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Ethnobotanical Investigation of Medicinal Phyto-Diversity in Muzaffargarh District, Punjab

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Abstract

The study explores the ethnobotanical knowledge and medicinal uses of 51 plant species across 33 families in the arid sand dune deserts of Muzaffargarh District, Punjab, Pakistan, focusing on Tehsil Alipur and nearby areas. Field surveys with 506 informants revealed that Moraceae, Cucurbitaceae, and Solanaceae were the most dominant families, with leaves, fruits, and seeds being the most commonly used plant parts due to their accessibility and sustainability. Key medicinal applications included treatments for gastrointestinal, respiratory, and skin disorders, as well as diabetes. Quantitative metrics such as Informant Consensus Factor (ICF), Use Value (UV), and Fidelity Level (FL) highlighted species like *Azadirachta indica* (FL: 100%), *Syzygium cumini* (FL: 98%), and *Nigella sativa* (FL: 94%) as highly valued for their therapeutic properties. The highest ICF values were observed for diabetes management (0.44) and respiratory ailments (0.6). The findings emphasize the critical role of traditional knowledge in disease treatment and bioactive compound discovery, while underscoring the need for conservation to mitigate overexploitation of local flora. Collaborative efforts between researchers and local healers are essential for preserving indigenous knowledge and ensuring the sustainable use of medicinal plants.

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Introduction

In recent decades, numerous research studies have shown that the global trend of using medicinal plants to treat different human diseases is widespread (Sardar *et al*., 2009; Zahoor *et al*., 2017 and Shah *et al*., 2020). Ethnobotanical surveys are frequently carried out in order to assess the intricate relationship between native communities and wild plant species (Awan *et al*., 2021). These surveys are essential for understanding the cultural beliefs related to the use and significance of indigenous plants. Such studies aid scientists in identifying new drugs derived from plants (Omotayo *et al*., 2020). Moreover, research on ethnobotany is validating the importance of medicinal plants in terms of socioeconomic factors (Silva *et al*., 2011 and Arshad *et al*., 2014).

These studies are essential for maintaining the traditional knowledge base of medicinal plants within specific geographical areas (Ambu *et al*., 2020 and Karous *et al*., 2021). These surveys offer an opportunity to identify new active compounds in plants that can combat deadly diseases. Ancient knowledge about the medicinal use of plants is essential for preserving, conserving, and advancing herbal medicine (Mesfin *et al*., 2009; Vitalini *et al*., 2013 and Zahoor *et al*., 2017).

For centuries, medicinal plants have played a crucial role in human society since ancient times. They have been utilized for a variety of health problems, such as fever, pain, infections, and chronic illnesses (Vitalini *et al*., 2013). Medicinal plants have a big impact on improving the financial status and quality of life for people living in isolated regions (Yaseen *et al*., 2015). There are over 20,000 wild plant species globally, yet only around twenty plant species meet 90% of the world's food needs. The practice of using medicinal plants is widely prevalent. The practice of utilizing medicinal plants is prevalent mainly in the developing nations worldwide. Certain areas in Asian nations are recognized for utilizing the entire plant or specific plant components to address various illnesses (Agisho *et al*., 2014). Despite extensive research, some regions of the world remain understudied regarding the collection and preservation of indigenous knowledge on medicinal plants. Traditional healers and elderly individuals often possess a wealth of such knowledge, which is unfortunately not being transmitted effectively to younger generations (Adnan *et al*., 2014). Approximately 65% of the world is affected by traditional practices using medicinal plants due to challenges from the modern healthcare system, as stated by the World Health Organization (WHO). The contemporary healthcare system is hindering the traditional use of medicinal plants for disease treatment (Amiri, 2013).

According to the World Health Organization (WHO), around 65% of the global population relies on traditional medicine using medicinal plants due to difficulties with modern healthcare.

The population relies on traditional methods as their main source of healthcare (Farnsworth, 1988 and Raskin, 2014). Modern medicines are too expensive, especially for the people living in underdeveloped or even in developing countries, so they always trust in traditional practices employing local plants until reaching a critical situation (Umair *et al*., 2019). Pakistan possesses a wide variety of medicinal plants across various ecological zones. There are more than 600 medicinal wild plant species in the country (Hamayun, 2003). In Pakistan, the majority of people rely on herbal medicines for their healthcare needs, with the exception of a few major cities (Akram *et al*., 2011; Yaseen *et al*., 2015 and Umair *et al*., and Zahoor *et al*., 2017).

It was previously stated that preserving the traditional knowledge of plants' ethnomedicinal value in various regions is important for future generations and can be beneficial for creating new medicines. To the best of our understanding, no research has been done to uncover the ethnomedicinal capabilities of native plants in the specific study location. Hence, this research was carried out to gather the Ancient indigenous knowledge of various plants in the area under observation. Considering all these details, the study was designed to document the medicinal plants

found in the local area and the traditional knowledge of the indigenous people harboring in this zone.

Materials and methods

Study area

Muzaffargarh is a district located in the province of Punjab, Pakistan. It is situated between the Chenab River to the east and the Indus River to the west. The district spans over an area of 8,249 km² (3,185 sq mi) and forms a strip between the two rivers. Muzaffargarh is 123 meters (404 ft) above sea level and is known for its flat alluvial plain, ideal for agriculture with many citrus and mango farms (Wikipedia Muzaffargarh, 2023). Focused research in areas like Tehsil Ali Pur, Khair Pur Sadat, Basti Deen Pur, and Seet Pur aims to gather indigenous knowledge regarding the utilization of medicinal plants.

Field surveys and data collection

Fieldwork was carried out during the months of September 2023 to April 2024. Fifty field trips were arranged to collect the best possible ethnobotanical data by simple interviewing or using semi-structural questionnaires (Malla *et al.*, 2015). Before the conduction of a formal interview, verbal consent to participate in this research work was given by all the participants. Individual interviews of 506 informants based on standard methods and guidelines (Ishtiaq *et al.*, 2012). During interviews, the demographic characteristics of each respondent and vernacular names of the plants, plant parts used as medicine, and the preparatory methods of the plants were also documented.

Inventory

During the field survey, plants were collected and all the necessary data, including their vernacular names and medicinal values, were documented. Plants were identified with the assistance of taxonomic experts at the Department of Botany, Women University, Multan, Pakistan.

Ethical consideration

Data collection was carried out in accordance with ethical standards in order to avoid or minimize any potential emotional or bodily harm to the respondents. Ethnobotanical data was collected only from people who were eager and ready to share their experiences with therapeutic plants.

Quantitative ethnobotany

Informant consensus factor

The Informant Consensus Factor (ICF) was calculated according to Heinrich's *et al.*, (1998) method.

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

The variable "Nur" represents the number of use citations for each disease category, while "Nt" indicates the number of taxa used for that particular disease category.

Use value

The use value (UV) represents the importance of a specific plant. Higher UVs indicate that there are more use reports for a particular plant species, while a value close to zero indicates fewer reports, confirming the use of the species. This calculation is done using the formula provided by Tardio (2008).

$$UV = \sum UiN \quad (2)$$

where "∑Ui" represents the total number of uses cited by each informant for a given species, while "N" refers to the total number of respondents or informants who participated in the survey (Bano *et al.*, 2014).

Relative frequency citation

The formula used to calculate the relative frequency citation (RFC) was provided by Bennett, (2000).

$$RFC = \frac{FC}{N} \quad (3)$$

FC represents the number of respondents or informants who mentioned the use of the species, while "N" represents the total number of respondents or informants involved in the study.

Fidelity level

The fidelity level (FL) indicates a species' preference

for treating a specific ailment over other species (Lulekal, 2013). The following formula was used to calculate the FL of plant species

$$FL\ (\%) = \frac{Ip \times 100}{Iu} \quad (4)$$

Data analysis

The collected data were subjected to quantitative analysis using Microsoft Excel 2016.

Results and discussion

Field survey

In total, 506 people were interviewed, 272 were females and 234 were males. The majority of the selected respondents were old-aged because they usually have more knowledge and expertise in using medicinal plants for particular disorders.

Occupational background of the respondents was as follows: 145 participants were students (involve study and studying individual), 69 were pansari,6 people belonged to nurse occupation, 23 females were house wives, 134 were Hakeem, 23 were farmers, 61 were engineer, 13 doctor, 51 were business man, 17 were teachers, 01 lane man Wapda, 01 dental surgeon, 01 professor, 01 were unemployed , 01 was PHD scholar, 01 were researcher, 01 were S.D.O Wapda, 01 belonged to Agricultural field, 01 was doctor of physiotherapy, 01 belonged to pharmacist, 01 police man, 01 belonged to education department (Table 1).

Table 1. Exhibiting the information of respondents (N=506).

Variation	Category	Number	Percentage
Gender	Male	234	46.3%
	Female	272	53.7%
Age	18 to 24	124	24.6%
	25 to 34	167	33.1%
	35 to 44	174	34.5%
	45 to 54	31	6.1%
	75 or older	10	1.9%
Marital status	Single	161	31.9%
	Married	266	52.7%
	Divorced	72	14.3%
	Living with partner	6	1.2%
Occupational background	Students	145	28.5%
	Pansaries	69	13.7%
	Nurses	6	1.2%
	House wives	23	4.5%
	Hakims	134	26.1%
	Farmer	23	4.5%
	Engineer	11	2.1%
	Doctor	13	1.3
	Business man	51	9.1%
	Lan man Wapda	1	0.2%
	Professor	1	0.2%
	Unemployed	2	0.4%
	PHD scholar	2	0.4%
	Researcher	1	0.2%
	Doctor	1	0.2%
	Policeman	1	0.2%
	Teachers	17	3.3%

Health problems/diseases

The results showed that the local inhabitants were suffering from several health issues, out of 506 responses, The data showed that the local inhabitants were suffering from several health issues, the most common being Digestive/gastrointestinal (GIT) disorders, respiratory disorders, diabetes, cancer cardiac disorders, skin problems, infections and fever,

ulcer and hepatitis. Several studies have shown that nearly all these health issues were common in different parts of the country (Akram *et al.,* 2011; Bibi *et al.,* 2014; Umair *et al.,* 2017; Zahoor *et al.*, 2017 and Khan *et al.,* 2018).

Medicinal plant diversity

A total of 51 plants species belonged to 33 taxonomic plant families *Moraceae* and *Cucurbitaceae* families with four medicinal plant species were found to be the most dominant, followed by *Apiaceae*, *Fabaceae*, and *Solanaceae* with three species each. The *Amaranthaceae*, *Meliaceae*, *Rutaceae*, *Lamiaceae* and *Amaryllidaceae* represented two species each. Finally, all other families represented in table 2 had only one medicinal species each.

Medicinal plant parts used for the treatment of diseases

The leaves were the most commonly used plant parts by the local inhabitants of the study areas, reported 22 times among the documented 51 plants, followed by the use of fruits (20) and seeds (15) as cited by respondents (Figure 1).

In a similar ethnobotanical survey conducted in Muzaffargarh, leaves were also identified as the most frequently used plant parts, supporting the findings of this study (Afzal *et al*., 2024). Other plant parts used to treat various ailments included the whole plant (3 times), flowers, roots, and bark (2 times each), while the stem, shoot, pods, bulb, and clove were each cited once.

Table 2. Demographic characteristics of the informants.

Variation	Category	Number	Percentage
Belief of people on healing power of plants	Yes	440	86.9%
	No	66	13.1%
Use of herbal teas as medicine	Yes	426	84.2%
	No	80	15.8%
Purpose of use of medicinal plants	Health promotion	260	51.3%
	Disease prevention	368	72.7%
	Cure	112	22.2%
	Never used	17	3.4%
	Other	51	10.1%
Use of medicinal plants over the last 12 months	Daily	141	27.9%
	Often	173	34.1
	Sometimes	97	19.2%
	When unwell	64	12.7%
	Never	31	6.1%
Dosage and longevity of medicinal plants	Followed label instructions	55	10.9%
	Followed practitioner instructions	314	62%
	Decided myself	111	22%
	Other	26	5.1%
Informing doctor about using medicinal plants	Yes	380	75%
	No	73	14.5%
	Not applicable	53	10.5%
Reaction of medical doctors	Accepted medicinal plants	319	63.2%
	Asked questions	177	35%
	Was doubtful	61	12.1%
	Not accepted	43	8.5%
	Do not know	53	10.5%
	Other	44	8.7%
Participants are either well or unwell over the last 12 months	Yes	399	78.8%
	No	107	21.2%
Longevity of unwell condition	Few days	393	77.6%
	Months	82	16.2%
	Longer/chronic	31	6.1%
Source of consultation during unwell condition	Medical doctor	214	42.4%
	Herbal practitioner	364	72.1%
	Did not consult	71	14.1%
	Other	45	8.9%

The frequent use of leaves in traditional remedies can be attributed to their ease of collection and minimal impact on plant sustainability, consistent with the observations of Giday *et al.* (2009) and Kadir *et al.* (2013). In contrast, the removal of other plant parts can severely affect plant growth and development.

Number of taxa curing or treating ailment categories

About 10 different ailment categories were determined from the number of taxa used for the treatment of these ailment categories (Figure 2). Cough, fever, flu, hepatitis, liver and kidney problems were among the other ailment categories treated by the maximum number of taxa (14), followed by digestive system disorders and nervous system disorders (12), respiratory and diabetes management (6). Furthermore, only four taxa were reported for the treatment of cardiac and skin disorders. The results of the current study have shown that the majority of respondents perform their work in the fields and are more prone to digestive system disorders therefore, they were aware of use of medicinal plants for treatment of these health issues.

Table 3. Families representing number of medicinal plants.

Sr. No	Family	Number of medicinal plants
1	Asclepiadacea	1
2	Lythraceae	1
3	Pedaliaceae	1
4	Amaranthaceae	2
5	Meliaceae	2
6	Moraceae	4
7	Apocynaceae	1
8	Ranunculaceae	1
9	Convolvulaceae	1
10	Boraginaceae	1
11	Cucurbitaceae	4
12	Apiaceae	3
13	Fabaceae	3
14	Rutaceae	2
15	Plantaginaceae	1
16	Myrtaceae	2
17	Solanaceae	3
18	Linaceae	1
19	Lamiaceae	2
20	Poaceae	1
21	Moringaceae	1
22	Rhamnaceae	1
23	Salvadoraceae	1
24	Brassicaceae	1
25	Rosaceae	1
26	Amaryllidaceae	2
27	Anacardiaceae	1
28	Vitaceae	1
29	Cannabaceae	1
30	Oleaceae	1
31	Arecaceae	1
32	Malvaceae	1
33	Asteraceae	1

Quantitative data analysis

Informant consensus factor

In the present study, the informant consensus factor (ICF) was examined for 10 ailment categories: (1) Respiratory Ailments; (2) Digestive System Disorders; (3) Skin Disorders; (4) Cardiovascular Issues; (5) Diabetes Management; (6) Cancer Treatment; (7) Inflammatory Diseases; (8) Nervous System Disorders; (9) Infections and Fevers; (10) Other Ailments includes diverse treatments.

Table 4. ICF values of the medicinal plant species exploited for the treatment of several ailment categories.

Ailment Categories	Nur	Nt	ICF
Respiratory Ailments		10	0.6
Digestive System Disorders		11	0.3125
Skin Disorders		4	0.25
Cardiovascular Issues		4	0.25
Diabetes Management		6	0.444
Cancer Treatment		5	0.333
Inflammatory Diseases		3	0.333
Nervous System Disorders		12	0.1538
Infections and Fevers		3	0.333
Miscellaneous (includes diverse treatments)		14	0.235

Note: Nur: number of use citations for each disease category; Nt: number of taxa used for that disease category; ICF: informant consensus factor.

The ICF value ranged from 0.15 to 0.64, while the average ICF value was 0.4 (Table 4). The highest value of ICF was reported for Diabetes Management (0.44) followed by Respiratory Ailments (0.6), followed by cancer treatment (0.33), and then GIT/ digestive system disorders (0.31).

The local people used their fields to grow crops for the fulfillment of their household requirements and it might be the reason that they were more prone to injury while working in the fields (Akram *et al.*, 2011). On the other hand, when people work in the fields during hot summer days, they ultimately suffer from GIT disorders due to extreme heat. Therefore, the highest value was reported for respiratory and gastrointestinal disorders. These results are nearly parallel to the results of the study carried out by Zahoor *et al.*, 2017. The results of the current study have shown that the local inhabitants were using 12 different species for nervous and digestive system.

The most cited plants were *Ipomoea batatas*, *Nigella sativa, Azadirachta indica* and *Calotropis gigantea*. The farmers are injured during their fieldwork and use *Azadirachta indica* for Skin infections for swift wound healing (Mahmood *et al.*, 2005).

Use value

In the present study, the use value (UV) ranged from 0.22 to 0.99 (Table 5). The highest UVs were represented by *Ipomoea batatas* (0.99) followed by *Azadirachta indica*, *Calotropis gigantea*, *Nigella sativa*, *Citrus limon*, *Pentatropis spiralis, Syzygium cumini* and *Morus alba* with UVs of 0.79 were also highly valued. The lowest UV were observed in case of *Salvadora oleoides*, *Allium sativum* (Garlic), *Capsicum annuum* (Chili pepper), and *Cichorium intybus* (0.22). Several studies have found similar plants as reported in the current study with highest UV values in other part of country. (Zahoor *et al.*, 2017). The UV shows relative importance of use of medicinal plants in specific area. However, it is important to understand that there is great diversity of plants in different areas of Pakistan. Therefore, the local inhabitant often exploits local and easily available plants to treat common diseases. There will always be a slight difference in the use value of plants even in two neighboring districts of the same country.

Table 5. Plants from the study areas with medicinal values.

Sr No	Scientific name	Vernacular Name	Family	Plant Part used	Medicinal Uses	UV	RFC	FL%
1.	*Pentatropis spiralis*	Ambevel	Asclepiadacea	Leaves, stems Flower, roots	Wound healing, fever, respiratory and digestive issues, skin disorders	0.79	0.642	75
2.	*Punica granatum*	Anaar	Lythraceae	all parts	Anticancer, balancing blood pressure, heart diseases	0.59	0.494	60
3.	*Sesamum indicum*	Til	Pedaliaceae	Seeds	Boosts digestion, Energy booster, Boosts Skin health and Stabilizes blood pressure	0.59	0.553	70
4.	*Chenopodium album*	Bathua	Amaranthaceae	Leaves, Shoots, Flowers	rheumatism, bug bites, sunstroke, treatment of skin problems	0.59	0.434	55
5.	*Azadirachta indica*	Nim tree	Meliaceae	All parts	skin diseases, dental disorders, treatment of inflammation, infections, fever, appendix	0.79	0.791	100
6.	*Ficus carica*	Anjeer	Moraceae	Fruit	Prevention of piles, stomach problems	0.44	0.355	50
7.	*Ficus benghalensis*	Boharr	Moraceae	Leaves and fruit	Healing of wounds, prevent heart diseases	0.42	0.395	45
8.	*Melia azedarach*	Bakain	Meliaceace	Root, Bark, Wood, Fruit, Nut	Anticancer, cardiac protective	0.51	0.395	45
9.	*Calotropis gigantean*	Aak	Apocynaceae	Leaves, Bark	Diarrhea,constipationstomach ulcers, gallstones	0.79	0.296	50
10.	*Nigella sativa*	Kaloonji	Ranunculaceae	Seeds	Stomach ulcers, weight reduction, lower blood cholesterol, Antioxidant	0.79	0.691	94
11.	*Ipomoea botatas*	Shaker Qandi	Convolvuaceae	Fruit	Constipation, fatigue, diabetes,hypertensiondysentery, arthritis, rheumatoid diseases	0.99	0.395	70
12.	*Cordia myxa*	Lasura	Boraginaceae	Fruit	Treat cough and chest complaints as well as for the treatment of wounds and ulcers.	0.52	0.434	55
13.	*Citrullus colocynthis*	Kortuma	Cucurbitaceae	Fruit,Seed	Cure hepatitis and constipation	0.43	0.316	40
14.	*Foeniculum vulgare*	Sonf	Apiaceae	Seed	Anticancer, Relieve menopausal symptoms, abdominal pain	0.59	0.474	60
15.	*Acacia karoo*	Kikar	Fabaceae	Leaves, and pods	Arrest secretion or bleeding, cleaning the teeth	0.42	0.237	25
16.	*Citrus limon*	Lemom, Nibu	Rutaceae	Fruits	Kidney stones, Reduce Cancer Risk, detoxify the digestive system Asthma	0.79	0.355	60

17.	*Plantago ovate*	Isabgol	Plantaginaceae	Seeds	Constipation,Diarrhea, piles,balance digestive health	0.59	0.435	55
18.	*Syzygium cumini*	Jamun	Myrtaceae	Leaf, stem, fruit seeds	Blood purifier, gastric ulcers, diabetes,diarrhea	0.79	0.751	98
19.	*Nicotiana tabacum*	Tobacco	Solanaceae	Leaves	Ringworm, athlete's foot, earache	0.41	0.296	35
20.	*Linum usitatissimum*	Alsi	Linaceae	Seeds	Diabetes, hepatitis, maintain cholesterol level	0.59	0.356	50
21.	*Ocimum basilicum*	Babari	Lamiaceae	Leaves and seeds	Respiratory, gastrointestinal tract disorders and Antiviral	0.59	0.553	70
22.	*Trachyspermum ammi*	Ajwain	Apiaceae	Seeds and leaves	prevent coughing, balance blood pressure	0.45	0.435	55
23.	*Eucalyptus camaldulensis*	Sufaida	Myrtaceae	leaves Bark	Respiratory issues,wound healing, fever, antimicrobial antiinflamatory	0.59	0.595	85
24.	*Moringa oleifera*	Sohan-jana	Moringaceae	Seeds and bark	Migraine,antidiabeticanticancer	0.59	0.593	75
25.	*Ziziphus jujube*	Beri	Rhamnaceae	Leaves, roots and fruits	Anxiety, Insomnia	0.44	0.316	40
26.	*Salvadora oleoides*	Pelu	Salvadoraceae	Whole plant	Epilepsy	0.23	0.237	15
27.	*Raphanus sativus*	Mooli	Brassicaceae	Leaves, seeds, fruit	Nervous weakness, diabetes	0.45	0.355	50
28.	*Cucurbita maxima*	Walayti kadoo, petha	Cucurbitaceae	Fruits	Nervous disorder, constipation	0.45	0.395	45
29.	*Daucus carota*	Gajjar	Apiaceae	Whole plant	kidney ailments, Hematopoietic	0.43	0.296	35
30.	*Momordica charantia*	Karela	Cucurbitaceae	Fruit and seed	Tumors, asthma, diabetes	0.59	0.692	75
31.	*Pyrus communis*	Nashpati	Rosaceae	Fruits	Insomnia, better digestion	0.44	0.395	45
32.	*Allium sativum*	Lehsan	Liliaceae	Head or clove	Control blood pressure	0.25	0.494	40
33.	*Allium cepa*	Piaz, Wassal,	Liliaceae	Bulb	Skin infection, Hair growth, For Swollen Feet	0.59	0.356	50
34.	*Mangifera indica*	Aam	Anacardiaceae	Seed	Reduce diarrhea, cure stomach heat	0.43	0.435	50
35.	*Mentha arvensis*	Podina	Lamiaceae	Leaves	against upset stomachs, treat fever	0.43	0.395	45
36.	*Vitis Vinifera*	Drakh, kishmish	Vitaceae	Fruit	Liver disorder, Cough	0.42	0.276	30
37.	*Cannabis sativa*	Bhang	Cannabaceae	Flower	Insomnia, relaxant	0.45	0.356	50
38.	*Jasminium officinale*	Chanbeli	Oleaceae	Whole plant	Anxiety,Tension and depression	0.44	0.276	30
39.	*Trigonella foenum-graecum*	Methi	Fabaceae	Leaves	painful menstruation, antiviral, obesity	0.059	0.435	55
40.	*Citrus sinensis*	Malta	Rutaceae	Fruit	Treat kidney stones, boost immunity, antiviral	0.59	0.316	45
41.	*Spinacia oleracea*	Palak	Amaranthaceae	Leaves	obesity, boost immune system	0.41	0.237	25

42.	*Phoenix dactylifera*	Khajoor	Arecaceae	Fruit	Promote Brain health, enhance health, male infertility	0.59	0.355	50
43.	*Cestrum diurnum*	Din ka raja	Solanaceae	Leaves	Headache and dizziness	0.42	0.197	20
44.	*Gossypium hirsutum*	Kapas	Malvaceae	Seeds	nervine tonic in headaches and brain infections	0.43	0.276	30
45.	*Ficus religiosa*	Peepal	Moraceae	Leaves, roots, bark	Cough, blood related problems, burning sensation	0.45	0.494	50
46.	*Capsicum annuum*	Surkh Mirch	Solanaceae	Fruit	Reduce weight	0.25	0.316	30
47.	*Cichorium Intybus*	Tukhum kasni	Solanaceae	Seeds	Use for hepatitis	0.23	0.237	15
48.	*Tamarindus indica*	Imli	Fabaceae	Fruit	constipation, liver and gallbladder problems, stomach disorders	0.59	0.395	50
49.	*Cucumis sativus*	Kheera	Cucurbitaceae	Fruit	Weight loss, Promotes Hydration	0.44	0.276	30
50.	*Morus alba*	Shatoot	Moraceae	Leaves and fruit	Protect against cancer, balance cholesterol and sugar level, use to treat cancer	0.79	0.593	80

Relative frequency citation

In the present study, the value of the relative frequency citation (RFC) ranged from 0.197 to a high of 0.791 (Table 5). As is clear from the data, the highest value of RFC was recorded in the case of the native plants of the area. The highest value was found in the case of *Azadirachta indica* (0.791) and *Syzygium cumini* (0.751), followed by Nigella sativa (0.692), *Pentatropis spiralis* (0.642) i(0.593), and the lowest RFC in the case of *Cestrum diurnum* (0.198). The local inhabitants are well aware of the use of locally available medicinal plants (Bibi *et al.*, 2014 and Zahoor *et al.*, 2017). Earlier, it has been found that Acacia nilotica and *Azadirachta indica* preferably grow under high temperature conditions (Jha *et al.*, 2010).

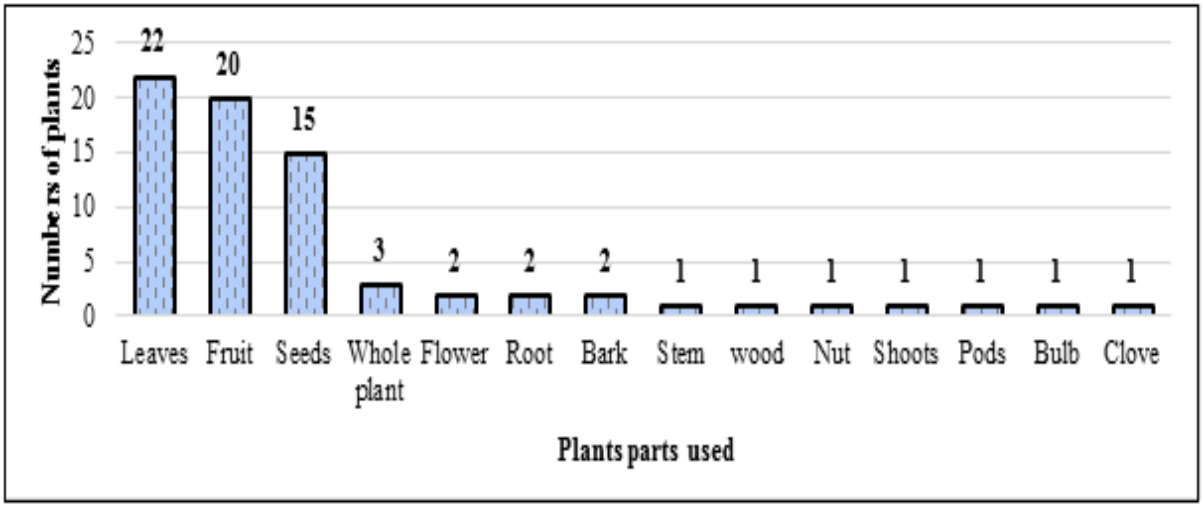

Fig. 1. Number of plants parts used in against ailments.

Fidelity level

The value of the fidelity level (FL) ranged from 15% to 100% (Table 5). It is a fact that the higher the value of FL, the higher will be the plant's usage (Farnsworth,1988). In the present study, the highest FL was represented by *Azadirachta indica* (100%) for blood purification followed by *Syzygium cumini* (98%) for diabetes, and Nigella sativa (94%) for

lowering of blood cholesterol, *Eucalyptus camaldulensis* (85%) for respiratory issues, wound healing and fever reduction, additionally *Morus alba* (80%) for cancer treatment and *Pentatropis spiralis* (75%) for respiratory, digestive and skin disorders at the same time, the lowest FL was recorded in the case of Salvadora oleoides (15%) followed by *Cestrum diurnum* (20%) for epilepsy and headache respectively.

Medicinal plants have been gaining increasing interest in Asian countries over the years, primarily for their contributions to food provision, healthcare support, and poverty alleviation. Researchers from nine Asian countries, including China, Korea, India, Indonesia, Malaysia, Myanmar, Sri Lanka, Thailand, and Vietnam, are placing a strong emphasis on discovering new drugs from plant materials. These countries have already published their National Monographs of herbal drugs (Oliver, 2013). Additionally, other Asian countries are also investing significant resources in the discovery of herbal drugs.

Asian communities have extensive knowledge and expertise in using medicinal plants to treat common local diseases (Shah *et al.*, 2020). Interestingly, both men and women have inherited a wealth of knowledge about traditional medicinal plant treatments from their ancestors. Undeniably, their expertise is a direct result of the valuable knowledge passed down through generations (Kamalebo *et al.*, 2018). The present study emphasizes the urgent need to enhance scientific research in the search for bioactive compounds from medicinal plants. Such surveys are crucial for national and international researchers in their exploration of medicinal plants for the development of new drugs (Kanwal, 2017 and Petrakoua *et al.*, 2020).

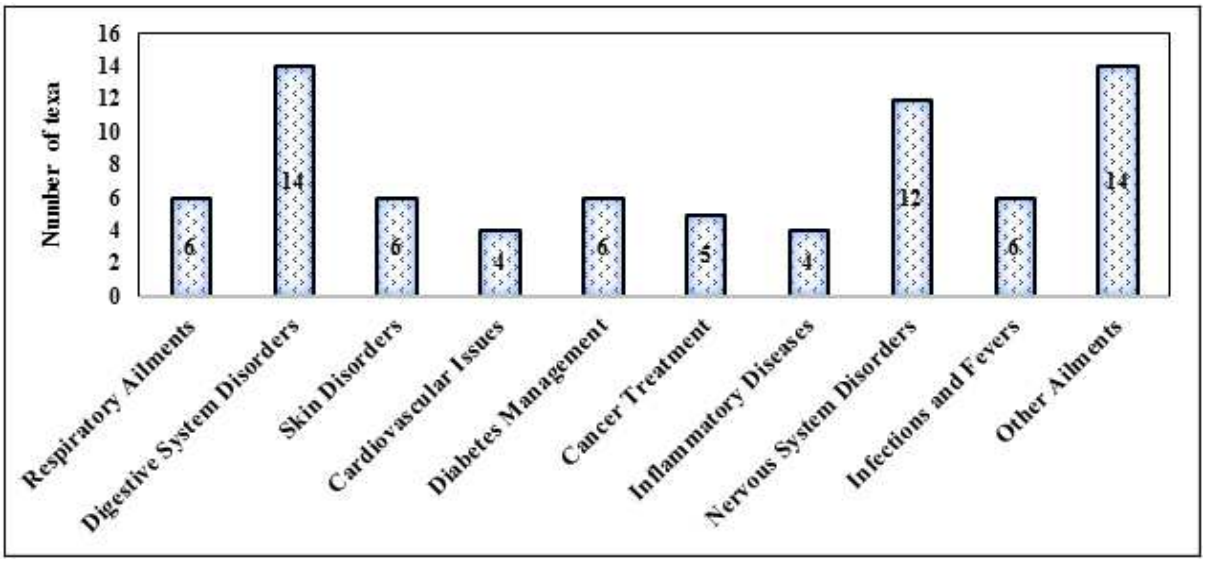

Fig. 2. The number of taxa used for treating different ailments.

Several studies have confirmed the extensive use of medicinal plants as observed in the present study (Jabbar *et al.*, 2006 and Ahmad *et al.*, 2017). Several Multiple reports have suggested that various plant species can be used to create a single herbal recipe for specific diseases (Shah *et al.*, 2020). Therapeutic plants play a crucial role in treating diseases for approximately 80% of people in emerging economies (Tuasha *et al.*, 2018). Traditional healers, known as Hakeems, play a crucial role in these communities. Due to the inadequate healthcare system in these areas, the people rely heavily on medicinal plants.

In the northern regions of the country, the local residents gather healing plants and sell them in the market to fulfill their daily financial needs (Hassan *et al.*, 2019). It is crucial to note that the majority of plants utilized in the study area for disease treatment are readily accessible and people possess knowledge on sustainable utilization of these plants.

Ethnopharmacological relevance

The current research is unique compared to the existing ethnomedicinal literature in other parts of Southern Punjab (Ahmed *et al*., 2015 and Badar *et al*., 2017). The results have only been compared to ethnomedicinal literature of neighboring areas due to the lack of similarities with distant areas. In this study, newly reported species and their most common uses are documented for the first time, which has not been done previously includes *Chenopodium album, Cordia myxa* (cough and chest), *Acacia karoo* (stop bleeding), *Salvadora oleoides* (epilepsy), *Cestrum diurnum* (headache), *Gossypium hirsutum* (Nervine tonic), and *Cichorium intybus* (hepatitis). The present study also reported that ten species could be used for the treatment of Digestive Health (Including Constipation, Diarrhea, Stomach Problems). In the literature, no study has reported such a good number of species for the treatment of digestive issues. On the other hand, six species have been documented for the treatment of diabetes and these results are pivotal for the researchers to focus on the detection of useful bioactive compounds for the preparation of novel drugs. The use of traditional medicinal plants for treating various diseases has gained popularity in the past decade. Numerous researchers have discovered that the ethno-pharmacological significance can be better understood by comparing it to previous studies. Chenopodium album is widely distributed plant species in the country, used against Rheumatism, bug bites, sunstroke, and treatment of skin problems and for cooking purposes (Qureshi *et al*., 2012). *Ricinus communis* is used as a laxative and for the treatment of GIT problems (Nisar *et al*., 2012 and Zahoor *et al*., 2017). *Foeniculum vulgare* have anticancer, relieve menopausal symptoms, abdominal pain, reproductive, and respiratory diseases (Jadid *et al*., 2023). *Moringa oleifera* is known for its numerous therapeutic properties, including analgesic, anti-inflammatory, and antioxidant effects Migraine, antidiabetic, anticancer (Fatoumata *et al*., 2020). *Azadirachta indica* is another plant used for the treatment of several diseases, including skincare, hair problems, birth control, abortion, and diabetes (Eid *et al*., 2017). *Ficus carica* is commonly used to treat diarrhea, jaundice, diabetes, vaginal infection, and is known to possess anti-inflammatory activities (Sharma *et al*., 2012). *Morus alba* provide protection against cancer, balance cholesterol and sugar levels sore throat (Alamgeer *et al*., 2013). *Cordia myxa* is used to treat cough and chest complaints as well as wounds and ulcers (Al-Snafi, 2016). *Citrullus colocynthis* extract is used to Cure hepatitis and constipation (Khan, 2020). Allium cepa, commonly known as onion, is not only used as a culinary ingredient worldwide but also possesses remarkable medicinal properties. It is utilized for various purposes, such as treating sexual disorders in both sexes, purifying the blood, relieving sore throat, promoting hair growth, addressing appetite issues in livestock, facilitating wound healing, and regulating normal blood pressure (Shafiq, *et al*., 2017).

Conclusions

This study highlights the extensive ethnobotanical knowledge of medicinal plants in the arid sand dune deserts of Muzaffargarh District, Punjab, Pakistan. A total of 51 medicinal plant species belonging to 33 families were documented, with Moraceae, Cucurbitaceae, and Solanaceae being the most prominent. The findings reveal that leaves, fruits, and seeds are the most frequently used plant parts, reflecting their accessibility and minimal impact on plant sustainability. Key species, such as *Azadirachta indica, Syzygium cumini,* and *Nigella sativa,* were identified as vital for treating a range of health conditions, including gastrointestinal, respiratory, and skin disorders, as well as diabetes.

The high Informant Consensus Factor (ICF) values for diabetes management and respiratory ailments underscore the reliance of local communities on these plants for primary healthcare. This research emphasizes the critical role of traditional knowledge in treating diseases and discovering novel bioactive compounds, offering a valuable resource for pharmacological studies. However, the overexploitation of local flora for fuel, fodder, and medicine poses a significant threat to biodiversity. To

address this, conservation initiatives are urgently needed, alongside collaborative efforts between scientific researchers and local healers to preserve indigenous knowledge and ensure sustainable utilization of medicinal plants. This study provides a foundational database for future research, aiming to bridge the gap between traditional practices and modern pharmacological advancements.

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