Ethnobotanical profile of some useful plants and fungi of district Dir Upper, Tehsil Darora, Khyber Pakhtunkhwa, Pakistan

Murad Muhammad, Lal Badshah, Adnan Ali Shah, Abdullah, Muhammad Ali Shah, Rainer W. Bussmann and Abdul Basit

Databases and Inventories

Abstract

Background: The present study was conducted to explore the ethnobotanical and ethnomedicinal uses of plants in 12 remote villages of Tehsil Darora, district Dir Upper, Pakistan.

Methods: Among the residents both, men, and women (some traditional healers like Hakeen and Pansires) were interviewed about the useful plants existing in the area using comprehensive questionnaires.

Results: A total of 91 plant species belonging to 37 families were recorded in the four seasons (spring, summer, autumn, winter) in 2019-2020. These included 86 angiosperms (94%) 2 gymnosperms (2%) 2 fungi (2%) and 2 pteridophytes (2%). Asteraceae was the dominant family having 9 species, followed by Lamiaceae (8 species), 6 species of Amaranthaceae, and Cucurbitaceae, Fabaceae (5 species), Euphorbiaceae, and Rosaceae, each with 4 species.

Conclusions: The documented plants were used by the local communities medicinally and for other purposes such as fuel, vegetables, fodder, shelter, and timber wood, etc.

Keywords: Ethnobotanical plants, Fungi, Tehsil Darora, District Dir Upper, Pakistan

Correspondence

Murad Muhammad*[1], Lal Badshah[1], Adnan Ali Shah[1], Abdullah[1], Muhammad Ali Shah[2], Rainer W. Bussmann[3] and Abdul Basit[4]

[1]Department of Botany, University of Peshawar, Pakistan
[2]Department of Botany, Islamia College Peshawar, Pakistan
[3]Department of Ethnobotany, Institute of Botany, Ilia State University, Tbilisi, Georgia
[4]Department of Horticulture, University of Agriculture Peshawar, Pakistan

*Corresponding Author: muradbotany1@uop.edu.pk

Ethnobotany Research & Applications
21:42 (2021)

Background

Plants have been used as food, medicines and other purposes all though human history (Punchay *et al.* 2020; Balász *et al.* 2020). Ethnobotany is an extensive field researching human-plant interactions (Latimer 2020; Aloi 2018). Ethnobotanical studies point out locally important plant species and might provide leads for the discovery of crude and modern-day drugs (Elachouri *et al.* 2021). In Pakistan ethnomedicinal studies are quite new, about 6000 plant species have been reported from Pakistan (Abbas *et al.* 2017; Majid *et al.* 2019). Of the approximately 414000 flowering plants globally, 40000 have been reported for a variety of uses. According to World Health Organization (WHO), 80% of the global

Manuscript received: 08/05/2021 - Revised manuscript received: 13/06/2021 - Published: 14/06/2021

http://dx.doi.org/10.32859/era.21.42.1-15

population uses plants for their primary health care (Mustafa et al. 2017). According to a survey in the early 1960s approximately 76% of the population of Pakistan was directly linked to plant use, and plants were considered a big and effective source for medicines (Jan *et al.* 2019; Witt *et al.* 2018). The residents of the rural areas often have excellent knowledge about the application and utilization of plant species (Sutrisno *et al.* 2020; Dapar *et al.* 2020). To preserve the traditional knowledge and contribute to drug prospecting, ethnobotanical studies have been conducted in different regions of this country (Pandey & Tripathi 2017).

The northern area of Pakistan has a rich history of folk knowledge regarding plants and animal resources (Abbas *et al.* 2020). Dir Upper in Khyber Pakhtunkhwa, Pakistan is a remote area since the day of independence where local communities always relied on medicinal plants for numerous diseases and have generally great dependency on plant products. During this survey, knowledge was obtained from the residents about the uses of different plants and fungal species which are used against different human and animal diseases. In addition medicinal uses of plant species, some plants were also used for various purposes such as a cosmetics agent, toothbrush, shelter, fuel, fodder, hedges, and furniture, etc. The current study was the first-ever systematic approach to document the uses of plants and some fungal species in the area. We intended to 1. Document plant uses in the area, 2. Gather data as baseline for better management practices, 3. The preservation of folk traditional knowledge and to make the data publicly available, and 4. Alert and motivate the concerned population against the overexploitation of the unique medicinal flora and reckless clearance of forests and vegetation of the area. We hypothesized that due to its remoteness plant and animal use in the area would be different to surrounding areas and the wider region.

Materials and Methods

Study Area

The research was carried out during 2018-2020 in Tehsil Darora, District Dir Upper which covers about 3,699 km^2 and comprises 7 tehsils divided into 28 union councils. According to the census 2017, its population was 946,421 (Elahi & Rahman 2021). It borders District Chitral and Afghanistan on North and Northwest and District Swat at the east, and on the south joined the District Lower Dir (Figure.1).

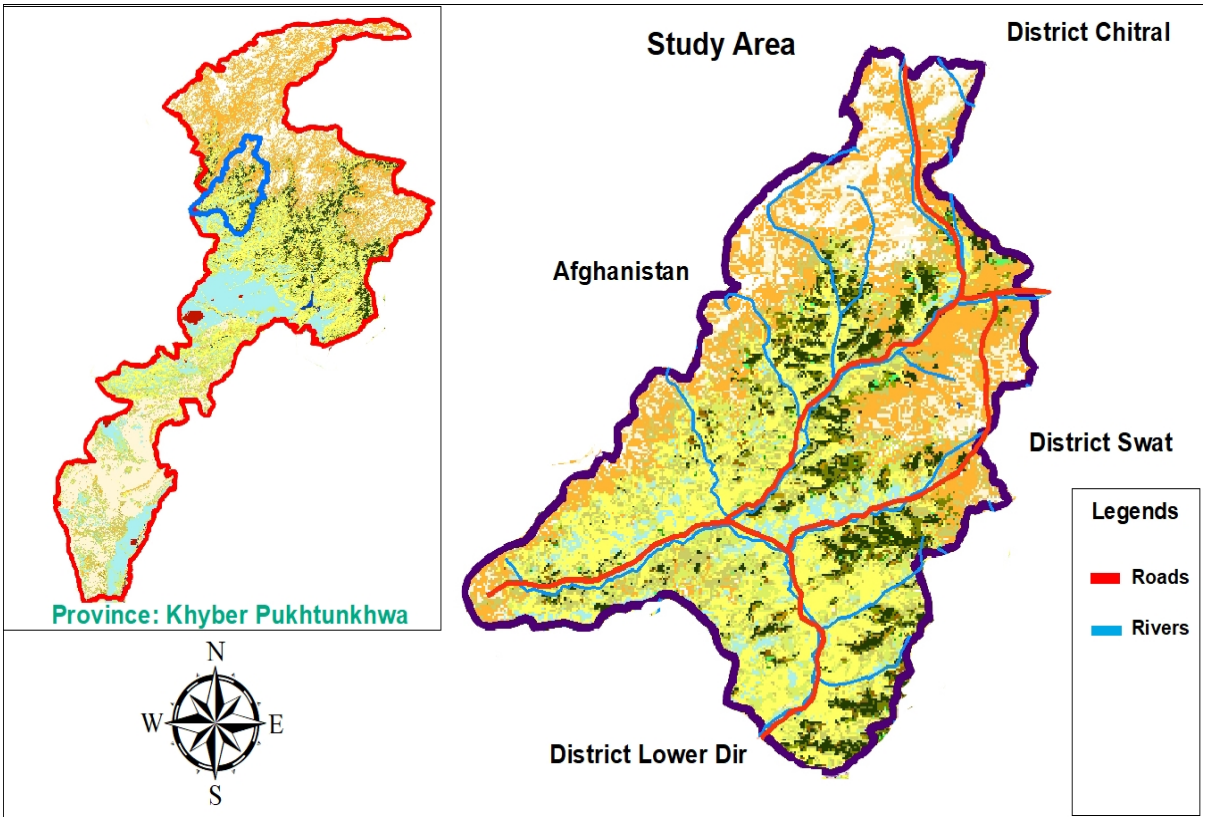

Figure 1. Study area map

At the time of independence of Pakistan, Dir was a separate princely state under the aegis of Nawab shah Jehan Khan. In 1969 it was merged with Pakistan and was declared a district in 1970. The headquarter of District Dir is Chakdara. District Dir is a predominantly rural and hilly area situated in the northern part of Pakistan, divided into two subdivisions i.e., Dir Upper and Dir Lower. The research area tehsil Darora and their associated villages are situated in district Dir Upper. District Dir upper lies between 35°12′24″N latitude and 71°52′36″E longitude, at an elevation of 1300-1500 m.a.s.l. It is administratively subdivided into seven tehsils which contain a total of 28 Union Councils. Tehsil Darora is situated in the south of Dir town (headquarter of Dir Upper). The research area, tehsil Darora is 23 km away (toward the south) from the headquarter of Upper Dir (the town of Dir). Climatically the research area falls in a humid subtropical climate zone with four distinct seasons (winter, spring, summer and, autumn). The winter season is harsh and long. Snowfall frequently happens in mid of the winter season (December and January) at high altitudes sites of the research area. The research covered 5 union councils, where the local inhabitants are Sultan Khel, Painda Khel, and Gujar with Pashto as native language. The residents of the area earn their livelihood from agriculture, selling bovine products, trading forest resources, and cattle rearing. Agriculture is the main source of income.

Data collection

Ethnobotanical data was collected on 16 study trips to representative areas, and specimens were collected in four different seasons. i.e., spring, summer, autumn, and winter. Information regarding ethnobotanical, ethnomycological and ethnozoological uses was collected using a detailed questionnaire (See appendix). Residents of different ages, and gender were interviewed after obtaining their prior informed consent. Informants were selected based on folk knowledge, locality, occupation, and age. Preference was given to the old and native peoples. Most of the interviewed informants were aged from 48 to 68. Some female residents were also included in the survey knowledge, although cultural rules made interviewing women difficult. The majority of the informants were rural, by occupation they were farmers and plant traders. Some urban residents were also interviewed, and the majority were teachers and shopkeepers. All the included informants had great experience and knowledge about the medicinal plants. Ethnobotanical and ethnomedicinal data, the local name of the plants, traditional usage of plants, and other basic suggestions and recommendations were noted. Few short visits were also conducted to the local markets to verify and elaborate the collected information regarding medicinal plants (Figure.2). The Code of Ethics of the International Society of Ethnobiology was followed (Shinwari, 2010). The local language (Pashto) was used during the survey for the sake of ease and accuracy. The participants did not want demographic details to be disclosed.

Specimens of all plants were collected and identified by expert plant taxonomists at the Department of Botany, University of Peshawar, and Islamia College University Peshawar. For confirmation and authenticity of scientific names the Flora of Pakistan was accessed. The taxonomy was updated to APG using Tropicos.org. The specimens were deposited in the herbarium Department of Botany, University of Peshawar, Pakistan for future reference. The plants along with their scientific name, vernacular name, part used, and local uses have been listed in Table 1.

Results

Ethnobotanical diversity

Total of 92 species belonging to 37 families in which 2 species of pteridophytes (2%) 2 fungal species (2%) and 2 gymnosperms (2%) were recorded. Asteraceae was the dominant family having 9 species, followed by Lamiaceae (8 species), Cucurbitaceae and Amaranthaceae (6 species), Fabaceae (5 species), Euphorbiaceae, and Rosaceae (4 species), Apiaceae (3 species) (Table 2). We found 61 herbs, 10 shrubs, 18 trees, and two fungi and their part used were enlisted, as shown in Figure 3 and 4.

Disease Categories

Out of all medicinal plants, the highest number (13) of plant species were used for gastrointestinal tract diseases (GIT) (30%) followed by respiratory diseases (14%). Some plant species were used for multiple ailments (e.g. Papaveraceae and Pinaceae). Some species were used against diabetes, fever, skin problems, renal problems, for wound healing, as body energizers, and anti-constipation (Figure 5). Earlier ethnobotanical research (Chetry et al. 2018; Umair et al. 2017; Santos et al. 2019) conducted in diverse areas also described the common usage of medicinal plants against gastrointestinal diseases. The reported plant species used against various diseases should be further appraised and examined through therapeutic and biological properties.

Table 1. Collected plants in the local area and their ethnobotanical uses.

Family **Scientific name**	**Local name (Pashto)**	**Part used**	**Life form**	**Indigenous knowledge**
Adiantaceae				
Adiantum capillus-veneris L.	Sumbal	Shoots and leaves	Herb	Shoots and leaves are effective against coughs, whooping cough, and other bronchitis infections.
Agaricaceae				
Agaricus campestris L.	Khareray	Whole plant	Mushroom	Used as a nutritional food and quick source of energy.
Alismataceae				
Alisma plantago-aquatica L.	Ghawa jabai	Leaves	Herb	Leaves are used for diabetes, also used for digestive and renal problems.
Amaranthaceae				
Amaranthus viridis L.	Churlyai	Leaves	Herb	Cooked leaves are used as a vegetable.
Chenopodium album L.	Churlayai	Leaves and shoots	Herb	Leaves and shoots used as anthelmintic agent, fodder, common source of vegetables.
Chenopodium ambrosioides (L.) Mosyakin & Clemants	Sakhaboty	Leaves and shoots	Herb	Extracted juice from leaves and stems is used against common and malarial fever, also used against abdominal heat.
Chenopodium botrys (L.) Mosyakin & Clemants	Kharawa	Seeds	Herb	Seeds are used against fever especially malaria, for skin problems, stomach-ache, and as blood thinner.
Chenopodium murale (L.) S. Fuentes, Uotila & Borsch	Churlayai	Leaves and shoots	Herb	Leaves and shoots are used against abdominal problems and as vegetables.
Spinacia oleracea L.	Palak	Leaves and shoots	Herb	Leaves and shoots are used as vegetables and to strengthen bones.
Amaryllidaceae				
Allium cepa L.	Piaz	Bulbs and leaves	Herb	Leaves are diuretic while bulbs are stimulant and decrease the intensity of bites (dogs, insects)
Allium sativum L.	Ooga	Bulb and leaves	Herb	Used as condiment, and expectorant, normalize lower blood pressure.
Apiaceae				
Ammi visnaga Mill.	Sperkai	Whole plant	Herb	Used against sharp fever, anti-asthmatic properties, also uses against internal wounds, abdominal pain (mixed with jaggery and boiled), coldness (for both human and livestock)
Coriandrum sativum L.	Dhanya	Seeds and leaves	Herb	Seeds and leaves are widely used as condiments, aromatic and flavoring agents, as a stimulating agent.
Foeniculum vulgare Mill.	Kaaga	Seeds	Herb	Seeds are used against any digestive and gastric problems, as an appetizer, criminative
Apocynaceae				
Calotropis procera (Aiton) W.T. (Aiton)	Spalmai	Latex	Shrub	Diuretic, for muscular pain, against stomach-ache
Periploca aphylla Decne.	----------	Leaves	Shrub	Leaves are used to cure gum diseases

Asclepiadaceae				
Artemisia vulgaris L.	Tarkha	Leaves and young shoots	Herbs	Used against abdominal worms, anti-malarial
Asphodelaceae				
Asphodelus tenuifolius Cav.	--------	Leaves	Herb	Leaves are used as condiment.
Asteraceae				
Artemisia scoparia Waldst. & Kit.	Jawakay	Stem and leaves	Herb	Stem along with leaves used as broom, also used as fuel.
Carthamus lanatus L.	Ghana	Whole plants	Herb	Used for living fences.
Carthamus oxyacantha M. Bieb.	Ghana	Leaves	Herb	Leaves utilized as bandages for external wounds.
Cichorium intybus L.	-----	Leaves and flower	Herb	Leaves as a vegetable and flowers/roots are used as coffee replacement.
Conyza canadensis (L.) Cronquist	Daniabotay	Seeds and leaves	Herb	Leaves are cooked as vegetable, seeds cooked in combination with rice.
Helianthus annuus L.	Namar parast	Oil and seed yields	Herb	Oil used for cooking, seeds for anti-constipation and diuretic properties.
Sonchus asper (L) Hill.	Shawda boaty	Ash and leaves	Herb	Ash reduces bodypain, leaves are used as fodder for cattle.
Taraxacum officinale (L.) Weber ex F.H. Wigg.	Ziar guly	Whole plant	Herb	The boiled plant is used as a body regulating and stimulating agent.
Xanthium strumarium L.	Geshkay	Leaves and stem	Herb	Leaves are used against respiratory disorders and as antipyretic.
Berberidaceae				
Berberis lycium Royle.	Kwaray	Fruits, roots, and shoots	Shrub	Fruits are used as a blood purifier, bark and root powder for throat, and stomach ulcer /infection, fever.
Brassicaceae				
Brassica campestris L	Sharsham	Whole plant	Herb	Fodder for cattle. Seed oils can be used for body massage, anti-dandruff, and ointment, leaves, and flowers used as vegetable.
Brassica oleracea L.	Zangali Falak	Whole plant	Herb	Vegetable and for salad
Eruca sativa (L.) Cav.	Pana saag	Barks and leaves	Herb	A rich source of nutrients (vegetable), boosting. immune response.
Lepidium sativum L.	Gul saag	Whole plant	Herb	As a tonic, and anti-gastric
Nasturtium officinale W.T. Aiton	Talmera	Shoots and leaves	Herb	Shoots and leaves are used against tetanus and as common vegetables.
Cannabaceae				
Cannabis sativa L.	Kabaly bhang	Seeds and shoots	Herb	Used against insomnia, depression, and loss of appetite.
Cucurbitaceae				
Citrullus colocynthis (L.) Schrad.	Anda botay	Fruits	Herb	Used as a digestive agent, for digestive disorders.
Cucumis melo L.	Andawna	Fruits	Herb	Fruits are edible, also used against water and blood deficiency.

Cucumis sativus L.	Baadrang	Fruits	Herb	Uses in salad as a digestive agent, also used against extensive thirst.
Cucurbita maxima Duchesne	Khug kaddu	Fruit	Herb	Used against stomach burns and joint inflammation, nervous disorders, as common vegetable.
Cucurbita pepo L.	Dobrr kadu	Fruits	Herb	Fruits are used to treat general debility and sugar, used widely as vegetable.
Luffa acutangula (L.) Roxb.	Toorai	Fruits	Herb	Used as a vegetable and digestive tonic.
Cupressaceae				
Cupressus sempervirens L.	Sarwah	Whole plant	Tree	Seeds are anthelmintic, widely used for ornamental purposes in gardens, stem used as fuelwood.
Ebenaceae				
Diospyros lotus L.	Toormanzay amluk/ farsimnn	Fruits and stem	Tree	Wood is used for furniture and as fuel, fruit is effective against flatulence.
Equisetaceae				
Equisetum arvense L.	Bandakay	Whole plant	Herb	Used against small intestinal and urinary bladder inflammation and kidney stones, fever.
Euphorbiaceae				
Euphorbia helioscopia L.	Mandanu	Milky sap	Herb	Latex is used to treat burns and skin eruptions.
Euphorbia hirta L.	Shawda botay	Latex, shoot	Herb	Latex is used against skin problems, shoot as a fodder.
Euphorbia prostrata Aiton.	Shawda botay	Shoots	Herb	Shoots are used against itching
Mallotus philippensis (Lam.) Muell- Arg.	Dana botay	Fruit	Shrub	Fruits are anti-diarrheal, also used for other abdominal disorders.
Fabaceae				
Acacia arabica (Lam.) Willd.	Kikaar	Leaves, Stem, and seeds	Tree	Boiled leaves are used against cough, seeds for dysentery, wood used as fuel.
Acacia nilotica (L.) Willd. ex Del.	Paloosa	Gum, leaves, bark	Tree	Bark and branches used as toothbrush and fuelwood, leaves as fodder, for gums, joints pain, against stomach ulcers.
Dalbergia sissoo Roxb.	Shawa	Stem	Tree	Wood is used for furniture (best source for cash income), and as fuel
Senegalia modesta (Wall.) P.J.H. Hurter	Watany / Kikaar	Gum, leaves, bark	Tree	Leaves are used for cough, intestinal infections.
Trifolium repens L.	Shwtal	Leaves and shoot	Herb	Leaves used as vegetable (commonly called saag) and as fodder for livestock.
Juglandaceae				
Juglans regia L.	Ghuz	Whole plant	Tree	The wood is used in quality furniture, leaves, and roots used for teeth cleaning and as lipstick (locally called Dandasa) ; fruit oils used as brain tonic.
Lamiaceae				
Ajuga bracteosa Wall ex. Benth	Khwaga / Bootei	Shoot and root	Herb	Shoot and root against constipation, cough, as blood purifier, cooling agent.
Ajuga parviflora Benth.	Khwaga / Bootei	Leaves	Herb	Leaves are considered carminative, anti-jaundice

Mentha arvensis L.	Podina	Leaves	Herb	As a digestive and stimulating agent, salad, criminative, expectorant, gastric problems.
Mentha longifolia (L.) Huds.	Enaly / wenaly	Leaves	Herb	Leaves are stimulants, astringent, against stomach-ache.
Ocimum basilicum L.	Kashmalyi	Seeds and leaves	Herb	As an ornamental plant commonly in the home as a fragrance agent, leaves are mostly used against cough, seeds (in cold water) used against vomiting.
Origanum vulgare L.	Jangali	Shoot	Herb	Diuretic and flavoring agent.
Otostegia limbata (Ben th.) Boiss.	Zerakay	Leaves	Herb	Leaves are effective against gum problems and other small wounds.
Salvia plebeian R. Br.	Sheenkay	Shoot	Herb	Anti-diarrheal, against urinary tract irritation.
Moraceae				
Ficus carica L.	Inzaar	Fruits and Latex	Tree	Fruits for stomach problems, constipation, urinary and bladder infection, latex used to remove warts and scab from the body.
Morus alba L.	Speen tut	Fruits and stem	Tree	Wood used for furniture and as fuel, fruits against joints pain (rheumatism)
Morus nigra L.	Khary tut / Toor tut	Stem and fruit	Tree	The wood is used in furniture and fuel, fruit used as a tonic and against cough (in dried form)
Morchellaceae				
Morchella esculenta Fr.	Gosay	Whole	Mushroom	Used as a high energy source
Nyctaginaceae				
Boerhavia diffusa L.	Abi gul	Whole plant	Herb	Diuretic, wound healing
Mirabilis jalapa L.	Mazigar gully	Seeds and, leaves	Herb	Seeds and leaves are used for wound healing, urinary disorders.
Oleaceae				
Olea europaea subsp. cuspidata (Wall. & G. Don) Cif.	Khoonah/ zaitoon	Leaves and oils	Tree	Leaves are used to treat throat problems and diabetes, oils antibacterial
Papaveraceae				
Papaver pavoninum schrenk.	Sur gulay	Fruit, seeds	Herb	For chest trouble, cough, diarrhea.
Papaver somniferum L.	Apium	Seeds, latex	Herb	Latex and seeds are used against diebetes and as a stimulant, for respiratory problem.
Pinaceae				
Pinus roxburghii Sarg	Nakhtar	Gum, stem, fruits	Tree	Use against various skin problems, to remove pus from wounds
Pinus wallichiana A. B. Jacks	Nakhtar	Gums, stem, fruits	Tree	Stems mostly used for furniture, dried leaves as fuel (domestically), fruits as body and brain tonic.
Poaceae				
Aristida cyanatha	Waakha	Whole plant	Grass	Fodder for cattle.
Avena sativa L.	Jawdar/jamdar	Whole plants	Herb	Seeds used forstomach problems, fodder.
Cynodon dactylon (L.) Pers	Kabll	Whole plant	Herb	odder, ornamental, anti-constipation.
Polygonaceae				
Rumex abyssinicus Jacq.	Taaroki	Leaves	Herb	Diuretic, carminative.

Rhamnaceae				
Zizyphus mauritiana Lam.	Markhanai/ nagara	Fruits and leaves	Tree	Leaves are widely used against diabetes, fruits are emollient.
Rosaceae				
Duchesnea indica (Andrews.) Focke.	Janati mewa	Fruits	Herb	Fruits are used for eye infection and as a tonic.
Pyrus communis L.	Nashpati	Fruits	Tree	Fruit is laxative and spasmodic.
Rubus ellipticus Sm.	Ziyra karwara	Fruits	Shrub	Fruits are used against vomiting and diarrhea.
Rubus fruticosus L.	Karwara	Whole plant	Shrub	Plants are used for living fences, fruits edible.
Salicaceae				
Populus nigra L.	Supidar	Stem	Tree	Stem used for furniture, matches, fuel.
Salix alba L.	Wala	Leaves and bark	Tree	Bark used to reduce sharp fever, leaves analgesic.
Sapindaceae				
Dodonaea viscosa Jacq.	Ghwarsky	Seeds, leaves, and stem.	Shrub	Leaves and seeds are used for wound healing (to remove pus), the stem is used as fuel.
Sapotaceae				
Monotheca buxifolia (A. DC.) T.D. Penn	Gwargwara	Fruits and stem	Shrub	Fruits are edible, wood is used for fuel.
Simaroubaceae				
Ailanthus altissima (Mill.) Swingle	Farmai shandai	Stem and leaves	Tree	Leaves are used as fodder, stem as fuelwood.
Solanaceae				
Datura innoxia Mill.	Datura	Leaves and fruits	Shrub	Leaf as bandage to control bleeding, boiled seeds used against asthma.
Solanum nigrum L.	Karmachu	Fruits	Herb	Fruits are used against fever, joint pain.
Solanum surattense Burm. f.	Anda botay	Seed	Herb	Seeds are used against headache, antidiabetic.
Withania somnifera (L.) Dunal	Khamazoory/ Ashwagandha	Seed	Shrub	Seeds for wounds, to regulate body temperature.
Zygophyllacae				
Tribulus terrestris L.	Markondayai	Seed	Herb	Seeds for urinary infections, as tonic.

Figure 2. Data collection

Table 2. Ethnobotanical diversity

Family Name	No. of species
Adiantaceae	1
Agaricaceae	1
Alismataceae	1
Amaranthaceae	6
Amaryllidaceae	2
Apiaceae	3
Apocynaceae	2
Asphodelaceae	1
Asteraceae	9
Berberidaceae	1
Brassicaceae	5
Cannabaceae	1
Cucurbitaceae	6
Cupressaceae	1
Ebenaceae	1
Equisetaceae	1
Euphorbiaceae	4
Fabaceae	5
Juglandaceae	1
Lamiaceae	8
Moraceae	3
Morchellaceae	1
Nyctaginaceae	2
Oleaceae	1
Papaveraceae	2
Pinaceae	2
Poaceae	3
Polygonaceae	1
Rhamnaceae	1
Rosaceae	4
Salicaceae	2
Sapindaceae	1
Sapotaceae	1
Simaroubaceae	1
Solanaceae	4
Zygophyllacae	1

Form and mode of utilization

Out of the 92 plant species, 43 plants were medicinal and were used against multiple ailments, while 13 plant species were used as fuel and timber, 8 species were used to construct shelter, 23 plants were used as a source of food and energy, and 13 plants were used as fodder for livestock as mentioned in Figure 6. Out of the 43 recorded medicinal species, 6 were used against respiratory disorders 3 plants were used anti-constipation. Figure 5.

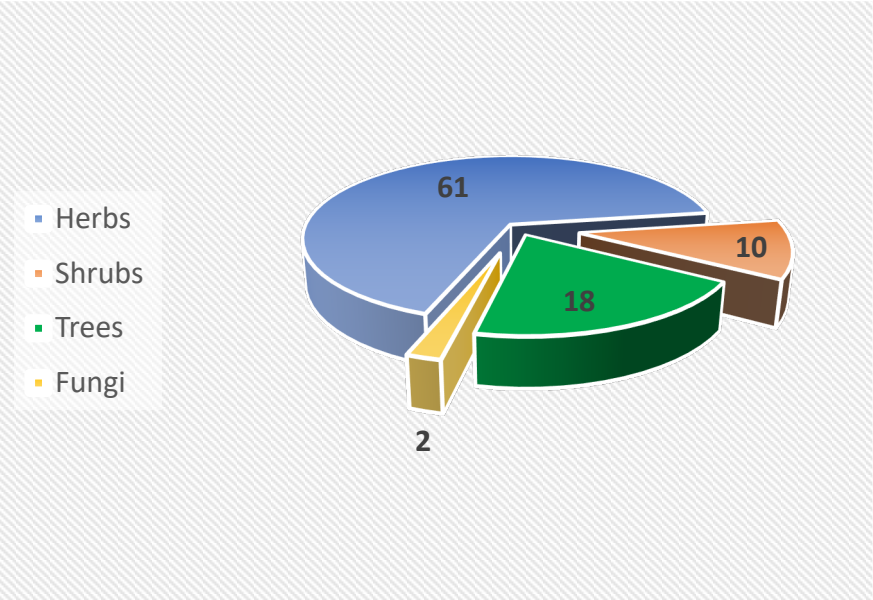

Figure 3. Life forms of plants used.

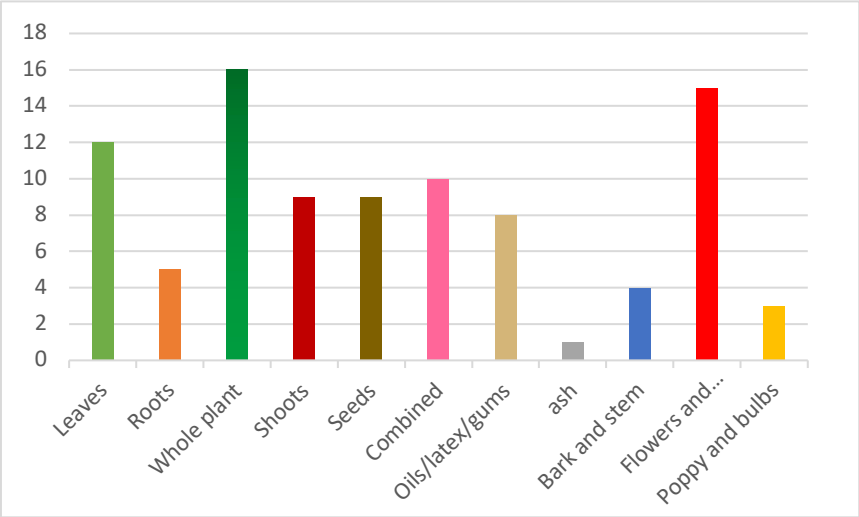

Figure 4. Plant parts used.

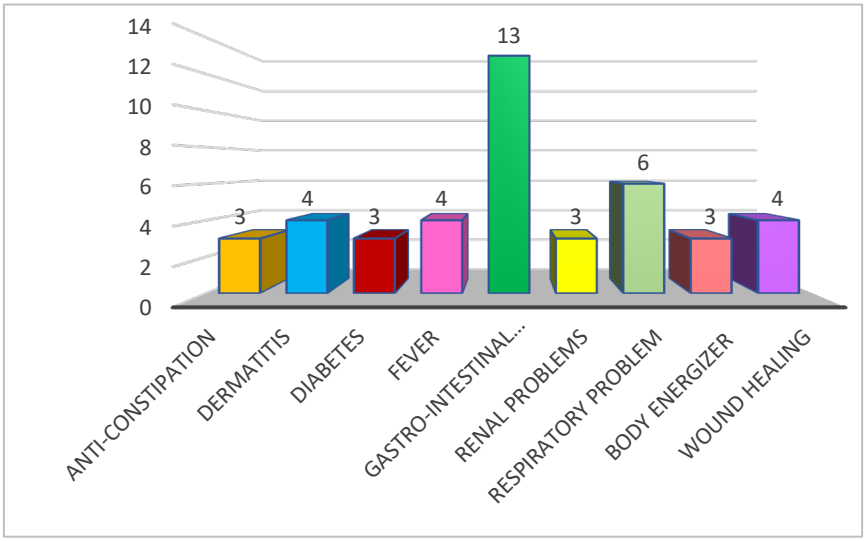

Figure 5. Disease category

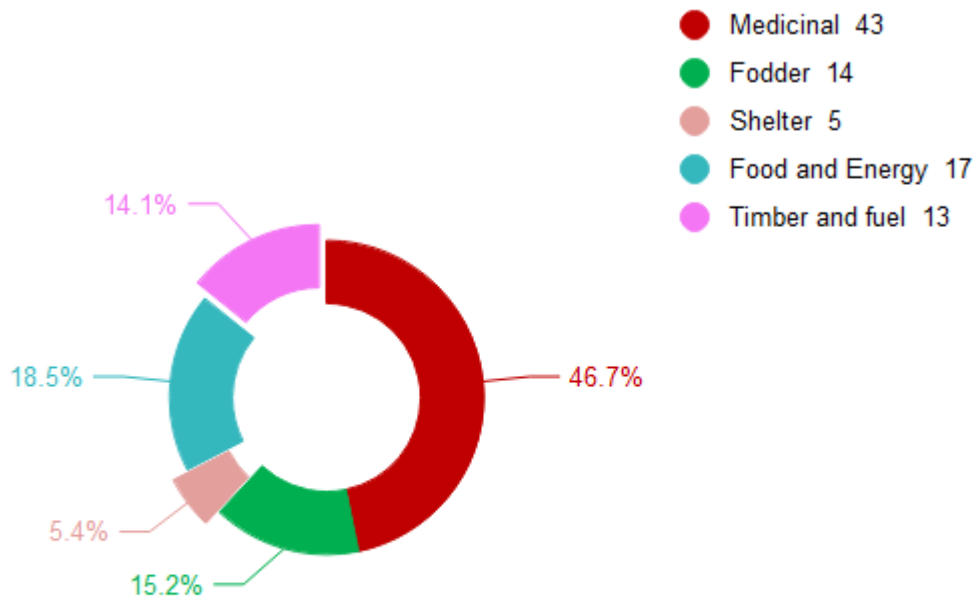

Figure 6. Form and mode of utilization

Discussion

Our study indicated that the residents of the research area still uses a wide variety of plants for their daily needs such as cash income, for fuel, medicine, fodder, shelter, etc. Asteraceae and Lamiaceae were the most dominant families in the research area. *Acacia nilotica Withania somnifera*, and *Berberis lycium* were the most cited plants by the residents. According to available literature *Berberis lycium*, *Cannabis sativa*, *Ammi visnaga* and *Dodonaea viscosa* showed highly medicinal properties (Ahmad *et al.* 2013), although also being heavily used as fuel and fodder. Some species like *Papaver somniferum*, *Cannabis sativa*, *Acacia arabica*, were found to be very effective against respiratory problems (Jindal *et al.* 2012). *Equisitum arvense* and *Ammi visnaga* have been shown to control sharp fever and wounds, similar to our results (Lorenzen *et al.* 2011). Rapee *et al.* (2005) also found *Taraxacum officinale* as a stimulating agent and energizer. Rani and Mohan (2009) documented that *Dodonaea viscosa* leaves and seeds were used for wound healing. *Mentha arvensis* leaves are widely used as digestive and stimulating agents, effective against gastric problems, expectorant, and have criminative properties, and our data matched with (Biswas et al. 2014).

Few members of Family Apiaceae like *Coriandrum sativum and Foeniculum vulgare* were considered strong digestive and kitchen agents, used as condiments and a flavoring mediator similar to (Asowata-Ayodele 2015). Some medicinal plants are under serve threat, due to over-harvesting, including *Dalbergia sisso, Pinus roxburghii* and *Acacia modesta,* which were mainly targeted by the timber mafia. The most common market is the furniture industry. The same species were also recklessly cut to construct shelters and homes. Some bold and serious steps are needed to protect the local biodiversity and ecosystems from such practices. We hope our study will be a baseline to create awareness in local bodies and forest departments to preserve the unique flora and fauna existing in the area and exercise some permanent laws to stop the over-exploitation of natural resources. We hope to encourage the residents to protect the natural value of the area. This would also facilitate national and international tourism, which could boost the economy and contribute to the health sector.

Conclusion

It is concluded from this survey that the area lacks modern facilities, and the majority of the inhabitants are poor and have no permanent and stable source of income. Due to these reasons the residents mostly depend on plants for medicinal use, and other basic needs such as fodder, timber, fuel, and construction. The medicinal flora is under severe

threat due to over harvesting because of its high cash value, as well as the impacts of population explosion. Some plants like *Dalbergia* spp., *Pinus* spp. and *Acacia* spp. are multipurpose plants that need serious management and conservation attention. The medicinal flora of the area and the vegetation in general are under the stress of overuse. Immediate conservation programs, reforestation, forest guard management, solid laws, and awareness programs for the local population are urgently needed.

Declarations

List of abbreviations: N/A

Ethics approval and consent to participate: All participants provided oral prior informed consent

Consent for publication: N/A

Funding: Self-support project. This project got not any fund or sponsorship.

Authors' contributions: Murad Muhammad and Rainer W. Bussmann wrote and reviewed the original manuscript as well as the final manuscript; Lal Badshah and Abdul Basit conceived and designed the study; Adnan Ali Shah, Abdullah, and Muhammad Ali Shah. contributed during field visits and data collection.

Competing interest: The authors have no competing interests.

Acknowledgments

All the authors are grateful to the residents, herbalists, and plant traders for sharing their authentic and experienced knowledge, ideas, suggestions, and recommendations as to be preserved for future references.

Literature cited

Abbas A, Khan SM, Alam J, Khan SW, Abbasi AM. 2017. Medicinal plants used by inhabitants of the Shigar Valley, Baltistan region of Karakorum range-Pakistan. Journal of Ethnobiology and Ethnomedicine 13(1):1-15.

Abbas W, Hussain W, Hussain W, Badshah L, Hussain K, Pieroni A. 2020. Traditional wild vegetables gathered by four religious groups in Kurram District, Khyber Pakhtunkhwa, North-West Pakistan, Genetic Resources and Crop Evolution 67(6):1521-1536.

Ahmad A, Husain A, Mujeeb M, Khan SA, Najmi AK, Siddique NA, Anwar F. 2013. A review on therapeutic potential of Nigella sativa: A miracle herb. Asian Pacific Journal of Tropical Biomedicine 3(5):337-352.

Aloi G. 2018. Why Look at Plants?: The Botanical Emergence in Contemporary Art. Brill, Leiden.

Asowata-Ayodele AM 2015. Pharmacological studies of *Foeniculum vulgare* (Mill.) and *Lippia javanica* (Burm. f.) Spreng. used as spices in Nkonkobe Municipality of the Eastern Cape province, South Africa. University of Fort Hare. http://hdl.handle.net/20.500.11837/241

Balázs VL, Filep R, Ambrus T, Kocsis M, Farkas Á, Stranczinger S, Papp N. 202. Ethnobotanical, historical and histological evaluation of Helleborus L. genetic resources used in veterinary and human ethnomedicine. Genetic Resources and Crop Evolution, 67(3):781-797.

Biswas A, Mandal A, Sharma S, Mohanty W. 2014. Delineation of subsurface structures using self-potential, gravity, and resistivity surveys from South Purulia Shear Zone, India: Implication to uranium mineralization. Interpretation 2(2):T103-T110.

Chauhan K. 2020. Role of Ethnobotany on Indian Society. Journal of Arts, Culture, Philosophy, Religion, Language and Literature 4(2):109-111.

Chetry LB, Basar K, Taye K, Taka T, Tsering J, Wangpan T, Bharali MK. 2018. Medicinal Plants used against gastrointestinal disorders among the Adi Tribe of Eastern Himalaya. NeBIO 9(1):93-101.

Cock I, Selesho M, van Vuuren S. 2018. A review of the traditional use of southern African medicinal plants for the treatment of selected parasite infections affecting humans, Journal of Ethnopharmacology 220:250-264.

Dapar MLG, Alejandro GJD, Meve U, Liede-Schumann S. 2020. Quantitative ethnopharmacological documentation and molecular confirmation of medicinal plants used by the Manobo tribe of Agusan del Sur, Philippines, Journal of Ethnobiology and Ethnomedicine 16 (1):1-60.

Elachouri M, Kharchoufa L, Fakchich J, Lorigooini Z, Subhasis P, Subhash M. 2021. Ancestral phytotherapeutic practices in Morocco: regards on history, current state, regulatory and safety of commonly used herbal medicine, Arabian Journal of Chemical and Environmental Research 8(1): 133-149.

Elahi K, ur Rahman A 2021. An Analysis of Women Voters as a Factor in JIP's Electoral Performance in Upper Dir & Lower Dir in General Elections 2018. The Dialogue 16(1):22-38.

Hubberten HW, Bolshiyanov DY, Grigoriev MN, Grosse G, Morgenstern A, Pfeiffer EM, Schirrmeister L. 2018. 20 Years of Terrestrial Research in the Siberian Arctic, The History of the Lena Expeditions. Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research.

Jan HA, Jan S, Bussmann RW, Wali S, Sisto F, Ahmad L. 2020. Complementary and alternative medicine research, prospects and limitations in

Pakistan: A literature review. Acta Ecologica Sinica 40(6):451-463.

Jindal SK, Aggarwal AN, Gupta D, Agarwal R, Kumar R, Kaur T, Shah B. 2012. Indian study on epidemiology of asthma, respiratory symptoms and chronic bronchitis in adults (INSEARCH). The International Journal of Tuberculosis and Lung Disease 16(9):1270-1277.

Latimer A. 2020. Encoded knowledge in oral traditions: Skwxwú7mesh transformer sites and their relationship with landscape perception and use (Doctoral dissertation, Environment: Department of Archaeology, Simon Frazer University).

Lorenzen ED, Nogués-Bravo D, Orlando L, Weinstock J, Binladen J, Marske KA, Willerslev E. 2011. Species-specific responses of Late Quaternary megafauna to climate and humans. Nature 479(7373):359-364.

Majid A, Ahmad H, Saqib Z, Rahman IU, Khan U, Alam J, Ali N. 2019. Exploring threatened traditional knowledge; ethnomedicinal studies of rare endemic flora from Lesser Himalayan region of Pakistan. Revista Brasileira de Farmacognosia 29(6):785-792.

Pandey AK, Tripathi Y. 2017. Ethnobotany and its relevance in contemporary research, Journal of Medicinal Plant Studies 5(3):123-129.

Punchay K, Inta A, Tiansawat P, Balslev H, Wangpakapattanawong P. 2020. Traditional knowledge of wild food plants of Thai Karen and Lawa (Thailand). Genetic Resources and Crop Evolution 67(5):1277-129.

Rani MS, Mohan RSPK. 2009. *Dodonaea viscosa* Linn. - an overview. Asian Journal of Pharmaceutical Research and Health Care 1(1).

Rapee RM, Kennedy S, Ingram M, Edwards S, Sweeney L. 2005. Prevention and early intervention of anxiety disorders in inhibited preschool children, Journal of Consulting and Clinical Psychology 73(3):488.

Santos FO, Cerqueira APM, Branco A, Batatinha MJM, Botura MB. 2019. Anthelmintic activity of plants against gastrointestinal nematodes of goats: a review. Parasitology 146(10):1233-1246.

Singh A, Pal K. 2017. Ethnobotanical and antibacterial study of some selected medicinal plants in Haryana, International Journal of Research in Medical and Basic Sciences 03(09).

Sutrisno IH, Akob B, Navia ZI, Nuraini N, Suwardi AB. 2020. Documentation of ritual plants used among the Aceh tribe in Peureulak, East Aceh District, Indonesia. Biodiversitas - Journal of Biological Diversity 21(11).

Umair M, Altaf M, Abbasi AM. 2017. An ethnobotanical survey of indigenous medicinal plants in Hafizabad district, Punjab-Pakistan, PloS one 12(6):e0177912.

Witt A, Beale T, van Wilgen BW. 2018. An assessment of the distribution and potential ecological impacts of invasive alien plant species in eastern Africa, Transactions of the Royal Society of South Africa 73(3):217-236.

Appendix

Structured Questionnaire

Preliminary questions

- Respondent name:…….
- Respondent age:……

Respondents total duration or residence around study area:…years

Plant Attributes

Local name: …….

Plant form (tick as appropriate. Filled in by interviewer from observation):
Tree……Shrub……Herb……Forb……Sedge……Grass……
Climber……Other(specify)……

Plant origin (tick as appropriate):
Indigenous……Exotic……

Common (English) name: to be filled in by interviewer …….....

Family: (to be filled in by interviewer):……

Scientific name (to be filled in by interviewer):……

Collection site

In relation to forest (Tick as appropriate)
Inside…….....….....Outside):…….…..…..

Forest block name: ……..

Symptoms or condition cured (List)

1. …….
2. …….
3. …….
4. …….
5. …….

Collection site description

……...
……...

Part(s) used or from which medicine is extracted (tick as appropriate)

Leaves ……
Bark ……....
Roots ……...
Fruits ……....
Flowers ……
Other (specify)
……..……
……..……

General preparation method

……..……
……..……
……..……

Method of administering medication.

……..……
……..……
……..……

Patient age group (tick as appropriate)

Elderly ……
Adults……...
Youth……....
Children……
Infants……...
All age groups…….....

Patient gender (tick as appropriate)

Male ……..
Female……...
Both genders ……...