Assessment of diversity and cultural importance of wild Plants in district Sargodha, Punjab, Pakistan

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Research

Abstract

Background: The present study was conducted in the town of Miani, district Sargodha, Punjab to make an inventory of economically important plants and further assess their conservational status by documenting the indigenous knowledge of local communities, hakims, and plant experts. The locals have close contact with the neighboring plant resources.

Methods: Quadrat and line transect methods were used for vegetation sampling. Several parameters like plant availability, exploitation level, and conservation efforts were studied. After the primary survey, 19 important medicinal wild plants of the area were short-listed with the help of local inhabitants and hakims. 100 samples were collected from 4 sites.

Results: The most abundant species were *Artemisia absinthium* and *Cannabis sativa*. The cultural importance and conservational status of economic and medicinal plants in the area were also assessed. Major species of the study area belong to the family Asteraceae (19.05%). *Artemisia absinthium* has a higher plant density (0.12). *Cannabis sativa* has the highest significance factor and *Chenopodium album* has the 2nd highest value of the Cultural Significance Index (CSI) in the study area. *Cannabis sativa* has the highest significance factor and *Chenopodium album* has the 2nd highest value of CSI in the study area.

Conclusions: It is concluded that the area offers a high potential for plant resources and a rich tradition of indigenous knowledge about how to utilize these species but the economic potential should be channelized and explored because these species are usually treated as wild weeds.

Keywords: Wild Medicinal plants, Conservation, Economic importance, Cultural Significance Index (CSI), plant resources.

Background

The world has shown growing commercial interest in wild plants mainly because of their widespread cultural suitability and economic potential. Potentially medicine species are analyzed only less than 5% and the remaining 95% species of the plants still need to be analyzed (Shinwari *et al.* 2009). There is a variety in the human diet due to the availability of different cultivated and wild species of plants. Wild plant species contribute to the security of household food. The majority of humans use a limited number of plants as food but in many developing countries the use of many types of wild plants is essential (Cavender, 2006; Pieroni *et al.* 2007). Wild medicinal plants have a very significant role in the lives of local communities all over the world, particularly in developing countries. They play significant role in the lives of people as a source of fuel wood and uncultivated foods. Wild plants are used in medicines, poisons, dyes, fibers, shelter, and cultural and religious ceremonies (Heywood and Skaula, 1999). Nowadays medicinal species are being commercially used for many different extractions of various ingredients. Different herbs are used in the Ayurveda system of treatment and for the preparation of numerous homeopathic and modern allopathic drugs (Azhar, 2014).

A medicinal plant, regardless of whether it is whole or in its many components such as roots, stems, leaves, bark, flowers, fruits, or seeds, contains a variety of chemical compounds that could be employed in pharmaceutical businesses and as therapeutic agents (Azhar, *et al.* 2014; Azhar, *et al.* 2015). So many herbal and medicinal plants have enormous economic and therapeutic importance for the aboriginal people of Pakistan (Tan *et al.* 1998). Plants are still in use for various everyday life purposes such as food, clothing, firewood, cosmetics, medicine, building materials, ritual materials, craft materials, and local technologies (Mulyoutami *et al.* 2009).

Wild useful plants are disappearing near populated areas and this phenomenon is much more intense in developing countries with a rapid increase in population and expansion of residential and agricultural areas (Kala *et al.* 2004; Hameed *et al.* 2011; Azhar, 2014). The study area is not exempted from this situation. Therefore, the present study was designed to explore the economic importance of wild neglected herbaceous plants (medicinal) and further assess their availability in Town Miani, District Sargodha, Punjab. Some potentially marketable species may have a great threat of disappearing and may currently be on the verge of extinction. Further, the cultural importance and diversity of wild plants were also focused.

Materials and Methods

Study Area

Town Miani of District Sargodha was selected for the research during 2016. The soil is fertile alluvial and possesses a variety of wild plant due to the River Jhelum and adjoining canals. It is located nearly 70 km away from Sargodha city between Tehsil Bhera of district Sargodha towards tehsil Malakwal, district Mandi Bahau-ud-din. The distance of Miani is 10 km from Malakwal towards Bhera and 16 km from tehsil Bhera of district Sargodha towards tehsil Malakwal of district Mandi Bahau-ud-din. The railway station of Malakwal is one of the biggest railway stations in Pakistan. Bhera (tehsil of district Sargodha) is nearly 13km towards the west and the Bhera Motorway interchange is 16 km away from the Town of Miani. It is situated on the bank of river Jhelum only a few Kilometers away from Kheura salt mine on the salt mountains.

Climate

The climate of the study area is mostly the same as the overall climate of Pakistan; there are 4 seasons in the study area. The first season is a cool and dry winter mostly from December to February; the temperature reaches in winter 0 degree Celsius. The second is a pleasant spring from March to 15th May. The third one is a hot summer from May to September and fourth one is autumn. Weather condition for the growth of the plant is suitable mostly throughout the year except in severe winter and summer.

Data collection and Sampling

Data was collected from 4 different sites of town Miani and its surrounding areas economically important plants by using questionnaires. Two sites were from the Town of Miani (one site was River Jhelum bank near Ghoghiat, 1 km away from Miani towards the north side and the other site was a bank of canal half a km away from Miani towards the south sides). These two sites were suitable for herb sampling. The other two sites were from other two union councils as village Sumblanwala from union council no.5 Kot Ahmad Khan which is nearly one km away from Town Miani towards the east side. The other site was from Union Council no.6 Hazoor Pur. Two methods were used for plant sampling, one was the quadrant method of plant sampling and the other was the line transect method.
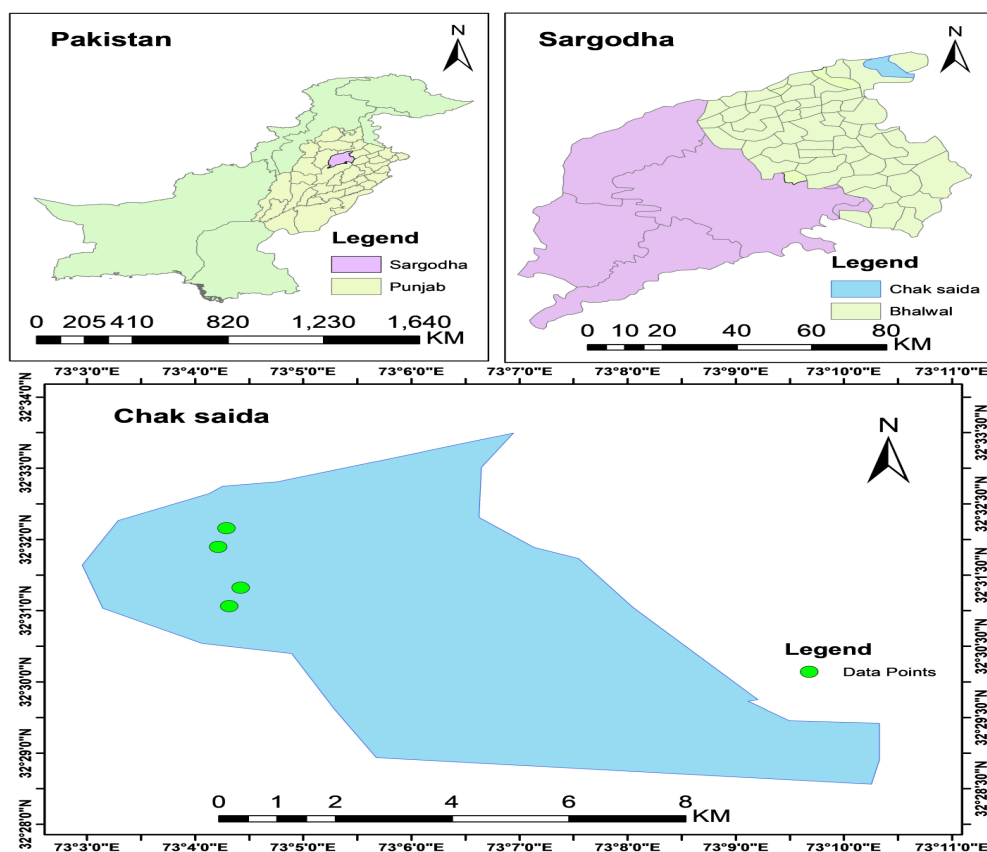
Figure 1. Study map showing data collecting sites.

Interviews

Interviews were conducted to record herbs' medicinal use and about the knowledge of collected plants from study sites. Interviews with the locals were scheduled during household surveys and personal interviews were also done with the medicinal plant experts (key informants, Hakims, etc.) of the study site area about different plant attributes. The interview was conducted in four different villages from three union councils. The villages were named as Sumblanwala, Miani, Hazoorpur, Gond Pur. From each village, 15 respondents were selected for the collection of information about the medicinal plants. Interviews were taken mostly from old ages men and farmers. 60 total persons were interviewed including fifteen hakims. Data collected through interviews was also verified by the local experts and hakims of town Miani.

Collection and Identification of Native Plant Species

We collected essential medicinal plants and their components throughout the field investigations. We marked these samples with their local names to guarantee correctness. We sought assistance from local experts for any plant species that were challenging to identify by analyzing plant components and/or photographs. We consulted taxonomists from the Department of Botany at the Department of Botany at The University of Lahore, Sargodha campus, Pakistan, to validate the scientific names and families of the described plant species. In addition, we investigated existing literature for additional validation. We pressed, dried, tagged, and mounted the plants on herbarium sheets to preserve them and submitted in the Herbarium of Department of Botany, The University of Lahore, Sargodha campus, Pakistan to acquire a voucher specimen number for future reference.

Analysis of data

Diversity of Medicinal Plants of the Study Area

The diversity of the collected plants was calculated by using the following equation.

Diversity of species (No. of species collected in sample / Total no. of individuals in sample)

Conservation Status

The inhabitant's perception about the conservational status of important medicinal plants was also recorded through field visits and consultation with the hakims, elders, and informed persons throughout the area. Several parameters like plant

availability, part collected, exploitation level, etc. were considered. While assessing conservation status of these plant species found in the study area IUCN protocols were followed.

Cultural Significance Index

The procedure described by Pieroni (2001) and adopted by Basir et al. (2015) was used to calculate the cultural significance index (CSI). Some scores have been given to calculate the index as shown in Table 3. These scores were given to plants according to the responses given by informants

$$CSI = (QI \times AI \times FUI \times PUI \times MFFI \times TSAI \times FMRI) / 100$$

Quotation Index (QI)
The QI represents the responses of informants about species.

Availability Index (AI)

This index represents the availability of the plants perceived by informants and is given a number according to availability.

Frequency of Use Index (FUI)

This index shows the frequency of the use of each plant. Interviewers answer the question "How often do you use?"

Part Used Index (PUI)

This index shows the use of plants either whole plants or parts of plants (Table 3).

Multi-Functional Food Use Index (MFFI)

This index represents the suitable food usage of each species.

Taste Score Appreciation Index (TSAI)

This index has the taste frequency of plants response by locals.

Food Medicinal Role Index (FMRI)

This index shows the response of informants to food medicine for plants.

Informant Consensus Factor (ICF)

The given formula for calculating the Fic is used as followed (Ali et al. 2023).

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

Where
ICF = Informants consensus factor, Nur = number of use citations in each category, and
Nt = number of medicinal plant species used.

Relative frequency citation (RFCs)

The FC value was calculated by using the below formula as used by (Ali et al. 2023).

$$RFCs = \frac{FCs}{N}$$

Where,
FCs is the number of informants who mentioned the use of a plant species and N indicates the total number of informants.

Fidelity Index (FI)

The FI of the species was calculated by using the below formula as used by (Ali et al. 2023).

$$FI\ (\%) = \frac{Ip}{Iu} \times 100$$

Where,
Ip is the number of respondents who reported the utilization of medicinal plants for a specific main ailment and Iu is the total number of respondents who mentioned the same plant for any ailment.

Results

Socio-economic characteristics are provided in Table 1. The data was collected mainly from the interviews of male respondents (n=45) due to socio-cultural and they are the family heads and socially more mobilized in earning activities. Most respondents are old (40-70 yrs.) and their main source of income is rearing livestock (n= 25) and agriculture (n= 18). The respondents who participated in the study are mostly illiterate (n=26). Due to a lack of awareness and education facilities, the literacy rate is very low. The main sources of livelihood of the respondents are farming (n=24), grazing livestock (n=21), and Hakim (n=15).

Table 1 Socio-economic Characteristics of the Respondents.

Characteristics	Categories	Sumblanwala	Miani	Hazoorpur	Gond Pur	Total
Gender	Male	11	9	12	13	45
	Female	4	6	3	2	15
	20-30	1	1	2	2	6
	30-40	1	3	5	2	11
Age class	40-50	3	5	7	3	18
	50-60	6	4	1	5	16
	60-70	4	2	0	3	9
	Labour	2	1	4	2	9
Source of Income	Agriculture	5	4	4	5	18
	Hunting	1	0	0	1	2
	Livestock	7	4	7	7	25
	Illiterate	7	8	7	4	26
Education	Primary	4	4	4	4	16
	Middle	4	3	4	7	18
Residence	Pre-Urban	6	4	6	5	21
	Rural	9	11	9	10	39
	Farming	7	5	6	6	24
Occupation	Hakim	4	3	4	4	15
	Grazing	6	4	6	5	21

Medicinal Plants Species of the Study Area

The present research was done in Miani and its surrounding areas and the species collected through quadrat and line transect methods. Table 2 shows the collected species from the study area with their common names, botanical names, and family.

Family wise species

The collected species are from 14 different families and each family has a different number of species. For example, 4 species are from the Asteraceae family 3 species are from the Solanaceae family 2 species are from Fabaceae. Table 2 shows family-wise species distribution of the collected species. Table 1 also shows the family-wise %age of the collected species. For example, 19.05% of species of the study area belong to the family Asteraceae.

Species Wise Diversity

Table 1 shows that a total of 100 individuals were collected from 4 sites. *Artemisia absinthium* has 12 plants out of 100. The density of *Artemisia absinthium* is 0.12 and the density of all other species is shown in Table 2. The table shows that *Artemisia absinthium* has the highest diversity figure as compared to other species. Similarly, *Anethum graveolens* shows the lowest diversity of about 0.01 which is minimum. The real focus is needed to conserve the species *Anethum graveolens.* If no more attention is provided it may reach to be the endangered species of the area.

Cultural Importance

The locals of the study site use plants for various purposes like medicinal purposes, as food, fodder, firewood, etc. Plants are great blessings for humans throughout the world. People mostly from rural areas depend upon plants to satisfy basic human needs like shelter, food, clothing, firewood and to cure different diseases. Different plants are used for the treatment of different diseases. *Chenopodium album* is mostly used as a food, *Cannabis sativa* is used for relaxation and *Calotropis procera* is used to heal wounds in the study area. Different uses of the most dominant species of the study are shown in Table 3. *Cannabis sativa*, *Withania somnifera*, *Calotropis procera,* and *Datura innoxia* have 100% medicinal uses while *Chenopodium album* is used as food 100% and as fodder 87.30%.

Table 2 Medicinal Plants Species Diversity.

Family	Species Name (Voucher No.)	Members	Total Members	Diversity	No. of Species	Species (%)
Cannabaceae	*Cannabis sativa* L. **DOB-UOL-765**	12	100	0.12	1	4.76
Chenopodaceae	*Chenopodium album* L. **DOB-UOL-766**	5	100	0.05	1	4.76
Asteraceae	*Onopordum acanthium* L. **DOB-UOL-767**	3	100	0.03	4	19.05
	Sonchus arvensis L. **DOB-UOL-768**	4	100	0.04		
	Artemisia absinthium L. **DOB-UOL-769**	12	100	0.12		
	Carthamus oxyacantha M. Bieb. **DOB-UOL-770**	6	100	0.06		
Fabaceae	*Medicago polymorpha* Roxb. **DOB-UOL-771**	4	100	0.04	2	9.52
	Alhagi maurorum Medik. **DOB-UOL-772**	7	100	0.07		
Fumariaceae	*Fumari aindica* (Hausskn.) Pugsley **DOB-UOL-763**	3	100	0.03	1	4.76
Solanaceae	*Withania somnifera* L. **DOB-UOL-774**	5	100	0.05	3	14.29
	Solanum nigrum L. **DOB-UOL-775**	6	100	0.06		
	Datura innoxia Mill. **DOB-UOL-776**	3	100	0.03		
Amaranthaceae	*Achyranthes aspera* L. **DOB-UOL-777**	6	100	0.06	1	4.76
Apocynaceae	*Calotropis procera* (Aiton) W. T. Aiton **DOB-UOL-778**	5	100	0.05	1	4.76
Euphorbiaceae	*Euphorbia hirta* L. **DOB-UOL-779**	4	100	0.04	2	9.52
	Ricinus communis L. **DOB-UOL-780**	2	100	0.02		
Zygophyllaceae	*Tribulus terrestris* L. **DOB-UOL-781**	5	100	0.05	1	4.76
Gentianaceae	*Gentiana chirayita* Roxb. **DOB-UOL-782**	4	100	0.04	1	4.76
Nyctaginaceae	*Boerhavia diffusa* L. **DOB-UOL-783**	3	100	0.03	1	4.76
Apiaceae	*Anethum graveolens* L. **DOB-UOL-784**	1	100	0.01	1	4.76
Poaceae	*Cynodon dactylon* (L.) Pers. **DOB-UOL-785**	1	100	0.01	1	4.76

Table 3 Cultural and Economic Importance of selected species.

Species	Common uses (%age)			
	Medicinal	Firewood	Food	Fodder
Cannabis sativa L.	100.00	-	-	-
Artemisia absinthium L.	87.30	-	-	39.68
Withania somnifera (Linn.)	100.00	-	-	-
Achyranthes aspera L.	47.62	-	-	36.51
Calotropis procera (Aiton) W. T. Aiton	100.00	17.46	-	-
Chenopodium album L.	55.56	-	100.00	87.30
Datura innoxia Mill.	100.00	-	-	39.68
Tribulus terresteris L.	39.68	-	-	31.75

Cultural Significance Index (CSI)

The cultural significance index of eight selected species was calculated as shown in Table 4. *Cannabis sativa* has the highest significance factor and *Chenopodium album* has the 2nd highest value of CSI in the study area. This shows that in society these two plants are utilized in excess. These are the most wanted plants for the people of the area. While *Tribulus terresteris* shows the lowest Cultural Significance Index of eight selected species. It shows that this plant is needed in very small quantity for use in society. It has the least economic importance.

Table 4 Cultural significance index (CSI) of selected species.

Species	QI	AI	FUI	PUI	MFFI	TSAI	FMRI	CSI
Cannabis sativa L.	63	4	4	2	1.5	7.5	4	907
Artemisia absinthium L.	55	4	3	2.5	0.5	5.5	1	45
Withania somnifera (Linn.)	63	3	3	2	1	4	2	91
Achyranthes aspera L.	30	2	2	2	0.5	5.5	1	7
Calotropis procera (Aiton) W. T. Aiton	63	3	4	2.5	1	5.5	3	312
Chenopodium album L.	35	3	3	2	1.5	9	4	340
Datura innoxia Mill.	63	3	3	2.5	0.5	4	2	57
Tribulus terresteris L.	25	2	1	2.5	0.5	5.5	1	3

Where, CSI (Cultural Significance Index), QI (Quotation Index), AI (Availability Index), FUI (Frequency of Use Index), PUI (Part Used Index), MFFI (Multi-Functional Food Use Index), TSAI (Taste Score Appreciation Index), FMRI (Food-Medicinal Role Index)

Informant Consensus Factor (ICF), Relative Frequency of Citation (RFCs) and Fidelity Index (FI)

We used numerous ethnobotanical quantitative indicators to assess the consistency of traditional knowledge of medicinal plants among the local community. The Informant Consensus Factor (Fic), Relative Frequency of Citation (RFCs), and Fidelity Index (FI) were among the measures used. We hoped to establish the amount of agreement in the use of medicinal herbs by the people living in the research region by using such indicators. First, we divided the reported disorders into 10 distinct ailment categories depending on the frequency with which they were used. We were computed the Informant Consensus Factor (ICF) for each illness category. Table 5 shows that the ICF values varied from 0.80 to 0.54.

Table 4. Informant Consensus Factor (ICF) values of selected species.

Disease categories	Nur	Nt	ICF
Skin diseases	86	33	0.62
Respiratory disorders	67	14	0.80
Woman's Problem	45	10	0.80
Cardiovascular disorders	52	19	0.65
Urinary problems	58	15	0.75
Hepatic disorders	44	17	0.63
Diabetes	32	13	0.61
Gastrointestinal disorders	92	35	0.63
Blood Diseases	25	12	0.54
Miscellaneous	96	42	0.57

For the reported plant species, the Relative Frequency of Citation (RFCs) ranged from 0.89 to 0.16. Figure 2 shows the RFCs values for all of the plant species that were chosen. *Cannabis sativa* had the highest RFCs value of 0.89, suggesting that it was often cited in reports. *Tribulus terrestris*, on the other side, had the lowest RFCs value of 0.16, indicating that it was referenced less frequently.

The reported species' Fidelity Index (FI) ranged from 92.2% to 29.7%. Figure 3 depicts the FI values for the chosen plant species. *Cannabis sativa* got the highest FI score of 92.2%, indicating a substantial link between the plant and the reported disorders. *Tribulus terrestris*, on the other hand, had the lowest FI value of 29.7%.
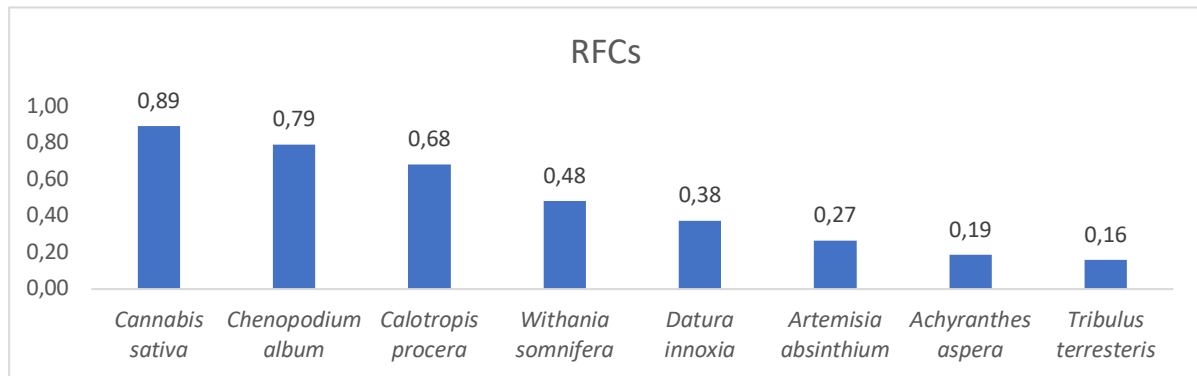

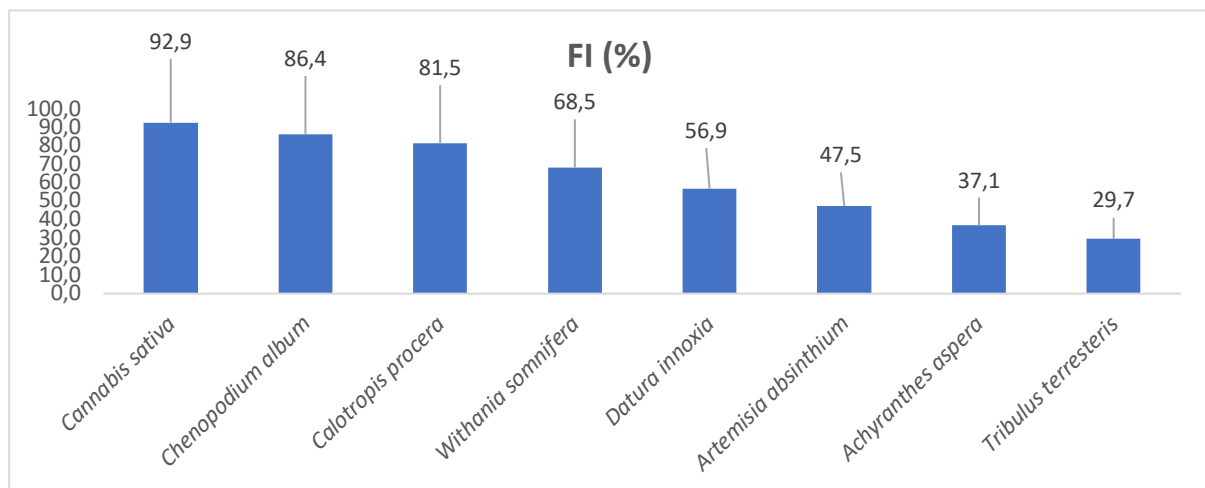Figure 2 Relative Frequency of Citation (RFCs) values of selected medicinal plants.

Figure 3. Fidelity Index (FI) values of selected medicinal plants.

Medicinal Importance of Dominated Species of the Area

Cannabis sativa was using against 5 different diseases by local inhabitants as shown in Table 6. The diseases treated by this plant were whooping cough 47.62 %, hemorrhoids 31.72%, stomach problems 39.68%, headache 50.79% and women problems 23.81%.

Artemisia absinthium

Mostly used parts of this plant were roots, stem and leaves. This plant was used to cure 8 common diseases like cough 39.68%, mucus 36.51%, fever 31.75%, liver problems 19.05%, spleen problems 15.87%, intestinal worms 17.46%, ear wounds 23.81% and women problems 25.40%as shown in Table 6.

Withania somnifera

It was locally used to cure four diseases as shown in Table 6. The leaves and roots are used frequently in medicine. The diseases treated by this plant are marasmus 15.87%, pain 39.68%, obesity 19.05% and spermatorrhoea39.68%.

Achyranthes aspera
Leaves were used abundantly in different diseases. It was used to cure 5 ailments like abdominal pain 47.62%, cough 31.75%, asthma 33.33%, blood purifier 39.68% and scorpion's sting 15.87% as shown in Table 6.

Calotropis procera
Mostly flowers, leaves and latex (Milk) of this plant were used in different diseases. This is a poisonous plant. This plant was used to treat 7 diseases in the area as shown in Table 6. The diseases that are treated were indigestion 49.21%, pains 39.68%, toothache 23.81%, and hair falls 31.75%, stomach problems 36.51%, snake bite 23.81% and wounds 55.56%.

Chenopodium album
It was used in only 3 diseases as shown in Table 6. The mostly treated diseases were jaundice 55.56%, liver problems 23.81% and cooling effect 49.21%.

Datura innoxia
The leaves and seeds of this plant were used medicinally as shown in Table 6. It is a narcotics and poisonous plant. It is used for the treatment of 6 different diseases like knee pain (arthritis) 39.68%, asthma 23.81%, flue 47.62%, headache 23.81%, eye problems 19.05% and piles 31.75%.

Tribulus terresteris
Whole plant is used medicinally as shown in Table 6. It is used to cure kidney stones 50.79%, gonorrhea 23.81%, urine obstruction 39.68%, women problems23.81% and diabetes 19.05%.

Conservation Status of plants
It is concluded that all these plant species of the area are not included in endangered species. These species are mostly considered as weeds. Therefore, they are not overused. Only Hakims of the area used these plants to make different medicines and the common people used some of these plants as their own food or for livestock grazing. So, there is no issue regarding the conservation of these species.

Discussion

Numerous human societies with exceptional cultural/ritual histories are surrounding by local vegetation of various importance for the present world (Ali *et al*. 2023). These human societies are the necessary focal point of medicinal plant research (Pal and Jain, 1998). These medicinal plants are also significant for their social, environmental, religious, cultural, and earnings generation roles as well their major applications in the health-care system (Azhar *et al*. 2020; Lambert *et al*. 2005). The findings of the present study emphasize the reliance of the local population in the study area on indigenous plant resources for treating various diseases, showcasing the significant role these resources play in the local healthcare system. Additionally, the local community also utilizes wild plant species for purposes such as food, shelter, firewood, timber, and fodder for livestock animals. This highlights the multiple ways in which these plant resources contribute to the livelihood and well-being of the local people. Similar results are also reported in previous studies (Shinwari and Khan, 1999; Azhar *et al*. 2022; Ali *et al.* 2023; Azhar *et al.* 2014; Azhar *et al.* 2020).

The current study reported that as medicine usually the entire plant or its different parts like roots, rhizome, tubers, seeds, stems, leaves, fruits and gums were utilized by the local peoples of the study area but the results of the study also reported that leaves and roots are the parts of plants which are mostly used as remedy to treat different diseases. Similar results were also reported by previous studies (Akhtar and Begum, 2009; Hameed *et al.* 2011; Ali *et al.* 2023). A large quantity of novel chemical entities (NCE) having the medicinal potential, are originated from wild plant families (Javid *et al*. 2017). The results of the current study highlight that *Cannabis sativa* was using against five different diseases whooping cough 47.62 %, hemorrhoids 31.72%, stomach problems 39.68%, headache 50.79% and women problems 23.81% by local inhabitants. *Cannabis sativa* is mostly used in drugs and used parts are seeds and leaves. Muhammad, (2012) also reported that leaves of this plant are boiled in milk and used orally to stop whooping cough and menses

Artemisia absinthium were used to cure eight common diseases like cough 39.68%, mucus 36.51%, fever 31.75%, liver problems 19.05%, spleen problems 15.87%, intestinal worms 17.46%, ear wounds 23.81% and women problems 25.40%. Powder of *Artemisia absinthium* plant is used for the treatment of cough, fever and to kill intestinal worms. Leaves of this plant are burnt in almond oil used to kill the ear worms also reported by Jamal, (2009).

Table 6. Importance of selected medicinal plant species

Name of Plant	Diseases	Responses (%)	Plant part used (%)						Method of Preparation	Mode of Administration
			Roots	Leaves	Stem	Flower	Seeds	Others		
Cannabis sativa L.	Whooping cough	47.62	-	79.37	-	-	-	-	Paste, Decoction	Both oral and Topical
	Hemorrhoids	31.75	-	23.81	-	-	-	-		
	Stomach Problems	39.68	-	31.75	-	-	-	-		
	Headache	50.79	-	19.05	-	-	33.33	-		
	Women Problems	23.81	-	31.75	-	-	-	-		
Artemisia absinthium L.	Mucus	36.51	12.70	31.75	-	-	-	-	Decoction, Infusion and Paste	Both oral and Topical
	Fever	31.75	11.11	23.81	-	-	-	-		
	Cough	39.68	14.29	31.75	3.17	-	-	-		
	Liver Problems	19.05	-	19.05	-	-	-	-		
	Spleen Problems	15.87	-	14.29	-	-	-	-		
	Intestinal worms	17.46	-	14.29	-	-	-	15.87		
	Ear Wounds	23.81	-	23.81	-	-	-	-		
	Women Problems	25.40	-	23.81	-	-	-	-		
Withania somnifera Linn.	Pains	39.68	-	23.81	-	-	-	-	Powder, Decoction, Infusion	Oral
	Marasmus	15.87	-	14.29	-	-	-	-		
	Obesity	19.05	-	17.46	-	-	-	-		
	Spermatorrhoea	39.68	-	31.75	-	-	11.11	-		
Achyranthes aspera L.	Abdominal pain	47.62	-	39.68	-	-	-	-	Decoction, Infusion and Paste	Both oral and Topical
	Cough	31.75	-	23.81	-	-	-	-		
	Asthma	33.33	-	22.22	-	-	-	-		
	Blood Purifier	39.68	-	31.75	-	-	-	-		
	Scorpion's sting	15.87	-	14.29	-	-	-	-		
	Wounds	55.56	-	34.92	-	-	-	-		
Calotropis procera (Aiton) W. T. Aiton	Pains	39.68	-	31.75	-	-	-	-	Paste, Eaten Fresh, Decoction	Both oral and Topical
	Indigestion	49.21	-	25.40	-	-	-	-		
	Toothache	23.81	-	19.05	-	-	-	19.05		
	Hair Fall	31.75	-	23.81	-	-	-	-		
	Stomach pain	36.51	-	30.16	-	19.05	-	-		
	Snake bite	23.81	-	19.05	-	-	-	-		
Chenopodium album L.	Jaundice	55.56	-	47.62	-	-	-	-		Oral

Species	Use								Preparation	Route
	Liver problems	23.81	-	19.05	-	-	-	-	Cook,	
	Cooling Effect	49.21	-	39.68	-	-	-	-	Decoction	
Datura innoxia Mill.	Knee pain (arthritis)	39.68	-	31.75	-	-	15.87	-		
	Asthma	23.81	-	19.05	-	-	-	-		
	Flue	47.62	-	39.68	-	-	-	-	Decoction	Oral
	Headache	23.81	-	19.05	-	-	-	-		
	Eye problems	19.05	-	15.87	-	-	-	-		
	Piles	31.75	-	30.16	-	-	-	-		
Tribulus terrestris L.	Kidney stones	50.79	-	31.75	-	-	-	-		
	Gonorrhea	23.81	-	19.05	-	-	-	-		
	Urine obstruction	39.68	-	19.05	-	-	22.22	-	Decoction	Oral
	Women problems	23.81	-	19.05	-	-	-	-		
	Diabetes	19.05	-	15.87	-	-	-	-		

Withania somnifera was used to treat marasmus 15.87%, pain 39.68%, obesity 19.05% and Spermatorrhoea 39.68% diseases. Powder made by the roots of *Withania somnifera* plant is effective for pains (Azhar *et al.* 2020). The powder made by the leaves of this plant is used for the treatment of Spermatorrhoea. According to Muhammad, (2012) and Shah, (2013) the root of this plant is very effective for dyspepsia, abortifacient, debility and rheumatism.

Achyranthes aspera plant was used to cure five ailments like abdominal pain 47.62%, cough 31.75%, asthma 33.33%, blood purifier 39.68% and scorpion's sting 15.87%. Half cooked seeds of *Achyranthes aspera* plant were effective for cough. The roots of this plant were macerated in water was effective to relieve the pain of scorpion's sting and was also affective in cough, inflammation of the interior organs and asthma. Muhammad (2011) also supported these uses in his research.

The diseases that are treated by using *Calotropis procera* plant were indigestion 49.21%, pains 39.68%, toothache 23.81%, and hair falls 31.75%, stomach problems 36.51%, snake bite 23.81% and wounds 55.56%. The leaves of *Calotropis procera* plant are burnt in mustard oil are used on wounds and also used to stop hair falling. The leaves of the plant are roasted and are applied on painful joints or swellings reported by Jamal (2009). Drops of milk (latex) scrolled in cotton are kept in teeth cavities are effective for toothache (Azhar *et al.* 2014). *Chenopodium album* plant is mostly used to treat diseases were jaundice 55.56%, liver problems 23.81% and cooling effect 49.21%. *Chenopodium album* plant has a cooling effect. Aerial parts of this plant are also used as food for cattle, and it is weed. Similar results were reported by Abbasi, (2013); Shah, (2013) and Muhammad, (2012).

The leaves and seeds of *Datura innoxia* plant were used medicinally. It is a narcotics and poisonous plant. It is used for the treatment of 6 different diseases like knee pain (arthritis) 39.68%, asthma 23.81%, flue 47.62%, headache 23.81%, eye problems 19.05% and piles 31.75%. The seeds of *Datura innoxia* plant are grinded to powder and tablets are made. One tablet is used at night with water or milk for the treatment of premature ejaculation. Grind seeds were also used to cure scabies said by Ajaib *et al.* (2010).

The present study reported that whole *Tribulus terresteris* plant is used medicinally. It is used to cure kidney stones 50.79%, gonorrhea 23.81%, urine obstruction 39.68%, women problems 23.81% and diabetes 19.05%. Muhammad, (2011) also reported that liquor is made by boiling the whole *Tribulus terresteris* plant and this liquor is effective in treatment of kidney stones. Powder (safoof/ Phakki) made from whole plant is effective in the treatment of gonorrhea. The fruit and roots are mixed with honey and used for curing impotence and the fruits with seeds are used for curing impotence, for diabetes and as vermicides (anti-anthelmintic).

It is concluded that all these plant species of the area are not included in endangered species. These species are mostly considered as weeds. Therefore, they are not overused. Only Hakims of the area used these plants to make different medicines and the common people used some of these plants as their own food or for livestock grazing. So, there is no issue regarding the conservation of these species.

Conclusions

The present study was conducted in town Miani, district Sargodha, Punjab to make an inventory of economically important plants and further to assess their conservational status by documenting the indigenous knowledge of local communities, hakims and plant experts. Most abundant species were *Artemisia absinthium* and *Cannabis sativa*. The cultural importance and conservational status of economical and medicinal plants in the area were also assessed. Major species of the study area belong to the family Asteraceae (19.05%). *Artemisia absinthium* has higher plant density (0.12). *Cannabis sativa* has highest significance factor and *Chenopodium album* has the 2nd highest value of Cultural Significance Index (CSI) in the study area. *Cannabis sativa* has highest significance factor and *Chenopodium album* has the second highest value of CSI in the study area. It is concluded that the area has great potential of plant resources with rich heritage of indigenous knowledge regarding the use of these species but the economic potential should be channelized and explored because these species are usually treated as wild weeds.

Declarations

Ethics approval: All participants provided oral prior informed consent.
Consent to publish: The paper does not show any personal data or photographs.
Availability of data and materials:
The authors will provide the raw data on request without the names of informants.

Literature Cited

Ajaib M, Khan ZD, Khan NU, Wahab W. 2010. Ethnobotanical studies on useful shrub of District Kotli, Azad Jammu & Kashmir, Pakistan. Pakistan Journal of Botany 42(3): 1407 – 1415.

Akhtar N. Begum S. 2009. Ethnopharmacological important plants of Jalala, district Mardan, Pakistan. Pakistan Journal of Plant Sciences 15 (2): 95-100.

Ali E, Azhar MF, Bussmann RW. 2023. Ethnobotanical inventory and medicinal applications of plants used by the local people of Cholistan desert, Pakistan. Ethnobotany Research and Applications 21:1- 23.

Azhar MF, Abida Aziz, Muhammad Sajjad Haider, Muhammad Farrakh Nawaz, Muhammad Asif Zulfiqar. 2015. Exploring the ethnobotany of Khar, *Haloxylon recurvum* and Lana, *Haloxylon salicornicum* in Cholistan Desert, Pakistan. Pakistan Journal of Agricultural Sciences 52(4): 1081-1086*.*

Azhar MF, Aziz A, Ali E. 2022. Assessment of medicinal folklores and chemical composition of *Aerva javanica* (Burm. f.) Juss. ex Schult. in Cholistan Desert of Pakistan. Ethnobotany Research and Applications 24:1-10.

Azhar MF, Naseer U, Aziz A, Zafar S, Qadir I, Farooq M, Ahmad I, Anjum K. 2020. Antioxidant and phytochemical composition of leaves, stem and root extracts of *Withania coagulans* and *Withania somnifera*. Zeitschrift Arznei-Gewurzpflanzen 25:27-30.

Azhar MF, Tahir Siddiqui M, Ishaque M, Asif Tanveer. 2014. Study of ethnobotany and indigenous use of *Calotropis procera* (ait.) in Cholistan desert, Punjab, Pakistan Journal of Agricultural Research 52(1):117-126. ISSN: 2076-7897.

Azhar MF. 2014. Ethnobotanical Potential of Medicinal Shrubs in Socioeconomic Uplift of Cholistan Rangeland Dwellers (Doctoral dissertation, PhD Thesis, Department of Forestry and Range Management. University of Agriculture Faisalabad, Punjab, Pakistan).

Basir A, Lahjie AM, Simarangkir BDAS, Matius P. 2015. Presenting the Cultural Significance Index of Plants in the MuaraLawa, Kutai Barat District. Journal of Biology, Agriculture and Healthcare 1.5, 140-150

Cavender A. 2006. Folk medicinal uses of plant foods in southern Appalchia, United States. Journal of Ethnopharmacology 108, 74-84.

Gönner C. 2011. Surfing on Waves of Opportunities: Resource Use Dynamics in a DayakBenuaq Community in East Kalimantan, Indonesia. Society & Natural Resources 24(2), 165–173.

Hameed, M., Ashraf, M., Al-Quriany, F., Nawaz, T., Ahmad, M.S.A., Younis, A. and Naz, N. 2011. Medicinal flora of the Cholistan desert: a review. *Pakistan* Journal of Botany 43(2), pp.39-50.

Heywood V, Skoula M. 1999. The MEDUSA Network: Conservation and sustainable use of wild plants of the Mediterranean region. In: J. Janick (ed.), perspectives on new crops and new uses. Alexandria, VA: ASHS Press, P 148-151. http://www.ethnobiomed.com/content

Jamal Z. 2009. Biodiversity, ethnobotany and conservation status of the flora of Kaghan Valley Mansehra, NWFP Pakistan (Doctoral dissertation, Quaid-i-Azam University, Islamabad).

Javid M, Aziz A, Azhar MF, Qayyum A. 2017. Antioxidant, antibacterial, phytochemical composition of leaves and roots extracts of *Datura alba*. Zeitschrift Fur Arznei-& Gewurzpflanzen 22(4):165-8.

Kala, C.P., Farooquee, N.A. and Dhar, U., 2004. Prioritization of medicinal plants on the basis of available knowledge, existing practices and use value status in Uttaranchal, India. Biodiversity & Conservation 13, pp.453-469.

Khan AA. 1991. Marketing of herbal drugs and its problems. In Proceedings of the National Workshop on Appropriate Use of Medicinal Plants in Traditional Medicine. National Institute of Health, Islamabad, Pakistan. November 20-21. pp. 69-72.

Lambert JDH, Ryden PA, Esikuri EE. 2005. Capitalizing on the Bio-Economic Value of Multi-Purpose Medicinal Plants for the Rehabilitation of Drylands in Sub-Saharan Africa. The International Bank for Reconstruction and Development / THE WORLD BANK .1818 H Street, NW Washington, DC 20433 USA.

Mehmood A. 2013. Ethnobotanical and Nutraceutical Investigation of Wild Edible Fruits and Vegetables Used by The Tribal Communities of Lesser Himalayas Pakistan (Doctoral dissertation, Quaid-i-Azam University, Islamabad).

Muhammad A. 2012. Exploration of Floral Diversity of District Kotli (Azad Jammu And Kashmir) And Evaluation of Ethnopharmacological Effects of Some Medicinal Plants of The Area (Doctoral dissertation, Govt. College University, Lahore).

Muhammad SK. 2011. Diversity of Vascular Plants, Ethnobotany and Conservation Status of Ushairy Valley, District Dir, Upper NWFP Northern Pakistan (Doctoral dissertation, Ph. D. Thesis, Quaid-i-Azam University, Islamabad, Pakistan. Available online: http://eprints. hec. gov. pk/7497/.

Mulyoutami E, Rismawan R, Joshi, L. 2009. Local knowledge and management of simpukng (forest gardens) among the Dayak people in East Kalimantan, Indonesia. Forest Ecology and Management 257(10), 2054–2061.

Munawaroh E, Purwanto Y. 2008. Etnobotani Lokal Masyarakat Dayak Benuaq Di Kecamatan Muara Lawa, Kutai Barat. Publikasi Institute Pertanian Bogor. 188 h.

Pal DC, Jain SK. 1998. Tribal Medicine. NayaProkash, Calcutta. 1-317.

Pieroni A, Houlihan L, Ansari N, Hussain B, Aslam S. 2007. Medicinal perceptions of vegetables traditionally consumed by south- Asian migrants living in Bradford, Northern England. Journal of Ethnopharmacology 113,100- 110.

Pieroni A. 2001. Evaluation of the cultural significance of wild food botanicals traditionally consumed in Northwestern Tuscany, Italy. Journal of Ethnobiology 21(1), 89–104.

Shah RA. 2013. Studies on Floral Biodiversity of District Mianwali And Allied Areas with Emphasis on Ethnobotanical Uses (Doctoral dissertation, Quaid-i-Azam University, Islamabad).

Shinwari MI, Khan MA. 1999. Ethnobotanical conservation status of Margalla Hills National Park, Islamabad. J. Plant Resources and Environment 8(2): 53-60.

Shinwari ZK, Khan J, Naz S, Hussain A 2009. Screening of medicinal plants of Pakistan for their antibacterial activity. African Journal of Biotechnology 8(24): 7082-7086

Tan, RX, Zheng WF, Tang HQ. 1998. Biologically active substances from the genus Artemisia. Planta Medica 64:295-302.