to local communities within the study area to document the ethnobotanical uses of plant resources, accompanied by the collection of plant specimens. Prior ethical approval for the study was obtained from the Ethics Committee of The Islamia University of Bahawalpur, Bahawalpur. Adherence to ethical guidelines outlined by the International Society of Ethnobiology (http://www.ethnobiology.net/) was strictly followed throughout the study. Information about the plants was gathered through structured interviews with various residents, including herbal practitioners, shopkeepers, pansars, farmers, and wood vendors, utilizing a predefined questionnaire. No coercion was exerted on informants to participate, and all participation was voluntary. Individuals who declined to participate were excluded from the study. Data collection was conducted with due respect to confidentiality, anonymity, and informed consent, with respondents briefed on the study's objectives before the interviews. Collected plant specimens were promptly pressed between blotting papers to prevent deterioration, and upon drying, were affixed to herbarium sheets. Plant identification was facilitated using resources from the Pakistani flora database (http://www.efloras.org)[17]. Each herbarium entry was labeled with regional, scientific, and familial names deposited in the Department of Botany's public herbarium for future reference.

Quantitative ethnomedicinal analysis

The primary data collected during the survey was analyzed quantitatively by using the below-mentioned indices.

Informant consensus factor (ICF)

Informant consensus factor be applied to verify the agreement among participants and plants used for particular disease groups. It was calculated by using formula[18]:

$$ICF = \frac{Nur - Nt}{(Nt - 1)}$$

Where Nur is use reports for a particular disease group, and NT is the total species used for this disease group. The high value (approaching 1) reflects that plant species are chosen according to specific criteria and information between participants is highly exchanged. While a low value (approaching 0) reflects that plants are selected randomly and information is not exchanged between participants.

Use value (UV)

It is a quantitative assessment of the relative importance of locally recognized plant species, and was determined by using the given formula[19]:

$$UV = \sum \frac{Ui}{N}$$

Where Ui is the total uses cited by each participant for given species and N is the total number of participants.

Fidelity level (FL)

It illustrates the most popular species used to cure a certain condition. It was calculated by using the given formula[20]:

$$FL\ (\%) = \frac{Np}{N} \times 100$$

Whereas Np is the participant number that cites plant use for treating specific disease and N is the total number of participants citing plant species for any ailment.

Jaccard index (JI)

It was determined by comparing the documented data with already published research from adjoining areas at a regional and global level to determine the novelty of the work. It was determined by using the given formula[21]:

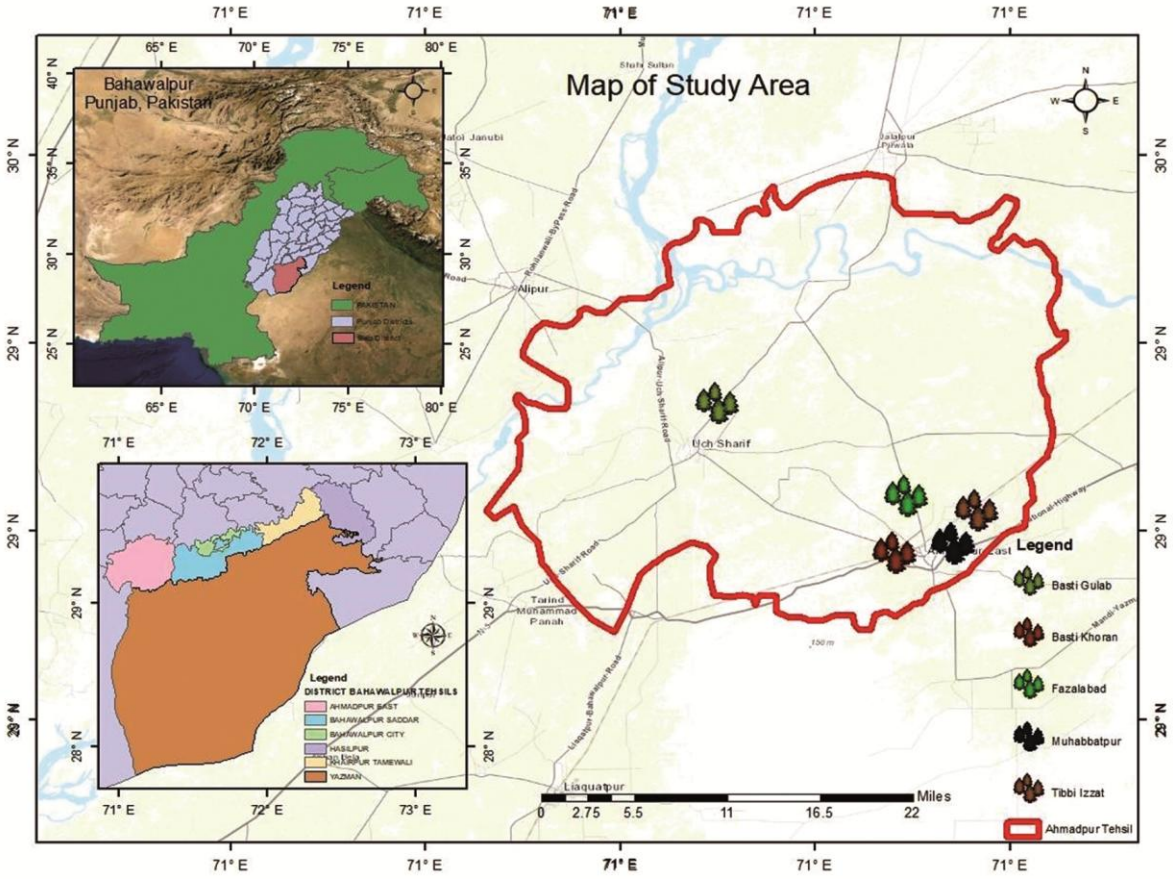

Fig. 1 — Study locations in Ahmedpur East, Punjab, Pakistan (Source: self-drawn)

$$JI = \frac{c \times 100}{(a + b) - c}$$

Where "a" are species of the study area, "b" are species of adjoining area and c are mutual plant species in both areas.

Results and Discussion

Socio-demographic data of informants

We interviewed 300 participants with a male majority (275 men and 25 women). Due to cultural dynamics like gender inequality and societal norms, ethnomedicinal knowledge is often transferred through males. However, women displayed a profound understanding of ethnomedicinal plants. Respondents aged over 60 demonstrated the most extensive understanding of medicinal plants. The knowledge of the elderly was more profound than that of the younger participants, underscoring the vast traditions and expertise of the older generation compared to the evolving practices of the younger cohort[22]. Interestingly, a majority (68%) of the most knowledgeable participants were illiterate. Conversely, individuals with formal education frequently leaned towards allopathic medicine, moving away from traditional plant-based treatments[20]. Farmers (56%) were primary custodians of traditional knowledge (Table 1). Traditional health practitioners, mainly Hakeems played a pivotal role in community healthcare[23,24].

Indigenous medicinal plants' diversity

Twenty plant species from 15 different families were recorded. The Amaranthaceae family was prominent, succeeded by Compositae, Fabaceae, and Brassicaceae (Fig. 2). The medicinal properties of these families can be linked to their abundant metabolite content. Studies from the Mandi Ahmad Abad district highlighted its abundant plant forests. Recognized for its farming endeavors, the region possesses an array of medicinal plants that locals use for various reasons. Poaceae was the dominant family, succeeded by others such as Solanaceae and Cucurbitaceae. In the Haripur District of KPK, an impressive 50 distinct plant families were recognized, showcasing its diverse flora. In contrast, our research cataloged 20 plants spanning 15 families. Lamiaceae emerged as the predominant species in this district among others. In the Buner district and Chinglai Valley, there was a notable range comprising 66 genera, 80 species, and 46 families[24]. Another investigation highlighted the dominance of herbaceous species, driven by the increased moisture content in mountain regions. This global trend of herbaceous species taking the lead due to specific ecological conditions is widely recognized[19].

Table 1 — Socio-demographic data of informants

Variation	Category	Number	Percentage
Gender	Male	275	92%
	Female	25	8%
Age	41-50	81	27%
	51-60	39	13%
	Above 60	180	60%
Educational Background	Primary	206	68%
	Middle	57	19%
	Above Matric	37	13%
Occupation	Farmer	169	56%
	Pansars	75	25%
	Herbalist	31	11%
	Others	25	8%

Life span of the ethnomedicinal flora

According to the current study data, 46% of plants are identified as annual, 39% are identified as perennial and 15% are identified as biennial. Based on the data *Acacia senegal*, *Asphodelus tenuifolius*, *Cannabis sativa*, *Chenopodium album*, *Linum usitatissimum*, *Melilotus indicus*, *Picnomon acarna*, *Sisymbrium irio*, *Solanum nigrum* and *Spergula arvensis* were identified as annual plants. *Melilotus albus* and *Aerva javanica* were identified as biennial plants. The plants identified as perennial were *Teucrium chamaedrys*, *Verbena bonariensis*, *Sonchus asper*, *Moringa oleifera*, *Malva sylvestris*, *Lepidium didymum*, *Chenopodium murale* and *Azadirachta indica* (Fig. 3).

Plant part(s) used in ethnomedicinal remedies

Various plant parts are used to address distinct ailments. Leaves were incorporated in 65% of the

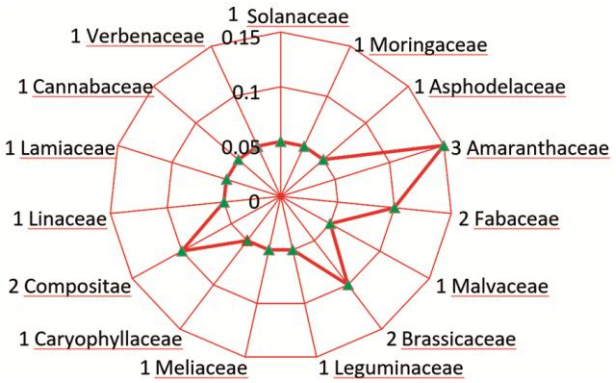

Fig. 2 — Indigenous medicinal plants' diversity

remedies while other plant components were sourced for the remaining 35% (Fig. 4). Being plentiful and readily available, leaves are recognized to be rich in bioactive compounds that can be easily extracted, which enhances their medicinal potential. After leaves, roots are favored because of their abundance of therapeutic ingredients[23].

Methods of preparation of ethnomedicinal remedies

In the current research, 45% of the plants were found to be juiced, 34% were found to be boiled, and 9% were found to be powdered from parts like seeds, stems and leaves while varied treatments including teas and extraction methods were applied to the remaining 12% (Fig. 5). Often extracts are formed by combining certain plant parts with substances like honey, soup, milk or water. The effectiveness of these remedies can be enhanced by heating as this stimulates their metabolic components[24]. Especially in high-altitude areas during winter, dry powder is observed to be popular, likely influenced by the cold, dry climate[25]. In a study from Mandi Ahmad Abad, it was noted that a range of preparations were made using local plants, including infusions, decoctions, and poultices. Fresh herbs were predominantly chosen (22.5%) followed by the use of powdered forms (17.5%) and freshly cooked ones (11.3%). *Acacia nilotica* flowers were specifically used for leucorrhea and *Cassia fistula* seeds were used for digestive concerns[1]. A survey was conducted in Toli Peer National Park in Jammu and Kashmir, where the common use of decoctions, juices, powders, and pastes in medicinal mixtures was revealed[16]. In Hafizabad district various preparation methods were embraced, including being decocted, extracted and ashed. The most favored were powders, juices and pastes followed by techniques like being decocted and infused[20].

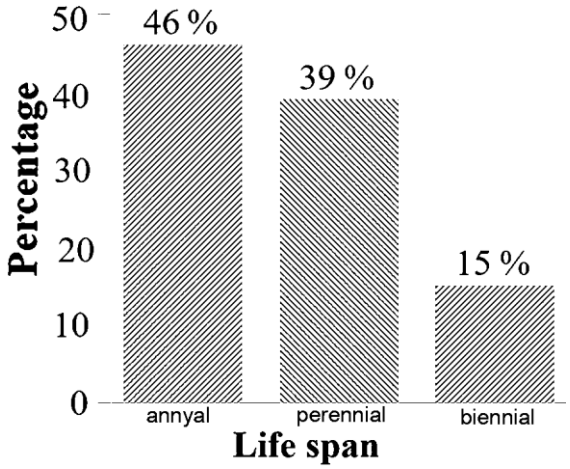

Fig. 3 — The life span of the ethnomedicinal flora

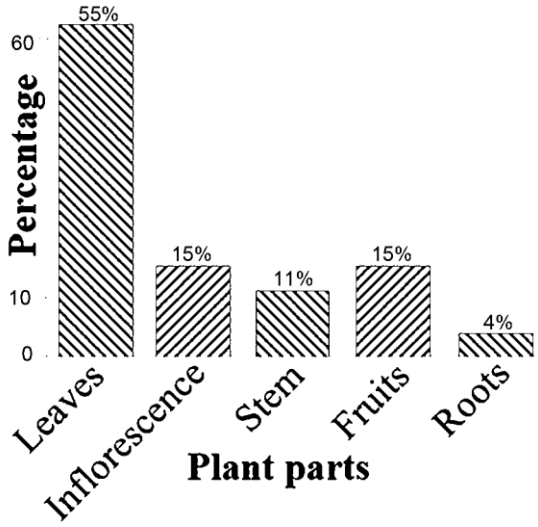

Fig. 4 — Plant part used in ethnomedicinal remedies

Quantitative analysis of ethno-medicinal data

***Informant consensus factor* (*ICF*)**

The residents use plants to combat numerous health issues. These issues have been grouped into 20 categories, inspired by the WHO's international disease taxonomy, yet they've been adjusted to reflect both the community's consensus and the specific ways plants are used locally. The ICF scores for these health challenges were found to range from 0.52 to 0.96 (Table 2). A community-wide agreement on specific plants for certain ailments is highlighted by the high ICF in the current study. Muscle, cardiac and high blood pressure issues were identified with ICF

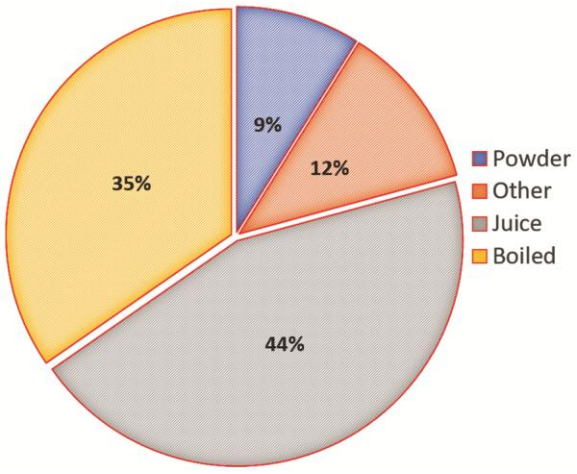

Fig. 5 — Methods of preparation of ethnomedicinal remedies

scores of 0.96 with plants like *Acacia senegal* and *Moringa oleifera* often being used. Diverse ICF scores were observed for other health concerns such as fever, joint discomfort and inflammation. A score of 0.52, the lowest, was recorded for thyroid conditions. When our results were compared with past research, it was indicated by a Rawalpindi survey that there were lesser ICF values for skin, fever, cardiac and muscular conditions. Elevated ICF scores for similar ailments were displayed by research from the Garam Chashma Valley, Chitral, Pakistan[22]. In the Thar Desert (Sindh), the values for muscle, skin, and heart ailments were found to be lower than our findings[26]. Scores in line with ours were shown by the Sudhnoti district, AJK, Pakistan[17]. Our research's ICF values were set against those from the Mandi Ahmad Abad district, Okara outcomes. Conditions like hepatitis and stomach ulcers were highlighted in their study, with leucorrhea found to have an ICF of 0.89 and vomiting at 0.86[1]. Reduced ICF values for ailments like wounds and fever were reported by the Chinglai Valley, Buner district research, a trend that was also reflected in the Sudhnoti District and Mastung, Balochistan. The findings from the Hafizabad district aligned with our results. They grouped health concerns into 11 categories, with skin issues emerging as a prominent concern. Gastrointestinal and dermatological conditions were identified by their study as the primary concerns in the area[20]. Their findings reported an average FIC of 0.17, reflecting results from previous Pakistani studies. Gastrointestinal issues were notably emphasized in their data, similar to what was observed in the Chenab riverine area[13].

Fidelity level (FL)

Plants are used by local inhabitants to address a myriad of health issues. In our study, the FL values were observed to range between 66% and 96% (Table 3). The highest FL of 96% for treating stomach pain was observed for *Chenopodium murale*. High fidelity levels were also displayed by species like *Aerva javanica*, *Cannabis sativa* and *Melilotus indicus* at 93%. A high FL is suggested to indicate extensive local use of a particular plant for treatments, while a low FL is denoted to indicate less frequent use. The lowest FL for inflammation was observed to be 66% for *Solanum nigrum*. When our findings are compared with other studies, variations in FL values become evident. For example in a study conducted in Rawalpindi, FL values for certain ailments were found to be significantly lower than ours[21]. On the other hand FL values for diseases in a study from the Thar Desert were shown to be higher compared to our results[26]. The relevance of plants like *Chenopodium murale* and *Aerva javanica* in local treatments was underscored by our study. The importance of other plants in their respective regions was highlighted by studies in Garam Chashma Valley and Rawalpindi. The variation in FL values between different studies might be attributed to differences in local preferences and the availability of plants. High FL plants as

Table 2 — Informant Consensus Factor (ICF)

Diseases	ICF
Heart problem	0.96
High BP	0.96
Muscles problem	0.96
Ulcer	0.91
Fever	0.87
Diabetes	0.87
Bronchitis	0.86
Kidney stone	0.86
Wounds	0.86
Cancer	0.86
Asthma	0.83
Skin diseases	0.83
Stomach pain	0.83
Liver problem	0.83
Diuretic	0.78
Allergy	0.76
Inflammation	0.75
Joint pain	0.63
Digestive problem	0.58
Thyroid problem	0.52

Table 3 — Fidelity Level (FL %)

Species	Diseases	Fidelity Level
Chenopodium murale	Stomach pain	96
Aerva javanica	Asthma	93
Cannabis sativa	Digestive problem	93
Melilotus indicus	Allergy	93
Asphodelus tenuifolius	Diuretic	86
Azadirachta indica	Diabetes	86
Chenopodium album	Digestive problem	86
Lepidium didymum	Cancer	86
Linum usitatissium	Diabetes	86
Melilotus albus	Ulcer	86
Spergula arvensis	Diuretic	86
Teucrium chamaedrys	Fever	86
Verbena bonariensis	Asthma	86
Acacia senegal	Wounds	80
Malva sylvestris	Inflammation	80
Moringa oleifera	High blood pressure	80
Picnomon acarna	Allergy	80
Sismbrium irio	Liver problem	80
Sonchus asper	Fever	80
Solanum nigrum	Inflammation	66

mentioned in other studies, can be either used independently or combined with others. Such plants have been identified as prime candidates for further ethnopharmacological research to confirm their efficacy[27]. For ailments like liver infections and asthma[13] in the Chenab Riverine Area, high FL values were shown by certain plants. A high FL indicates the widespread use of a particular plant to tackle common local health issues. The need for ongoing research to recognize and comprehend the significance of plants with high FL values for treating specific ailments in different areas is emphasized[28].

Jaccard index (JI)

Ethnomedicinal practices across different regions were compared, illuminating the pivotal role of traditional knowledge influenced by historical, ecological, sensory and phytochemical factors. This study's findings were contrasted with 20 other investigations from adjacent areas (Table 4). Such disparities are suggested to imply an ecological divide between these regions, leading to species differentiation and habitat alterations. Usage similarities were found to range from 0% to 18.8%, while differences were observed to range between 0% and 11.53%. The JI was noted to fluctuate between 0 and 15.78, where higher scores are understood to signify a greater overlap in flora and ethnomedicinal traditions. Several plant applications previously undocumented in this area were revealed by our analysis. For instance, leaves of *Solanum nigrum* were identified as remedies for cancer and ulcers and leaves of *Moringa oleifera* were found to be recommended for asthma and digestive issues. Such findings suggest potential avenues for thorough pharmacological and phytochemical research to develop new therapeutic solutions[29].

Use value (UV) and Novelty index

In this study, we used quantitative indices to assess ethnomedicinal data. The UV ranging from 0.73 to 0.93 served as a measure for the relative importance of plant species to local communities (Table 5). The species *Aerva javanica*, *Melilotus indicus* and *Cannabis sativa* topped the list with UV values of 0.93. Interestingly, the plants most frequently reported by users consistently matched those with the highest UV scores. The plant *Sonchus asper* recorded the least UV of 0.7. High UV scores suggest that the respective plants are regularly used and esteemed for their therapeutic qualities by the community. Past studies have implied that such commonly used plants could offer tangible pharmacological advantages. Conversely, a lower UV doesn't necessarily deem a plant ineffective, but it may be less recognized among the community. It's recommended that plants with notable UV values be subjected to further pharmacological and phytochemical tests to determine their medicinal potential. When juxtaposing our findings with earlier research, we gained perspective on the comparative importance of these plants in different locales. For example, a study from the Cholistan Desert, Punjab, Pakistan indicated lower UV values for some plants compared to ours[28]. Similarly, the Lakki Marwat District of Pakistan and the Haripur District, Khyber Pakhtunkhwa, Pakistan presented UV values somewhat less prominent than those in our study[24]. Our analysis highlighted certain plants as particularly esteemed by the locals for their medicinal attributes. Their dominant use values reveal their crucial role in age-old medicinal practices suggesting local familiarity with their benefits[30]. Comparing our data with earlier works emphasizes the diverse plant usage patterns across varied regions and groups, emphasizing each region's distinctive

Table 4 — Jaccard index

Area	SY	NPSU	NRPs	NPDU	TSCBA	PPSU	PPDU	JI	C
Comparison Studies Pakistan from Tehsils of Punjab									
Bahawalnagar	2006	56	3	1	4	5.35	1.78	16	29
Yazman	2019	45	2	4	2	4.44	4.44	5.55	31
Vehari	2013	77	3	3	6	3.89	0.03	12	32
Deragazi Khan	2023	47	3	4	5	6.38	8.51	16.6	33
Mianwali	2019	26	2	3	4	7.69	11.533	13.7	34
Hafizaabad	2017	85	3	3	6	3.52	3.52	9.09	20
South Punjab	2019	58	0	0	2	0	3.84	0	30
Jhang	2017	46	1	1	2	2.71	2.17	4.16	35

Study year (SY), Number of reported plant species (NRPs), Number of plants with similar uses (NPSU), Number of plants with different uses (NPDU), Total species common in both areas (TSCBA), Percentage of plant with similar uses (PPSU), Percentage of plant with different uses (PPDU), Jaccard index (JI), Citation (C)

Table 5 — Novelty index and ethnobotanical profile of plants from the area

Family	Botanical name	Local name	Parts used	Application	Uses	UV
Fabaceae	*Senegalia senegal* (L.) Britton	Kekar	Leaves	Oral	Stomach pain, muscle problem	0.8
Amaranthaceae	*Aerva javanica* Juss.	Bui	Leaves, seeds	Oral	Bronchitis, skin diseases	0.93
Asphodelaceae	*Asphodelus tenuifolius* Cav.	Bhukal	Seeds	Topical	Diuretics, inflammation, liver problems, diabetes	0.86
Meliaceae	*Azadirachta indica* A. Juss.	Neem	Leaves	Oral	Diabetes	0.86
Cannabaceae	*Cannabis sativa* L.	Marijuana	Seeds, leaves	Oral	Digestive problems	0.93
Amaranthaceae	*Chenopodium album* L.	Bathu	Leaves	Oral	Stomach pain	0.86
Amaranthaceae	*Chenopodium murale* L.	Sowbane	Leaves	Oral	Asthma, stomach problems	0.96
Brassicaceae	*Lepidium didymum* L.		Stem, root	Oral	Allergy	0.86
Linaceae	*Linum usitatissimum* L.	Alsi	Seeds	Oral	Allergy	0.86
Malvaceae	*Malva sylvestris* L.	Mallow	Leaves, flower	Oral	Inflammation	0.8
Fabaceae	*Melilotus albus* Medik.	Sanji	Leaves	Topical	Liver problems	0.86
Meliaceae	*Melilotus indicus* (L.) All.	Sweet clover	Seeds	Oral	Allergy	0.93
Moringaceae	*Moringa oleifera* Lam.	Sohanjna	Seeds	Topical	Allergy	0.80
Compositeae	*Picnomon acarna* (L.) Cass.	Kendari	Leaves	Oral	Liver problems	0.8
Brassicaceae	*Sisymbrium irio* L.	Jungle sarson	Leaves, fruit	Topical	Bronchitis	0.8
Solanaceae	*Solanum nigrum* L.	Mako	Leaves	Oral	Diabetes, fever	0.66
Compositae	*Sonchus asper* (L.) Hill.	Sow thistle	Leaves	Oral	Fever, digestive problems	0.8
Caryophyllaceae	*Spergula arvensis* L.	Stickwort	Leaves, fruit	Oral	Diuretic, inflammation	0.86
Lamiaceae	*Teucrium chamaedrys* L.	Wall germander	Leaves	Oral	Fever	0.86
Verbenaceae	*Verbena bonariensis* L.	Purple top	Leaves	Topical	Skin diseases	0.86

ethnomedicinal characteristics[31,32]. These findings highlight the importance of documenting and preserving traditional knowledge while also highlighting the potential for further research into the pharmacological properties of indigenous medicinal plants. Overall, this study contributes to our understanding of the intricate relationship between humans and plants in healthcare traditions, emphasizing the continued relevance of ethnomedicinal practices in contemporary society.

Ayurvedic texts offer a rich repository of knowledge regarding the historical uses of medicinal plants, providing a solid foundation for understanding their therapeutic properties. In Ayurvedic texts, many of the plants mentioned in our study have been documented for their therapeutic properties, establishing a historical foundation for their medicinal use. For example, *Chenopodium murale*, known as Bathua in Ayurveda, has been traditionally used to treat digestive disorders and skin conditions. *Aerva javanica*, or Gorakhbuti, finds mention in Ayurvedic texts for its diuretic and anti-inflammatory properties. *Cannabis sativa*, or Bhang, has a long history of use in Ayurvedic medicine for various ailments, including pain management and neurological disorders. By integrating references to Ayurvedic texts, we can elucidate the enduring legacy of ethnobotanical practices and emphasize the continuity of traditional medicinal knowledge across generations. By elucidating the connections between modern ethnobotanical research and ancient healing systems like Ayurveda, our study can contribute to the preservation and propagation of traditional medicinal practices. Furthermore, it can stimulate further investigation into the pharmacological properties of indigenous medicinal plants, fostering a holistic understanding of their therapeutic efficacy.

Conclusions

This comprehensive research underscores the importance of preserving traditional plant knowledge, which plays a pivotal role in the well-being and healthcare of communities, especially in regions like Ahmedpur East in Pakistan. Our findings affirm that a myriad of plant species, such as *Aerva javanica*, *Melilotus indicus* and *Cannabis sativa* hold profound significance for local populations due to their therapeutic properties. This is especially pertinent in areas where traditional knowledge forms the backbone of healthcare practices. The quantitative indices, including UV, ICF, and FL, not only revealed the medicinal importance of these plants but also highlighted their prominence in the daily lives of the community members. It's evident that many plants, regardless of their UV values, hold potential pharmacological benefits which warrant further investigation. Moreover, by juxtaposing our research with past studies, the unique ethnomedicinal landscape of each region becomes more pronounced. Variability in plant usage across different

communities emphasizes the value of documenting, preserving, and understanding traditional knowledge in the modern era. Such endeavors not only conserve cultural heritage but also pave the way for novel therapeutic discoveries and solutions in the realm of organic medicine. As the world continues to grapple with health challenges, turning our gaze towards time-tested traditional knowledge, and integrating it with modern research methodologies, may hold the key to holistic and sustainable solutions.

Acknowledgments

This research was funded by the Researchers Supporting Project No. (RSP2024R390), King Saud University, Riyadh, Saudi Arabia.

Conflict of Interest

The authors declare that they do not have any conflict of interest.

Author Contributions

TA: Methodology, supervision, Experimentation, and data Curation; HQ: Validation and Software, writing, Investigation, drafting, statistical analysis, validation, and research design; WZ: writing, Software, Resource, research design, validation, data collection, drafting, statistical analysis; WS: writing, funding, statistical analysis, Resource, software, validation. All authors have read and approved the final manuscript and declare that they have no competitive interest.

Prior Informed Consent

Prior informed consent was obtained from all informants who voluntarily agreed to participate in the study.

Ethics Approval

All methods were performed according to International Society of Ethnobiology guidelines and regulations. We strictly adhered to the guidelines of the International Society of Ethnobiology (http://www.ethnobiology.net/). Information obtained from people, including photographs of human subjects, was gathered using the best practices for informed consent and human subjects regulations.

Data Availability

The author confirms that all data generated or analyzed during this study are included in this published article.

References

1 Munir M, Sadia S, Khan A, Rahim B Z, Nayyar B G, *et al*., Ethnobotanical study of Mandi Ahmad Abad, District Okara, Pakistan, *Plos one*, 17 (4) (2022) 26-35.

2 Farzana, Abid M & Hussain F, Screening of ethnomedicinal plants for their antifungal and nematicidal activities against soil-borne phytopathogens, *South Afr J Bot*, 147 (2022) 18-23.

3 Shah S A, Iqbal W, Sheraz M, Javed B, Zehra S S, *et al*., Ethnopharmacological study of medicinal plants in Bajwat Wildlife Sanctuary, District Sialkot, Punjab Province of Pakistan, *Evid-Based Complement Altern Med*, 2021 (2021) 5547987.

4 Habiba U, Nisar J, Choohan M A, Shah S M A, Nisar Z, *et al*., Antibacterial activity of Tris NaCl and PBS buffer protein extract of *Cassia fistula*, *Saccharum officinarum*, *Albizia lebbeck*, and *Cymbopogon citrates* against bacterial strains, *Dose-Response*, 19 (1) (2021) 1-9. doi: 10.1177/1559325821992239

5 Sarkar C, Mondal M, Khanom B, Hossain M M, Hossain M S, *et al*., *Heliotropium indicum* L.: From farm to a source of bioactive compounds with therapeutic activity, *Evid-Based Complement Altern Med*, 70 (1) (2015) 27-41. doi: 10.1155/2021/9965481

6 Rahmatullah M A, Das A K, Mollik M A, Rahmam T & Majeedul H, An ethnomedicinal survey of Dhamrai sub-district in Dhaka District, Bangladesh, *Am-Eurasian J Sustain Agri*, 3 (4) (2009) 881-888.

7 Ajaib M T, Ali T & Siddiqui M F, A survey of ethnobotanically important herbaceous plants of Tehsil Jatoi, District Muzaffargarh, Punjab, Pakistan, *Int J Biol Res*, 3 (2) (2015) 87-92.

8 Amjad M S, Qaeem M F, Ahmad I, Khan S U, Chaudhari S K, *et al*., Descriptive study of plant resources in the context of the ethnomedicinal relevance of indigenous flora: A case study from Toli Peer National Park, Azad Jammu and Kashmir, Pakistan, *PloS one*, 12 (2) (2017) 17-26.

9 Shuaib M, Hussain F, Rauf A, Jan M & Parvez R, *et al*., Traditional knowledge about medicinal plant in the remote areas of Wari Tehsil, Dir Upper, Pakistan, *Brazil J Biol*, 83 (2023) e246803.

10 Baidya S, Thakur B & Devi A, Ethnomedicinal plants of the sacred groves and their uses by Karbi tribe in Karbi Anglong district of Assam, Northeast India, *Indian J Tradit Know*, 19 (2) (2020) 277-287.

11 Ettebong E O, Ubulom P M & Obot D, A Systematic review on *Eleucine indica* (L.) Gaertn.: From ethnomedicinal uses to pharmacological activities, *J Med Plant Stud*, 8 (4) (2020) 262-274.

12 Ahmad S, Zafar M, Shinwari S, Ahmad M, Shinwari Z K, *et al*., Ethno-medicinal plants and traditional knowledge linked to primary health care among the indigenous communities living in Western hilly slopes of Dera Ghazi Khan, Pakistan, *Pak J Bot*, 52 (2) (2020) 519-530.

13 Umair M, Altaf M, Bussmann R W & Abbasi A M, Ethnomedicinal uses of the local flora in Chenab riverine area, Punjab province Pakistan, *J Ethnobiol Ethnomed*,15 (2019) 7.

14 Farooq A, Amjad M S & Ahmad I, Ethnomedicinal knowledge of the rural communities of Dhirkot, Azad

Jammu and Kashmir, Pakistan, *J Ethnobiol Ethnomed*, 15 (2019) 45.

15 Akhtar N, Rashid A, Murad W & Bergmeier E, Diversity and use of ethno-medicinal plants in the region of Swat, North Pakistan, *J Ethnobiol Ethnomed*, 9 (2013) 25.

16 Nawab M & Sherwani F, Understanding validation of traditional approaches to health: An analysis of research trends and the need for minimum standards- A systematic review, *Indian J Tradit Know*, 23 (3) (2024) 213-223.

17 Annonymous, http://www.efloras.org. Accessed on 14-03-2023.

18 Ismail S & Nisar M F, Ethnomedicinal survey for important plants of District Lodhran, Punjab, Pakistan, *BIOL E-J Life Sci*, 1 (2010) 52-58.

19 Jan H A, Wali S, Ahmad L, Jan S, Ahmed N, *et al*., Ethnomedicinal survey of medicinal plants of Chinglai Valley, Buner District, Pakistan, *Eur J Integr Med*, 13 (2017) 64-74.

20 Umair M, Altaf M & Abbasi A M, An ethnobotanical survey of indigenous medicinal plants in Hafizabad district, Punjab-Pakistan, *PloS one*, 12 (2017) e0177912.

21 Bibi T, Ahmad M & Tareen R B, Tareen N M, Jabeen R, *et al*., Ethnobotany of medicinal plants in District Mastung of Balochistan province-Pakistan, *J Ethnopharmacol*, 157 (2014) 79-89.

22 Shaheen S, Abbas S, Hussain J, Mabood F, Umair M, *et al*., Knowledge of medicinal plants for children diseases in the environs of district Banu, Khyber Pakhtunkhwa (KPK), *Front Pharmacol*, 8 (17) (2017) 430-445.

23 Ahmad K S, Hamid A, Nawaz F, Hameed M, Ahmad F, *et al*., Ethnopharmacological studies of indigenous plants in Kel village, Neelum valley, Azad Kashmir, Pakistan, *J Ethnobiol Ethnomed*, 13 (2017) 68.

24 Siddique Z, Shah G M, Ahmed H M, Nisa S, Khan A, *et al*., Ethno phytotherapy practices for wound healing among populations of District Haripur, KPK, Pakistan, *Evid-Based Complement Altern Med*, 19 (2019) 4591675.

25 Khan S U, Haroon A, Muhammad A, Mehmood S, Ullah I, *et al*., Ethnomedicinal plants used by local inhabitants in the prevention of gastrointestinal problems in low hilly areas of FR Bannu, Pakistan, *Pak J Weed Sci Res*, 22 (4) (2016) 617-625.

26 Yaseen G, Ahmad M, Sultana S, Alharrasi A S, Hussain J, *et al*., Ethnobotany of medicinal plants in the Thar Desert (Sindh) of Pakistan, *J Ethnopharmacol*,163 (2015) 43-59.

27 Ishtiaq M, Mahmood A & Maqbool M, Indigenous knowledge of medicinal plants from Sudhanoti District (AJK), Pakistan, *J Ethnopharmacol*,168 (2015) 201-207.

28 Ahmed N, Mahmood A, Mahmood A, Tahir S S, Bano A, *et al*. Relative importance of indigenous medicinal plants from Layyah district, Punjab Province, Pakistan, *J Ethnopharmacol*, 155 (1) (2014) 509-523.

29 Nisar M F, Jaleel F, Haider S M, Toor Y, Ismail S, *et al*., Exploration of ethno-medicinal plants and their ritual uses in Bahawalnagar, Pakistan, *Middle East J Sci Res*, 21 (9) (2014) 1466-1471.

30 Ahmed N, Anees M & Zhang L, An appraisal of ethnobotanical investigation of indigenous flora from a high temperature affected area in the Southern Punjab, Pakistan, *Pak J Bot*, 51 (4) (2019) 1493-1506.

31 Fatima I, Munawar M, Iqbal S & Sadaf Z, Ethno-medicinal uses of wild herbs and shrubs of Tehsil Yazman, Punjab, Pakistan, *Pak J Agri Sci*, 56 (3) (2019) 735-741.

32 Nadeem M, Shinwari Z K & Qaiser M, Screening of folk remedies by genus *Artemisia* based on ethnomedicinal surveys and traditional knowledge of native communities of Pakistan, *Pak J Bot*, 45 (S1) (2013) 111-117.

33 Mustafa A, Hanif U, Sardar A A & Jan H A, Ethnomedicinal study of medicinal plants used by the population of Taunsa Sharif, Dera Ghazi Khan, Punjab, Pakistan, *Ethnobot Res Appl*, 26 (2023) 1-27.

34 Khan A N, Akram M A, Shaheen S, Huda N U, Nawaz M S, *et al*., Medicinal Flora flora of Sawans Valley Mianwali, Punjab Pakistan, *Int J Progress Sci Technol*, 16 (2) (2019) 207-211. doi: http://dx.doi.org/10.52155/ijpsat.v16.2.1286

35 Badar N, Iqbal Z, Sajid M S, Rizwan H M, Jabbar A, *et al*., Documentation of ethnoveterinary practices in district Jhang, Pakistan, *J Anim Plant Sci*, 27 (2) (2017) 398-406.