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RESEARCH

Indigenous traditional knowledge and ethnobotanical flora: a quantitative assessment of medicinal flora of Fateh Pur Thakyala, Azad Jammu, and Kashmir, Pakistan

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Background: The current study is the first quantitative ethnobotanical evaluation of Fateh Pur Thakyala, an unexplored area of Azad Kashmir, Pakistan. The exploration and quantification of ethnobotanical knowledge among people of the study area mainly focused during field survey. The study likely focuses on documenting and preserving the indigenous knowledge and practices related to medicinal plants in the region. A total 70 informants (45 males and 25 females) selected randomly to collect data were interviewed using semi structured questionnaire. The data like demographic characteristics of informants, methods of preparation, life form, modes of application, parts used, and ethnomedicinal uses was documented. The quantitative indices including relative frequency of citation (*RFC*), use value (*UV*), informant consensus factor (*ICF*), fidelity level (*FL*), consensus value for plant part (*CPP*), rank order priority (*ROP*), percentage respondent knowledge (*PRK*), were applied to analyze the collected data. Furthermore, primary data were also compared with fifteen papers published from adjoining areas by Jaccard index (*JI*).
Results: The current study reported 135 medicinally important plants species belonging to 115 genera and 54 families. The dominating family was Asteraceae (14 sp.), followed by Fabaceae (11 sp.), Rosaceae (11 sp.), Lamiaceae (8 sp.), Moraceae (5 sp.), Solanaceae, Cyperaceae, Euphorbiaceae (4 sp.) and Poaceae, Sapindaceae, Rhamnaceae, Mrytaceae, Malvaceae (3 sp.) for each. The study revealed that there were small differences in usage of medicinal plants of different families. The herbaceous life form was dominating the study area with (79 sp.) used as herbal medicines followed by shrubs (23 sp.) and trees (33 sp.). The comparative study of for novelty of species and their uses by *JI* revealed 13 novel plants species which were not reported earlier from this region.
Conclusions: Local inhabitants still prioritize herbal medicines as an effective way to treat a wide variety of ailments. Elders and health practitioners of the study area are well aware of indigenous knowledge about medicinal plants, but young people are not much interested in herbal practices. Thus, valuable knowledge about the use of plants is on the verge of decline. The overexploitation and seasonal fires are major threats for medicinal flora in the area.

Keywords: Fateh Pur Thakyala, indigenous knowledge, informants, medicinal plants, nomads, traditional uses, treatment

Introduction

The Ethnobotanical studies focuses on the discovery of contemporary drugs from indigenous medicinal plant resources (Rehman et al. 2023a). There are many appropriate sources of information about the beneficial medicinal plant species, which can be used for management and domestication (Awan et al. 2023; Hussain et al. 2023). The documentation of indigenous knowledge of native plant species has significant role in formation of vital drugs and important aspect of conservation approach (Awan et al. 2023). In recent era, the contribution of medicinal plants species in traditional health practices have diverted the attention of researchers towards ethnomedicines (Rehman et al. 2023b). Currently, 25% of herbal drugs in modern pharmacopeia are plant based and allopathic drugs are derived from

chemicals substances extracted from plants (Hussain et al. 2023; Iqbal et al. 2022). The use of plant species as traditional medicines provides a real substitute in health care services in rural communities of the developing countries. It has been estimated that about 80% of the population in developing countries depends on traditional plant based medicines for their primary health care system (Awan et al. 2023; Hussain et al. 2023; Iqbal et al. 2022). 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. The traditional usage of plants for primary health care is cost effective, safe and affordable. Almost, 85% of traditional medicines isolated from the plants are used for primary health care around the globe (Hussain et al. 2023; Iqbal et al. 2022). Therefore, medicinal plants are regarded as indigenous heritage of global importance (Ali et al. 2023).

The ethnobotanical research focuses on the relationships between the local people and their natural environments, including customs and religious belief connected to many types of applications. The ethnobotanical study is fundamental for highlighting the medicinal importance of plants species utilized by local people (Rehman et al. 2023c). The survival of people in developing countries depends on medicinal plants across the world due to their availability and secure alternative to allopathic medication. About, 80,000 plants are used as herbal medicinal plants among them around 50,000 are flowering plants (Ali et al. 2023; Hussain et al. 2023; Rehman et al. 2023c). Herbal treatments are widely utilized throughout the world even in developed countries. For example, the 30% to 40% people of China, 40% to 50% people in Germany, 48% in people Australia 49% people in France and 42% people in USA are using herbal medicines for their primary health care (Bahadur et al. 2023; Benamar et al. 2023).

Plants Resources have been used for herbal supplement, fodder, fuel wood, food and timber in rural areas by people. Pakistan contains a diverse ecological zones enrich with medicinal plant diversity (Waheed et al. 2023). There are about 6,000 plants species and 4,000 fungal species are reported in different climatic zone of Pakistan (Bahadur et al. 2023; Waheed et al. 2023). Around, 600 plants species are recorded as medicinal plants species used in health care systems, nearly 300 are highly economic value (*EC*) which are traded in billions dollars in local and international markets (Bahadur et al. 2023; Waheed et al. 2023). The traditional knowledge about the ethnomedicinal importance of plants in different areas of the country needs to be preserved for our future generations. In addition, this knowledge could be used for the development of new medicines. Therefore, a quantitative ethnobotanical study of the area is necessary to protect the indigenous knowledge and native medicinal flora of the study area. The study area Fateh Pur Thakyala is situated in north and east side of Pakistan at 1,524 m above sea level (Amjad et al. 2017). The ethnic groups of Fateh Pur Thakyala are Gujjar, Malik, Rajpot Sardar (Domal and Thakyal), Syed, Mughal, Kashmiri (But), and Sheikh. The region is feature is hilly terrains and subtropical climatic zone. The extensive interaction of Sheikh, Gujjar, Malik, Mughal, and Syed with environments have not only consumed the wild edible medicinal plants (WEPs) but also acquired significant indigenous knowledge about these plants. However, there has been no previous research on the inventory of medicinal flora or WEPs or quantitative research have been conducted in the Fateh Pur Thakyala.

The main objective of this study is development of local medicinal plant inventory and exploration of indigenous knowledge and traditional practices of herbal medicines in Fateh Pur Thakyala, Kashmir. The present study also focused on: (1) the awareness of people about conservation of native medicinal flora and collection of plants samples for their proper identification; (2) conduct a quantitative ethnobotanical survey; (3) developing Inventory of medicinal flora of area; (4) Traditional uses of plant species in health care systems; (5) to compute importance and fidelity indices of ethnomedicinal uses, which could be helpful to evaluate species or preparations for further evidence-based pharmacological screenings.

Materials and Methods

Study area

Fateh Pur Thakyala is tehsil of Azad Kashmir Located in north east of Pakistan at 1,524 m above sea level. It lies between 33° 38′ 20N latitude and 73° 58′ 45E longitude. The valley is lush green, has hilly stations, tourist spots and Pir Lasora National Park enrich with biodiversity (Amjad et al. 2017). The climate of the study area is sub tropical humid where the winter is cold (average temperature 5°C) and summer is pleasant (average temperature 35°C) and average rainfall is 95.60 mm annually (Amjad et al. 2017). The area has less modern health care facilities; poorly develop road infrastructure and lack of government services due to their remoteness and difficult mountain terrains. The people of the area are dependent on sustainable agriculture. The main crops included corn (*Zea mays* L.), bean (*Phaseolus vulgaris* L.), wheat (*Triticum astivum* L.), cucumber (*Cucumis sativus* L.), rice (*Oryza sativa* L.) in an integrated system (Amjad et al. 2017). The forest types are scrub tropical scrub forest; subtropical Chir forest and subtropical broad leaf humid forest are found in the study area. People are associated with livestock, agriculture, shopkeepers, construction workers, hakims, drivers and high proportion of people is abroad for their jobs. In light of these demographic changes, it is vital to document the local knowl-

edge of medicinal plant usage in this area before such information declines or is lost completely (Fig. 1).

Data collection

The ethnobotanical fieldwork of this quantitative study was conducted during January 2023 to November 2023 following the methods of (Amjad et al. 2020; Awan et al. 2023). Standard ethnobotanical methods such as participant observation and open and semi structured interviews were used to gather the indigenous information. All the participants were local of the study area except 15 nomads which are well informed and herbal venders. Data documentation consisted information about disease name, plant parts use, remedial preparation, route of administration. The purpose, method and the nature of the research work were clearly explained before the interviewers (informants) and prior informed consent (PIC) were strictly followed in the field survey (Awan et al. 2023).

Data preservation

The plant specimens were collected, pressed, dried and sprayed with preservative 1% $HgCL_2$ solution and mounted on standard herbarium sheets. The identification of plant specimens, authentication of data, botanical names, families of each plant were confirmed with help of herbaria comparison, taxonomic literature and using eflora of Pakistan and China (Hussain et al. 2023). Whereas the International Plant Name Index (IPNI), Scopus, Web of Science and Google Scholar, catalog of vascular plants of West Pakistan and Kashmir were also consulted to obtain correct botanical names (Awan et al. 2023; Hussain et al. 2023).

Quantitative ethnobotanical data analysis

The recorded values analyzed with various tools used in quantitative documentation of plants (Hussain et al. 2023). These indices help to understand the used pattern of medicinal species among the communities of studied areas in Fateh Pur Thakyala. For quantification, the characters of species recorded during free listing were mention to obtain the results. Different statistical measuring tools were used as; fidelity level (*FL*), relative frequency of citation (*RFC*), family important value (*FIV*), use value (*UV*), informant consensus factor (*ICF*), consensus value for plant part (*CPP*), percentage respondent knowledge (*PRK*), rank order priority (*ROP*), cultural significance index (*CSI*), practical use value (*PV*), *EC*, total value and Jaccard index (*JI*) (Hussain et al. 2023).

Informant consensus factor

The homogeneity of the information regarding a particular category of ailment is highlighted by the *ICF* values. *ICF* was calculated by following (Heinrich 2000; Awan et al. 2023):

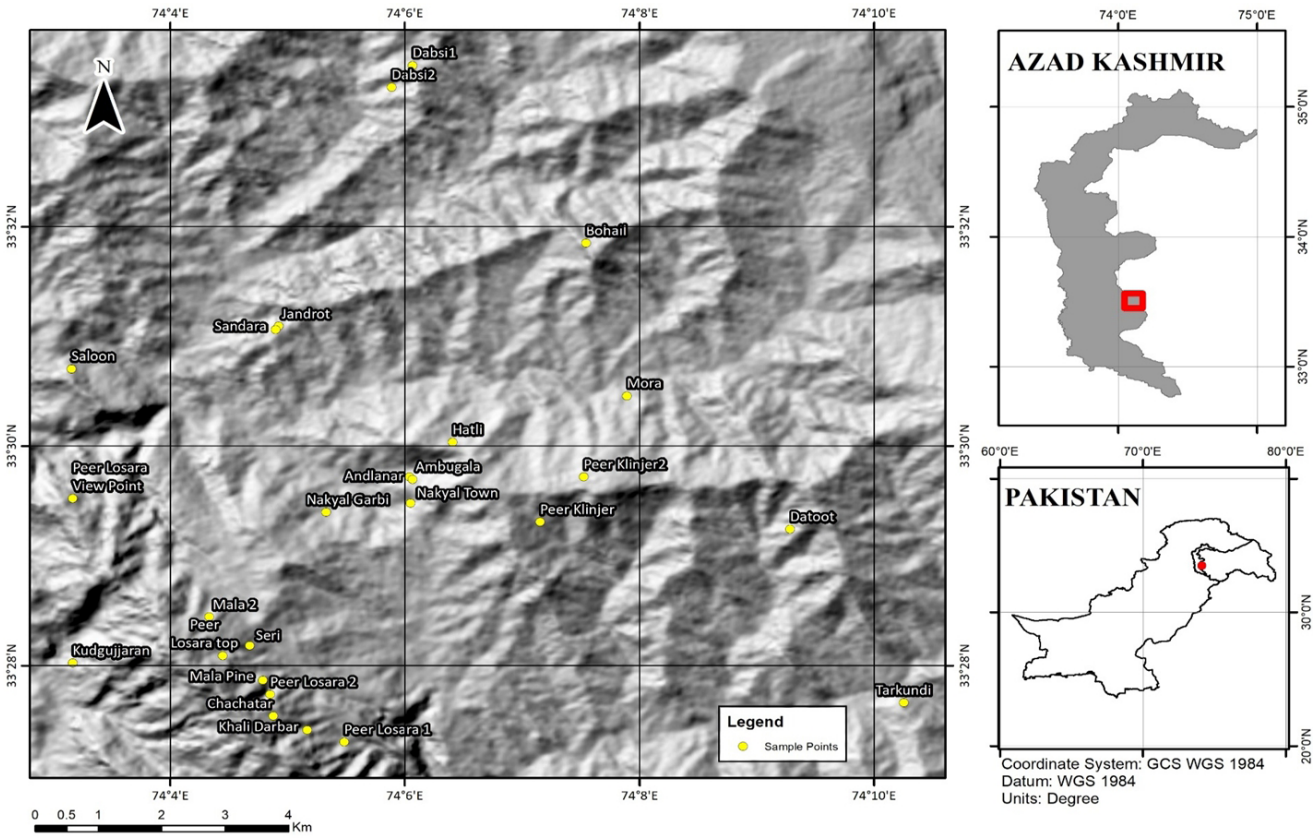

Fig. 1 Map of the study area Fateh Pur Thakyala.

$$ICF = (Nur - Nt) / (Nur - 1)$$

where, "*Nur*" is the number of use citations for each disease category and "*Nt*" represents the number of taxa used for that disease category.

Consensus value for plant part

Herbal recipes were prepared using different plant parts in investigated area (Awan et al. 2023). The consensus value for plant different parts was calculated by formula as follow:

$$CPP = PX / Pt$$

where *PX*, is total number of part citation and *Pt*, is sum of all part citation.

Family important value

It is calculated by formula as follow:

$$FIV = FC / N \times 100$$

where *FC*, total participants who mention species, *N* is sum of all the plant families mention by participants (Awan et al. 2023).

Use value

The *UV* represents the relative importance of a particular plant. Moreover, higher *UV*s indicate that there are many use reports for a given plant species, whereas the value near zero indicates fewer reports, confirming the use of the species (Awan et al. 2023).

It was calculated by using the following formula:

$$UV = \sum U_i / N$$

where, "$\sum U_i$" 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.

Relative frequency of citation

The *RFC* was calculated by using the formula as follows:

$$RFC = FC / N$$

where, *FC* indicates 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 (Hussain et al. 2023; Ullah et al. 2023).

Fidelity level

The *FL* indicates the preference of one species over others for the treatment of a particular ailment (Hussain et al. 2023; Ullah et al. 2023). For the calculation of the *FL* of plant species, the following formula was used:

$$FL\ (\%) = NP / N \times 100$$

where, NP is the number of respondents who mention the use of species for a particular ailment category, while "*N*" is the number of respondents who cited the use of that species for any ailment category.

Jaccard index

The similarity of knowledge between different communities was determined by comparing the findings of the current study with 15 published peer reviewed papers at regional and national level by applying *JI* (Amjad et al. 2020). This includes 6 studies from Azad Jammu and Kashmir, 6 form Khyber Paktunkhawa, and 3 from other areas of Pakistan. The studies conducted on the areas with similar, vegetation, climatic condition, and cultures were considered for comparison. *JI* was calculated following Gonza et al. determined by (Amjad et al. 2020) using the given formula:

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

where, "a" is species of study area, "*b*" is species in surrounding areas and "*c*" is number of common species in both areas.

Data analysis

The collected data were subjected to quantitative analysis using Microsoft Excel 2016 (Microsoft, Redmond, WA, USA) regarding the percentages and graphical presentation. Arc-GIS version 10.7 (Esri, Redlands, CA, USA) was used to make a study area map.

Results

Demographic data of informants

A total of 70 informants compromising of 45 male (64%) and 25 female (36%) were selected for interviewed after initial survey and many discussions. The demographic Information of the participants is presented in (Table 1) which showed the 70 informants were selected for interviews, out of these, eight were between ages 25–40 (11%), nineteen were 41–55 (27%), thirty-three were 56–70 (47%) and ten were above 70 (14%). Educational status of the informants revealed that there was illiterate 25 (36%), primary and middle 14 (20%), matriculation 11 (16%), intermediate 13 (19%), and bachelors 7 (10%). The occupations of the informants were observed farmers 8 (11%), herb venders 24 (34%), herbalist/hakeems 16 (23%), nomads 15 (22%), and

Table 1 Demographic information of informants participated in interviews

Distribution of respondents	Number	Percentage (%)
Sex		
Male	45	64
Female	25	36
Total	70	100
Age in years		
25–40	8	11
41–55	19	27
56–70	33	47
>70	10	14
Profession		
Farmers	8	11
Herb vendors	24	34
Herbalist/hakeems	16	23
Nomads	15	22
Educationists	7	10
Education		
Illiterate	25	36
Primary and middle (1–8)	14	20
Matriculate (9–10)	11	16
Intermediate (11–12)	13	19
Bachelors (13–16)	7	10

The ethical approval for this study was obtained from the headmen of the studied areas. All respondents were asked to sign a prior informed consent (PIC) form after the objectives and possible consequences of the study had been explained. The PIC form was translated into the Urdu language; however, participants were not subjected to any clinical treatment.

educationists 7 (10%). The informants were selected based on their popularity in the area and interaction with the medicinal plants. In addition to this, information obtained from female informants about the use of indigenous plant in different ailments was compared with the information obtained from the male informants. It was observed that female informants have more knowledge about the utilization of local plants in the preparation and administration of local drugs, which mirror their part in household administration and infection treatment with a specific end goal to keep the family healthy. Meanwhile, their role as a plant collector particularly in rough and steep mountainous tracts of the area was found to be less as compared to men and traditional healers.

Floristic diversity of medicinal plants

The current study reported 135 medicinally important plants species belonging to 115 genera and 54 families (Table 2). The dominating family was Asteraceae (14 sp.), followed by Fabaceae (11 sp.), Rosaceae (11 sp.), Lamiaceae (8 sp.), Moraceae (5 sp.), Solanaceae, Cyperaceae, Euphorbiaceae (4 sp.) and Poaceae, Sapindaceae, Rhamnaceae, Mrytaceae, Malvaceae (3 sp.) for each (Fig. 2A). The study revealed that there were small differences in usage of medicinal plants of different families. The herbaceous life form was dominating the study area with (79 sp.) used as herbal medicines followed by shrubs (23 sp.) and trees (33 sp.) (Fig. 2B). The predominance of the herbaceous habit in mountainous areas is a common ecological phenomenon throughout the world. The reason might be the high rainfall and moisture content at higher altitudinal areas. Our results are in accordance with (Aftab et al. 2023; Ajaib et al. 2015; Amjad et al. 2017; Arif et al. 2021). The prevalence of these families might be due to their abundance and easy accessibility in the study area. Moreover, majority of the reported species of these families possess significant pharmaceutical, pharmacological and organoleptic properties.

Method of preparation and administration

The medicinal plants were traditionally used by making different recipes based on the actual site and type of disease treated. Decoction (40 reports) was the most common method for preparation of herbal recipes, followed by extract (25 reports), fresh eaten (21 reports), powder (19reports), juice (6 reports), tea (5 reports), Infusion (5 reports), paste and cooked (4 reports) (Fig. 3A). Remaining mode of remedial preparation oil, chewed, milk, pulp, resin, miswak, ash, cooked, soaked, and milk were shared by three or less than three plants. The route of administration was recorded oral (79%) and topical/oral (21%) (Fig. 3B). The current findings were supported by previous documentation (Aftab et al. 2023; Amjad et al. 2020; Arif et al. 2021; Ijaz et al. 2021). The availability of active metabolic compounds might increase due to the fact of heating which speed up the biological reactions. Sometimes, whole plants were used in herbal preparations. Most of the herbal recipes were prepared using single plant species assuming non-toxicity, palatability, and high efficacy (Shaheen et al. 2017). Some recipes were based on application of two or more plants to attain maximum therapeutic effects. The number of medicinal plants and frequency of dose are based on patient condition, health, age, and disease severity. These findings were comparable to previous reports (Ahmad et al. 2017; Amjad et al. 2020; Ijaz et al. 2021; Shaheen et al. 2017).

Quantitative ethnobotanical data

Participants of free listing cited 135, ethnomedicinal species that used to cure different diseases, were both cited and observed.

Cultural, practical, economic, and total value

Cultural, practical, and *EC*s of study area were calculated to check the valuation of species concerning their distribution. The study area is situated in sub-tropical ecological zone with mountain terrains. About 86 plants species in current study had very low total value and 49 had a high value. The species *Allium cepa*, *Zanthoxylum armatum*, *Allium sativum*, *Olea ferruginea*, *Mentha royleana*, *Ficus carica*, *Punica granatum*, *Mallus domestica*, *Bergenia ligu-*

Table 2 Inventory list of ethnomedicinal flora and their uses in Fateh Pur Thakyala

Plant name	Local name	Family	Habitat	Part used	Mode of preparation	Route of administration	Ethnobotanical use
Abelmoschus esculentus (L.) Moench	Bhindi	Malvaceae	Herb	Fr, Sd, R	Extract/ cooked/paste	Topical/oral	Crushed leaves applied on body used to treat inflamed joint (antirheumatic). Flowers are used to treat fever, eyes infection and womb infection.
Acacia arabica (Lam.) Willd.	Kikar	Fabaceae	Tree	S, L	Infusion/ extract	Topical/oral	Leaves are used to relief abdominal pain. Its wood is used as fuel wood. Fresh stem is used for teeth whitening.
Acacia modesta Wall.	Plai	Fabaceae	Tree	L, F, S, Lt	Extract/paste	Oral/topical	Gum is used as tonic and stimulant. Leaves are used as fodder. Flowers are used for honeybee collection.
Acacia nilotica (L.) Delile.	Kikar	Fabaceae	Tree	L	Powder/extract	Oral	It is used as fodder. Legume is used against dysentery and diabetes. It is used as fuelwood.
Achyranthes aspera L.	Puth kanda	Amaranthaceae	Herb	L	Extract/ powder/tea	Oral/topical	It is used to prepare special medicines called Kshara used extensively in surgical procedures to treat obesity.
Ailanthus altissima (Mill.) Swingle.	Toon	Simaroubaceae	Tree	L, B			
Albizia lebbeck (L.) Benth.	Saree	Fabaceae	Tree	Sd, L	Extract	Oral	Extracts of leaves and seeds are used to cure kidney infection.
Allium cepa L.	Piyaz	Alliaceae	Herb	S, L	Cooked/paste	Oral	It is used for the digestive, urinary track disorders and skin treatment.
Allium griffithianum Boiss	Jangli pyaz	Alliaceae	Herb	S, L	Cooked/paste	Oral	Bulbs are used to cure wounds pain. It is effective pain killer.
Allium sativum L.	Thom	Alliaceae	Herb	S	Cooked/paste	Oral	It is used for cardiac, asthma and whooping cough. It is also used as antiseptic.
Aloe vera (L.) Burm.f.	Kanwal gandal	Asphodelaceae	Herb	L	Extract/ powder	Oral	Leaves are used as bandage on pus wounds. It is also used for blood purifier and diabetes.
Alternanthera pungens Kunth	Leedra	Amaranthaceae	Herb	L, R	Extract/ powder	Oral	Leaves are used on snake and scorpion bite. Root is used to control menstruation. It is used as vegetable.
Amaranthus viridis L.	Ganar	Amaranthaceae	Herb	L, R	Extract/ powder	Oral	Ash of this plant is rich in soda and use to make soda. Root is used to treat inflammation during urination. It is also used treat constipation.
Androsace umbellata (Lour.) Merill	Unknown	Geraniaceae	Herb	L	Extract	Oral/topical	This plant is used as tonic. It is also used as fodder.
Artemisia annua L.	Chahoo	Asteraceae	Herb	L	Extract	Oral	Leaves are used against chest inflammation and chronic fever, killing abdominal warms.
Artemisia vulgaris L.	Kala chahoo	Asteraceae	Herb	L	Extract/ decoction	Oral	Leaves are used against abdominal pain, stomach and ear wounds.
Astragalus psilocentros Fisch.	Tindni	Fabaceae	Shrub	L,	Powder	Oral	Leaves are used to cure stomach ulcer. It increases the weight of animal. It is also used as fuel.
Barleria cristata L.		Acanthaceae	Herb	L, F	Powder/ decoction	Oral	It is used to treat anaemia, snake bite, diabetes, lungs disorders, blood diseases and inflammatory conditions.
Bauhinia variegata L.	Kachnar	Fabaceae	Herb	L, F	Decoction/ extract	Oral	It is used to cure inflammation and diabetes.
Berberis lycium Royal	Sumbal	Berberidaceae	Herb	L, Fr	Powder/extract	Oral	Fruit is edible. Leaves help in digestion. It makes muscles strong.
Bergenia ligulata Wall.	Zakham Hayat	Saxifragaceae	Herb	R, L	Powder/ decoction	Oral	It is used for wound healing, dysentry, stomach disorder, fever cold, cough and ulcer.
Bidens bipinnata L.		Asteraceae	Herb	L, R	Powder/ decoction	Oral	Leaves extracts are used for treatment of headches, ear infection, kidney and unrinary tract infections.

Table 2 Continued

Plant name	Local name	Family	Habitat	Part used	Mode of preparation	Route of administration	Ethnobotanical use
Boerhavia procumbens L.		Nyctaginaceae	Herb	L, R	Powder/extract	Oral	Leaves are used to cure jaundice, gonorrhea, cough, dropsy, eyes, asthama and inflammation.
Bombax ceiba L.	Simple	Bombacaceae	Tree	L, S, B	Powder, decoction	Oral	The Plant possesses astringent, cooling, stimulant, diuretic, aphrodisiac, demulcent, and tonic effects. Bark is used to soften the tumors.
Calotropis procera (Aiton) Dryand.	Akk	Aslepidiaceae	Herb	La, L	Paste/topical	Oral	Leaves are used against snake bite, burn injuries and body pain.
Cannabis sativa L.	Bhang	Canabaceae	Herb	L, Sd	Extract/ powder	Oral	Grind leaves helps to cure. Hemorrhoids caused by piles. Helps in reducing whooping cough and chronic headache Leaves are painkiller.
Cardiospermum halicacabum L.	Bollon wise	Sapindaceae	Herb	L, WP	Poultice/ extract/tea	Oral/topical	Leaves extract helps to relief ear pain. Whole plant tea used in treatment of asthma and relief joint pain.
Carissa opaca Stapf exhaines.		Apocynaceae	Shrub	L, F	Decoction/ extract	Oral	Used against cardiac dysfunction, fever, asthma, diarrhea, gastrointestinal ailments, and skin diseases.
Carissa spinarum L.	Grunda	Apocynaceae	Shrub	L, F	Cooked/paste	Oral	Stem, root and fruit are blood are purifier, headache, chest complains, rheumatism, oedema, gonorrhoea, syphilis, rabies.
Caryopteris odorata (D.Don) B.L. Roxb.	Puthjari	Lamiaceae	Herb	L	Decoction/ extract	Oral	It is used to cure motion, treat diabetes, wound healing, and inflammation. It is mostly used by animals to reduce motion.
Cassia angustifolia Vahl. A	Amaltas	Fabaceae	Shrub	L	Juice	Oral	Leaves are used to kill stomach worms and mixed with lemon waters are beneficial for skin.
Catharanthus roseus (L.) G.Don	Sadda bahar	Apocynaceae	Herb	L	Infusion	Oral	Extract of leaves helps to remove itchiness. It is also in treatment of chest and lung infection.
Celtis australis L.	Khirck	Cannabaceae	Herb	L, Sd, B	Extract/ powder	Oral	Seeds and leaves are used as fodder. Bark is used against skin diseases. Seeds are used for dysentery.
Chenopodium album L.	Bathwa	Amaranthaceae	Herb	Sd, WP	Extract	Oral	Oil from seeds helps kill abdomen insects. Oil from seeds helps to cure dysentery. It is also used as fodder.
Cirsium arvense (L.) Scop.	Kandal	Asteraceae	Herb	L	Extract	Oral	Extract from leaves mixed with honey helps in treatment of catarrh and chest inflammation.
Cirsium wallichii DC.	Ount katara	Asteraceae	Herb	L	Extract	Oral	It is traditionally used in the treatment and prevention of several ailments like leprosy, inflammation, rickets, leucoderma, scabies, rheumatism, ringworm.
Commelina benghalensis L.	Chura	Commelinaceae	Herb	L	Extract/ powder	Oral	It is used in treating numerous ailments and diseases such as infertility in women, malaria, fever, jaundice.
Convolvulus arvensis L.	Lahli	Convolvulaceae	Herb	L,F	Powder/ decoction/ tea	Oral	The flower is laxative, used as a tea infusion and also in treatment of wounds and fever, whereas the leaf can be helpful during the menstrual period.
Cordia myxa L.	Lasori	Borangiaceae	Tree	L, Fr, R, Sd	Powder/extract	Oral	Fruits and leaves are used in chest and urinary tract infections, diarrhoea, dysentery, tuberculosis, liver.
Cuscuta reflexa Roxb.	Neela dhari	Cascutaceae	Herb	L	Powder	Oral/topical	Used to treat sciatica and scurvy. The fresh plant is applied to the skin against scrofula derma.

Table 2 Continued

Plant name	Local name	Family	Habitat	Part used	Mode of preparation	Route of administration	Ethnobotanical use
Cydonia oblanga Mill.	Bai dana	Rosaceae	Tree	Fr	Eaten	Oral	Fruits are used as jams and fresh both for increase spermatogenesis, blood purification and treat infection in female sexual organs. Respiratory disorders.
Cynodon dactylon (L) Pers.	Gass	Poaceae	Herb	L	Poultice/juice	Topical/oral	It is used for wound healing and lungs Infection.
Cynoglossum lanceolatum Forssk.	Chorun	Borangiaceae	Herb	Sd, WP	Extract	Oral	Helps to treat dysentery, helps to treat skin allergies. Helps to remove any kind of inflammation. It is used as a blood purifier. It is used as fodder.
Cyperus rotundus L.	Kah	Cyperaceae	Herb	L	Decoction	Oral	Tea of cyprus with mint helps in treatment of cholera.
Cyperus scariosus R.Br.	Ghass	Cyperaceae	Herb	L, R	Extract/ powder	Oral	It is used in making perfume and act as brain tonic.
Dalbergia sissoo DC.	Tali	Fabaceae	Tree	L, W	Extract/latex	Oral/topical	Boiled leaves extract helpsto reduce the inflammation of breast and urethral infection. Shampoo of leaves helps in hair growth. The oil obtained from wood is beneficial for skin infection (pruritus).
Dicliptera bupleuroides Nees	Pipri	Acanthaceae	Herb	L, WP	Extract/ powder	Oral	The plant is used as antidyspeptic, blood purifier, anthelmintic, cholagogue, diaphoretic, diuretic, stomachic, sedative, laxative and tonic.
Dodonaea viscosa (L) Jacq.	Sanatha	Sapindaceae	Herb	Sd. L	Extract	Oral	Seed oil is used to cure the tetanus disease, leaves are used for skin disorders.
Dryopteris stewartii Fraser Jenk	Jangli Morpankh	Dryopteridaceae	Herb	R, L	Extract/ powder	Oral	Leaves are used to heal the wounds. Rhizome is used to increase butter.
Eclipta alba (L.) Hassk.	Safaid banghara	Asteraceae	Herb	L	Decoction	Oral	Leaves extract helps to reduce fever. Its leave extract mixed with gooseberry oil helps to stop premature hair whitening. It is used as fodder.
Eriobotrya japonica (Thunb) Lindl.	Lokaat	Rosaceae	Tree	Fr	Eaten	Oral	It is used to treat coughing, pulmonary inflammation, asthma, tuberculosis, nausea, restlessness, and thirst.
Eriophorum comosum (Wall.) Nees	Babya	Cyperaceae	Herb	L, WP	Powder/ decotion	Oral/topical	The plant dried, fired and ash is used for abdominal and kidney pain.
Euphorbia helioscopia L.	Booti	Euphorbiaceae	Herb	S, l	Decoction	Oral	It is used to treat cough. It is also used to cure allergies.
Euphorbia royleana Boiss	Booti	Euphorbiaceae	Herb	S, L	Powder	Oral	It is used to treat cough. It is also used to maintain blood pressure.
Ficus benghalensis L.	Bohar	Moraceae	Tree	Fr, Lt, B, R	Decoction/ paste/eaten	Oral/topical	Latex is used in the treatment of Erectile dysfunction. Bark boiled in water act as antidiabetics. Column roots paste used in the treatment of infertility. It is used in the treatment of infection transmitted due to sexual contact (Gonorrhea). Leaves are used as fodder.
Ficus carica L.	Toosa	Moraceae	Tree	Fr, L	Eaten/paste	Oral	It is used in treatment of constipation, heart attack, asthma, and cough. Its wood is used as fuel food. Leaves are used as fodder.
Ficus palmata Forssk.	Phagwara	Moraceae	Tree	Fr, L	Eaten/paste	Oral	It is used in treatment of paralysis and cough. Paste of leaves to make tablets helps in piles.
Fumaria indica Hausskn.	Shahteera	Papveraceae	Herb	Sd, L	Powder/ infusion	Oral	Leaves extract helps in the treatment of skin diseases (psoriasis) and chronic fever. Seed acts as blood purifier and helps in the treatment of jaundice.
Geranium rotundifolium L.	Jandaruna	Geraniaceae	Herb	L	Fresh/eaten/ powder	Oral	Used against sore throat, bleeding, nephritis, and bruises.
Grewia villosa Willd	Dhaman	Malvaceae	Shrub	S, L, R	Powder/paste	Oral/topical	Leaves are very pleasant to goats. It is used to make tablets that are used aphrodisiac. It is used as fuel wood.

Table 2 Continued

Plant name	Local name	Family	Habitat	Part used	Mode of preparation	Route of administration	Ethnobotanical use
Hedera nepalensis K.Koch	Bajli	Araliaceae	Herb	L	Extract	Oral	Leaves are used for the treatment of diabetes. It is also used for skin diseases.
Heliotropium strigosum Willd	Gorakhpan	Boraginaceae	Herb	L	Extract	Oral	It is used to cure diabetes, leukoria, and asthma.
Hilanthus annus L.	Soraj Mukhi	Asteraceae	Herb	L, Sd	Powder/extract	Oral	Seed powder mixed with water is used to kill abdominal worms (vermicide). Leaves extract helps to cure earache. It is used as fodder.
Indigofera heterantha Wall.ex Brandis.		Fabaceae	Shrub	L, Sd, Fr	Powder/ decoction/ extract	Oral	Leaves are given to treat dysentery, skin allergy, leprosy, and cancerous patients. Fruits and seeds are used against hepatitis and respiratory disorders.
Ipomoea carnea Jacq.	Kala dana	Convolvulaceae	Herb	Sd, WP	Powder	Oral	Grind Seeds are used in the treatment of dysentery and loose motion. It is used as an expectorant.
Juglans regia L.	Khor	Juglandaceae	Tree	Sd, L, B, R	Paste/eaten/ powder	Oral/ toothbrush	Nuts are used to treat jaundice, fever, stomach aches, asthma, arthritis, gall bladder stones, and skin eruptions. Bark, leaves, and roots are used for cleaning teeth.
Justicia adhatoda L.	Bakhar	Acanthaceae	Herb	L	Infusion	Oral	It acts as blood purifier and reduce Inflammation in stomach.
Lamium amplexicaule L.	Motcapra	Lamiaceae	Herb	L, F	Extract/ powder	Oral	Leaves are used as vegetable. Whole plants used as fodder.
Litsea glutinosa (Lour.) C.B.Rob.	Meda sack	Lauraceae	Tree	L, B	Extract/ powder	Oral	It is used to kill pain of back. It is also used to heal up the breakage of bones.
Luffa acutangula (L.) Roxb.	Toori	Cyperaceae	Herb	Fr, R, Lt	Extract	Oral	Drops of extract of fruit helps treatment of epilepsy (brain disorder). It is also used as vegetable. Its leaves are used as fodder.
Mallotus phillipensis (Lam.) Muell. Arg	Kamila	Euphorbiaceae	Tree	Fr	Infusion	Oral	It is used to expel parasitic worms from body (anthelmintics) and helps in treatment of skin infection due to fungus (ringworm). The wood is often used as fuel wood.
Malva parviflora L.	Cheesweed	Malvaceae	Herb	Fr, L	Powder/ decoction	Oral	They are used to treat inflammation, wounds, gastritis, bladder ulcers, diuretic, constipation, abdominal pain, diarrhea, anthelmintic, hair.
Melia azedarach (L.) Pers.	Dreek	Myrtaceae	Tree	L, Fr, Sd	Extract/ decoction	Oral/topical	Fruits extract is for hair growth and kill lices. Seeds help to treat constipation and piles. Leaves extract is blood purifier. Leaves are used as fodder.
Mentha longifolia (L.) L.	Pudina	Lamiaceae	Herb	L	Juice	Oral	Leaves extract drops are used to kill ear worms. Juice of mint used to stop Singultus. Best for heart and stomach Jaundice vomiting, catarrh. it is used to treat obesity.
Mentha royleana Benth	Jangli pudina	Lamiaceae	Herb	L	Juice/infusion/ extract	Oral	Beneficial for belly ache. It is used to treat obesity and stomach disorders.
Micromeria biflora (Buch. Ham. ex D.Don) *Benth.*		Lamiaceae	Herb	L, F	Powder/extract	Oral	It is widely used for treating toothaches, nose bleeding, wounds, and sinusitis.
Mirabilis jalapa L.	Gul e abbasi	Nyctaginaceae	Herb	F, Sd, L, R	Powder/paste/ decoction	Oral/topical	Antirheumatic, seeds are used for immunity. The grind leaves paste applied on skin for treatment of skin diseases (abscesses) and piles.
Morus alba L.	Shahtoot	Moraceae	Tree	L, Fr, Sd, R	Paste/powder/ eaten	Oral/topical	Powder of dried flower used in treatment of piles. The grind leaves paste applied on skin for treatment of abscesses. Seed are best for immunity. It is used in therapy of inflamed joints (antirheumatic). Roots used as blood purifier. Its wood acts as fuel wood.

Table 2 Continued

Plant name	Local name	Family	Habitat	Part used	Mode of preparation	Route of administration	Ethnobotanical use
Morus nigra L.	Toot	Moraceae	Tree	L, Fr, Sd, R	Paste/powder/ eaten	Oral/topical	Powder of dried flower used in treatment of piles. The grind leaves paste applied on skin for treatment of abscesses. Seed are best for immunity. It is used in therapy of inflamed joints (antirheumatic). Roots used as blood purifier. Its wood acts as fuel wood.
Nerium oleander L.	Gandeera	Apocynaceae	Shrub	F, L, R	Juice/infusion/ extract	Oral	Dried powder of flower mixed in milk used to stop vomiting (nausea). Extract of leaves helps to remove itchiness. It is also in treatment of chest and lung infection. Poultice applied on body to heal wounds and skin infection (leprosy).
Ocimum basilicum L.	Niazboo	Lamiaceae	Herb	L, F, Sd, R	Syrup/powder/ extract	Oral/topical	Leaves extract mixed with honey ast as flum expectorant. Flowers act as diuretics (difficulty in passing urine) and skin emollient. Seeds used in treatment of spermatorrhoea. Roots used in treatment of skin problems (abscesses).
Olea ferruginea Wall. ex Aitch.	Kahu	Oleaceae	Tree	Fr, Sd, S, B	Juice/ tootbrush/ extract	Oral	It is best for bleeding gums and helps to reduce toothache. It is used in treatment of cough and lungs infection, fever and helps to relief the pain inflamed joint, oil is used for cooking.
Opuntia monacantha (Willd.) Haw.	Thor	Cactaceae	Herb	Fr, R, Lt	Eaten/syrup/ juice	Oral	Ripened fruit is used to kill bacteria that are cause gonorrhea. It is used in treatment of rabies. Roots are used to treat snake bite. Latex is beneficial for digestion.
Origanum vulgare L.	Jangali majorum	Lamiaceae	Herb	L	Decoction/tea	Oral/topical	Paste of leaves beneficial for sore eyes. Tea of leaves helps in treatment of nousia. It is also act as blood purifier.
Oxalis corniculata L.	Jandaro	Oxalidaceae	Herb	L	Poultice/juice	Oral/topical	Grinded leaves applied on skin to treat scorpion bite area. It also act as appetizer and helps in treatment of jaundice.
Pinus roxburghii Sarg.	Cherr	Pinaceae	Tree	L, Sd, Lt	Eaten/ decoction	Oral/topical	Resin is used to cure wounds. Seeds are eaten for nutrional purposes. Boiled leaves used in treatment of throat and lungs infection and relief in tooth pain.
Plantago lanceolata L.	Isbaghol	Plantaginaceae	Herb	L, Sd	Eaten/paste	Oral	Leaves are used to cure wounds. Seeds are used to treat diarrhea and dysentery.
Populus alba L.	Safeda	Salicaceae	Tree	L	Paste/ decoction	Oral/topical	It is used as fodder and to cure flu, constipation, and dysentery.
Potamogeton nodosus Poir.	Jajuli	Potamogetonaceae	Herb	L	Decoction/ powder	Oral/topical	Leaves are used to cure constipation. Leaf extracts used on irritant skin.
Prinsepia utilis Royle	Kakran	Rosaceae	Shrub	Fr, L	Decoction/ syrup	Oral	Fruit is used in the cough syrup. Scales of this plant cause constipation.
Prunus armeniaca L.	Khobani	Rosaceae	Tree	Fr, S	Eaten/powder	Oral	It is used against typhoid, malaria and fever.
Prunus persica L. Batsch	Aroo	Rosaceae	Tree	Fr, L	Eaten/powder	Oral	It is used for treatment of gastritis, whooping cough, coughs and bronchitis.
Psidium guajava L.	Amrood	Myrtaceae	Tree	Fr, Sd, F	Eaten/paste	Oral/topical	Fruit is best for stomach and heart. Helps in digestion. Leaves are used as fodder. Seeds used to kill abdominal worms (vermicide). Flowers paste is used for eyes infection.
Pteris vittata L.	Panj patra	Pteridaceae	Herb		Decoction/ powder	Oral	Its only use is to purify blood.

Table 2 Continued

Plant name	Local name	Family	Habitat	Part used	Mode of preparation	Route of administration	Ethnobotanical use
Pueraria tuberosa (Willd.) DC.	Bandhari	Fabaceae	Shrub	L	Powder	Oral	It is used in genetics and reproductive disorders.
Punica granatum L.	Daruna	Punicaceae	Shrub	F, Sd, S	Powder/ decoction/ eaten	Oral	Seeds are used as heart and liver tonic. Flower powder orally used to treat cough and fever. Prevent vomiting. Diuretics. Helps to cure jaundice.
Pyrus communis L.	Nashpati	Rosaceae	Tree	Fr	Eaten/powder	Oral	Dry Fruit are used against cough.
Pyrus pashia Buch.Ham. ex D. Don.	Batangi	Rosaceae	Tree	Fr	Eaten/powder	Oral	Fruits are used for healthy digestive tract and cure the constipation.
Pyrus veriolosa Wall. ex G.A Camus.	Dandaley	Rosaceae	Tree	Fr, L	Eaten/powder	Oral	Fruit is edible and used to treat stomach disorders and respiratory tract infections.
Quercus dilatata Lind	Reen	Fabaceae	Tree	Sd, B	Powder/extract	Oral/topical	It is used as brain, sexual tonic, cleaning teeth eradication of gonorrhea, urinary tract.
Quercus incana Lind	Reen	Fabaceae	Tree	Sd, B	Powder/extract	Oral/topical	It is used as brain, sexual tonic, cleaning teeth eradication of gonorrhea, urinary tract.
Ranunculus sceleratus L.	Kore kandoli	Ranunculaceae	Shrub	Fr	Eaten	Oral	Fruits are used for healthy digestive tract.
Reinwardtia indica Dumort.	Bsant bhar	Linaceae	Shrub				It is used for stomach, blood purification and cure diabetes.
Ricinus communis L.	Harnoli	Euphorbiaceae	Shrub	Fr	Paste/juice	Oral	Paralysis, Bell's palsy and cough. Oil is immunity. It is also used as fodder. Its paste when applied on breast of mother which helps to increase flow of milk.
Rosa indica L.	Gulab	Rosaceae	Shrub	F, L	Paste/extract	Oral	Gulkand of flower is used to cure constipation, liver disorder and powerful tonic. Extract of flowers and leaves used in treatment of piles, eyes, Jaundice, and throat problems.
Rubus ellipticus Smith.	Peela akhra	Rosaceae	Shrub	Fr	Eaten	Oral	Fruit is edible used as tonic, skin moisturing.
Rubus fructicosus L.	Akhra	Rosaceae	Shrub	Fr	Eaten	Oral	Fruit is edible used as tonic, skin moisturing.
Rumex dentatus L.	Harfali	Polygonaceae	Herb	L	Extract	Oral	It is used to treat constipation, gut disorders and helps prevent vomiting.
Salix caroliniana Michx.	Wangera	Salicaceae	Herb	L	Extract	Oral/topical	Leaf extract used to treat influenza, ear pain, headache.
Sapindus mukorossi Gaertn.	Raitha	Sapindaceae	Tree	Fr, Sd	Extract	Oral/topical	Fruit is used as hair tonic. Extract of fruits and seeds is also used for Pile and constipation.
Silybum marianum (L.) Gaertn	Kandyara	Asteraceae	Shrub	Fr	Extract/eaten	Oral	Seeds are used as antioxidant and appetite.
Solanum nigrum L.	Kachach	Solanaceae	Herb	L,S	Decoction/ infusion	Oral	Extract from stem and leaves used to remove excess fluid from body tissues (hydropsy).
Solanum surattense Burm.f	Mokhari	Solanaceae	Herb	R	Decoction	Oral	Its roots boiled with honey to treat excessive discharge of mucus in the nose or throat (catarrh). It is used for treatment of skin diseases and blood purifier.
Sonchus asper (L.) Hill	Prickly sow thistal	Asteraceae	Shrub	S, L	Decoction	Oral/topical	Stem and leaves have agreeable flavors and helps in wound healings.
Sonchus oleraceus (L.) L.	Bhrum dandi	Asteraceae	Herb	S, L	Decoction	Oral/topical	Stem and leaves extracts are used to treat diarrhea, menstrual problems, fever, inflammation and warts.

Table 2 Continued

Plant name	Local name	Family	Habitat	Part used	Mode of preparation	Route of administration	Ethnobotanical use
Sorghum halepense (L.) Pers.	Began	Solanaceae	Herb	Fr		Oral	Fruit is used as vegetable.
Syzygium cumini (L.) Skeels	Jamman	Myrtaceae	Tree	Fr, Sd	Powder/juice/ eaten	Oral	It helps to reduce burning sensation (prickly heat), ulcer and pimples. Seeds powder mixed in milk acts as antidiabetic.
Tagetes Erecta L.	Booti	Asteraceae	Herb	L, F	Vegetable/ paste	Oral	Leaves used as vegetable in treatment of tonsillitis. Flower paste is helpful for eyes infection.
Taraxacum officinale Weber.	Kali Hand	Asteraceae	Herb	F	Decoction/tea	Oral	It is used to cure hepatitis, inflammation.
Tribulus terrestris L.	Gurgunduk	Zygophyllaceae	Herb	L, Sd, R, F	Paste/powder/ extract	Oral/topical	It's used for skin diseases, remove kidney stones, dengue fever.
Triticum aestivum L.	Gandum	Poaceae	Herb	S, L	Decoction/ powder	Oral	Straw is used for diabetes. It reduces insulin level. It is used as fodder.
Urtica dioica L.	Bichoo booti	Urticaceae	Herb	L, Sd	Paste/powder	Oral/topical	It is used in treatment of skin diseases, to control involuntary emission of semen (spermatorrhoe) without orgasm and increase lactation in breastfeeding mothers.
Verbascum Thapsus L.	Gidar tambako	Sacrophulariaceae	Herb	Fl	Extract	Oral	It is used to relief facial pain (prosopagia), involuntary urination that happens at night while sleeping (nocturnal enuresis) and piles.
Vernonia cinerea (L.) Less.	Sarkandi	Asteraceae	Herb	L	Poultice	Topical	Leaves used in treatment of skin problems (abscesses).
Viburnum grandiflorum Wallich ex DC.		Adoxaceae	Shrub	Sd, B	Extract/ powder	Oral	Used for abdominal pain, typhoid, toothache, respiratory disorders, whooping cough, upset stomach, wounds.
Viola canescens Wall.	Banafsha	Violaceae	Herb	L, F	Powder/ decoction/ eaten	Oral	Flowers are used to cure epilepsy and nervous disorder. Roots are used as laxative and diuretic. Its syrup is very useful for body coldness.
Vitex negundo L.	Bannna	Lamiaceae	Shrub	L, F	Poultice/juice/ extract	Topical/oral	Crushed leaves applied on body used to treat inflamed joint (antirheumatic). Boiled leaves in hot water helps in treatment of skin infection (leprosy).
Withania somnifera (L.) Dunal	Asgand	Solanaceae	Herb	R	Powder	Oral	The scales of its roots are used against pain in joints and swelling of joints.
Woodfordia fruticosa (L.) Kurz	Dhavi	Lythraceae	Herb	F,L	Decoction/ extract	Oral	Extract of flowers and leaves are used in those medicines which reduces weakness of organisms.
Xanthium strumarium L.	Booti	Asteraceae	Herb	Sd, WP	Poultice/juice	Topical/oral	It is used treatment of dysentery, whole plant juice mixed with carrot act as antirheumatic. It is also used as fodder.
Zanthoxylum armatum DC.	Timber	Rutaceae	Shrub	Sd, S	Paste/ toothbrush	Oral/topical	It stem is used reduce toothache and stops bleeding from gums. It is used to treat obesity and gastric problems.
Zea maize L.	Makai	Poaceae	Herb	Fr,	Decoction/ extract	Oral	Corn silk is used for the treatment of kidney and abdominal pain. It is used as forage and fodder.
Ziziphus jujuba Mill.	Jand beery	Rhamnaceae	Shrub	Fr, B, L	Eaten/ decoction	Oral	Fruit is edible and blood purifier. Bark and leaves are used to cure dysentery and diarrhea. It is also used as fodder.
Ziziphus nummularia (Burm.f.) Wight & Arn.	Jhandi	Rhamnaceae	Shrub	Fr, R	Eaten/powder	Oral	Fruit used to treat teeth problems and acts as stomach tonic. Grind roots with black paper boiled in water are used for dysentry.
Ziziphus oxyphylla Edgew	Mamyanu	Rhamnaceae	Tree	L, Fr, R	Eaten/ decoction	Oral/topical	Leaves are used to cure diabetes. Fruit and root are used in Jaundice. Wood is used as fuel.

Fr: fruit; F: flower; Sd: seed; L: leaf; R: root; WH: whole plant; B: bark; S: stem.

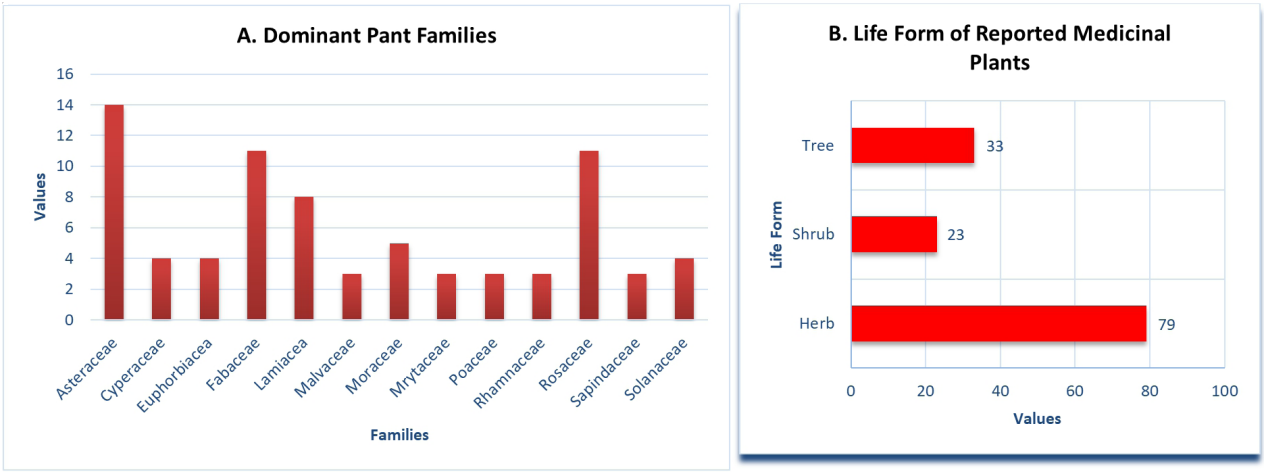

Fig. 2 (A) The number of plant families and (B) life form of medicinal plants reported in study area.

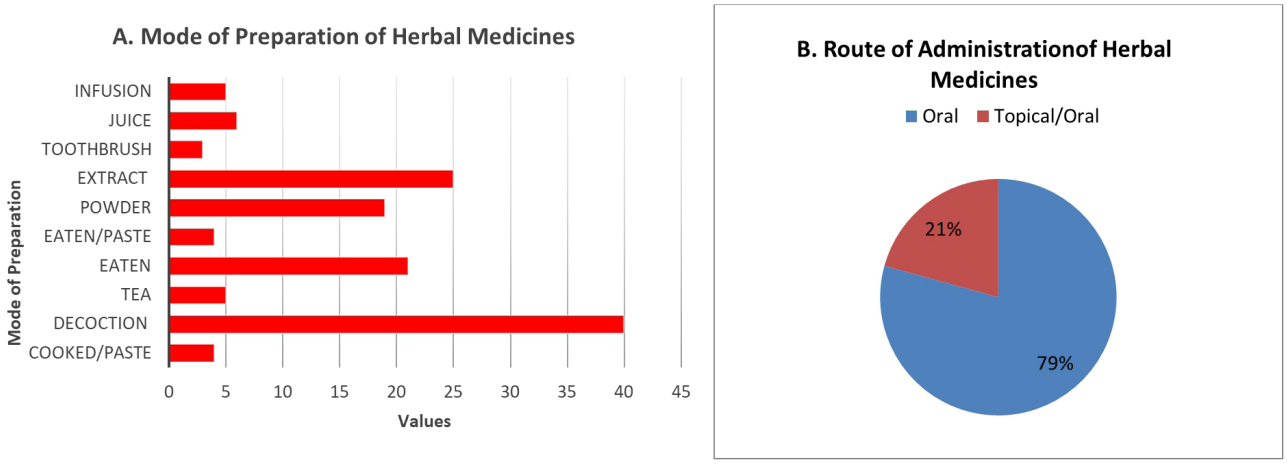

Fig. 3 (A) Mode of preparation and (B) route of administration of herbal medicines.

lata, *Berberis lyceum*, *Juglans regia*, and *Justicia adhatoda* recorded in study area had highest total value. *Cydonia oblanga* represented low practical, economic, and total value as they had low cultural value only recorded for the treatment of sexual disorders by hakeems (Table 3).

Informant consensus factor

The *ICF* value ranged from 0.25 to 0.81, calculated on the base of reports against each disease category as presented in Figure 4. The ailments were classified into 12 different categories. The disease category digestive disorders, respiratory disorders, Urinogenital disorder and dental disorders showed maximum consensus since the informants approved the same plants for each disease category. The major plant reported are *M. royleana*, *A. cepa*, *A. sativum*, *F. carica*, *J. regia*, *B. lyceum*, and *B. ligulata* in study area (Fig. 4).

Family important value

The collected data showed *FIV* values (2.59) Alliaceae, Lamiaceaeae, Juglandaceae, Moraceae, Solanaceae, Rosaceae, Punicaceae, Rutaceae, Oleaceae, Poaceae, and Saxifragaceae were dominant families with *FC* values (100%) while Lauraceae (1.07), Araliaceae (1.00), Linaceae (0.56), Adoxaceae (0.78) Potamogetonaceae (0.81) Pteridaceae(0.78), Violaceae (0.67) shown least *FIV* value in study area of Fateh Pur Thakyala, Kashmir (Fig. 5).

Consensus value for plant part

The values of *CPP* range from 0.03 to 0.40. Total fourteen reports were recorded in studied areas that contain leaves, flowers, fruit, seeds, roots, stems, bark, whole plant, twigs, rhizome, bulb, corms, pods and tubers (Fig. 6A). In current study leaves (0.41 *CPP* values) were commonly used in preparation of medicines followed by fruits (0.17 *CPP* values), seeds (0.13 *CPP* values), flowers (0.09 *CPP* values), stems (0.06 *CPP* values), roots (0.06 *CPP* values) and whole plants (0.03 *CPP* values). The remaining parts twig, pods, arial part, corm; bulb denotes denoted low *CPP* value (Fig. 6B).

Relative frequency of citation

In present, study the value of frequency citation sort from (0.2–1). Maximum value of *RFC* verified for *Acacia*

Table 3 Classification of plants on quantitative measures of ethnobotanical data and their comparison with previous reports

Sr. no	Plant name	*FC*	*FL*	*ROP*	*UV*	*RFC*	*PRK*	Previously cited/references
1	*Abelmoschus esculentus* (L.) Moench	25	35.71	15.36	0.19	0.36	0.43	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
2	*Acacia arabica* (Lam.) Willd.	45	64.29	49.78	0.33	0.64	0.77	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
3	*Acacia modesta* Wall.	70	100.00	120.46	0.52	1.00	1.20	17, 20, 22
4	*Acacia nilotica* (L.) Delile.	70	100.00	120.46	0.52	1.00	1.20	19, 20, 21, 22
5	*Achyranthes aspera* L.	25	35.71	15.36	0.19	0.36	0.43	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
6	*Ailanthus altissima* (Mill.) Swingle.	70	100.00	120.46	0.52	1.00	1.20	19, 20
7	*Albizia lebbeck* (L.) Benth.	52	74.29	66.47	0.39	0.74	0.89	19, 20, 22
8	*Allium cepa* L.	70	100.00	120.46	0.52	1.00	1.20	19, 20
9	*Allium griffithianum* Boiss	22	31.43	11.90	0.16	0.31	0.38	20
10	*Allium sativum* L.	70	100.00	120.46	0.52	1.00	1.20	20
11	*Aloe vera* (L.) Burm.f.	70	100.00	120.46	0.52	1.00	1.20	20
12	*Alternanthera pungens* Kunth	17	24.29	7.10	0.13	0.24	0.29	20
13	*Amaranthus viridis* L.	27	38.57	17.92	0.20	0.39	0.46	20, 22
14	*Androsace umbellata* (Lour.) Merill	14	20.00	4.82	0.10	0.20	0.24	20
15	*Artemisia annua* L.	30	42.86	22.13	0.22	0.43	0.52	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
16	*Artemisia vulgaris* L.	40	57.14	39.33	0.30	0.57	0.69	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
17	*Astragalus psilocentros* Fisch.	40	57.14	39.33	0.30	0.57	0.69	20
18	*Barleria cristata* L.	19	27.14	8.87	0.14	0.27	0.33	20
19	*Bauhinia variegata* L.	48	68.57	56.64	0.36	0.69	0.83	20
20	*Berberis lycium* Royal	57	81.43	79.87	0.42	0.81	0.98	17, 20, 23
21	*Bergenia ligulata* Wall.	70	100.00	120.46	0.52	1.00	1.20	17, 20, 21, 24
22	*Bidens bipinnata* L.	26	37.14	16.62	0.19	0.37	0.45	17, 20
23	*Boerhavia procumbens*	16	22.86	6.29	0.12	0.23	0.28	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
24	*Bombax ceiba* L.	30	42.86	22.13	0.22	0.43	0.52	20
25	*Calotropis procera* (Aiton) Dryand.	23	32.86	13.00	0.17	0.33	0.40	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 22
26	*Cannabis sativa* L.	45	64.29	49.78	0.33	0.64	0.77	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20, 21
27	*Cardiospermum halicacabum* L.	20	28.57	9.83	0.15	0.29	0.34	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
28	*Carissa opaca* Stapf exhaines.	35	50.00	30.12	0.26	0.50	0.60	17
29	*Carissa spinarum* L.	38	54.29	35.50	0.28	0.54	0.65	20
30	*Caryopteris odorata* (D.Don) B.L. Roxb.	45	64.29	49.78	0.33	0.64	0.77	20
31	*Cassia angustifolia* Vahl. A	35	50.00	30.12	0.26	0.50	0.60	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
32	*Catharanthus roseus* (L.) G.Don	22	31.43	11.90	0.16	0.31	0.38	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
33	*Celtis australis* L.	31	44.29	23.63	0.23	0.44	0.53	20
34	*Chenopodium album* L.	44	62.86	47.59	0.33	0.63	0.76	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
35	*Cirsium arvense* (L.) Scop.	32	45.71	25.17	0.24	0.46	0.55	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

Table 3 Continued

Sr. no	Plant name	*FC*	*FL*	*ROP*	*UV*	*RFC*	*PRK*	Previously cited/references
36	*Cirsium wallichii* DC.	23	32.86	13.00	0.17	0.33	0.40	20
37	*Commelina benghalensis* L.	62	88.57	94.50	0.46	0.89	1.07	20
38	*Convolvulus arvensis* L.	23	32.86	13.00	0.17	0.33	0.40	20, 22
39	*Cordia myxa* L.	21	30.00	10.84	0.16	0.30	0.36	20
40	*Cuscuta reflexa* Roxb.	37	52.86	33.66	0.27	0.53	0.64	19, 20
41	*Cydonia oblanga* Mill.	70	100.00	120.46	0.52	1.00	1.20	19, 20
42	*Cynodon dactylon* (L) Pers.	43	61.43	45.46	0.32	0.61	0.74	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
43	*Cynoglossum lanceolatum* Forssk.	47	67.14	54.31	0.35	0.67	0.81	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
44	*Cyperus rotundus* L.	21	30.00	10.84	0.16	0.30	0.36	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19
45	*Cyperus scariosus* R.Br.	17	24.29	7.10	0.13	0.24	0.29	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
46	*Dalbergia sissoo* DC.	63	90.00	97.57	0.47	0.90	1.08	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 22
47	*Dicliptera bupleuroides* Nees.	22	31.43	11.90	0.16	0.31	0.38	20
48	*Dodonaea viscosa* (L) Jacq.	66	94.29	107.09	0.49	0.94	1.14	19, 20
49	*Dryopteris stewartii* Fraser Jenk.	30	42.86	22.13	0.22	0.43	0.52	20, 21, 23
50	*Eclipta alba* (L.) Hassk.	19	27.14	8.87	0.14	0.27	0.33	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
51	*Eriobotrya japonica* (Thunb)Lindl.	70	100.00	120.46	0.52	1.00	1.20	26, 27
52	*Eriophorum comosum* (Wall.) Nees	21	30.00	10.84	0.16	0.30	0.36	20, 22
53	*Euphorbia helioscopia* L.	41	58.57	41.33	0.30	0.59	0.71	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
54	*Ficus benghalensis* L.	65	92.86	103.87	0.48	0.93	1.12	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
55	*Ficus carica* L.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20
56	*Ficus palmata* Forssk.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
57	*Fumaria indica* (Hausskn.)	60	85.71	88.50	0.44	0.86	1.03	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
58	*Geranium rotundifolium* L.	32	45.71	25.17	0.24	0.46	0.55	17, 19, 20
59	*Grewia villosa* Willd	53	75.71	69.06	0.39	0.76	0.91	20
60	*Hedera nepalensis* K.Koch	23	32.86	13.00	0.17	0.33	0.40	20
61	*Heliotropium strigosum* Willd	27	38.57	17.92	0.20	0.39	0.46	20
62	*Hilanthus annus* L.	63	90.00	97.57	0.47	0.90	1.08	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
63	*Indigofera heterantha* Wall.ex Brandis.	37	52.86	33.66	0.27	0.53	0.64	17
64	*Ipomoea carnea* Jacq.	43	61.43	45.46	0.32	0.61	0.74	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
65	*Juglan regia* L.	70	100.00	120.46	0.52	1.00	1.20	21, 25
66	*Justicia adhatoda* L.	60	85.71	88.50	0.44	0.86	1.03	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
67	*Lamium amplexicaule* L.	23	32.86	13.00	0.17	0.33	0.40	20
68	*Litsea glutinosa* (Lour.) C.B.Rob.	17	24.29	7.10	0.13	0.24	0.29	20
69	*Luffa acutangula* (L.) Roxb.	29	41.43	20.68	0.21	0.41	0.50	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
70	*Mallotus phillipensis* (Lam.) Muell. Arg	33	47.14	26.77	0.24	0.47	0.57	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20

Table 3 Continued

Sr. no	Plant name	*FC*	*FL*	*ROP*	*UV*	*RFC*	*PRK*	Previously cited/references
71	Malus domestica L.	70	100.00	120.46	0.52	1.00	1.20	
72	*Malva parviflora* L.	43	61.43	45.46	0.32	0.61	0.74	17, 20, 22
73	*Melia azedarach* (L.) Pers.	61	87.14	91.48	0.45	0.87	1.05	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
74	*Mentha longifolia* (L.) L.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
75	*Mentha royleana* Benth	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19
76	*Micromeria biflora* (Buch.-Ham. ex D.Don) Benth.	23	32.86	13.00	0.17	0.33	0.40	20
77	*Mirabilis jalapa* L.	31	44.29	23.63	0.23	0.44	0.53	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
78	*Morus alba* L.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
79	*Morus nigra* L.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
80	*Nerium oleander* L.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
81	*Ocimum basilicum* L.	32	45.71	25.17	0.24	0.46	0.55	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
82	*Olea ferruginea* Wall. ex Aitch.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
83	*Opuntia monacantha* (Willd.) Haw.	27	38.57	17.92	0.20	0.39	0.46	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
84	*Origanum vulgare* L.	18	25.71	7.97	0.13	0.26	0.31	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
85	*Oxalis corniculata* L.	54	77.14	71.69	0.40	0.77	0.93	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
86	*Pinus roxburghii* Sarg.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
87	*Plantago lanceolata* L.	38	54.29	35.50	0.28	0.54	0.65	20, 23
88	*Populus alba* L.	44	62.86	47.59	0.33	0.63	0.76	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
89	*Potamogeton nodosus* Poir.	22	31.43	11.90	0.16	0.31	0.38	20
90	*Prinsepia utilis* Royle	18	25.71	7.97	0.13	0.26	0.31	20
91	*Prunus armeniaca* L.	70	100.00	120.46	0.52	1.00	1.20	14, 15, 16, 20
92	*Prunus persica* L. Batsch	70	100.00	120.46	0.52	1.00	1.20	20
93	*Psidium guajava* L.	42	60.00	43.37	0.31	0.60	0.72	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
94	*Pteris vittata* L.	21	30.00	10.84	0.16	0.30	0.36	20
95	*Pueraria tuberosa* (Willd.) DC.	18	25.71	7.97	0.13	0.26	0.31	20
96	*Punica granatum* L.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
97	*Pyrus veriolosa* Wall. ex G.A Camus.	19	27.14	8.87	0.14	0.27	0.33	20
98	*Pyrus communis* L.	70	100.00	120.46	0.52	1.00	1.20	14, 15, 16, 20
99	*Pyrus pashia* Buch.Ham. ex D. Don	70	100.00	120.46	0.52	1.00	1.20	14, 15, 16, 20
100	*Quercus dilatata* Lind	70	100.00	120.46	0.52	1.00	1.20	17, 21
101	*Quercus incana* Lind	70	100.00	120.46	0.52	1.00	1.20	17, 21
102	*Ranunculus sceleratus* L.	56	80.00	77.10	0.41	0.80	0.96	20
103	*Reinwardtia indica* Dumort.	34	48.57	28.42	0.25	0.49	0.59	20
104	*Ricinus communis* L.	30	42.86	22.13	0.22	0.43	0.52	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
105	*Rosa indica* L.	70	100.00	120.46	0.52	1.00	1.20	20, 27

Table 3 Continued

Sr. no	Plant name	*FC*	*FL*	*ROP*	*UV*	*RFC*	*PRK*	Previously cited/references
106	*Rubus ellipticus* Smith.	50	71.43	61.46	0.37	0.71	0.86	20
107	*Rubus fructicosus* L.	55	78.57	74.37	0.41	0.79	0.95	20
108	*Rumex dentatus* L.	45	64.29	49.78	0.33	0.64	0.77	18, 22
109	*Salix caroliniana* Michx.	14	20.00	4.82	0.10	0.20	0.24	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
110	*Sapindus mukorossi* Gaertn.	17	24.29	7.10	0.13	0.24	0.29	20
111	*Silybum marianum* (L.) Gaertn	19	27.14	8.87	0.14	0.27	0.33	20
112	*Solanum nigrum* L.	60	85.71	88.50	0.44	0.86	1.03	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
113	*Solanum surattense* Burm.f	23	32.86	13.00	0.17	0.33	0.40	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
114	Sonchus asper (L.) Hill	44	62.86	47.59	0.33	0.63	0.76	20
115	*Sonchus oleraceus* (L.) L.	32	45.71	25.17	0.24	0.46	0.55	20
116	*Sorghum halepense* (L.) Pers.	23	32.86	13.00	0.17	0.33	0.40	20
117	*Syzygium cumini* (L.) Skeels	21	30.00	10.84	0.16	0.30	0.36	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
118	*Tagetes Erecta* L.	40	57.14	39.33	0.30	0.57	0.69	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
119	*Taraxacum officinale* Weber.	54	77.14	71.69	0.40	0.77	0.93	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
120	*Tribulus terrestris* L.	33	47.14	26.77	0.24	0.47	0.57	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20
121	*Triticum aestivum* L.	70	100.00	120.46	0.52	1.00	1.20	20
122	*Urtica dioica* L.	51	72.86	63.94	0.38	0.73	0.88	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
123	*Verbascum Thapsus* L.	33	47.14	26.77	0.24	0.47	0.57	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20
124	*Vernonia cinerea* (L.) Less.	24	34.29	14.16	0.18	0.34	0.41	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
125	*Viburnum grandiflorum* Wallich ex DC	21	30.00	10.84	0.16	0.30	0.36	17, 23
126	*Viola canescens* Wall.	18	25.71	7.97	0.13	0.26	0.31	17, 20
127	*Vitex negundo* L.	27	38.57	17.92	0.20	0.39	0.46	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
128	*Withania somnifera* (L.) Dunal	23	32.86	13.00	0.17	0.33	0.40	20
129	*Woodfordia fruticosa* (L.) Kurz	32	45.71	25.17	0.24	0.46	0.55	17, 20
130	*Xanthium strumarium* L.	17	24.29	7.10	0.13	0.24	0.29	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
131	*Zanthoxylum armatum* DC.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
132	*Zea maize* L.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
133	*Ziziphus jujuba* Mill.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 20
134	*Ziziphus nummularia* (Burm.f.) Wight & Arn.	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20
135	*Ziziphus oxyphylla* Edgew	70	100.00	120.46	0.52	1.00	1.20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20

FC: frequicy of citation; *FL*: fidelity level; *ROP*: rank order priority; *UV*: use-value; *RFC*: relative frequency citation; *PRK*: percentage respondent knowledge of ethnomedicinal species.
1: Azeem et al. (2020); 2: Hussain et al. (2021); 3: Abbasi et al. (2013); 4: Qaseem et al. (2019); 5: Amjad et al. (2020); 6: Ullah et al. (2013); 7: Ibrar et al. (2015); 8: Bibi et al. (2014); 9: Umair et al. (2017); 10: Iqbal et al. (2021); 11: Malla and Chhetri (2009); 12: Napagoda et al. (2019); 13: Kefalew et al. (2015); 14: Ugulu et al. (2009); 15: Chellappandian et al. (2012); 16: Aftab et al. (2023); 17: Medeiros et al. (2011); 18: Lee et al. (2008); 19: Ajaib et al. (2016); 20: Jabeen et al. (2015); 21: Ahmad et al. (2014); 22: Umair et al. (2019); 23: Ijaz et al. (2022); 24: Awan et al. (2023); 25: Rehman et al. (2023a); 26: Liu et al. (2016); 27: Zareef et al. (2023).

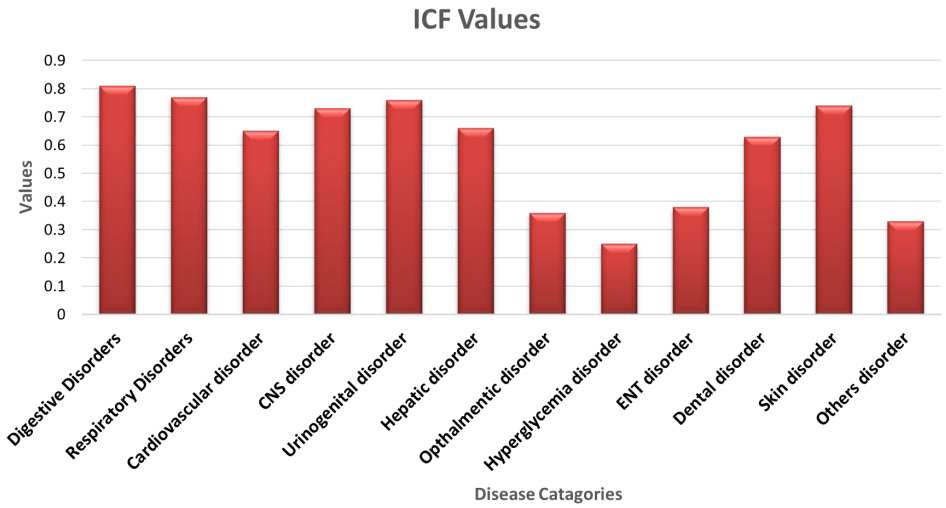

Fig. 4 Informant consensus factor (*ICF*) of medicinal plants used against reported major diseases.

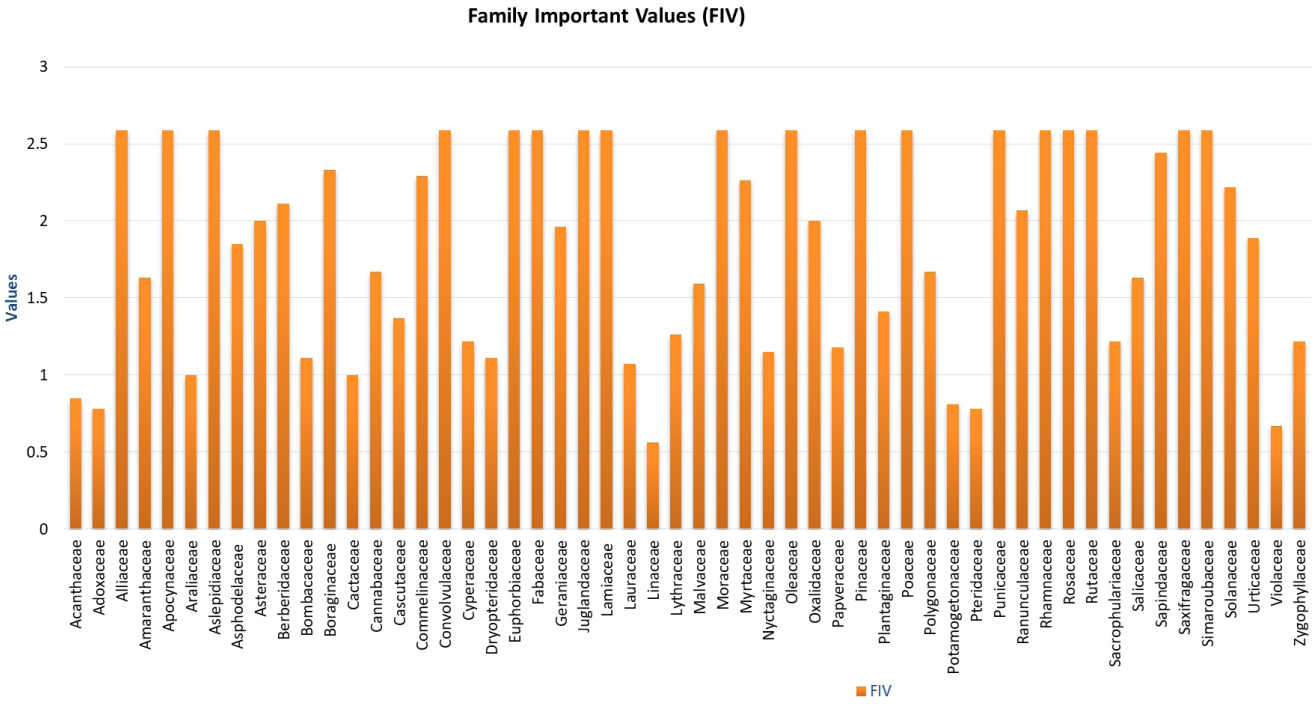

Fig. 5 Family important value of reported medicinal flora.

modesta, *A. sativum*, *Aloe vera*, *M. royleana*, *Ailanthus altissima*,*B. ligulata*, *Z. armatum*, *C. oblanga*, *Eriobotrya japonica*, *F. carica* (1.00 each). The minimum value of *RFC* in Fateh Pur Thakyala was recorded for *Salix caroliniana*, *Androsace umbellata* (0.20 each), Boerhavia procumbens (0.23), *Cyperus scariosus*, *Litsea glutinosa*, *Xanthium strumarium*, *Sapindus mukorossi* (0.24 each), and *Pueraria tuberose*, *Prinsepia utilis*, *Origanum vulgare* (0.26 each). The detailed literature reviews of the reported medicinal plants in current study were performed to explore their previously reported medicinal values (Table 3).

Fidelity level

The fidelity values reveal the preference of a specific plant species as reported by local people for treatment of particular disease in study area. The *FL* values of reported medicinal plants ranges between 20% to 100%. The fidelity values of plants species *A. cepa*, *Z. armatum*, *A. sativum*, *O. ferruginea*, *M. royleana*, *F. carica*, *P. granatum*, *J. regia*, *B. ligulata*, *Rosa indica*, *A. vera*, and *Malus domestic*, *Morus alba* were recorded 100%. These plants species are mainly used to cure digestive, respiratory disorders, urinogenital disorder, opthalmentic disorder, ENT, dental and skin disorders. Some others plant species with high *FL* values were recorded *Dodonaea viscosa* (94%), *Ficus benghalensis* (92%), *Commelina benghalensis* (88%) *J. adhatoda* (85%), *B. lyceum* (81%), *Albizia lebbeck* (74%), *Cannabis sativa* (64%), and *Grewia villosa* (53%). These plant species were mostly used for the treatment of dysentery, indigestion, pain and constipation, etc. The species with high fidelity values re-

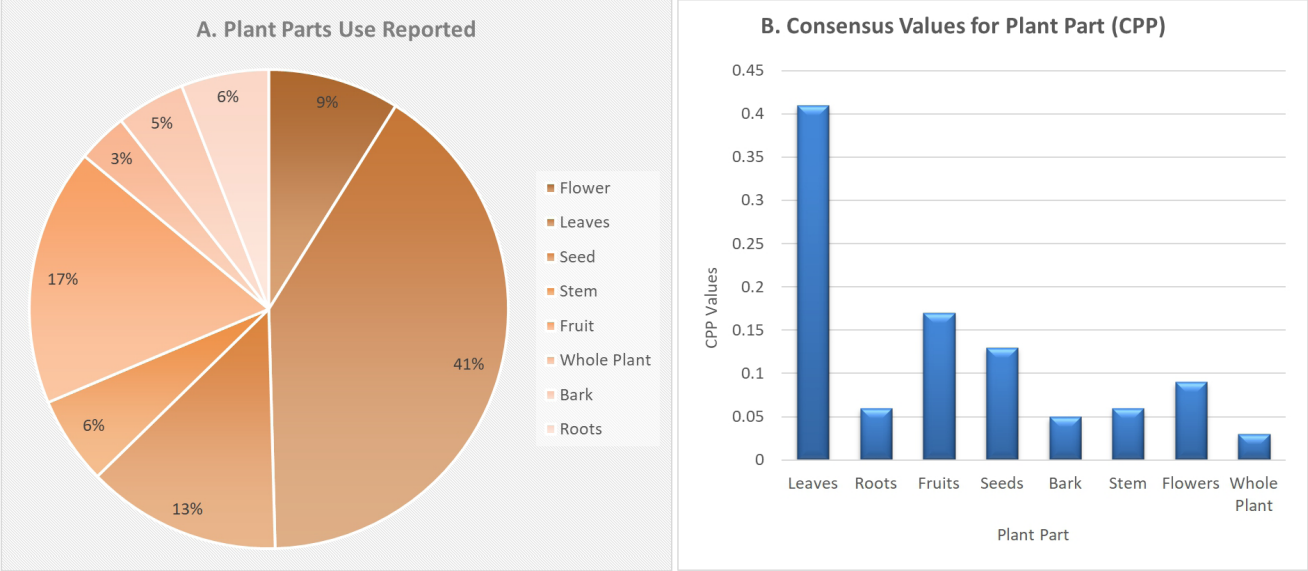

Fig. 6 (A) Plant parts used reported in study area and (B) consensus values for plant part.

flects their extensive use against specific disease in the study area that can be subjected to further pharmacological studies (Table 3).

Novel plant uses

The results of current study were compared with 10 latest published articles from adjoining areas or areas having similar vegetation across Pakistan. The *JI* showed highest values with results of studies published by (Aftab et al. 2023; Hussain et al. 2018; Umair et al. 2019) on Tehsil Khuirratta (AJK), Chenab riverine area, Punjab province Pakistan and Koh-e-Safaid Range, northern Pakistan respectively. The least value for *JI* was found in the studies of (Hussain et al. 2023) on Western Himalays and (Awan et al. 2023) on the Lesser Western Himalayas Azad Kashmir, Pakistan and (Bano et al. 2014b) on Karakoram-Himalayan range, Pakistan (Table 4). High similarity reflects similar culture, traditions vegetation, and geography among the areas along with high level of cross-cultural exchange of traditional knowledge among the community while high differences or least value of *JI* reflects that areas do not share common cultural values. The comparative analysis of current study with previous literature revealed some novel plants uses which were not reported earlier from this region. These novel uses included the extract of whole plant of *B. ligulata*for wound healing. An extract Bulb of *A. cepa* was used to treat Urinary disorders. Fruits of *C. oblanga* cooked in ash were used against sexual disorders. The extract of root of *Acacia nilotica* was used to cure jaundice. Leaves of *A. vera* were used against diabetic patient. The seeds of *Z. armatum* were used in powdered form to treat cholera.

Discussion

The wild herbaceous flora was dominated in the study area with 79 reported plant species followed by trees and shrub life form with 33 and 23 reported plant species respectively (Fig. 2B). Often, the medicinal plants reported have perennial life cycles. These findings were closely related to the previous reports (Aftab et al. 2023; Ahmad et al. 2017; Amjad et al. 2017, 2020). The common use of wild herbs for medicinal purposes are due to their easily availability and their high potential of curing diseases as compared to others life forms. Probably, traditional healers used mostly herbs and trees compared to other life forms as medicine due to their availability in nature. Local people usually collected medicinal plants from roadsides, swamp or swamp edges, woodlots, wet grasslands, grassland, bush land, forest, forest edge, fallow land, home garden, and cropland (Amjad et al. 2020). Species range limits are alienated by the species ecological niche which are often found to be linked with spatial gradients in ecological factors (e.g., precipitation, temperature) and are explained by a set of factors, e.g., climate, habitat structure, and predators or competitors pairs (Ahmad et al. 2017). The local informants revealed that herb dealers collect herbs from the wild and supply to herbal shops or market without paying any attention to their preservation. Although some of the listed plants are presented in the study area, some of them are rare due to harvesting or deforestation. The mode of preparation and route of administration of herbal medicines depends on the availability of plants and indigenous knowledge of people (Ajaib et al. 2021; Amjad et al. 2020). Among different plant parts uses, leaves are reported most commonly used plant part in herbal recipes due to their availability and rich in bioactive compounds (Ajaib et al.

Table 4 Jaccard index comparing current study with previously published literature

Study area	SY	NRPs	NPSU	NPDU	TSCBA	SEAA	SESA	PPSU	PPDU	*JI*	Reference
Shawal Valley, North Waziristan, KPK, Pakistan	2023	108	17	7	24	84	107	15.74%	6.48	14.37	Rehman et al. (2023b)
Lesser Western Himalayas Azad Kashmir, Pakistan	2023	47	3	1	4	43	127	6.38	2.12	2.41	Awan et al. (2023)
Western Himalayas Azad Kashmir, Pakistan	2023	18	0	131	0	18	131	0	0	0.00	Hussain et al. (2023)
Traditional medicines in Rawalpindi, Punjab-Pakistan	2023	169	24	14	38	131	93	14.2	8.28	20.43	Zareef et al. (2023)
Tehsil Khuiratta, AJK, Pakistan	2023	65	41	10	51	14	80	63.07	15.38	118.60	Aftab et al. (2023)
District Buner, KPK, Pakistan	2020	60	5	2	7	53	123	8.33	3.33	4.14	Jan et al. (2020)
Hari Gal, Bagh Azad Kashmir, Pakistan	2020	150	23	6	29	121	102	15.33	4	14.95	Amjad et al. (2020)
Neelum Valley, Azad Kashmir	2022	61	5	4	9	52	122	8.19	6.55	5.45	Ijaz et al. (2022)
Chenab riverine area, Punjab province Pakistan	2019	129	21	10	31	98	100	16.27	7.75	18.56	Umair et al. (2019)
Wazirabad District, Gujranwala, Punjab, Pakistan	2018	32	7	2	9	23	122	21.87	6.25	6.62	Noreen et al. (2018)
Koh-e-Safaid Range, Northern Pakistan	2018	92	21	13	34	58	101	20.8	12.87	27.20	Hussain et al. (2018)
Mohmand Agency, FATA, Pakistan	2018	64	18	4	22	42	113	15.92	3.53	16.54	Aziz et al. (2018)
Karakoram-Himalayan range, Pakistan	2014	51	4	1	5	46	130	8.69	2.17	2.92	Bano et al. (2014a)
Rawalakot, District Poonch Azad Jammu and Kashmir	2017	136	27	4	31	105	104	25.96	3.84	17.42	Shaheen et al. (2017)
Tehsil Kabal, District Swat, KP, Pakistan	2015	45	17	2	19	24	116	14.65	1.72	15.70	Khan et al. (2015)

NRPs: number of reported plant species; NPSU: plants with similar use; NPDU: plants with dissimilar use; TSCBA: total species common in both area; SEAA: species enlisted only in aligned areas; SESA: species enlisted only in study area; PPSU: percentage of plants with similar uses; PPDU: percentage of plants with disimilar uses; *JI*: Jaccard index.

2021). Leaves are photosynthetic organ responsible for making sugar and storing excretory materials. In previous investigations, leaves were also reported the most commonly used plant part to treat various ailments. Apart from leaves fruits, seeds and roots, whole plants have been reported in various studies (Ajaib et al. 2021; Amjad et al. 2017). In some cases, same plant was used against different diseases, e.g., *C. oblanga* was used as jam for spermatogenesis and powder for treating infection in the female sexual organs and cooked for respiratory infections. The traditional recipes for herbal medicines based on single plant species but in some cases more than one plant species were also used for drugs preparations (Ahmad et al. 2017; Aftab et al. 2023; Manzoor et al. 2023). For example, the powder of *C. oblanga*, *F. carica* and *Ficus palmata* were used to enhance the spermatogenesis and the decoction of *C. sativa* and *B. ligulata*was used to pain relief and wound healing. The extract of *A. sativum, A. cepa*, and *A. vera* were used to maintain healthy respiratory system and skin. The herbal medicines were prepared in water mostly; however, honey, milk, oil and tea were also used for preparing herbal drugs. In the current study, the herbal medicines were utilized to cure different diseases like gastrointestinal disorders (stomachache, gastric ulcer, gas trouble, intestinal worms, vomiting, constipation, dysentery, diarrhea), respiratory problems (asthma, cough, flu, throat ache), skin infections (chicken pox, measles, eczema, rashes, cuts, and wounds), fever, diabetes, kidney problems, cancer, toothache, earache, eye pain, cardiac problems, jaundice, inflammation, menstrual disorders, piles, bone fracture, rheumatism, snake bite, scorpion sting, milk production, and general weakness. The mode of preparation in study area were decoction, fresh eaten, tea, powder, extracts, juice and infusion while the route of administration were seen oral and topical (Fig. 3B). Similar results were reported by in Hafizabad district (Umair et al. 2017). It has been reported that oral mode of administration for herbal medicines is most frequently used method in Gujranwala with 76% Punjab, Pakistan. The Amjad et al. (2020) also reported oral administration (76.2%) of herbal medicines as most common method among the people of harigal bagh, Azad Kashmir, Pakistan. The practice of oral administration may be linked to the use of some additives or solvents (milk, tea, hot coffee, fruit juice, and water) that are commonly believed to serve as a vehicle to transport the herbal medicines (Amjad et al. 2020). The additives or solvents are also important to improve the taste, minimize soreness, and decrease adverse effects such as diarrhea, vomiting, and increase the efficacy and healing conditions. These results are in agreement to other studies (Amjad et al. 2020; Jan et al. 2018; Shaheen et al. 2017; Umair et al. 2019). The high *ICF* values recorded in Fateh Pur Thakyala revealed the dependence of native people on local medicinal flora especially, for digestive, respiratory, urinary and

dental disorders whereas, low *ICF* values for others diseases showed the less consistency among informants' indigenous knowledge. Disease of stomach, bronchitis, cough, flue and fever are domination in study area due to their cold temperature and indigenous people sustain their lives by working in forest and fields. The fidelity value reflects the importance of specific plant species reported by local people for treating the specific disease in the study area. The high *FL* of plants species represented their high potential of treating diseases which must be subjected for pharmaceutical investigations (Amjad et al. 2020). The literature revealed that high *FL* values of species are used for treating digestive, respiratory and urinary disorders. The plants species reported with low *FL* values were not well known by local informants about their ethnomedicinal usage. This forecast that may be in upcoming generation the ethnobotanical knowledge about these plant species may be completely depleted (Amjad et al. 2020).

RFC is used to determine the important species used for curing different ailments by native people. The plants species with high *RFC* value were abundant in the area therefore the local people were much familiar with them particularly concerning ethnomedicinal perspective over a long period. Likewise, the plants with special properties to cure particular disease were well known among the local culture; therefore, their precise properties to treat particular disease have got famous and deep rooted. The plant species with high *RFC* values would be interesting for phytochemical and pharmacological profiling and possible future drug discovery, as well as authentication at a commercial level (Amjad et al. 2020; Shaheen et al. 2017; Umair et al. 2019).

UV reflects the relative importance of every species with to more use reports by local people. The *UV* values are directly related to plant use reports which reflect their high *UV* (Amjad et al. 2020; Hussain et al. 2023). These plant species are used repetitively and are biologically more active. It is not necessary that the plant which has low *UV* value become unimportant or not biologically active as the *RFC* and *UV* are constant in particular area but they may be change according to the variation in the knowledge of indigenous people from area to area or within area. Species with high *RFC* and *UV* were often overharvested by inhabitants, so they are prioritized for conservation and sustainable use; otherwise, they will be extinct from the area in near future (Amjad et al. 2020; Awan et al. 2023; Hussain et al. 2023; Mirzaman et al. 2023).

Threats to medicinal flora and indigenous knowledge

The majority people of the Fateh Pur Thakyala are rural and inhabitants on hilly areas. Due to less development in the area majority of the people are illiterate and their main source of incomes are diaspora, agriculture, livestock, cutting forest. Some of them collect the medicinal plants and selling them at low prices to local herb dealers. The local dealers exploit herbs to pharma companies or exported to other places. Over-exploitation of medicinal plant species by untrained collectors, e.g., uprooting of medicinal plants, forest fires, deforestation, over-grazing, and urbanization, are contributing significantly toward the decline of medicinal plant species of the study area. Therefore, authorities should take strict action against over exploitation of medicinal plants and make sure the conservation and sustainable usage of medicinal flora. Moreover, forest and agriculture departments' collaboration with universities and local people can contribute conservation and sustainable use of medicinal plants. People should be aware for their medicinal importance as the indigenous knowledge is under threat due to urbanization and allopathic medicines revolution by conduction seminars in schools, colleges and universities by competent authorities. The traditional knowledge of medicinal flora in the study area is mainly restricted to the older now members of the community members which are passing away. The younger generation is not interested in learning about traditional plant use, and makes more use of allopathic medicine. The traditional health practitioners (hakeems) have profound traditional knowledge, but many are not willing to share it with other people. These factors may lead to the erosion of traditional medicinal knowledge among the rural communities of area.

Conclusions

In conclusion, the 135 medicinal plant species were recorded in the study area used by inhabitants for curing different ailments. Medicinal plants are growing abundantly in the wild, or some are cultivated on farmlands in the Punjab, Sindh, KPK, Baluchistan, and Azad Kashmir. The documented data reflect that local people are still highly dependent on medicinal plants for treating various diseases, as public health facilities are hard to reach, and still have a large knowledge of medicinal plants. The traditional knowledge is mainly in the hand of elder people and health practitioners (hakims), but the young generation is not much interested in herbal recipes. This lack of interest, as well as impacts like overgrazing, deforestation, and soil erosion, are reducing the medicinal flora in the area, and strategies related to resource conservation and further ethnobotanical and pharmacological research are highly recommended for the conservation of this precious treasure.

Abbreviations

WEP: Wild edible medicinal plant

PIC: Prior informed consent

FL: Fidelity level

RFC: Relative frequency citation
FIV: Family important value
UV: Use value
ICF: Informant consensus factor
CPP: Consensus value for plant part
EC: Economic values
JI: Jaccard index

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Authors' contributions
SS collected and analyzed data according to the designed project. NIR performed statistical analysis, RQ reviewed the manuscript, and KH draw final draft. All authors read and approved the final manuscript.

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