Ethnomedicinal relevance of selected monocot taxa from different geographical regions of Pakistan

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Research

Abstract

Background: Pakistan has a unique biodiversity of monocotyledon flora and due to its unique climatic condition a huge number of medicinal plants are distributed in the area. Ethnobotany plays a crucial role in understanding the dynamic relationships between biological diversity and social and cultural systems. However, studies about the ethnomedicinal significance of monocot taxa in Pakistan are very limited.

Methods: This study documented the indigenous uses of selected medicinal monocot taxa. The ethnomedicinal data was obtained through semi-structured interviews with the local men, women and herbalists of the area. The ethnomedicinal data were analyzed by different quantitative indices i.e. Use value (UV), frequency of citation (FC), relative frequency of citation (RFC), and information consent factor (ICF).

Results: In the present study, selected medicinal monocots belonging to seven families were collected from different geographical regions of Pakistan. Family Amaryllidaceae was reported as higher number of used species. Most often used parts were noted as bulbs followed by leaves and roots. The most frequent mode of preparation method was found as a decoction and raw form. Nine different disease categories were reported including respiratory diseases, antidote, gynecological problems, urogenital problems, digestive disorders, glandular disorders, blood circularity system disorders, dermatological problems, and musculoskeletal disorders. Among them, the respiratory disorders show the high value of ICF.

Conclusion: The study document showed that selected monocot taxa were used as folk medicine against various diseases. Medicinal monocots having high used value help to identify a phytochemical compound that is bioactive and indispensable for the synthesis of novel drugs for various diseases.

Keywords: Monocotyledons taxa, medicinal value, medicinal usage; local communities; ethnobotanical indices.

Background

Pakistan has a unique biodiversity, having nine major ecological zones. Due to its unique climate, the country is very rich in medicinal and endemic plants distributed in its large area (Bibi et al. 2018). A rich diversity of plants were used by the local communities for various medicinal purposes (Mahmood et al. 2011). The gathering and processing of plants as medicinal plants for the preparation of traditional herbal medicine is an old practice among the local communities in Pakistan for both women and men (Sher et al. 2015). The ethnomedicinal approach requires an ethnopharmacologist, an ethnobotanist, a modern physician, traditional healers and an anthropologist (Iwu & Wootton 2002). Traditional medicinal systems including unani medicines, traditional Chinese medicine (TCM) and ayurveda medicine help researchers interested in botanical dietary supplements and natural product medicine (Graham & Farnsworth, 2010).

Traditional knowledge about plants and biological experience accumulated over generations has made a great and crucial contribution to studies in different local communities of Pakistan (Abidin et al. 2022; Ahmad et al. 2015; 2016; 2021). Different authors have contributed to ethnobotany from time to time in different geographical regions of the world (Gazzaneo *et al*. 2005; Gedif et al. 2003; Giday et al. 2003; Vijayakumar *et al*. 2015), but the medicinal uses specifically monocot taxa have never been explored before, and in this regard, the present study can be considered as the first one which deals with an ethnomedicinal study on monocot species in different geographical regions of Pakistan. Medicinal plants have been used for various ailments since ancient times (Sureshkumar *et al*. 2017). Ethno-botanical knowledge of medicinal plants for the various reproductive problems was documented by Talukdar *et al*. (2017). The plants used by traditional healers for the treatment of malarial diseases have been enlisted (Ngarivhume *et al*. 2015). Herbal plants for the treatment of gastrointestinal disorders were reported by Neamsuvan & Ruanfrit (2017). Ethnobotanical knowledge of medicinal weeds used by the traditional communities of Mato Grosso, Brazil has been analyzed by Ribeiro *et al*. (2017) and found that a wide variety of medicinal plants are used by the local communities in self-care health and the therapeutic potential of some of these plants has been scientifically validated. The plants used to cure lymphatic filariasis in South Africa were mentioned by Komoreng *et al*. (2017). An ethnobotanical survey was documented by Balamurugan *et al*. 2017) and reported 66 traditional plants used for the treatment of gynecological disorders. Similarly, Pieroni *et al*. (2017) investigated the traditional food usage of wild medicinal plants used by the Gorani of South Kosovo and showed a remarkable level of traditional knowledge concerning the folk use of wild botanical and mycological taxa. Trends and consumption of wild food plants were reported by Menendez-Baceta *et al*. (2017) and reported that uses strongly linked to traditional agrarian activities are being largely lost, indicating that pervasive socioeconomic changes such as industrialization and changes in lifestyle are the main driving factors explaining current trends in the consumption of wild edibles plants. Plants used as remedies for the treatment of helminthiasis are investigated by (Ba Ndob *et al*. 2016). A total of 71 medicinal plants were reported by Yeshi *et al*. (2017) and despite their therapeutic usage, are used as fruit, food and vegetable. The usage of traditional medicine among the Pakistani people in Copenhagen was enlisted by Ramzan *et al*. (2017) and concluded that this study will enhance the understanding of Pakistanis' use of traditional medicines and thus make an important contribution to the limited literature on this topic. Most of the ethnobotanical studies in the country focus more on the indigenous groups and less on more urbanized ethnic communities whose traditional healthcare practices are also at threat. Hence, the continuous documentation of the ethnomedicinal potential of plants through research is crucial to be conducted not only to conserve this oral custom but to support local health care as well.

Keeping in view the therapeutic potential of medicinal plants, this study was designed and conducted with an aim, to document the traditional usage of monocotyledonous plants sampled from different geographical regions of Pakistan. Monocotyledon taxa require detailed information, and its therapeutic value is gauged by the ethnobotanical and ethnomedicinal knowledge.

Material and Methods

Collection of monocot taxa and study area

The plant species were collected from different geographical regions of Pakistan and were listed in (Table 1) and illustrated in (Figure 1). The Swat Valley is situated in the Khyber Pukhtoon Khwa (KPK) at 34° 34' N and 72° 08' to 50' E. The total area of Swat is 5337 sq km from the valley of Gorbal in the North to the village of Landaakay. Swat Valley is well known for its green mountains and beautiful transparent fast-flowing rivers. The valley has varied topography with an altitudinal range of

700 to 6000 m above the average sea level, providing a complex biodiversity hotspot for researchers to be explored and protected. This complex topography gives rise to a complex biota and thus a surprisingly unique man-plant relationship (ethnobotany) (Ahmad *et al*. 2014). The Bunair District is situated in KPK with an area of 1760 sq km and lies on the globe between 34°-9'and 34°-43'N latitudes and 72°-10'and 72°-47' E longitudes (Hamayun, 2003). The Swabi District of Khyber Pakhtunkhwa province is situated at 34° 7', 48" N and 72° 28', 11" E of Khyber Pakhtunkhwa, Pakistan, and lies between the Indus and Kabul Rivers. It is the fourth most populous district of the province of Khyber Pakhtunkhwa in Pakistan (Naveed et al. 2018). Similarly, the Ziarat district is located between 67° 11′ 18″ to 68° 36′ 0″ east longitudes, and 30° 09′ 46″ to 30° 35′ 56″ north latitudes. The district is bordered on the north by Pishin, Loralai and Killa Saifullah districts, on the south by Sibi district, on the northeast by Loralai district, on the northwest by Pishin district, and the southwest by Quetta district. Overall, Ziarat remains the smallest district of Balochistan in area, with a total area of 3,670 km2. The Neelum Valley lies between 73° – 75° E longitude and 32° – 35° N latitude, covering an area of 3737 km^2 situated north-east of Muzaffarabad at an altitude of 900-6325 meters above sea level. The study area includes high mountains, deep valleys, dissected small terraces, gentle to steep slopes and inclined spurs. The maximum daily temperature varies from 20 to 30^o C during summer and the average temperature ranges from 4 to 0°C in winter (Dar, 2003).

Table 1. List of selected monocot species along with their locality.

Plant Species	**Locality**	**Family**	**Voucher No.**
Agave sisalana Perrine	Islamabad	Asparagaceae	QAU-SB-102
Allium jacquemontii auct.	Islamabad	Amaryllidaceae	QAU-SB-107
Allium sativum L.	Swabi	Amaryllidaceae	QAU-SB-103
Allium cepa L.	Swabi	Amaryllidaceae	QAU-SB-108
Asparagus densiflorus (Kunth) Jessop	Islamabad	Asparagaceae	QAU-SB-104
Asparagus officinalis L.	Islamabad	Asparagaceae	QAU-SB-105
Asphodelus tenuifolius Cav.	Rohtas fort, Jehlum	Xanthorrhoeaceae	QAU-SB-109
Colchicum laetum Steven	Swat	Colchicaceae	QAU-SB-110
Eremurus stenophyllus (Boiss. & Buhse)	Quetta/Ziyarat	Xanthorrhoeaceae	QAU-SB-125
Eremurus persicus (Jaub. & Spach) Boiss.	Quetta/Ziyarat	Xanthorrhoeaceae	QAU-SB-106
Gagea rawalpindica Levichev & Ali	Islamabad/Rawalpindi	Liliaceae	QAU-SB-113
Hemerocallis fulva L.	Islamabad	Xanthorrhoeaceae	QAU-SB-127
Hippeastrum reginae L.	Islamabad	Amaryllidaceae	QAU-SB-124
Hymenocallis littoralis (Jacq.)	Islamabad	Amaryllidaceae	QAU-SB-114
Iris decora Wall.	Bener	Iridaceae	QAU-SB-123
Ixiolirion tataricum (Pall.) Schult. & Schult.	Bener	Ixioliriaceae	QAU-SB-112
Moraea sisyrinchium L.	Bener	Iridaceae	QAU-SB-119
Narcissus tazetta L.	Swat/Miandam	Amaryllidaceae	QAU-SB-122
Notholirion thomsonianum (Royle)	Neelum Valley/Azad Kashmir	Liliaceae	QAU-SB-111
Polygonatum multiflorum L.	Murree/Bara Gali	Asparagaceae	QAU-SB-117
Polygonatum verticillatum L.	Murree/Bara Gali	Asparagaceae	QAU-SB-126
Scilla griffithii Hochr.	Islamabad	Asparagaceae	QAU-SB-118
Tulbaghia violacea Harv.	New Murree	Amaryllidaceae	QAU-SB-116
Tulipa clusiana Redoute	Swat/Miandam	Liliaceae	QAU-SB-120
Zephyranthes citrina Baker	Islamabad	Amaryllidaceae	QAU-SB-115
Zephyranthes rosea Lindl.	Peshawar	Amaryllidaceae	QAU-SB-121

Figure 1. Sampling at Neelum Valley, Kahsmir (a), sampling at Chail Valley Swat, sampling at Ziyarat Quetta, sampling at Maindam, Swat (d).

Identification and preservation

The species were first collected from different geographical regions of Pakistan (Figure 2). The samples were then pressed, dried, documented, identified and finally mounted on herbarium sheets. For the identification, first we compare our species with the already available specimen in the Herbarium of Pakistan (ISL), Quaid-i-Azam University Islamabad and then confirmed with the online Flora of Pakistan.

Ethno-medicinal data documentation of monocot flora

Socio-demographic and ethnomedicinal data (Vernacular name, locality, ethnomedicinal uses, habit, mode of preparation and part used) of the medicinal plants were collected through semi-structured ethnobotanical interviews. A total of 150 informants were interviewed out of which 90 were men and 60 were women (Table 2). The results were analyzed both qualitatively and quantitatively.

Qualitative analysis

The qualitative analyses were calculated that included life form, part used, dominant family, mode of utilization, and method of preparation as found in the previous study (Ahmad, 2016).

Used value (UV)

To evaluate the importance of medicinal plants which shows high use against different disease (Butt and others, 2015). Used value were calculated by using the following formula:

$$UV = u/n,$$

UV=Total number of ailments/Total No of informants

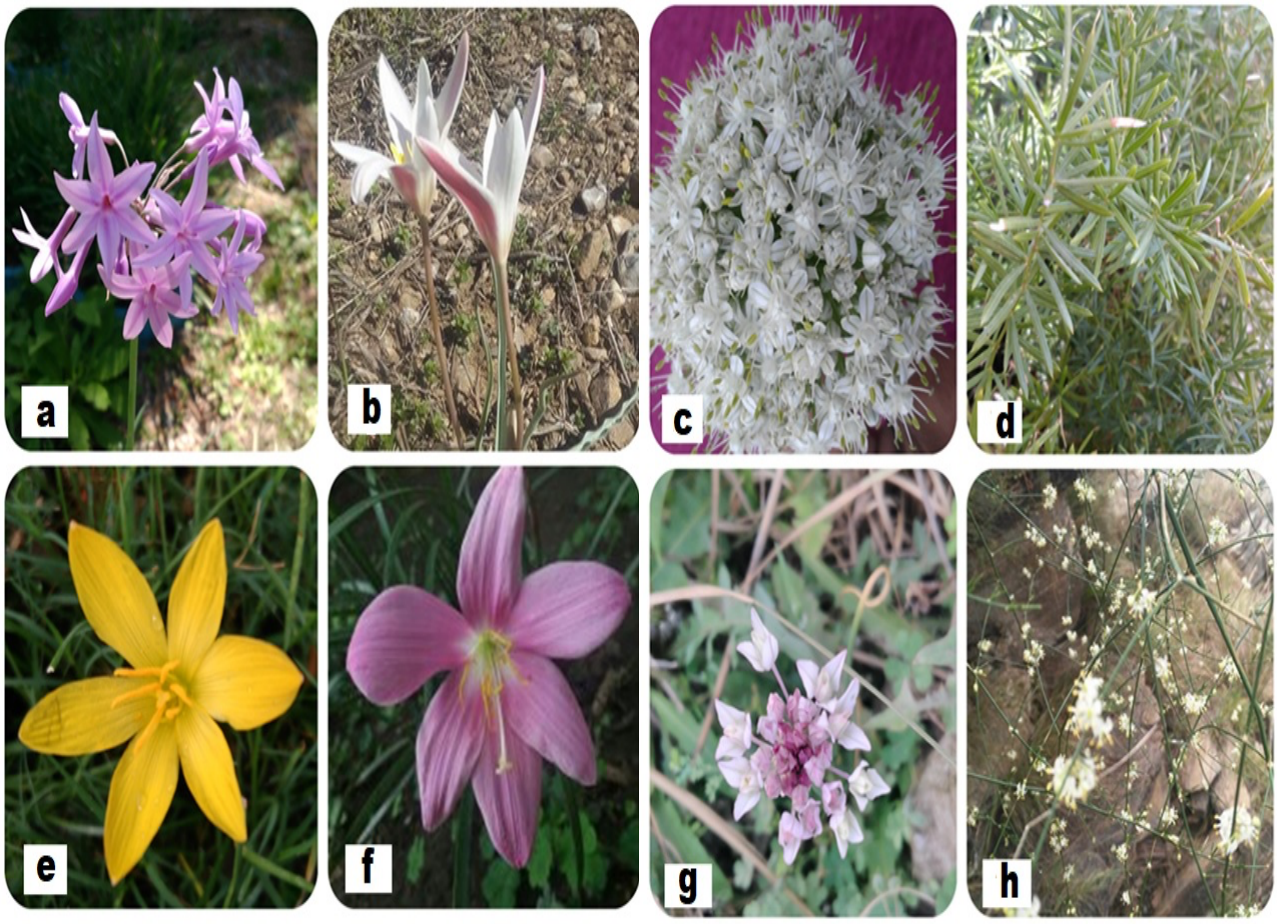

Figure 2. Illustration of selected monocot taxa; *Tulbaghia violacea* (a) *Tulipa clusiana* (b), *Allium cepa* (c) *Asparagus densiflorus* (d) *Zephyranthes citrina* (e) *Zephyranthes rosea* (f) *Allium jacquemontii* (g) *Asparagus officinalis* (h).

Table 2. Demographic data of informants.

Variable	**Categories**	**No. of Persons**	**Percentages %**
Category of Informant	Traditional health practitioners	15	10
	Indigenous people	135	90
Gender	Female	45	30
	Male	90	60
Age	20-30	5	3
	30-40	20	13
	40-50	30	20
	50-60	35	23
	More than 60 years	60	40
Educational background	Illiterate	60	40
	Completed 5 years education	32	21
	Completed 8 years education	20	13
	Completed 10 years education	15	10
	Some under grade degree	10	7
	Graduate	8	5
Traditional health practitioners experience	Less than 2 years	4	27
	2-8 years	7	47
	8-14 years	2	13
	14-20 years	1	7
	More than 20 years	1	7

Relative frequency of citation (RFC)

RFC was calculated to elaborate the knowledge of indigenous use (Ahmad and Beg, 2001).

$$RFC=FC/N$$

Where FC is the Frequency of citation and N stands for the Total number of informants (0<RFC<0). This reflects the comparative importance of a particular species in a given community.

Informant consensus factor (ICF)

In this study, we calculated the informant consensus factor (ICF) for each group of diseases to identify the agreement of the local informants on the reported remedy for the disease categories (Heinrich et al. 1998). ICF was calculated with the following formula of Pandikumar et al. (2011).

$$ICF=N_{ur}-N_t/N_{ur}-1$$

It shows how much plant has been used for the treatment of ailments within an area. ICF value should be lies in the range of 0.0 to 1.0.

Results and Discussion

Ethno medicinal study of Monocotyledonous flora

In the present study, Table 3 shows the ethno-medicinal use of selected monocotyledonous plant species belonging to seven families. The distribution of the reported plant species was also enlisted in Table 1. Members of monocot families are the sole component of the primary source of medicinal plants (Shrestha and Dhillion, 2003). Medicinal plants play a vital role in the treatment of countless ailments both in developed and developing countries. At a very cheap rate, these herbal medicines heal the infected person as compared to modern medicines. In the present study, an attempt has been made to gather the ethno medicinal information about the use of monocotyledonous medicinal flora. A significant number of our modern medicines have originated from indigenous utilization of plants, for example, Ginkgo, Curcuma, and Ginseng. Hence, data on natural medications, from ethno medicine to current utilization, has been organized given their contribution to different diseases (Ramawat et al. 2009).

Demography of the area

In total 150 informants including 45 women, 90 men and 15 were traditional healers (THs). The 3% informants were in the age of 20 to 30 years, 13% were in the age of 30 to 40 years, 20% were in the age of 40 to 50 years, 23% were in the age of 50 to 60 years, while the majority of the informants were more than 60 years old. These findings are in line with Abbas et al. (2017) and Bibiet al. (2022), who also reported a maximum number of informants were above the age of 60 years (51%) and middle age such as 40-60 years (26%). While young people about 20-40 years old seem less interested in herbal treatments and traditional knowledge of their elders. Almost 40% of informants were reported as uneducated and only a few (5%) of them have higher education (Table 2). In current research majority of informants during the ethno-medicinal survey were reported as men. In previous records, men were found to be more active in conveying indigenous knowledge about medicinal plants as compared to women (Dumonceau et al. 2017). According to Yaseen et al. (2015), most of the women were not permitted to examine or discuss anything with outsider men so therefore, the contribution of ladies was negligible to the ethno-medicinal data documentation. The traditional knowledge of medicinal plants and their use by indigenous healers are not only useful for the conservation of cultural traditions and biodiversity but also for community healthcare and drug development in the present and future (Pei, 2001). It is through folk medicine that many traditional healers can cure effectively certain diseases and ailments like snake and dog bite etc. (Sing & Sharma, 2018).

Species diversity and life form

Ethnomedicinally important selected monocot species belonging to seven families were investigated during the ethnomedicinal survey. These include Amaryllidaceae, Asparagaceae, Xanthorrhoeaceae, Liliaceae, Iridaceae, Ixioliriaceae and Colchicaceae. Family Amaryllidaceae were reported as higher number of used species (nine species) followed by Asparagaceae (six species) and Xanthorrhoeaceae (four species), Liliaceae (three species), Iridaceae (two species), Ixioliriaceae and Colchicaceae one specie each (Table 1 and Figure 3).

Table 3. Ethno-medicinal uses of selected monocot taxa.

Botanical name /Family	Local name/ Common name	Life form	Part used	Formulation	Administration	Medicinal uses	FC*	UR*	UV*	RFC*
Agave sisalana	Malina sisal	Herb	Leaves	Extract	Oral	To kill worms, Digestive disorders	30	2	0.07	0.2
Allium jacquemontii	Jungle piyaz	Herb	Bulb	Raw	Oral	Hypertension, digestive problems	35	2	0.06	0.23
Allium sativum	Ouga	Herb	Whole plant, bulb	Raw, decoction	Oral	Hypertension, female aphrodisiac, Blood pressure, female infertility	44	4	0.09	0.29
Allium cepa	Piyaz	Herb	Bulb	Juice	Oral	Aphrodisiac, Blood sugar, High blood pressure, Indigestion and vomiting.	48	5	0.1	0.32
Asparagus densiflorus	Sprengeri fern	Herb	Leaves	Extract	Topical	Skin cuts	55	1	0.02	0.37
Asparagus officinalis	Sparrow grass	Herb	Leaves, roots	Juice, decoction	Oral	Diuretic, laxative, purify blood, kidney stone, aphrodisiac, lower blood pressure, throat infection chest pain and tonic	67	9	0.13	0.45
Asphodelus tenuifolius	Bokat	Herb	Seeds	Oil, Powder	Oral,Topical	Ulcer, bite of bees, diuretic	38	3	0.08	0.25
Colchicum laetum	Qaimat guly	Herb	Whole plant	Extract, Raw, powder	Oral	Aphrodisiac, blood purifier and laxative, Body pain, lactation problems, Digestive disorders, Joint pain	45	7	0.16	0.3
Eremurus stenophyllus	Shezgai	Herb	Root, Leaves	Powder, Paste	Oral	Digestive disorders, Cooling	55	2	0.04	0.37
Eremurus persicus	Shezgai	Herb	Leaves	Paste	Topical	Skin burns antiseptic	65	2	0.03	0.43
Gagea rawalpindica	Yellow star lily	Herb	Bulb	Raw	Oral	Body pains	43	1	0.02	0.29
Hemerocallis fulva	Day lily	Herb	Root	Juice, decoction	Topical, oral	Antidote, Inflammation, digestion	66	3	0.05	0.44
Hippeastrum reginae/ Amaryllidaceae	Star-lily	Herb	Bulb	Juice	Topical	Swellings and wounds.	59	2	0.03	0.39
Hymenocallis littoralis	Spider lily	Herb	Bulb	Juice	Topical	Wound healing, Blemishes and freckles.	63	2	0.03	0.42
Iris decora	Blackberry lily	Herb	Roots	Decoction	Oral	Diarrhea, cough	54	2	0.04	0.36

Ixiolirion tataricum	Hadoogai	Herb	Leaves, bulb	Raw	Oral	Digestive disorders, mouth diseases	75	2	0.03	0.5
Moraea sisyrinchium	Gandechar	Herb	Bulb	Decoction	Oral	Diuretic	39	1	0.03	0.26
Narcissus tazetta	Guli nargas	Herb	Bulb	Raw	Oral	Hypertension	54	1	0.02	0.36
Notholirion thomsonianum	Shyajey	Herb	Leaves	Infusion, decoction	Oral	Muscular pain, menstruation problems	33	2	0.06	0.22
Polygonatum multiflorum	Noorealam	Herb	Rhizome	Infusion	Oral	Dysentery, aphrodisiac	62	2	0.03	0.41
Polygonatum verticillatum	Noorealam	Herb	Rhizome	Infusion	Oral	Aphrodisiac, rheumatism	39	2	0.05	0.26
Scilla griffithii	Chaulmoogra	Herb	Bulb	Powder	Oral	Kidney disorders, cardiac diseases, diuretic	37	3	0.08	0.25
Tulbaghia violacea	Jungle piyaz	Herb	Rhizome	Decoction	Oral	Infectious diseases, fever, rheumatism, asthma, used as purgative.	47	5	0.11	0.31
Tulipa clusiana	Spin gul	Herb	Bulb	Raw	Oral	Heart problems, joint pains	62	2	0.03	0.41
Zephyranthes citrina	Nargis	Herb	Bulb, leaves	Fresh bulb	Oral	Diabetes mellitus	51	1	0.02	0.34
Zephyranthes rosea	Fairy lily	Herb	Bulb	Extract	Oral	Diabetes, ear and chest ailments, and viral infections	52	4	0.08	0.35

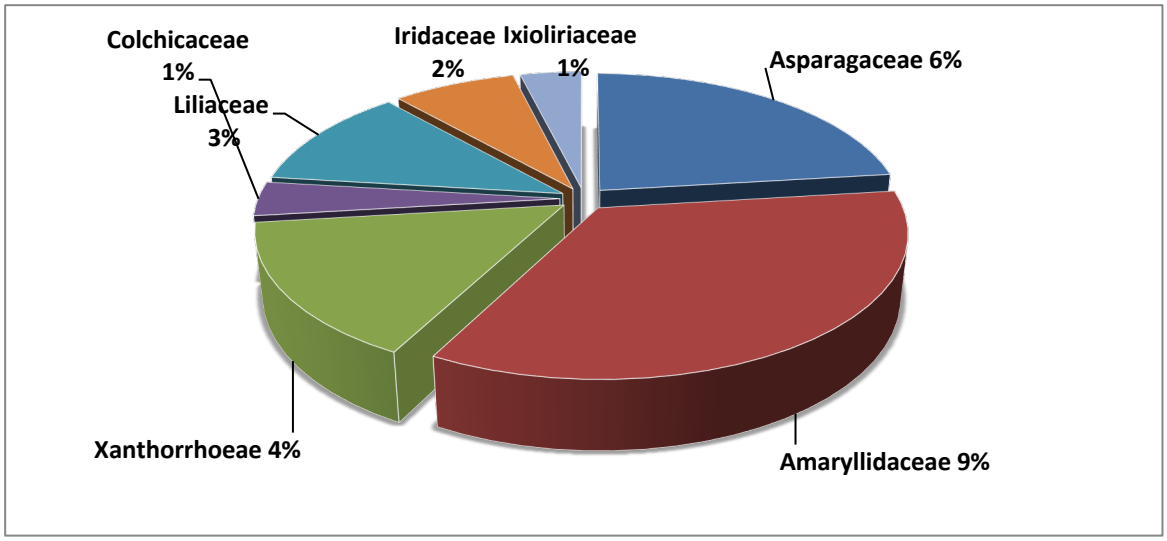

Figure 3. Percentages of medicinal plant families.

All monocotyledonous flora reported in the present study were herbs (Table 3). According to Senbeta et al. (2013), herbs are usually found everywhere and also show minimum side effects and extraction of active constituents is quite easy from herbs. Herb was also leading in some previous studies (Ahmad et al. 2014; Cooper et al. 2005; Teklehaymanot, 2009). During the ethnomedicinal survey total of 26 monocots belonging to seven families were reported. Family Amaryllidaceae were reported as dominant followed by Asparagaceae and Xanthorrhoeaceae. Amaryllidaceae is one of the large monocot families and is distributed all over the country. In comparison with a previous study, the ethnobotanical significance of 34 monocot species belonging to 10 families such as Zingiberaceae, Araceae, Liliaceae etc. had been investigated. Among them, the Zingiberaceae were found dominant family and reported that these 34 taxa were used to treat 30 various ailments such as fever, scorpion and snake stings, skin problems, stomach-related problems and cough (Padal et al. 2013).

Preparation, mode of administration and part used

The details about the ethnomedicinal usage of selected monocot taxa were enlisted in (Table 3). Decoction and raw (22%) were prominently used methods of preparation of herbal drugs followed by juice (16%) and powder (13%) and extract 12 %. While 9 % used as infusion and 6 % used as a paste (Figure 4). The oral mode was the favored mode of administration (79%), followed by topical 21%. According to Ghasemi et al. (2013), active constituents are extra active in fresh plants and highly soluble in hot water due to water polarity. In a previous study, the most common preparations method were decoction (36.10%), paste (16.70%), juice (11.10%) followed by bandage, steam, extract and ashes (Sharif et al. 2022)

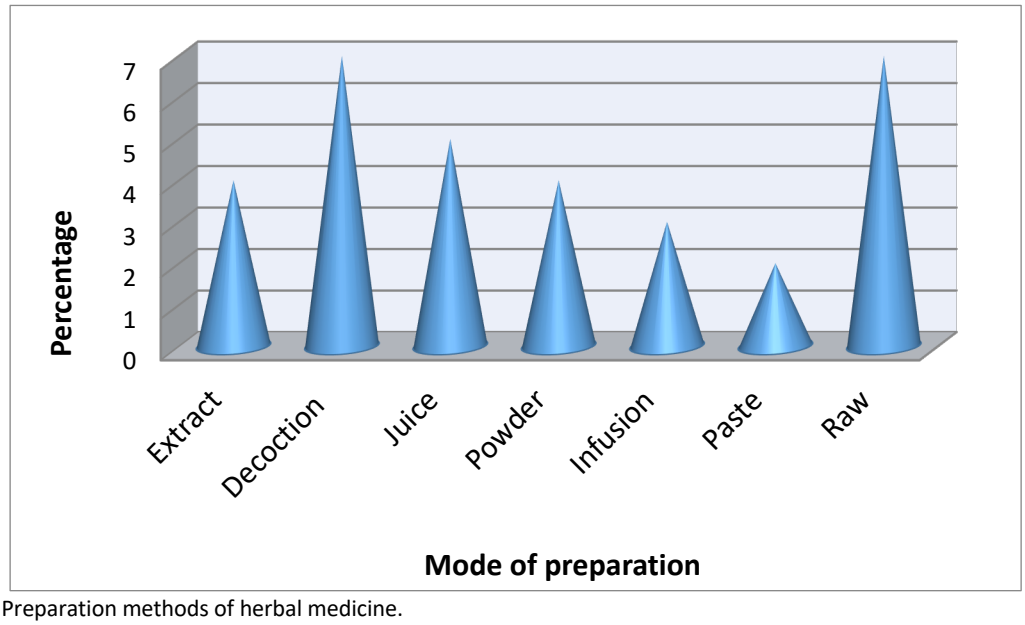

Figure 4. Preparation methods of herbal medicine.

In the survey oral mode of administration was reported dominant followed by the topical mode of administration. As reported in earlier studies, the oral mode of administration was considered to be more recommended (Ayyanar and Ignacimuthu, 2011; Nadembega and others, 2011). Similarly, Tahir et al. (2023) recently documented the ethnobotanical usage of medicinal plants in Ethiopia and reported various ways of administration of the prepared remedies to treat various ailments. Among them, oral administration was found the principal route of administration (46.6%), followed by skin application (22.3%).

Frequently used plant parts were bulbs (45%), followed by leaves (26%) and roots (13%). 10% rhizome and 6 % whole plants are used (Figure 5). Mostly, all parts of the plant were used for the treatment of various ailments. In line with this, Ahmad et al. (2014), reported that the most commonly used plant parts in herbal preparations were leaves which is about (33%), followed by roots 17 %, fruits 14%, whole plants 12%, rhizomes 9% stems 6% barks 5% and seeds 4%. Our study approximately supports these findings in terms of leaves, roots and rhizomes. Similarly, for the treatment of 44 various ailments and diseases, Sing & Sharma. (2018) reported that rhizomes of the monocot taxa were used in most of the cases (41.18%), followed by leaves (23.53%) and whole plants (11.76%). The minimum usage is represented by young shoots with a usage value of 2.94% each. Among the 30 species, Zingiber officinale Rosc. is used in the treatment of 12 diseases followed by *Zingiber montanum* and *Curcuma longa* with 11 diseases each. Further research is recommended to ascertain the exact number of plants being used by this small scheduled caste community along with the exact methods of treatment. In many cases, more than one part of the same species i.e. leaves, and aerial parts were used in various herbal preparations and remedies. Leaves were the most frequent part of the traditional herbal drugs found in previous studies (Cornara et al. 2009). Some other studies reported that leaves were the most widely used part (47%) for the ethno medicinal purpose followed by seeds (25%), fruit (13%) roots (10 %) and whole part (10%) (Tahir et al. 2023). Leaves are the main photosynthetic organs in plants and are considered the natural pharmacy for the synthesis of most of the constituents that are pharmacologically more active against several diseases (Passalacqua et al. 2007). Similar to previous reports, in the present study it was found that roots were the most frequent part after leaves (Ragunathan & Solomon, 2009; Rashid et al. 2011; Savikin et al. 2013).

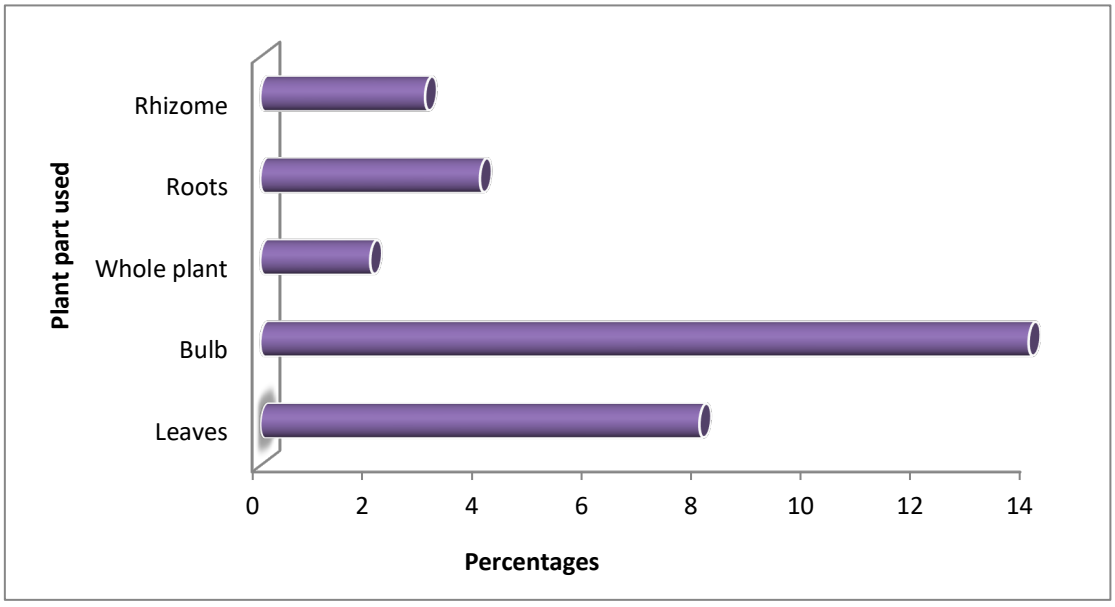

Figure 5. Percentage of plant parts used for herbal remedies.

Quantitative analysis of ethnomedicinal data

Use Value (UV)

The utilization importance of monocot taxa in the community was calculated by use value (UV) (Kushwaha et al.2018). UV values range from 0.02 to 0.16. High UV was noted in plant species *Colchicum laetum* (0.16) followed by *Asparagus officinalis* (0.13) and *Allium cepa* (0.1) (Table 1). This indicated that these plants are widely utilized, thus of high importance. It is proposed that species with higher UV consider being examined in advance for pharmacological and phytochemical screening to create homegrown medications (Qureshi et al. 2010) According to Rokaya et al. (2010) Sometimes informants had very little information about the plant species which may be the reason for the low value of UV. In a previous study, the UV ranged from 0.02 to 1 (Ullah et al. 2023). Plants that have more natural abundance in any area are widely studied because local

communities are well aware of their properties and frequently use them. According to Yaseen (2015), ethnomedicinal species having high UVs and RFCs values should be checked to evaluate and demonstrate their pharmacological activity. While plants with low UVs are not important (Amjad et al. 2017) but their low values indicate that locals are unaware of their applications, and this hinders the transfer of traditional knowledge to descendants. The maximum use values of medicinal plants might be due to their common distribution and local practitioner's awareness which make the first choice for the ailment to be treated (Sharif et al. 2022).

Relative Frequency of Citation (RFC)

Relative frequency of citation in the quantitative indicator of a plant's popularity among the informants. In the present study, the RFC values range from 0.2 to 0.45. The highest RFC was shown by *Asparagus officinalis* (0.45) followed by *Hemerocallis fulva* (0.44) and *Eremurus persicus* (0.43). The lowest value of RFC was reported for *Agave sisalana* 0.2 (Figure 6 and Table 3). These were the most familiar plants to the communities of the study area. Our results concerning RFC were practically identical to some past investigations (Shaheen et al. 2012; Yaseen et al. 2015). The ethnobotanical data were quantitatively analyzed in some previous studies using the Relative Frequency Citation (RFC) index. This indicator shows the local importance of each species and is calculated from the frequency of citation (FC, the number of informants mentioning the usage of the species) divided by the total number of informants in the survey (N), without considering the use categories (Shuaib et al. 2021). Higher RFC values indicated widespread knowledge among the local communities. The value ranges from zero (none of the informants cites the plant as useful) to one (every informant report the plant to be useful) (Shuaib et al. 2021). A species could be more popular in the area, due to its easy availability and abundance (Bibi et al. 2022).

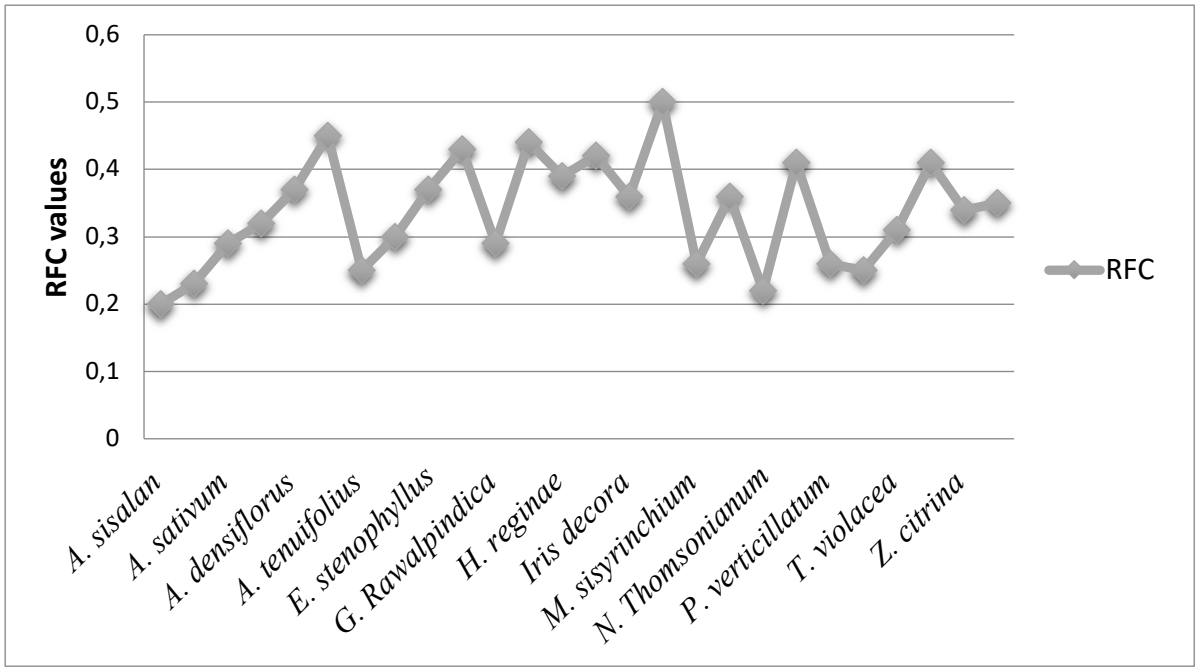

Figure 6. RFC values of medicinal plants.

Diseases categories and informant consensus factor (ICF)

For the treatment of a particular disease, the percentage of plant species utilization was documented in (Table 4). Nine different disease categories were reported including respiratory diseases, antidote, gynecological problems, urogenital problems, digestive disorders, glandular disorders, blood circularity system disorders, dermatological problems, and musculoskeletal disorders following Farooq et al. (2019) and Umair et al. (2020). Similarly, the ethnomedicinal plants used to treat 40 different ailments were grouped into 10 categories in the previous study. The maximum number of ethnomedicinal species were used to treat fever (43 species), gastrointestinal (40 species), urinary problems (23 species), and dermal disorders (23 species) (Arshad et al. (2023).

Table 4. ICF Value of medicinal plants used for the treatment of different diseases.

Disease category	Nur*1	Nur%*2	Nt*3	Nt%*4	ICF*5
Respiratory diseases	4	8.16	3	11.54	0.33
Antidote	3	6.12	2	7.69	0.5
Gynecological problems	7	14.29	6	23.08	0.17
Urogenital problems	5	10.2	4	15.38	0.25
Digestive disorders	9	18.37	7	26.92	0.25
Glandular disorders	3	6.12	2	7.69	0.5
Blood circularity disorders	8	16.33	6	23.08	0.29
Dermatological problems	5	10.2	4	15.38	0.25
Musculoskeletal disorders	5	10.2	4	15.38	0.25

*1 = Number of Use reports; *2 = %age of use reports; 3*=Number of taxa used; 4*= %age of taxa; 5*=Informant Consensus Factor.

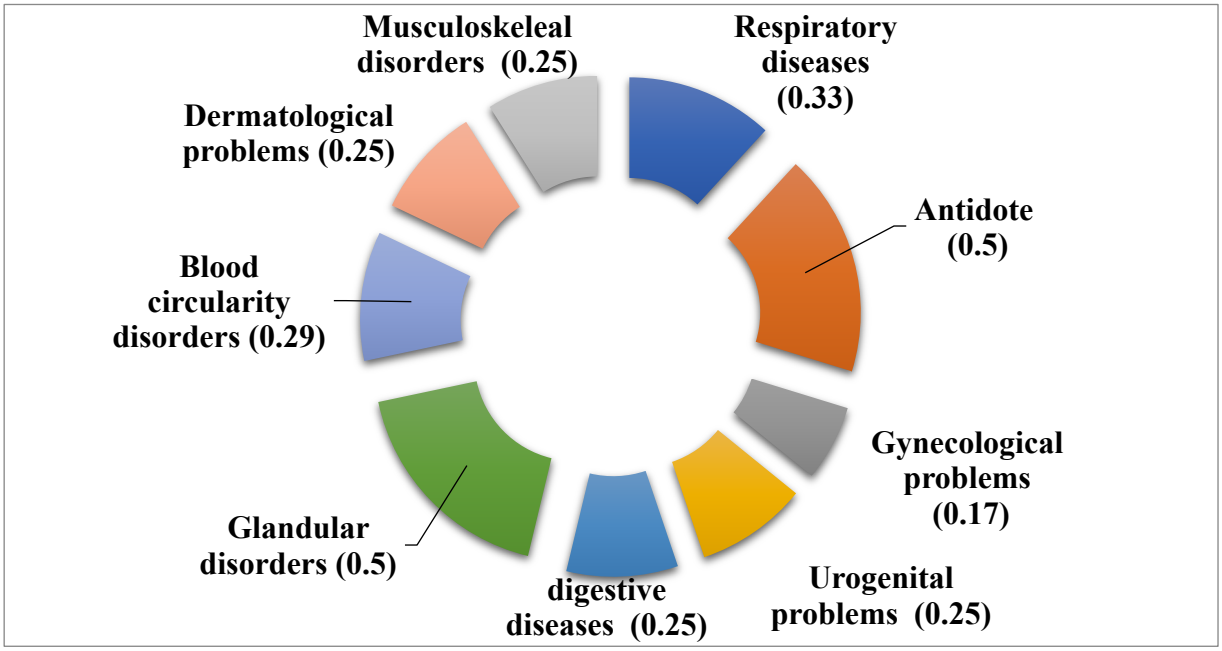

Figure 7. ICF values of disease categories.

The informant consensus factor (ICF) was calculated to determine the homogeneity among informants over plant species to be utilized for every ailment classification. In the present study, respiratory disease shows a high value of ICF (0.33), followed by Blood circularity system disorders (0.29), while least ICF values were reported in Gynecological problems (0.17). Herbal medications for the treatment of respiratory issues are a basic practice in many parts of the world. Also, respiratory diseases are basic in the investigation zone because of their remoteness, cool and unforgiving climatic conditions and additionally constrained medicinal services. Over the past couple of decades, there has been a developing interest in the investigation of medicinal plants and their use in different parts of Pakistan. In recent years quantities of data recorded on the utilization of plants in indigenous healing networks by ethnic individuals throughout the world and Pakistan has been amassed (Jimenez-Arellanes et al. 2003; Kayani et al. 2014; Rahmatullah et al. 2012).

Currently, the need for the quality control of Greek medicines has attracted attention, but most people seem to forget that we cannot determine the value of Greek medicines without standards in herbal drug sources. This long-standing question of correct identification of drug origins is not yet adequately discussed by herbalists and researchers. Professionals who may not be botanists or taxonomists normally collect the Unani medicinal plants. Similarly, without subjecting the plant material to a strict system of taxonomic recognition, the determination of a crude herbal drug obtained from a market based on a trade or vernacular name is taken for granted. Hence, the authentication of medicinally important taxa is crucial for the reason of safety and efficacy (Bahadur et al. 2022).

Overall, traditional medicine is rich due to the diversity of human groups, languages, and customs, combined with the diversity of ecological regions, leading to innovative plant use and specialized knowledge (Schultes, 1994). This study can serve as baseline information on the medicinally important monocot species wealth of the local communities. Further investigation will throw more light on the vast wealth of ethnobotanical information possessed by this community.

Conclusion

The present study contributed to the establishment of an inventory of plant-based medicines used by the local communities in the primary health care system. A total of 150 informants were interviewed during the survey to interpret the traditional knowledge about the uses of medicinally important selected monocot taxa. This study summarizes the data of selected monocot species used for various diseases as nine different disease categories were reported including respiratory diseases, antidote, gynecological problems, urogenital problems, digestive disorders, glandular disorders, blood circularity system disorders, dermatological problems, musculoskeletal disorders. The highest RFC was shown by *Asparagus officinalis* (0.45) followed by *Hemerocallis fulva* (0.44) and *Eremurus persicus* (0.43) as the topmost cited and well-known among the monocot taxa. Similarly, the high UV was reported for *Colchicum laetum* (0.16) followed by *Asparagus officinalis* (0.13) and *Allium cepa* (0.1). Most of the plants were employed to treat the disease of respiratory problems. The traditional knowledge shared by the local informants and analyzed in this paper clearly shows that indigenous knowledge of medicinal plant uses is still alive. The significance of this rich ethnomedicinal knowledge has furnished us with novel information that not only will provide recognition of this undocumented knowledge of the monocot taxa but also could provide the basis for new avenues in future pharmacological screening that leads to natural drug discovery development to improve healthcare systems globally. However, to validate this information, detailed pharmacological studies must be carried out to improve the use of medicinally important monocot flora at global perspective. This study also provides the basis for the conservation of the local flora, and its use as food and medicine. It will also provide various socioeconomic dimensions associated with the common people.

Declarations

Ethics approval and consent to participate: This study was authorized by the Department of Center for Plant Sciences and Biodiversity, University of Swat, Pakistan. All participants provided oral prior informed consent.

***Conflict of interest*:** We all authors have no conflict of interest to declare.

Consent for publications: Not applicable.

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Conflicts of Interest: The authors declare that there are no conflicts of interest in this article.

Data Availability statement: The figures and tables supporting the results of this study are included in the article, and the original data sets are available from the first author upon request.

Author's contribution: Saraj Bahadur and Mushtaq Ahmad collected the field data, Mushtaq Ahmad supervised the research. Najla Begum, Yaseen Muhammad, Maroof Ali and Tanweer Kumar participated in data analysis and the final revision of the manuscript. All the authors approved the final manuscript after revision.

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