Ethnobotanical and therapeutic application of plants with the altitudinal description of Lar Sadin and Bar Amadak, Tehsil Salarzai, Bajaur, Pakistan

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Databases and Inventories

Abstract

Background: The ethnobotanical and ethnopharmacological studies of an area provide the best possible pathway to conventional modern medicine and other conventional. This study was conducted to collect the traditional knowledge about plants from local people and then convey this knowledge to people of world.

Methods: The ethnobotanical information was collected through questionnaires, observations and interviews during 2018-2019. The main focus of interviews was to collect information about plants, local names, ethnobotanical uses, plant part uses, diseases treatment, mode of usage and administration. Collected plant specimens with informants were submitted to the Herbarium of University of Peshawar, Pakistan. Quantitative data of the result were analyzed through ethnobotanical indices.

Results: The study reported a total of 209 plants of 180 genera and 64 families were utilized by the local people for various indigenous uses. The highest species belonged to Asteraceae with 21 genera and 25 species followed by Poaceae with 16 genera and 18 species. Out of these 209 plants, 152 species were used as medicinal, 48 as fodder species, 32 as fuel species, 25 species as ornamental, 18 species as vegetables, 13 species as fruits and 6 species as food. The selected area plants were medicinally important for stomachic, vermifuge, fevers, cholera, anthelmintic, diabetes, cancer, laxative, antimicrobial, antiviral and antioxidants.

Conclusion: The study area has been extensively occupied by medicinal and non-medicinal plants that are being used for significant purposes. This study uncovered the traditional and ethnobotanical knowledge of study area. The unwritten ethnobotanical knowledge of local people about medicinal plants and altitudinal details must be preserved.

Keywords: Ethnobotany, Bajaur Salarzai, Afghan border, Medicinal plants, and Informants consensus.

Background

Medicinal plants have been playing an essential role in the development of human culture. It is regarded as rich resources of traditional medicines and from these plants many of the modern medicines are produced (Dar *et al.*, 2017). Most of the people in Pakistan (4.80%) are practicing medicinal flora in their local healthcare system. This sort of traditional medicinal knowledge has been regularly practiced in homes and is transferred from generation to generation with the passage of time (Mahmood *et al.*, 2011). Vegetables have been commonly used as food in Pakistan. The vegetables have the potential to provide essential nutrients to the human beings. It is a good source of proteins, fats, carbohydrates and hence capable of providing energy to the consumer (Hussain *et al.*, 2011). Traditional fuels like firewood, dung and crop residues currently contribute a major share in meeting the everyday energy requirements of rural and low-income urban households in Pakistan (Mirza *et al.*, 2008). Low fruit and vegetable consumption is an important risk factor for chronic diseases, but for many (mainly developing) countries, no prevalence data have ever been published. This study presents data on the prevalence of low fruit and vegetable intake for 52 countries and for various socio-demographic groups and settings across these countries (Hall *et al.,* 2009). In third word regions medicinal plants are preferred as mode of treatment for diseases. It is estimated that more than 80% of developing nations, rely on indigenous medicinal plants for healthcare needs. About 90% population of African countries prefers medicinal plants in ailment treatment (Hostettmann *et al.,* 2000) Out of half million species of plants existing on Earth, only about 3,000 species have been used as agricultural crops for fodder and food and 150 plant species have been cultivated on commercial bases (Heywood *et al.,* 1999). The research area is different both ecologically and culturally from other areas of Bajaur, therefore it was assumed that its residents would be having different approach toward ethnobotanical knowledge. This study was conducted with aim and objective to compile the unwritten traditional and ethnobotanical knowledge of research area and then analyzed this field data through ethnobotanical quantitative indies (ICF).

Materials and Methods

Study area

Study area included Lar Sadin and Bar amadak of Tehsil Salarazai, Bajaur which showed variation in its altitudes. Lar Sadin included Derakai (870 m), Sango (890 m) and Bar Amadak included Chachagay (2380 m), Bangar (1880 m), Akhun kasai (1630 m), Gulo Derai (1490 m) Tandatok (1400 m), Ambar Khana (1390 m), Lakyano (1310 m), Kadok (1290 m), Bara Dandokai (1150 m), Danqol (1090 m) and Lara dandokai (990 m). Bajaur located at an altitude of 1128 m asl with E 71° 290′ latitude and N 34°510 longitude (Fig. 1). According to the 2017 census, the population of the district was 1,093,684. It bordered with Afghanistan, Dir, Muhmmand and Malakand and Kunar Valley lies at a high level to the east. Bajaur is about 45 miles (72 km) long by 20 miles (32 km) broad. Fruits, vegetable and various crops are cultivated. 53685 ha area is uncultivated while total area is 75350 hectares. 54006 ha land is non-irrigated while 14061 ha land is under irrigation. About 25000 ha land comprises forest (Rahman *et al.*, 2017). Similar studies have also been carried out in District Bajaur are (Abidullah *et al.*, 2021, Shah *et al.*, 2020, Haq & Badshah 2021, Fazal, 2019, Aziz *et al.*, 2018 and Khan *et al.*, 2021). No such study has been done on the plants of research area where residents still use plants to cure various ailments.

Fieldwork

The research work was conducted to find out the ethnobotanical information of plants of tehsil Salarzai, District Bajaur. Research area included Lar Sadin and Bar Amadak of Tehsil Salarazai, Bajaur which showed variation in its altitudes. Lar amadak included Derakai (870 m), Sango (890 m) and Bar Amadak included Chachagay (2380 m), Bangar (1880 m), Akhun kasai (1630 m), Gulo derai (1490 m), Tandatok (1400 m), Ambar Khana (1390 m), Lakyano (1310 m), Kadok (1290 m), Bara Dandokai (1150 m) Danqol (1090 m)do and Lara dandokai (990 m). It is located at 1128 m asl with E 71° 290′ latitude and N 34°510 longitude. The collected plants were dried, preserved in newspapers using standard size sheets 11□16 inches. The research areas were visited during (December 2018 to April 2019) and (May 2019 to October 2019) for plants collection at flowering and fruit stage. The ethnobotanical information about plants were collected through questionnaires from local people (25-65 years, old). The questionnaire was based on ethnobotanical uses, local name, diseases treatment, mode of usage and administration. Mostly aged people of study area knew about plants and contributed a lot in research study. The plants collected from the study areas were classified on the basis of their overall utility in the valley. The ethnobotanical information was also collected through interviews of the inhabitants, herd's men, hakims and plants collectors on the basis of age and gender group. The ethnobotanical information included the plant usage as medicinal, fuel, timber, fodder, fruit, vegetable, condiment, spices as ornamental, fences, dyes and poisonous activity.

Questionnaire

Questionnaire No._____ ***Date.*** _____

1. Information about informant.

Name. _____

Age. _____ Tribe. _____

Education. _____ Gender. _____

Occupation. _____

2. Information about Plant Species

Botanical name. _____ Local name. _____

Medicinal uses. _____

Other uses. _____

Part used. a. Stem b. Leaves. Roots c. Flower e. Bark f. Latex g. Whole

3. How to use. _____

_____

4. How much time used for disease treatment. _____

5. Information about area. _____

Botanical identifications

In field surveys, identification was based on the local names of plants, with the help of local informants. Plants were identified with the help of Flora of Pakistan and confirmed by Professor Dr. Ghulam Dastagir and Mr. Ghulam Gilani, Lecturer, University of Peshawar and were given voucher specimen numbers. Then for taxonomic confirmation, the Flora of Pakistan (www.eflora.com) was followed, whereas the International Plant Name Index (IPNI) (www.ipni.org) was used to obtain the correct botanical names confirmation. Collected plant specimens with informants were submitted to the Herbarium of University of Peshawar, Pakistan.

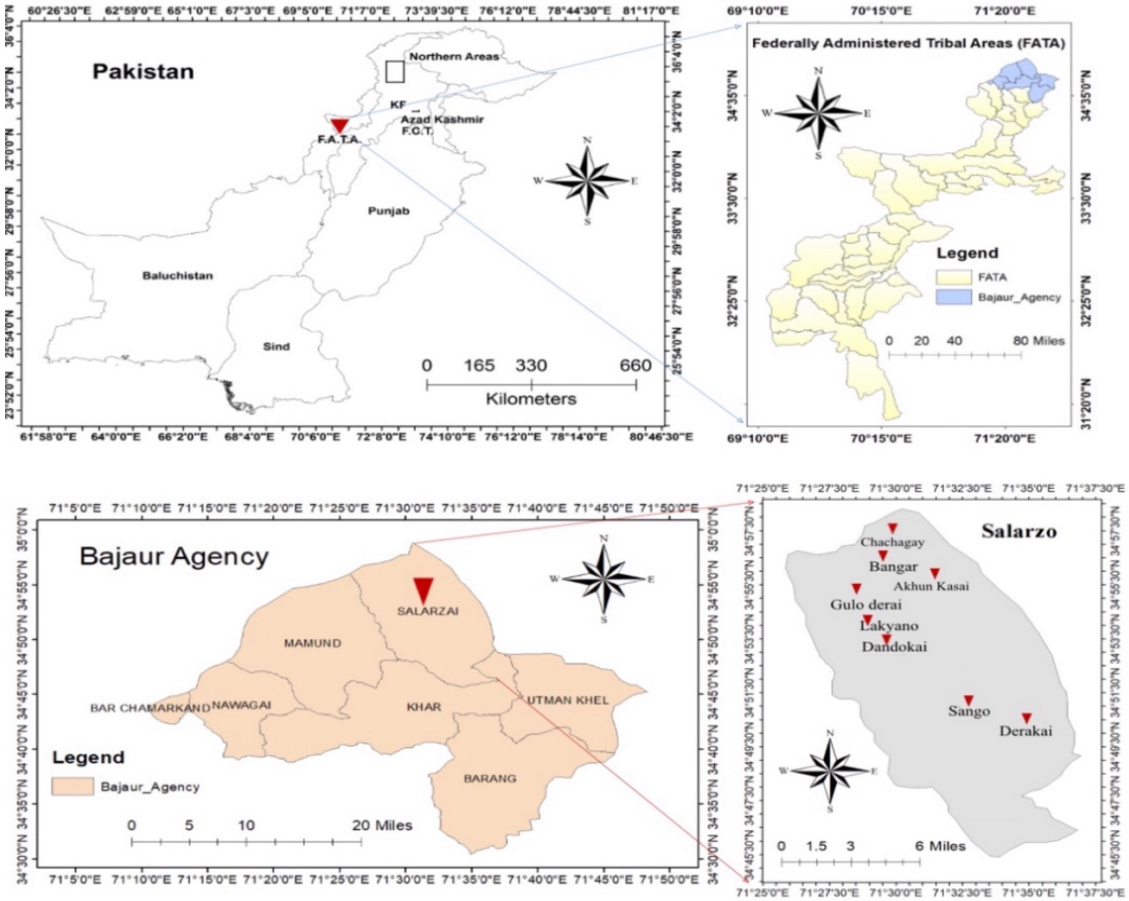

Figure 1. Study area map.

Informants demographics and questionnaire of survey

The information was collected from local people through questionnaire. The questionnaire consisted basic information like: About informants, (Name, age, locality and education), About plant (Local name, uses, part uses and habitat) and about area. These data were collected and note on paper or mobile phone.

The primary source of knowledge which obtained from local through questionnaire The secondary information was obtained from several published papers, textbooks and thesis from online portals like Google Scholar and Research Gate. The age and gender distribution and education level of interviewed are shown in (Table 1).

Total 166 interviewed from study area. Of these, 154 were men (92.7%) and 12 (6.4%) were women. Majority of the interviewers were illiterate (Table. 1).

Table. 1. Demographic information of the informants with number and percentage.

Variable	Category	Number	Percentage
Gender	Male	154	92.7
	Female	12	7.22
Age	20-30	22	13.2
	30-35	30	18.0
	35-40	19	11.4
	40-45	26	15.6
	45-50	29	17.4
	50-65	40	24.0
Education level	Illiterate	108	65.0
	Primary	23	13.8
	Middle	19	11.4
	Collage	12	7.22
	University	4	2.4
Religion	Muslim	166	100
	Non-Muslim	0	0

Data analysis

The collected information about plants were converted into ethnobotanical quantitative indices to make it easier to understand and for better result.

Information consensus factor (ICF)

It is used to measure the similarity and differences among the informants for medicinal uses of plants species in different disease category (Shah *et al.*, 2020).

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

Here "Nur" is the number use for use report for specific use category and ''Nt'' is number of species for treatment of that disease category

Results

The present study reported 209 plants, including dicots 174 (83.2%), monocots 28 (13.3%), pteridophytes 4 (1.9%), gymnosperm 2 (0.95%) and fungi 1 (0.47%) of 180 genera and 64 families presently utilized by the local people for medicinal and other indigenous uses .The maximum species belonged to family Asteraceae with 21 genera (11.6%) and 25 species (11.9%) followed by Poaceae with 16 genera (8.8%) and 18 species (8.61%). Out of 209 species were herbs159 species (76.4%), shrubs 23 species (11%), Trees 21 species (10%), ferns 4 species (1.9%) and fungi species (0.4%). Out of these 209 plants, 152 were used as medicinal (72.7%), 48 species fodder (22.9%), 32 species fuel (15.3%), 25 ornamental species (11.9%), 18 vegetables species (8.61%), 13 fruits species (6.2%) and 6 food species (2.8%). The most common mode of administration was oral (28.2%), powder (21.6), extract (20.1), fresh form (14.9), paste (11.5), decoction (8.6%), poultice (6.7%), Infusion (3.8%), juice (2.8), and oil (1.9). Different part of plants was used for medicinal purposes such as leaves (40.8%), shoots (12.5%), fruits (11.5%), woods (10%), seeds (7.6%), roots (4.6%), latex (4.8%), flowers (4.3%), stems (4.3%), bark (1.44%), branch (0.9%), cone (0.9%) and rhizome (0.4%). These plant parts were used against different diseases (Tables 2, 3) (Figs. 2a & 2b, 3a & 3b, 4a & 4b, 5 a & 5b).

Table 2. Ethnobotanical uses and altitudinal description of plants.

Family	Botanical name	Local name	Voucher number	Habit	GB	Sub locality (m)	Part used	Ethnobotanical uses	MOP
Acanthaceae	*Dicliptera bupleuroides* Nees	Azghai	S. Ahmad Bot. 104. (PUP)	H	W	Tandatok (1400 m)	L	Worm killing	Extract
Acanthaceae	*Justicia adhatoda* L.	Baikar	S. Ahmad Bot. 106. (PUP)	S	W	Derakai (870 m)	L	Anti-inflammatory, antispasmodic and febrifuge	Oral
Acanthaceae	*Strobilanthes glutinosus* Nees	-	S. Ahmad Bot. 105. (PUP)	H	W	Lakyano (1310 m)	L	Influenza, pneumonia and mumps	Oral, decoction
Alliaceae	*Allium cepa* L	Pyaz	S. Ahmad Bot. 199. (PUP)	H	C	Derakai (870 m)	L / Rt	Diuretic, stomachic and vegetable	Fresh form
Alliaceae	*Allium griffithianum* Boiss.	Ogai	S. Ahmad Bot. 166. (PUP)	H	W	Kadok (1290 m)	L / Rt	Reduce blood cholesterol. Vegetable	Oral
Alliaceae	*Allium sativum* L.	Oga	S. Ahmad Bot. 200. (PUP)	H	C	Derakai (870 m)	L / Rt	Blood pressure, heart disease and cough. Vegetable	Fresh form
Amaranthaceae	*Achyranthes aspera* L.	Sor Guly / Ghareza chalwai	S. Ahmad Bot. 177. (PUP)	H	W	Lakyano (1310 m)	Rt	Rheumatism, stomachic, skin diseases and rabies	Powder
Amaranthaceae	*Achyranthes bidentata* Blume	Ghareza chalwai	S. Ahmad Bot. 146. (PUP)	H	W	Tarano (1210 m)	St	Anodyne and antirheumatic	Juice, Paste
Amaranthaceae	*Alternanthera pungens* Kunth	Ghana	S. Ahmad Bot. 144. (PUP)	H	W	Tandatok (1400 m)	L	Diuretic and fever	Powder
Amaranthaceae	*Alternanthera sessilis* (L.) R.Br. ex DC.	-	S. Ahmad Bot. 145. (PUP)	H	W	Tandatok (1400 m)	Rt	Hepatitis, bronchitis, asthma and lung trouble to stop bleeding	Juice
Amaranthaceae	*Amaranthus viridis* L.	Chalwai	S. Ahmad Bot. 202. (PUP)	H	W	Tarano (1210 m)	L	Vegetable potherb	Oral
Amaranthaceae	*Digera muricata* (L.) Mart.	Soor gulay	S. Ahmad Bot. 143. (PUP)	H	W	Tandatok (1400 m)	St	Urinary disorders.	Oral
Amaryllidaceae	*Ixiolirion tataricum* (Pall.) Schult	Shen Guly	S. Ahmad Bot. 130. (PUP)	H	W	Derakai (870 m)	WP	Ornamental	-
Amaryllidaceae	*Narcissus tazetta* L.	Gul-e-gangas	S. Ahmad Bot. 201. (PUP)	H	W	Sango (890 m)	WP	Honeybee and ornamental	-
Apiaceae	*Ammi visnaga* (L.) Lam.	Sperkai	S. Ahmad Bot. 203. (PUP)	H	W	Lara dandokai (990 m).	Fr	Cough, asthma and abdominal pain	Powder
Apiaceae	*Coriandrum sativum* L.	Dhanya	S. Ahmad Bot. 150. (PUP)	H	C	Derakai (870 m)	L	Diarrhea and colic. Vegetable	Oral

Apiaceae	Eryngium biebersteinianum	Ghana	S. Ahmad Bot. 204. (PUP)	H	W	Kadok (1290 m)	Sh	Rheumatic joints	Powder
Apiaceae	*Scandix pecten-veneris* L.	Shepherds	S. Ahmad Bot. 149. (PUP)	H	W	Tandatok (1400 m)	WP	Vegetable	Oral
Apiaceae	*Torilis leptophylla* (L.) Reichb. F.	-	S. Ahmad Bot. 148. (PUP)	H	W	Derakai (870 m)	St / Fr	Hepatic disease	Oral
Asclepiadaceae	*Calotropis procera* (Aiton) Dryand.	Spalmai	S. Ahmad Bot. 128. (PUP)	S	W	Danqol (1090 m)	Lx	Rheumatism, pimple, scorpion stings and ophthalmic disorder	Extract, paste
Asteraceae	*Artemisia absinthium* L.	Jaukay	S. Ahmad Bot. 57. (PUP)	H	W	Derakai (870 m)	L	Worm killing.	Powder
Asteraceae	*Artemisia californica* Less.	Qabrono Tarkha	S. Ahmad Bot. 190. (PUP)	H	W	Gulo derai (1490 m)	L	Ear pain. Local people believe that it is holly plant.	Paste, decoction
Asteraceae	*Artemisia maritima* L.	Tarkha	S. Ahmad Bot. 55. (PUP)	H	W	Lakyano (1310m)	L	Anthelmintic, carminative and stomachic	Powder
Asteraceae	*Artemisia vulgaris* L.	Tarkha	S. Ahmad Bot. 64. (PUP)	H	W	Gulo Derai (1490 m)	WP	Indigestion and roundworm killing	Powder, Poultice
Asteraceae	*Aster subulatus* (Michx.) Hort. ex Michx.	-	S. Ahmad Bot. 71. (PUP)	H	W	Lara dandokai (990 m).	Se	Cough	Powder
Asteraceae	*Calendula arvensis* L.	Mekhaky gul	S. Ahmad Bot. 74. (PUP)	H	W	Tarano (1210 m)	L / Fl	Antispasmodic and emmenagogue. Fodder and ornamental	Extract
Asteraceae	*Carduus edelbergii* Rech.f.	Kalazary	S. Ahmad Bot. 63. (PUP)	H	W	Lakyano (1310 m)	WP	Ornamental	-
Asteraceae	*Centaurea iberica* Trevir. Ex Spreng.	Kareza Ghana	S. Ahmad Bot. 65. (PUP)	H	W	Sango (890 m)	Fl / L	High fever, headache, and healing of wounds	Poultice, Paste
Asteraceae	*Cichorium intybus* L.	Hun	S. Ahmad Bot. 67. (PUP)	H	W	Derakai (870 m)	WP	Skin disease and ornamental	Paste
Asteraceae	*Cirsium vulgare* (Savi) Ten.	Ghana	S. Ahmad Bot. 73. (PUP)	H	W	Lakyano (1310 m)	Rt	Rheumatic joints	Decoction
Asteraceae	*Erigeron bonariensis* L.	Nezak Botay	S. Ahmad Bot. 62. (PUP)	H	W	Derakai (870 m)	WP	Antiulcer, digestive and carminative	Oral
Asteraceae	*Helianthus annuus* L.	Nawar Faraz	S. Ahmad Bot. 59. (PUP)	H	C	Derakai (870 m)	Se / L	Malaria and lung disease	Poultice, Oil
Asteraceae	*Helichrysum Luteoalbum* (L.) RchB	-	S. Ahmad Bot. 189. (PUP)	H	W	Kadok (1290 m)	WP	Abdominal pain	Powder
Asteraceae	*Heteropappus altaicus* (Willd.) Novopokr.	Rehan gulay	S. Ahmad Bot. 69. (PUP)	H	W	Derakai (870 m)	WP	Ornamental	-

Asteraceae	*Lactuca dissecta* D.Don.	Tamna	S. Ahmad Bot. 68. (PUP)	H	W	Tandatok (1400 m)	WP	Antiulcer and Ornamental	Fresh form
Asteraceae	*Lactuca serriola* L.	Zar gulay	S. Ahmad Bot. 58. (PUP)	H	W	Sango (890 m)	WP	Anodyne, antispasmodic, digestive, catarrh, and coughs.	Powder
Asteraceae	*Launaea procumbens* L.	Sarazghai	S. Ahmad Bot. 178. (PUP)	H	W	Chachagay (2380 m)	WP	Ulcers	Extract
Asteraceae	*Marticaria discoidea* DC.	Babona	S. Ahmad Bot. 179. (PUP)	H	W	Lakyano (1310 m)	WP	Joint pain	Extract
Asteraceae	*Parthenium hysterophorus* L.	Kharboty	S. Ahmad Bot. 66. (PUP)	H	W	Ambar Khana (1390 m)	WP	Skin disease, rheumatic pain, urinary tract infections, dysentery and malaria	Paste, Powder
Asteraceae	*Silybum marianum* (L.) Gaertn.	Orejakai	S. Ahmad Bot. 180. (PUP)	H	W	Bara dandokai (1150 m)	WP	Obesity rheumatic pain Appetizer and diuretic	Powder
Asteraceae	*Sonchus asper* (L.) Hill	Shuda pai	S. Ahmad Bot. 61. (PUP)	H	W	Bangar (1880 m)	WP	Wounds and boils	Poultice
Asteraceae	*Tagetes minuta* L.	Zangali Dambar Guley	S. Ahmad Bot. 72. (PUP)	H	W	Lakyano (1310 m)	L	Anthelmintic, antispasmodic and stomachic	Extract and Paste
Asteraceae	*Taraxacum campylodes* G.E.Haglund	Shuda pai	S. Ahmad Bot. 60. (PUP)	H	W	Bangar (1880 m)	L / Lx	Obesity and increase milk production in cattle. Fodder	Powder, Fresh form
Asteraceae	*Urospermum picroides* (L.) Scop. ex F.W.Schmidt	Makhaky gulay	S. Ahmad Bot. 70. (PUP)	H	W	Lakyano (1310 m)	WP	Intestinal disorders. Fodder	Extract
Asteraceae	*Xanthium strumarium* L.	Gishkay	S. Ahmad Bot. 56. (PUP)	H	W	Sango (890 m)	WP	Anthelmintic, improves appetite, diuretic and sedative	Decoction, powder
Berberidaceae	*Berberis lycium* Royle	Kwary	S. Ahmad Bot. 132. (PUP)	S	W	Gulo derai (1490 m)	Fr / Rt / Ba	Constipation, astringent febrifuge, ophthalmic, infection in bones and wounds. Fencing and fruits.	Powder, Paste, oral
Boraginaceae	*Buglossoides arvensis* (L.) I.M.Johnst.	-	S. Ahmad Bot. 189. (PUP)	H	W	Gulo derai (1490 m)	WP	Diuretic	Fresh form
Boraginaceae	*Cynoglossum glochidiatum* Wall. ex Benth.	-	S. Ahmad Bot. 122. (PUP)	H	W	Lakyano (1310 m)	L	Vegetable and fodder	Oral
Boraginaceae	*Cynoglossum lanceolatum* Forssk.	-	S. Ahmad Bot. 121. (PUP)	H	W	Akhun kasai (1630 m)	L	Diuretic, expectorant and ophthalmic disease	Oral, Infusion

Boraginaceae	*Heliotropium europaeum* L.	-	S. Ahmad Bot. 120. (PUP)	H	W	Akhun kasai (1630 m)	L	Boils, ulcers and bites of snakes and mad dogs	Oral, paste
Boraginaceae	*Trichodesma indicum* (L.) R.Br.	-	S. Ahmad Bot. 181. (PUP)	H	W	Lakyano (1310 m)	Rt / L	Infected wounds, boils and snake bite	Powder, paste
Brassicaceae	*Brassica campestris* Burnett.	Sharlsham	S. Ahmad Bot. 24. (PUP)	H	C	Sango (890 m)	Se / Sh	Fodder, vegetable and its oil use for preventing of hair fall. Bajaur is most famous for brassica oil and brassica khal (Seed cakes) locally known as khal as a fodder.	Oil, Fresh form
Brassicaceae	*Brassica juncea* (L.) Czern.	Sharlsham	S. Ahmad Bot. 28. (PUP)	H	W/C	Lakyano (1310 m)	Sh	Rheumatism, stomachic, skin disease and ulcers. Fodder	Oil, Powder
Brassicaceae	*Capsella bursa-pastoris* (L.) Medik.	Bibi paisa	S. Ahmad Bot. 22. (PUP)	H	W	Derakai (870 m)	WP	Diuretic, blood pressure and healing of wounds.	Oral, Paste
Brassicaceae	*Coronopus didymus* (L.) Sm.	Mordar botay	S. Ahmad Bot. 21. (PUP)	H	W	Derakai (870 m)	WP	Fuel	-
Brassicaceae	*Descurainia sophia* (L.) Webb ex Prantl	Jingar	S. Ahmad Bot. 26. (PUP)	H	W	Tarano (1210 m)	Se	Toothache, dysentery and coughs	Powder
Brassicaceae	*Eruca vesicaria* (L.) Cav.	Khojei	S. Ahmad Bot. 27. (PUP)	H	W	Tarano (1210 m)	L	Diuretic and stomachic. Vegetable.	Oral
Brassicaceae	*Nasturtium officinale* R.Br.	Tarmera	S. Ahmad Bot. 25. (PUP)	H	W	Bangar (1880 m)	L	Kidney problems, T.B and stomachic. Vegetable.	Fresh form
Brassicaceae	*Sisymbrium irio* L.	Khoob Kalan	S. Ahmad Bot. 23. (PUP)	H	W	Bara dandokai (1150 m)	Se	Coughs and Asthma	Powder
Cactaceae	*Opuntia ficus-indica* (L.) Mill.	Inzar ghana	S. Ahmad Bot. 182. (PUP)	H	W	Kadok (1290 m)	Fr / Lx	Ophthalmic disease and fruit	Extract, oral
Cannabaceae	*Cannabis sativa* L.	Bhang	S. Ahmad Bot. 138. (PUP)	H	W	Tandatok (1400 m)	L	Asthma, Dandruff and obesity	Extract
Carophyllacae	*Silene conoidea* L.	Munguty boty	S. Ahmad Bot. 127. (PUP)	H	W	Derakai (870 m)	Fl / Fr	Emollient and ophthalmic	Juice, extract
Carophyllacae	*Stellaria media* (L.) Vill.	Stargai	S. Ahmad Bot. 126. (PUP)	H	W	Chachagay (2380 m),	WP	Demulcent, expectorant, laxative and refrigerant. Fodder	Poultice, Paste
Chenopodiaceae	*Chenopodium album* L.	Sarmay	S. Ahmad Bot. 142. (PUP)	H	W	Danqol (1090 m)	L	Anthelmintic, bloody dysentery and swollen feet. Vegetable	Paste, Decoction
Chenopodiaceae	*Chenopodium botrys* L.	Shka khawara	S. Ahmad Bot. 141. (PUP)	H	W	Derakai (870 m)	L	Asthma and cough	Extract

Convolvulaceae	*Convolvulus arvensis* L.	Perwatai	S. Ahmad Bot. 163. (PUP)	H	W	Tarano (1210 m)	L	Fodder	Fresh form
Convolvulaceae	*Ipomoea purpurea* (L.) Roth	Perwatai	S. Ahmad Bot. 163. (PUP)	H	W	Kadok (1290 m)	L / Fl	Worm killing and constipation. Fodder	Extract
Crassulaceae	*Rosularia adenotricha* (Wall. ex Edgew.) C.-A. Jansson	Ghar warkharai	S. Ahmad Bot. 165. (PUP)	H	W	Akhun kasai (1630 m)	WP	Ornamental	-
Cucurbitaceae	*Citrullus colocynthis* (L.) Schrad	Markondai	S. Ahmad Bot. 167. (PUP)	H	W	Sango (890 m)	Fr	Antirheumatic, anthelmintic and skin infections	Powder
Cucurbitaceae	*Luffa cylindrical* (L.) Roem.	Toorai	S. Ahmad Bot. 205. (PUP)	H	C	Derakai (870 m)	Fr	Vegetable	Fresh oral
Dryopteridaceae	*Polystichum munitum* (Kaulf.) C. Presl	Babozai	S. Ahmad Bot. 3. (PUP)	F	W	Tandatok (1400 m)	L	Used as an ornamental	-
Ebenaceae	*Diospyros lotus* L.	Tor amlok	S. Ahmad Bot. 160. (PUP)	T	W	Akhun kasai (1630 m)	Fr / Wo	Influenza, fruits and fuel	Oral
Equistaceae	*Equisetum arvense* L.	Bandakay	S. Ahmad Bot. 4. (PUP)	F	W	Tandatok (1400 m)	L	Wound healing and obesity. Also used for cleaning of teeth.	Paste, extract
Euphorbiaceae	*Chrozophora tinctoria* (L.) A.Juss.	-	S. Ahmad Bot. 77. (PUP)	H	W	Danqol (1090 m)	WP	Antidiabetic, and anthelmintic	Powder
Euphorbiaceae	*Euphorbia helioscopia* L.	Arbay	S. Ahmad Bot. 79. (PUP)	H	W	Sango (890 m)	Lx	Febrifuge and vermifuge	Extract
Euphorbiaceae	*Euphorbia hirta* L.	Pai Botay	S. Ahmad Bot. 82. (PUP)	H	W	Bara dandokai (1150 m)	L / Lx	Ulcers, kidney stones, menstrual problems and vomiting	Extract
Euphorbiaceae	*Euphorbia peplus* L.	Arbay	S. Ahmad Bot. 80. (PUP)	H	W	Lakyano (1310 m)	L	Expectorant, anthelmintic and antipyretic	Powder, paste
Euphorbiaceae	*Euphorbia prostrate* L.	Warmagha	S. Ahmad Bot. 198. (PUP)	H	W	Lara dandokai (990 m)	Lx	Antidandruff	Paste
Euphorbiaceae	*Euphorbia serpens* Kunth	Prawaty	S. Ahmad Bot. 78. (PUP)	H	W	Bara dandokai (1150 m)	Lx	Breathing disorders including asthma and chest congestion	Decoction
Euphorbiaceae	*Ricinus communis* L.	Harhanda	S. Ahmad Bot. 81. (PUP)	S	W	Tarano (1210 m)	St	Anthelmintic, cathartic, emollient and laxative	Powder
Fabaceae	*Acacia modesta* (Wall.) P.J.H. Hurter	Palosa	S. Ahmad Bot. 169. (PUP)	T	W	Derakai (1190 m)	L / Wo	Diarrhea, aphrodisiac, ulcers and Alzheimer's diseases. Honeybees species and fuel	Powder, Poultice

Fabaceae	*Indigofera heterantha* Wall	Gwareja	S. Ahmad Bot. 89. (PUP)	S	W	Ambar Khana (1390 m)	Fl / L / Wo	Diarrhea. Protect against erosion and fuel.	Extract
Fabaceae	*Lathyrus cicera* L.	Wara Chilo	S. Ahmad Bot. 87. (PUP)	H	W	Bara dandokai (1150 m)	L	Diarrhea and dysentery	Fresh form
Fabaceae	*Lespedeza juncea* (L) Pers.		S. Ahmad Bot. 84. (PUP)	S	W	Bangar (1880 m)	Sh / Wo	Fuel and fodder	Oral
Fabaceae	*Medicago minima* L.	Shpeshtary	S. Ahmad Bot. 90. (PUP)	H	W	Bara dandokai (1150 m)	WP	Edible, cooked as a potherb. Fodder	Oral
Fabaceae	*Robinia pseudoacacia* L.	Kikar	S. Ahmad Bot. 83. (PUP)	T	W	Lara dandokai (990 m)	L / Fl / Wo	Ornamental, honeybees species, fodder and fuel	Fresh form
Fabaceae	*Sesbania sesban* (L.) Merr.	Harhar	S. Ahmad Bot. 91. (PUP)	S	C	Lara dandokai (990 m)	Sh / Fr	Sore throat, fuel and prevent erosion	Powder
Fabaceae	*Trifolium alexandrinum* L.	Shawtal	S. Ahmad Bot. 86. (PUP)	H	C	Bara dandokai (1150 m)	WP	Fodder	Oral
Fabaceae	*Trifolium ochroleucon* Huds.	Reshqa	S. Ahmad Bot. 88. (PUP)	H	C	Bara dandokai (1150 m)	WP	Fodder	Oral
Fabaceae	*Trifolium repens* L.	Gharez Shawtal	S. Ahmad Bot. 214. (PUP)	H	W	Chachagay (2380 m)	WP	Fodder	Oral
Fabaceae	*Vicia sativa* L.	Marghai khfa	S. Ahmad Bot. 85. (PUP)	H	W	Bara dandokai (1150 m)	WP	Fodder, food and ornamental.	Oral
Fagaceae	*Quercus incana* Roxb.	Serai	S. Ahmad Bot. 140. (PUP)	T	W	Tandatok (1400 m)	Wo / Se	Astringent, antiseptic and stop bleeding. Fuel	Extract
Fumariaceae	*Fumaria officinalis* L.	Shatara	S. Ahmad Bot. 16. (PUP)	H	W	Gulo Derai (1490 m)	WP	Blood purification, skin problems and allergy. Fodder	Extract
Geraniaceae	*Erodium cicutarium* (L.) L'Hér.	-	S. Ahmad Bot. 152. (PUP)	H	W	Akhun kasai (1630 m)	L	Astringent and blood pressure	Oral
Geraniaceae	*Geranium ocellatum* Camb.v	-	S. Ahmad Bot. 190. (PUP)	H	W	Ambar Khana (1390 m)	WP	Astringent, dysentery and diuretic	Decoction
Geraniaceae	*Geranium rotundifolium* L.	Jareb	S. Ahmad Bot. 151. (PUP)	H	W	Tandatok (1400 m)	L / Fr	Astringent and diuretic	Powder
Helvellaceae	*Morchella esculenta* (L.) Pers ex. Fr.	Khusay	S. Ahmad Bot. 197. (PUP)	Fu	W	Tarano (1210 m)	WP	Edible and medical.	Fresh form
Hypericaceae	*Hypericum perforatum* L.	-	S. Ahmad Bot. 155. (PUP)	S	W	Lakyano (1310 m)	L / Fl	Anxiety, hepatitis, pain in mouth and migraine headache	Powder
Iridaceae	*Iris germanica* L.	Gul-e-Zanbaq	S. Ahmad Bot. 172. (PUP)	H	W	Kadok (1290 m)	WP	Local people believed that it is holly plant and planted it on graveyards. Ornamental	-

Iridaceae	*Iris Kashmiriana* Baker	Gul-e-Zanbaq	S. Ahmad Bot. 173. (PUP)	H	W	Lara dandokai (990 m)	WP	Local people believed that it is holly plant and planted it on graveyards. Ornamental.	-
Iridaceae	*Moraea sisyrinchium* Ker Gawl	Ghwandichar	S. Ahmad Bot. 174. (PUP)	H	W	Bara dandokai (1150 m)	Rt / Fl	Antidandruff and ornamental	Extract
Juglendaceae	*Juglans regia* L.	Ghuz	S. Ahmad Bot. 123. (PUP)	T	W	Gulo derai (1490 m)	Fr / Ba	Dandruff and emollient in skin disorders. Leaves and bark used for cleaning of teeth and mouth. Fruit Fuel and furniture.	Oil, oral
Lamiaceae	*Ajuga integrifolia Buch* Ham ex D.Don	Gooti	S. Ahmad Bot. 29. (PUP)	H	W	Akhun kasai (1630 m)	L	Diarrhea and dysentery	Juice
Lamiaceae	*Ajuga parviflora* Benth.	Sasmay boti	S. Ahmad Bot. 38. (PUP)	H	W	Tandatok (1400 m)	WP	Headaches, blood pressure and hepatitis	Oral
Lamiaceae	*Clinopodium vulgare* L.	-	S. Ahmad Bot. 39. (PUP)	H	W	Lakyano (1310 m)	WP	Carminative, diaphoretic and expectorant	Infusion, Decoction
Lamiaceae	*Lamium amplexicaule* L.	-	S. Ahmad Bot. 36. (PUP)	H	W	Ambar Khana (1390 m)	L	Antirheumatic and fever	Oral
Lamiaceae	*Lamium galeobdolon* (L.) crantz	-	S. Ahmad Bot. 32. (PUP)	H	W	Akhun kasai (1630 m)	WP	Blood purification, insomnia and abdominal pain	Fresh form
Lamiaceae	*Marrubium vulgare* L.	-	S. Ahmad Bot. 183. (PUP)	H	W	Gulo derai (1490 m)	L	Cough and cold	Extract
Lamiaceae	*Mentha arvensis* L.	Podina	S. Ahmad Bot. 35. (PUP)	H	W/C	Sango (890 m)	L	Antispasmodic, fevers and stomachic. Vegetable	Extract, Fresh form
Lamiaceae	*Mentha longifolia* (L.) Huds	Elanay	S. Ahmad Bot. 206. (PUP)	H	W	Tandatok (1400 m)	L	Carminative and vegetable	Fresh form, powder
Lamiaceae	*Micromeria biflora* (Buch-Ham. ex D.Don) Benth.	Shomakai	S. Ahmad Bot. 37. (PUP)	H	W	Tandatok (1400 m)	WP	Blood pressure, hepatitis, nose bleeds and wounds.	Oral
Lamiaceae	*Nepeta cataria* L.	-	S. Ahmad Bot. 33. (PUP)	H	W	Lakyano (1310 m)	WP	Intestinal disease, reduces swelling and increase appetite.	Poultice, Oral
Lamiaceae	*Ocimum basilicum* L.	Kashmaly	S. Ahmad Bot. 213. (PUP)	H	W/C	Tarano (1210 m)	WP	Ornamental with pleasant smell	-
Lamiaceae	*Otostegia limbata* (Benth.) Boiss.	Spen azghay	S. Ahmad Bot. 43. (PUP)	S	W	Tarano (1210 m)	L / Wo	Headache, diabetes, and toothache Fuel	Extract, Decoction
Lamiaceae	*Rabdosia rugosa* (Wall. ex Benth.) H.Hara	Gotti botay	S. Ahmad Bot. 34. (PUP)	H	W	Lakyano (1310m)	WP	Vermicide, colic and insecticide	Extract

Lamiaceae	*Salvia moorcroftiana* Wall. ex Benth.	Kharghwag	S. Ahmad Bot. 31. (PUP)	H	W	Akhun kasai (1630 m)	L	Dysentery and colic	Extract, oral
Lamiaceae	*Salvia plebeia* R.Br.	Gwamrey	S. Ahmad Bot. 40. (PUP)	H	W	Tarano (1210 m)	L	Astringent, diuretic and vermifuge	Poultice, oral
Lamiaceae	*Teucrium stocksianum* Boiss.	Kwandi Butay	S. Ahmad Bot. 30. (PUP)	H	W	Lakyano (1310m)	WP	Anti-inflammatory and antispasmodic	Paste, oral
Lilliaceae	*Gagea elegans* Wall.	Zar Guly	S. Ahmad Bot. 175. (PUP)	H	W	Kadok (1290 m)	WP	Ornamental and fodder	Fresh form
Lilliaceae	*Tulipa clusiana* Red.	Ghan tol	S. Ahmad Bot. 176. (PUP)	H	W	Kadok (1290 m)	WP	Ornamental	-
Linaceae	*Reinwardtia indica* Dum	-	S. Ahmad Bot. 42. (PUP)	H	W	Lakyano (1310m)	L	Fodder and ornamental.	Oral
Malvaceae	*Malva parviflora* L.	Panderak	S. Ahmad Bot. 168. (PUP)	H	W	Sango (890 m)	L	Demulcent, diuretic, expectorant and laxative. Vegetable	Extract and oral
Meliaceae	*Melia azedarach* L.	Watani Shandai, Tora shanda, Bakana	S. Ahmad Bot. 124. (PUP)	T	W/C	Derakai (870 m)	Br / Wo / L	Anthelmintic, emmenagogue and kidney stone. Fuel, timber, furniture and fodder	Extract, Fresh form
Moraceae	*Broussonetia papyrifera* (L.) Vent.	Tot	S. Ahmad Bot. 97. (PUP)	T	W	Lara dandokai (990 m)	L / Wo	Fuel	Powder
Moraceae	*Ficus carica* L.	Inzar	S. Ahmad Bot. 93. (PUP)	T	W/C	Tandatok (1400 m)	Fr / Lx	Laxative, demulcent, digestive and chest problem. Fuel and fruit	Fresh form, Decoction
Moraceae	*Ficus sarmentosa* Buch-Ham. ex Sm.	Zelai	S. Ahmad Bot. 94. (PUP)	S	W	Tandatok (1400 m)	WP	Ornamental and fuel	-
Moraceae	*Morus alba* L.	Spen tot	S. Ahmad Bot. 95. (PUP)	T	W/C	Bara dandokai (1150 m)	Fr / L	Astringent, toothache, and ophthalmic disease. Fuel, Agri. tools, furniture, fodder and fruit	Oral, Infusion
Moraceae	*Morus nigra* L.	Tor tot	S. Ahmad Bot. 96. (PUP)	T	W/C	Bara dandokai (1150 m)	Fr / L	Fruit, fodder, furniture, Agri. tools and fuel	Oral
Nyctaginaceae	*Mirabillis jalapa* L.	-	S. Ahmad Bot. 207. (PUP)	H	W/C	Bangar (1880 m)	Fl	Ornamental	-
Oleaceae	*Jasminum humile* L.	Rambil chambil	S. Ahmad Bot. 20. (PUP)	S	W	Akhun kasai (1630 m)	WP	Astringent, ringworm and ornamental	Powder
Oleaceae	*Olea ferruginea* Wall. ex Aitch.	Khuna	S. Ahmad Bot. 19. (PUP)	T	W/C	Lara dandokai (990 m)	L / Wo	Asthma, intestinal diseases and mouth disease. Fuel, timber, Agri. tools and fruit	Decoctions, Oral

Onagraceae	*Oenothera rosea* L'Hér. ex Aiton	-	S. Ahmad Bot. 156. (PUP)	H	W	Lakyano (1310 m)	L	Dysentery	Extract
Oxalidaceae	*Oxalis corniculata* L.	Threwakay	S. Ahmad Bot. 170. (PUP)	H	W	Sango (890 m)	L	Joint pain, depurative, diuretic and stomachic	Oral
Papaveraceae	*Hypecoum pendulum* L.	-	S. Ahmad Bot. 18. (PUP)	H	W	Akhun kasai (1630 m)	WP	Fodder and ornamental	Oral
Papaveraceae	*Papaver rhoeas* L.	Raday	S. Ahmad Bot. 17. (PUP)	H	W	Derakai (870 m)	Lx	Anodyne, emollient, emmenagogue, expectorant and sedative	Extract, Infusion
Pinaceae	*Pinus roxburghii* Sarg.	Nakhtar	S. Ahmad Bot. 5. (PUP)	T	W	Kadok (1290 m)	St / Br / Wo / Co	Ornamental, timber, furniture wood and fuel	-
Pinaceae	*Pinus wallichiana* A.B.Jacks	Sraf	S. Ahmad Bot. 6. (PUP)	T	W	Akhun kasai (1630 m)	St / Br / Wo / Co	Uses as a food, ornamental, timber, furniture wood and fuel	Oral
Plantaginaceae	*Plantago lanceolata* L.	Ghwajabai	S. Ahmad Bot. 98. (PUP)	H	W	Sango (890 m)	L / Se	Cough, asthma and pulmonary diseases	Powder, Decoction
Plantaginaceae	*Plantago major* L.	Ghwajabai	S. Ahmad Bot. 102. (PUP)	H	W	Tandatok (1400 m)	L / Se	Astringent, demulcent, expectorant and hemostatic	Powder, Decoction
Platanaceae	*Platanus orientalis* L.	Chinar	S. Ahmad Bot. 133. (PUP)	H	W/C	Tandatok (1400 m)	L / Wo	Astringent and vulnerary. Fuel.	Powder
Poaceae	*Arundo donax* L.	Durma	S. Ahmad Bot. 8. (PUP)	H	W	Derakai (870 m)	L	Emollient and anticancer. Living fence and prevent erosion	Fresh form
Poaceae	*Avena sativa* L.	Jaodar	S. Ahmad Bot. 201. (PUP)	H	W	Danqol (1090 m)	Sh	Fodder	Fresh form
Poaceae	*Brachiaria reptans* L.	Wakha	S. Ahmad Bot. 11. (PUP)	H	W	Derakai (870 m)	Sh	Snake bite, diuretic and kidney problems. Fodder	Extract, fresh form
Poaceae	*Bromus japonicus* Thunb.	Jaodar	S. Ahmad Bot. 9. (PUP)	H	W	Lara dandokai (990 m)	Sh	Fodder	Fresh form
Poaceae	*Cynodon dactylon* (L.) Pers.	Kabal	S. Ahmad Bot. 14. (PUP)	H	W	Lakyano (1310 m)	Sh	Fodder, prevent erosion	Fresh form
Poaceae	*Hemarthria altissima* (Poir.) Stapf & C.E.Hubb.	Wakha	S. Ahmad Bot. 10. (PUP)	H	W	Bara dandokai (1150 m)	Sh	Fodder	Fresh form
Poaceae	*Hordeum murinum* L.	Shanelay	S. Ahmad Bot. 191. (PUP)	H	W	Kadok (1290 m)	Sh	Fodder	Fresh form
Poaceae	*Hordeum vulgare* L.	Warbashi	S. Ahmad Bot. 211. (PUP)	H	C	Sango (890 m)	Se / L	Dyspepsia, food and fodder	Powder, Fresh form
Poaceae	*Lolium rigidum* Gaud.	Fastaonay	S. Ahmad Bot. 194. (PUP)	H	W	Bara dandokai (1150 m)	Sh	Fodder	Fresh form

Poaceae	*Oryza sativa* L.	Chawal/ Sholy	S. Ahmad Bot. 212. (PUP)	H	C	Tandatok (1400 m)	Se / L	Food (Chawal) and fodder	Oral
Poaceae	*Phalaris canariensis* L.	-	S. Ahmad Bot. 192. (PUP)	H	W	Lakyano (1310 m)	Sh	Fodder	Fresh form
Poaceae	*Polypogon monospeliensis* L. Desf.	Shanelay	S. Ahmad Bot. 193. (PUP)	H	W	Kadok (1290 m)	Sh	Fodder	Fresh form
Poaceae	*Setaria viridis* (L.) P.Beauv.	Ghat kabal	S. Ahmad Bot. 7. (PUP)	H	W	Sango (890 m)	Sh	Diuretic and Fodder	Fresh form
Poaceae	*Sorghum bicolor* (L.) Moench	Makhi/ Khanjara	S. Ahmad Bot. 210. (PUP)	H	C	Derakai (870 m)	Sh	Fodder	Fresh form
Poaceae	*Sorghum halepense* (L.) Pers.	Dadam	S. Ahmad Bot. 13. (PUP)	H	W	Derakai (870 m)	Sh	Demulcent and diuretic. Fodder	Extract
Poaceae	*Triticum aestivum* L.	Ghanam	S. Ahmad Bot. 209. (PUP)	H	C	Kadok (1290 m)	Se / Sh	Food (flour), fodder	Powder, fresh form
Poaceae	*Urochloa panicoides* P.Beauv.	Kabal	S. Ahmad Bot. 12. (PUP)	H	W	Lara dandokai (990 m)	Sh	Fodder	Fresh form
Poaceae	*Zea mays* L.	Jowar	S. Ahmad Bot. 208. (PUP)	H	W	Gulo derai (1490 m)	Se / Sh	Heart disease, food (grain) and fodder	Powder, fresh form
Polygonaceae	*Fallopia convolvulus* (L.) Á.Löve	Perwatay	S. Ahmad Bot. 49. (PUP)	H	W	Ambar khana (1390 m)	Sh	Fodder	Oral
Polygonaceae	*Persicaria amplexicaulis* (D.Don) Ronse Decr.	-	S. Ahmad Bot. 184. (PUP)	H	W	Tandatok (1400 m)	Rh / L	Rheumatic pains, backache, fever and flu.	Extract, Oral
Polygonaceae	*Persicaria glabra* (Willd.) M.Gómez	Polpolak	S. Ahmad Bot. 185. (PUP)	H	W	Derakai (870 m)	Se / Sh	Snake bite, diuretic and anthelmintic	Paste, Poultice
Polygonaceae	*Polygonum aviculare* L.	Bandakai	S. Ahmad Bot. 45. (PUP)	H	W	Derakai (870 m)	WP	Fever, stop bleeding, diuretic, kidney stone and healing wound.	Extract, Poultice
Polygonaceae	*Rumex dentatus* L.	Shalkhay	S. Ahmad Bot. 46. (PUP)	H	W	Derakai (870 m)	L	Skin disease and vegetable	Paste, Poultice
Polygonaceae	*Rumex hastatus* D. Don	Tarokay	S. Ahmad Bot. 44. (PUP)	S	W	Lakyano (1310m)	WP	Astringent and bloody dysentery	Extract, Oral
Portulacaceae	*Portulaca grandiflora* Hook.	Gul warkharay	S. Ahmad Bot. 196. (PUP)	H	W/C	Lakyano (1310 m)	WP	Ornamental	-
Portulacaceae	*Portulaca oleracea* L.	Warkharay	S. Ahmad Bot. 171. (PUP)	H	W	Sango (890 m)	L	Vegetable as a potherb	Oral
Primulaceae	*Anagallis arvensis* L.	Mangotai	S. Ahmad Bot. 153. (PUP)	H	W	Derakai (870 m)	L	Skin infections, hepatic and gall bladder. Fodder	Infusion, paste, Poultice
Pteridaceae	*Adiantum capillus-veneris* L.	Sumbal	S. Ahmad Bot. 2. (PUP)	F	W	Chachagay (2380 m)	L	Antidandruff, cough and demulcent	Extract

Pteridaceae	*Pteris cretica* L.	Toraparna	S. Ahmad Bot. 1. (PUP)	F	W	Bangar (1880 m)	L	Teeth clean and clean unhealthy tongues of young children	Paste
Ranunculaceae	*Clematis graveolens* Lindl.	-	S. Ahmad Bot. 186. (PUP)	S	W	Gulo derai (1490 m)	Fl	Cough	Infusion
Ranunculaceae	*Ranunculus arvensis* L.	Zar Guly	S. Ahmad Bot. 116. (PUP)	H	W	Tandatok (1400 m)	WP	Fever and Ulcer	Extract
Ranunculaceae	*Ranunculus diffusus* DC	-	S. Ahmad Bot. 115. (PUP)	H	W	Tandatok (1400 m)	WP	Astringent and expectorant	Oral
Ranunculaceae	*Ranunculus flammula* D. Don	-	S. Ahmad Bot. 114. (PUP)	H	W	Akhun kasai (1630 m)	L	Cure ulcers	Extract
Ranunculaceae	*Ranunculus sceleratus* L.	-	S. Ahmad Bot. 117. (PUP)	H	W	Lakyano (1310 m)	L	Anodyne, antispasmodic, emmenagogue and redness of skin	Extract, paste
Rhamnaceae	*Ziziphus nummularia* (Burm. f.) Wight	Markhanai	S. Ahmad Bot. 162. (PUP)	T	W	Akhun kasai (1630 m)	Fr / Wo	Anemia, Kidney problem and memory. Fuel and fruit	Oral
Rosaceae	*Cotoneaster nummularius* Fisch. & C.A.Mey.	Kharawa	S. Ahmad Bot. 110. (PUP)	S	W	Ambar khana (1390 m)	L	Astringent and expectorant	Oral
Rosaceae	*Duchesnea indica* (Andrewa) Th. Wolf	Balmangae	S. Ahmad Bot. 108. (PUP)	H	W	Bangar (1880 m)	Fr	Fruit and fodder	Oral
Rosaceae	*Pyrus pashia* Ham ex. D. Done	Tangai	S. Ahmad Bot. 198. (PUP)	T	W/C	Akhun kasai (1630 m)	Wo / Fr	Laxative, fruit and fuel wood	Fresh form
Rosaceae	*Rosa webbiana* Wall. ex Royle	Gulab	S. Ahmad Bot. 112. (PUP)	S	W	Sango (890 m)	L / Sh	Stomachic and living fences mark out land boundaries	Oral
Rosaceae	*Rubus vestitus* Weihe	Mar marra	S. Ahmad Bot. 187. (PUP)	H	W	Tandatok (1400 m)	L	Astringent, diuretic and vulnerary	Powder
Rosaceae	*Sibbaldia cuneata* Schouw ex Kunze	Lewani shestera	S. Ahmad Bot. 111. (PUP)	H	W	Akhun kasai (1630 m)	L	Fodder	Fresh form
Rubiaceae	*Galium aparine* L.	Ganal	S. Ahmad Bot. 154. (PUP)	H	W	Derakai (870 m)	L / Fr	Obesity, constipation, diuretic and febrifuge	Extract, Oral
Rutaceae	*Zanthoxylum armatum* DC.	Dambara	S. Ahmad Bot. 147. (PUP)	S	W	Gulo Derai (1490 m	Fr / Wo	Stomachic, vermifuge, fevers and cholera. Living Fencing, fruits and fuel	Oral, Powder
Salicaceae	*Populus nigra* L.	Spirdat	S. Ahmad Bot. 75. (PUP)	T	W/C	Bara dandokai (1150 m)	St	Stem use as a timber and fuel	-

Salicaceae	*Salix tetrasperma* Roxb.	Wala	S. Ahmad Bot. 158. (PUP)	T	W	Bara dandokai (1150 m)	Wo / L	Febrifuge, rheumatism and stones in bladder. Fuel	Powder
Sapindaceae	*Dodonaea viscosa* (L.) Jacq.	Ghwaraskai	S. Ahmad Bot. 107. (PUP)	S	W	Bara dandokai (1150 m)	L / Se	Malaria and fuel	Powder
Scrophulariaceae	*Buddleja crispa* Benth.	-	S. Ahmad Bot. 135. (PUP)	H	W	Tandatok (1400 m)	WP	Ornamental	-
Scrophulariaceae	*Scrophularia sambucifolia* L.	-	S. Ahmad Bot. 136. (PUP)	H	W	Chachagay (2380 m)	WP	Ornamental	-
Scrophulariaceae	*Scrophularia scorodonia* L.	-	S. Ahmad Bot. 137. (PUP)	H	W	Tandatok (1400 m)	WP	Itching and swollen skin.	Poultice
Scrophulariaceae	*Verbascum thapsus* L.	Khardag	S. Ahmad Bot. 134. (PUP)	H	W	Lakyano (1310 m)	L	Asthma, coughs and tuberculosis	Extract
Scrophulariaceae	*Veronica anagallis-aquatica* L.	-	S. Ahmad Bot. 101. (PUP)	H	W	Akhun kasai (1630 m)	L	Appetizer and diuretic	Poultice
Scrophulariaceae	*Veronica biloba* schreb. ex L.	-	S. Ahmad Bot. 100. (PUP)	H	W	Lakyano (1310 m)	WP	Expectorant, appetizer, diuretic and wound healing.	Powder, Paste, Poultice
Scrophulariaceae	*Veronica persica* Poir.	Speai Guli	S. Ahmad Bot. 99. (PUP)	H	W	Bara dandokai (1150 m)	Sh	Fodder	Oral
Simaroubaseae	*Ailanthus altissima* (Mill.) Swingle	Shandai/ spena shandai	S. Ahmad Bot. 125. (PUP)	T	W/C	Derakai (1190 m)	Ba / L / Lx/ Wo	Vaginal infections and menstrual pain. Gum uses as a hair removal. Fuel, timber and fodder	Decoction
Solanaceae	*Datura innoxia* Mill.	Barbaka	S. Ahmad Bot. 50. (PUP)	S	W	Sango (890 m)	Se / Sh	Anodyne, antispasmodic, hypnotic and narcotic. Fuel	Powder
Solanaceae	*Physalis minima* L.	Mangoty boti	S. Ahmad Bot. 53. (PUP)	S	W	Tandatok (1400 m)	WP	Diuretic, antipyretic, blood pressure and abdomen problem	Decoction
Solanaceae	*Solanum americanum* Mill.	Kamacho	S. Ahmad Bot. 51. (PUP)	S	W	Derakai (870 m)	Fr	Laxative, analgesic ophthalmic and rabies	Decoction, Infusion
Solanaceae	*Solanum surattense* Burm. f.	Markondai	S. Ahmad Bot. 54. (PUP)	H	W	Tandatok (1400 m)	Fr	Improve digestive straight and asthma	Powder, Juice
Solanaceae	*Withania somnifera* (L.) Dunal	Kotilal	S. Ahmad Bot. 52. (PUP)	S	W	Derakai (870 m)	WP	Aphrodisiac, diuretic, narcotic and sedative. Fuel	Powder
Tamaricaceae	*Tamarix aphylla* (L.) H.Karst.	Ghaz	S. Ahmad Bot. 157. (PUP)	T	W	Lakyano (1310 m)	L / Wo	Astringent, skin diseases and fuel	Extract, Paste
Thymelaeaceae	*Daphne mucronata* Royle	Waly gume	S. Ahmad Bot. 118. (PUP)	S	W	Gulo Derai (1490 m)	L / Fr / Wo	Cleaning eyes and eyes pain. Fuel	Extract, Infusion

Thymelaeaceae	*Thymelaea passerina* (L.) Coss. & Germ.	-	S. Ahmad Bot. 131. (PUP)	H	W	Derakai (870 m)	WP	Fodder	Oral
Ulmaceae	*Celtis australis* subsp. *caucasica* (Willd.) C.C.Towns.	Tagha	S. Ahmad Bot. 139. (PUP)	T	W	Tandatok (1400 m)	Wo / Fr / Se	Fuel and fruit	Oral
Urticaceae	*Urtica dioica* L.	Sezoonkay	S. Ahmad Bot. 129. (PUP)	H	W	Akhun kasai (1630 m)	L	Blood purifier, anemia, antidandruff and excessive menstruation	Juice, Extract
Verbenaceae	*Verbena officinalis* L.	-	S. Ahmad Bot. 76. (PUP)	H	W	Derakai (870 m)	L / Rt	Dysentery, headaches, fevers and depression	Extract
Verbenaceae	*Vitex negundo* L.	Marwandi	S. Ahmad Bot. 41. (PUP)	H	W	Tandatok (1400 m)	WP	Vermifuge, rheumatism, ulcers and malaria	Decoction
Violaceae	*Viola canescens* Wall.	Banafsha	S. Ahmad Bot. 159. (PUP)	H	W	Kadok (1290 m)	WP	Cough and cold	Oral
Violaceae	*Viola rupestris* Schm.	Swee Boti	S. Ahmad Bot. 188. (PUP)	H	W	Akhun kasai (1630 m)	WP	Dysentery	Oral
Zygophyllaceae	*Tribulus terrestris* L.	Ghana	S. Ahmad Bot. 92. (PUP)	H	W	Bara dandokai (1150 m)	L / Fr	Kidney stone and aphrodisiac	Powder

Table. 3. The medicinal uses of selected area plants with number and percentage.

Medicinal Use	No.	%	Medicinal Use	No.	%
Rheumatism	13	16	Cough	13	16
Diuretic	12	14.8	Dysentery	11	13.5
Stomachic	11	13.5	Anthelmintic	10	12.3
Ulcers	10	12.3	Expectorant	10	12.3
Skin disease	10	12.3	Wound healing	9	11.1
Asthma	9	11.1	Fever	9	11.1
Antispasmodic	8	9.8	Kidney problems	7	8.6
Blood pressure	6	7.4	Demulcent	6	7.4
Laxative	6	7.4	Emollient	5	6.1
Eyes disease	5	6.1	Febrifuge	5	6.1
Diarrhea	5	6.1	Antidandruff	4	4.9
Emmenagogue.	4	4.9	Headache	4	4.9
Carminative	4	4.9	Hepatitis	4	4.9
Snake bite	4	4.9	Eye problem	4	4.9
Weight loss	4	4.9	Worm killing	4	4.9
Malaria	4	4.9	Vermifuge	4	4.9
Aphrodisiac	3	3.7	Appetizer	3	3.7
Blood purification	3	3.7	Colic	3	3.7
Constipation	3	3.7	Intestinal disorders	3	3.7
Menstrual problems	3	3.7	Toothache	3	3.7
Sedative	3	3.7	Abdominal pain	2	2.4
Heart disease	2	2.4	Anti-inflammatory	2	2.4
Antipyretic	2	2.4	Lung disease	2	2.4
Influenza	2	2.4	Urinary disorders.	2	2.4
Rabies	2	2.4	Alzheimer	1	1.2
Allergy	1	1.2	Anemia	1	1.2
Analgesic	1	1.2	Anticancer	1	1.2
Anodyne	1	1.2	Anxiety	1	1.2
Ant diabetic	1	1.2	Blood cholesterol	1	1.2
Aphrodisiac	1	1.2	Catarrh	1	1.2
Bronchitis	1	1.2	Depression	1	1.2
Cathartic	1	1.2	Dyspepsia	1	1.2
Depurative	1	1.2	Eyes pain	1	1.2
Ear pain	1	1.2	Indigestion	1	1.2
Hemostatic	1	1.2	Insomnia	1	1.2
Infection in bones	1	1.2	Mumps	1	1.2
Itching	1	1.2	Pneumonia	1	1.2
Pimple	1	1.2	Pneumonia	1	1.2
Scorpion stings	1	1.2	Tuberculosis	1	1.2
Sore throat	1	1.2	Vulnerary	1	1.2
Vomiting	1	1.2			

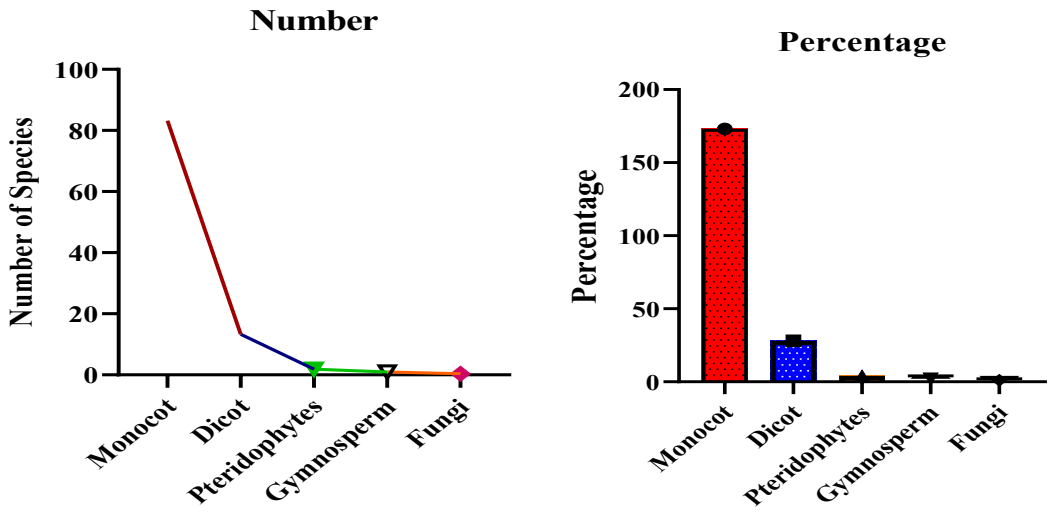

Figure 2a & 2b. Distribution of plants in numbers and percentage.

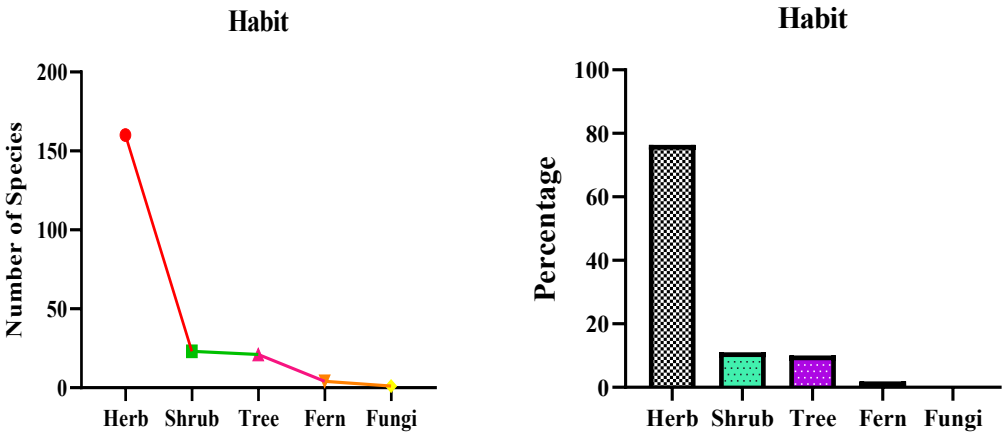

Figure 3a and 3b. Habit of number of species and percentage.

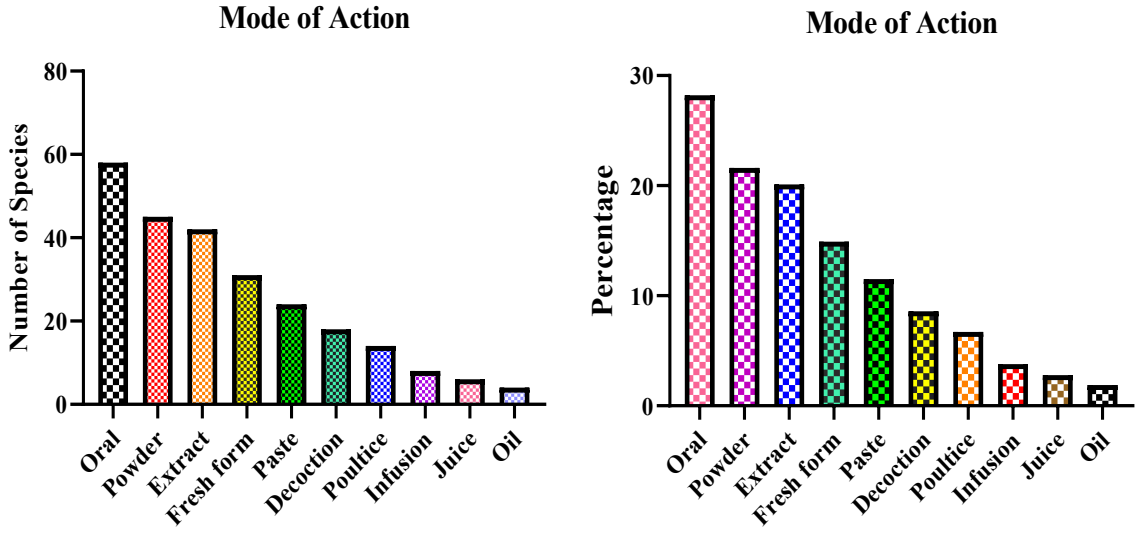

Figure 4a & 4b. The mode of action of species in number and percentage

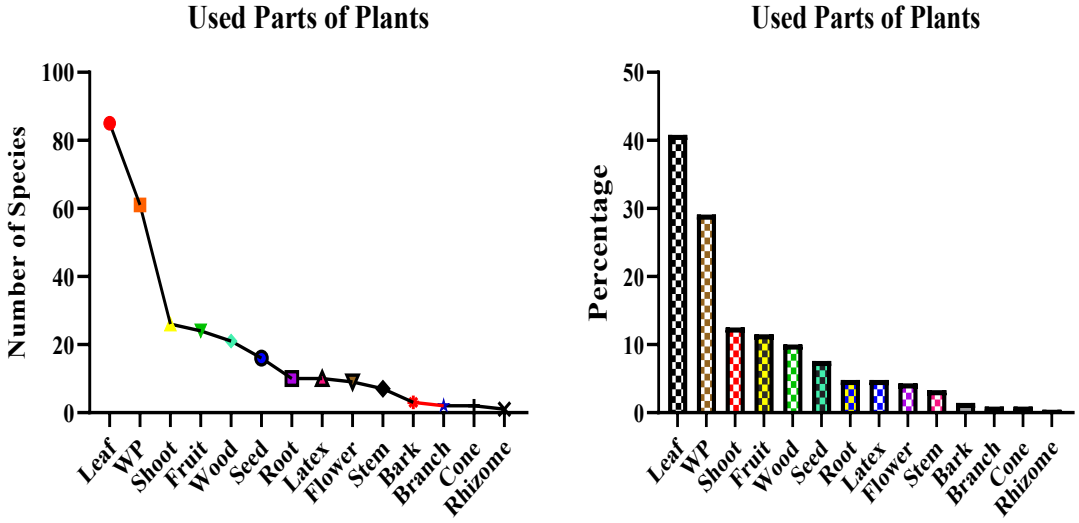

Figure 5a & 5b. The Part used of species in number and percentage.

Information consensus factor (ICF) The result of ICP in the range between 0 and 1. The 1 value indicated the highest value and 0 indicated the lowest value of a category. Table 4 show the value of disease category: Gastrointestinal tract disease having, and respiratory disease 0.37 value followed by parasitic disease 0.36 value and bone and muscular 0.34 value. Neurological disorder having the lowest 0.14 value.

Table 4. ICF value and number with % of ailment category.

Category of ailment	Number of UR	% of UR	Number of species	% of species	ICF
Gastrointestinal tract Disorders	87	21.0	55	19.2	0.37
Respiratory disorder	71	17.1	45	15.7	0.37
Parasitic disease	34	8.21	22	7.69	0.36
Bone and muscular disease	33	7.97	22	7.69	0.34
Nephrological disease	32	7.72	21	7.34	0.35
General disease	27	6.52	18	6.29	0.34
Skin disorder	25	6.03	17	5.94	0.33
Ear, Nose, Eyes and mouth disease	23	5.55	16	5.59	0.31
Fever disease	19	4.58	14	4.89	0.27
Cardiovascular and Blood disease	16	3.86	13	4.54	0.25
Sexual disease	13	3.14	11	3.84	0.16
Pain related disease	10	2.41	10	3.49	0.18
Wound disease	10	2.41	10	3.94	0.18
Neurological disorder	8	1.93	7	2.44	0.14
Liver and spleen disease	6	1.44	5	1.74	0.20

Discussion

Medicinal Species

In the present study 152 species (72.7%), 124 genera (68.8%) and 58 families (89.2%) were used medically. Most of species have multiple uses and some have single use. They were used with different mode of application, the dominant mode of application used by the local people oral, powder, decoction and paste etc. Some of plants used single and the remaining were used mixture as *Zanthoxylum armatum* fruit, Mentha arvensis leaves, *Berberis lyceum* fruit and leaves, *Salvia moorcroftiana* leaves, *Calotropis procera* latex, *Ficus carica* fruit and *Viola canescens* shoots most popular medicinal plants and a source of revenue for local people. *Morchella esculenta* sold (Rs. 12000/Kg)

in local markets, which were used, in various pharmaceutical companies. The study areas are rich of medicinal plants, and many were transported to different the local markets. The plant species used against different diseases are shown in Table No. 1. These plants, which had same medicinal uses such as *Zanthoxylum armatum* (stomachic, vermifuge, fever, and cholera) Khan *et al.* (2015) reported it for stomach and chest infection; *Jasminum humile* (ring worm) Sher *et al.* (2014) reported it ringworm*; Polygonum glabrum* (diuretic and fever) Nisar *et al.* (2014) reported it as diuretic, astringent and relieve pain; *Ranunculus arvensis* (fever and asthma) The same medicinal uses were also reported by another worker such as Ali et al. (2017), Shuaib *et al.* (2014), Ullah *et al.* (2014), Zabihullah *et al.* (2006), Gulshan *et al.* (2012). (Table. 2) (Fig. 6).

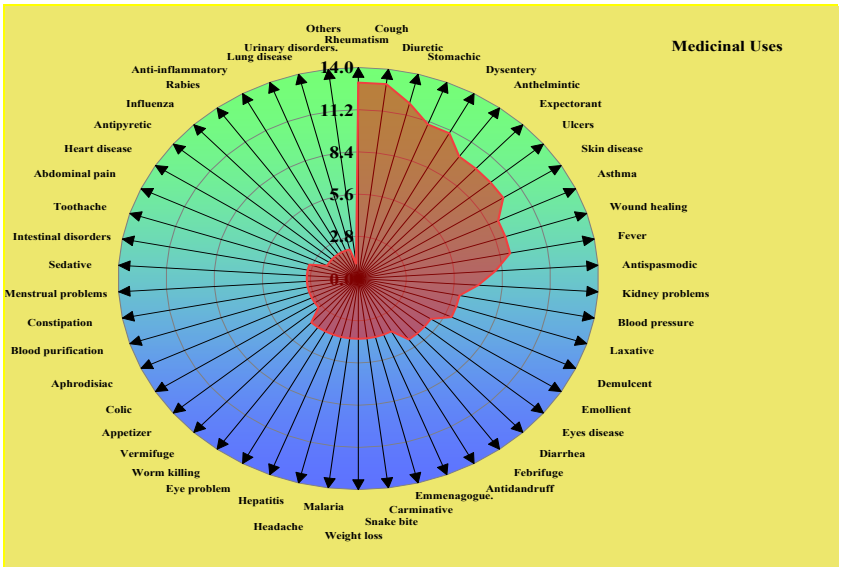

Figure. 6: Highest six cured diseases with number of species.

Vegetable

In the present study 17 species (8.1%) 15 genera (8.33%) and 10 families (15.3%) are uses as vegetable by local inhabitants. Some of the wild vegetables like *Chenopodium album*, *Rumex dentatus* and *Brassica campestris* are sold Rs. 20/small bundle (Bundle is called gedai by local people) and *Malva parviflora* (Rs. 80/small bundle). Some cultivated vegetables including *Mentha arvensis* and *Coriandrum sativum* (Rs.10/bundle), *Allium cepa* (Rs. 80/Kg), *Allium sativum* (Rs. 240/Kg) and *Luffa cylindrical* (Rs. 60/Kg). The rest of the species are not cultivated in the study areas. Local people transport these vegetables to the local markets for earning money. Several workers have reported the use of wild and cultivated vegetables in the country such as (DKa, Khyber Pukhtunkwa (Hussain et al., 2009); DMr (Hussain *et al.,* 2011); Chagharzai Valley, DB, (Sher *et al.,* 2014).

Fodder

In study area out of 209 species 48 species (22.9%) were used as fodder. 6 species (12.7%) *Brassica compestris*, *Trifolium ochroleucon Oryza sativa*, *Sorghum bicolor*, *Triticum aestivum* and *Trifolium alexandrinum* are cultivated as fodder and remaining 41 species are wild. *Setaria viridis*, *Hemarthria altissima*, *Polypogon monospeliensis*, *Urochloa panicoides*, *Hordeum murinum*, *Sorghum halepense* and *Cynodon dactylon* are grazeable species. *Brassica compestris*, *Trifolium ochroleucon* and *T. alexandrinum* are cultivated to used when the shortage occurred in winter. The remaining 44 species were used in spring and summer season. Some of the grasses species are harvested in summer and dried and stored for winter. Several studies indicated that fodder species, found in the present study area were also used in other parts of the country such as Ghaznafar *et al.* (2011) reported *Morus alba*, *M. nigra* and *Melia azedarach* from District Chakwal; Ahmad *et al.*, 2011 reported *Cynodon dactylon* from Tehsil Kabal. Several workers have also reported same species as fodder, Tehsil Kabal DS KP (Khan *et al.*, 2015), Central Punjab (Zereen *et al.*, 2013), Chagharzala Valley DB (Sher et al., 2014). , Allai Valley DBt (Haq *et al.*, 2012), DT (Badshah *et al.*, 2012), Allai Valley DB (Haq *et al.*, 2012), Tehsil Oghi, DMn (Ahmed *et al.*, 2019), DK Kashmir (Ajaib *et al.*, 2010), DD Lower (Shuaib *et al.*, 2014), Takht-e-Nasratti, DKa (Khan *et al.*, 2013) , Gokand Valley DB (Khan *et al.*, 2013) and DB (Haq *et al.*, 2012).

Fruits

In present study out of 209 species 13 species (6.22%) were used as fruit. All of the 13 species are wild. Some of these fruit like *Ficus carica* (Rs. 120/Kg), *Morus alba* (Rs. 100/Kg), *Juglans regia* (Rs. 220/Kg), *Berberis lycium* (Rs.

250/Kg), *Diospyros lotus* (Rs. 70/Kg), *Pyrus pashia* (100/Kg) and *Ziziphus mauritiana* (Rs. 80/Kg) are sold in local markets (Pashat bazar, Batwar bazar and Khar bazar) for earning money. These fruits are either directly sold to the consumers or sold to retailers. The remaining fruits were used by local people and not sold in the market due to low demand in market. The cultivation of the wild fruit plants can boost up the socio-economic condition of the poor people, who depend on them. The cultivation of *Olea ferruginea* and *Juglans regia* can be initiated through government involvement as these plants have good markets in the country and having medicinal significance. Similar studies were carried out by Zabihullah *et al*., 2016 who reported *O. ferruginea* from Manzaray Baba Valley, DM Murad *et al*., 2012 reported *O. ferruginea* from DM; Abbasi *et al*., 2013 reported *Z. armatum* from Lesser Himalayas; Marwat *et al*., 2012 reported *Z. armatum* from Pabbar Valley, DShi. These studies strengthen the view of cultivation of these plants on priority bases. Several workers have reported the use of fruit plants from other parts of the country (DIK, Marwat *et al*., 2012; Marwat *et al*., 2011; DS, Khan *et al*., 2015 and DB, Ali *et al*., 2015).

Fuel

In the present study out of 209 species, 32 species (15.3%) were used as fuel. Most of these are wild and some are Sami-cultivated. The study area has no gas system and people are totally depending on fuel wood. In winter the consumption of fuel wood increased therefore local people collect fuel wood in summer and autumn for store. Some woody plants like *Quercus incana* sold on (Rs. 800/50 kg), *Acacia modesta*, *Populus nigra*, *Melia azedarach*, *Diospyros lotus*, *M. nigra*, *M. alba* and *Ficus carica* (Rs. 600/50 kg) and *O. ferruginea* and *J. regia* on (700/50 kg). *Pinus roxburghii* and *P. willichiana* wood were used for fuel, furniture and timber. Its needles and wood are highly inflammable. The remaining woody species are not sold in markets because its demand is very low. *Quercus incana*, *Morus nigra*, *M. alba*, *O. ferruginea* and *J. regia* demand increased day by day. Some fuel plants have been reported from other parts of the country such as Shah *et al*. (2006) reported *Quercus incana*, *Cedrus deodara* and *Taxus wallichiana* from Siran Valley DMn; Ali *et al*. (2011) reported fuel plants from Malam jabba Valley, DS; Badshah *et al*. (2012) reported fuel plants and total annual fuel wood consumption from DT. Other workers reported same fuel species from various parts of country such as Jan *et al*. (2009) from DD Kohistan Valley reported *P. roxburghii* and *P. willichiana.* Ibrar *et al*. (2007) from Ranyal Valley DSh reported *M. alba, M. nigra, F. carica, Q. incana, J. regia and M. azedarach;* Zabihullah *et al.* (2006) from Manzaray Baba Valley DM *A. nilotica, Populus nigra, S. tetrasperma* and *T. aphylla.*

Ornamental

Out of 209 species 25 species (11.9%) were used as ornamental. Two species (8%) *Ocimum basilicum* and *Portulaca grandiflora* are cultivated, and remaining species are wild (92%). Local people used it for ornamental, but it can be become a good source of income. The local people are unaware from the income and important of ornamental plants. Ornamental plants play main role in the beauty of an area they attract tourist to itself, which can become a good source of small business for local people. Shortly now a day tourisms become a good source of economy. Similarly, many ethnobotanical studies on research area have been reported the ornamental plants (Ali *et al*., 2017; Shuaib *et al*., 2014 & Muhammad *et al*., 2021).

Agriculture

Out of 209 species 9 species (4.3%) were used in agriculture sector. Most of land of Bajaur are rain to fed due lack of irrigation system. Mostly agriculture practices are carried out by tractor. Wheat, barley, maize, sorghum and rice were grown in plain area of Bajaur. In some fields, onion, tomatoes, gourds and lady finger are also grown. Peach, apple, pear, orangs, persimmon and jujube. All of the species are cultivated or sami-cultivated. Some of them are cultivated for flour like *Triticum aestivum* and *Zea mays*. For vegetable *Allium sativum*, *Allium cepa* and *Luffa cylindrical*. *Brassica campestris* is the only species, which is cultivated for oil. Most of these species are cultivated for fodder for domestic animal except vegetable species. Unlike, other ethnobotanical investigation also reported agriculture plants from close to research area (Aziz *et al*., 2018; Haq *et al*., 2021 and Murad *et al*., 2014).

Miscellaneous plants

There were some other uses of plants which were used by the local people including oil producer: 3 species (1.4%), furniture, baskets and boxes: 5 species (2.3%), timber: 6 species (2.8%), prevent erosion: 4 species (1.9%), living fences: 4 species (1.9%) and source of nectar (Honeybee): 3 species (1.4%). Some of them were used for more than one purpose. Research area is faced with serious problem in the form of deforestation and overgrazing. Gulo derai (1490 m), Tandatok (1400 m), Bangar (1880 m) and Chachagay (2380 m) are the most affected area by deforestation. Local people have cut woody plants for fuel, therefore above areas are mostly affected. *Quercus incana, Pinus roxburghii* and *P. willichiana* are also most vulnerable plants in research area. Similarly, many ethnobotanical

investigations also reported oil producer, timber, furniture, living fences and honeybee producer plants species from near research area (Aziz *et al.*, 2018; Abidullah *et al.*, 2019; Ali *et al.*, 2017 and Abdullah *et al.*, 2021)

Conclusion

Medicinal plants that used for significant purposes extensively occupy the research area (Tehsil Salarzai near Afghan border, District Bajaur). The local people mostly dependent on plants for food, fuel, fodders, fruits and ailment purpose. The results of this study demonstrated that the local community of research area have abundant knowledge and experiences to apply different plant parts, their collection, preparation, dosages, and their utilization or consumption. This study provides the documentation of ethnobotanical and ethnomedical usage to address local residents' needs. It is a pathway to modern science that would enable the transfer the natural resources from traditions to the scientific evaluation. Therefore, This type of research must be received attention because it deals with those issues that directly impact on our life.

Declarations

List of abbreviations: DS: District Swat, **DSh:** District Shangla, **DM:** District Malakand, **DD:** District Dir, **DB:** District Bunir, **DMr:** District Mardan, **DAt:** District Attock, **DT:** District Tank, **DMn:** District Mansehra, **DK:** District Kotle, **DBt:** District Battagram, **DKa:** District Karak, **DShi:** District Shimla and **DIK**: District D. I. Khan. **H:** Herb, **T:** Tree, **S:** Shrub, **F**: Fern, **Fu:** Fungi, **W:** Wild, **C:** Cultivated, **L:** Leaves, **Co:** Cone, **WP:** Whole plant, **W:** Wood, **Fr:** Fruit: **Fl:** Flower: **St:** Stem, **Rt:** Root, **Se:** Seed, **Sh:** Shoot, **Rh:** Rhizome, **Br:** Branches, **Ba**: Bark and **Lx**: Latex.

Ethics approval and consent to participate: All the participants provided prior informed consent before the interviews.

Consent for publication: Oral permission from each participant.

Availability of data and materials: The data set generated for the current study is available upon request.

Competing interests: The authors declared they have no competing interests.

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Author's contribution: Sajjad ahmad and Ghulam dastagir designed the research structure for collected plants and information from research area then wrote manuscript. Ghulam dastagir analyzed the data and revised the manuscript.

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