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Ethnomedicinal applications of plant taxa by the local communities of Tehsil Adenzai, District Lower Dir, Khyber Pakhtunkhwa, Pakistan

Muhammad Irfan[1,2*], Nabeela[1], Mohammad Kamil[1], Niaz Ali Khan[1], Arshad Ali[1], Zakir Ullah[1], Muhammad Ilyas[2], Imran Ahmad[3], Ashfaq Ali[3], Saif ullah[1,4], Fazli Subhan[5], Usman Khan[6]

[1]Department of Botany, Abdulwalikhan University, Mardan, Pakistan

[2]Department of Botany, University of Swabi- Swabi, Pakistan

[3]Department of Botany, Hazara University, Mansehra, Pakistan

[4]Department of Botany, Government Degree College, Lahor, Swabi, Pakistan

[5]Department of Agriculture, University of Swabi - Swabi, Pakistan

[6]Department of Tourism & Hospitality, University of Swabi - Swabi, Pakistan

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Abstract

Ethnomedicinal applications of plant taxa by the local communities of tehsil Adenzai, district lower Dir, Khyber Pakhtunkhwa, Pakistan was conducted to collect the valuable information from the local inhabitants. A total of 60 ethnomedicinal taxa were distributed in 57 genera and 39 families which were utilized by the local people for various disorders. Amongst them fifty eight taxa were Angiosperms including fifty four Dicotyledonous and four taxa of Monocotyledonous and two taxa were Gymnosperms while thirty taxa were herbs, eight taxa were shrubs and thirteen taxa were trees. Lamiaceae were the largest family having eight taxa, Asteraceae and Rosaceae were the second largest family having three taxa followed by Alliaceae, Apiaceae, Brassicaceae, Chenopodiaceae, Cucurbitaceae, Euphorbiaceae, Moraceae, Pinnaceae, Rutaceae and Solanaceae having two taxa each while the remaining all families viz. Acanthaceae, Amaranthaceae, Apocynaceae, Asclapadaceae. Berberidaceae, Canabiaceae, Convolulaceae, Ebanaceae, Fagaceae, Geraniaceae, Hederaceae, Juglandaceae, Liliaceae, Malvaceae, Meliaceae, Mimosaceae, Myrtaceae, Oleaceae, Oxalidaceae, Papaveraceae, Papilionaceae, Poaceae, Polygonaceae, Punicaceae, Sapindaceae, Violaceae and Rhamnaceae having one taxa each used by the local inhabitants of the studied area. They were mostly used for the remedies against respiratory infections viz. asthma, bronchitis, coughing, diabetes, pneumonia, kidney and urinary problems, circulatory disorders and skin diseases by the methods of decoction and infusion.

* **Corresponding Author:** Muhammad Irfan ✉ Mirfan310@yahoo.com

Introduction

Tehsil Adenzai district Lower Dir Khyber Pakhtunkhwa Pakistan has richest diversity of plants which were used ethnomedicinally by the local inhibitants which was selected for the research work. It is located on south-west of sub division Timergara, district Lower Dir, Khyber Pakhtunkhwa, Pakistan. It has huge diversity of plants and are utilized by the local inhabitants for the ethomedicinal purposes that's why the studied area was selected to be studied. It shares its boundaries on western side with Bajour agency viz. village Qazafi, towards northern side teshsil Samarbagh, towards eastern side connected with tehsil Laalqilla viz. Maidan and towards southern side connected with tehsil Timergara. Topographically most of its area is plane and rarely hilly. Summer season is hot in the months of June-July and in August temperature reaches up to 35°C maximum. December-January and February are the coldest months while the remaining months are moderate (Anon, 1998). Due to variation in altitudinal ranges, topographic factors, precipitation and humidity the vegetation of tehsil adenzai is sub-tropical and temperate in nature. The most common crops grown are Wheat, Maize, Rice, Sugar cane and Oat etc while the common vegetables grown are Beans, Onion, Garlic, Ladyfinger, Pumpkin, Chilly and Bingil *etc* while the common fruits grown are Apple, Peach, Plum and Grapes etc. Ethnomedicine expresses the relationship between plants and their uses for medicinal purpose by the local peoples. Those plants which have any bio-chemical constituents and having some active ingredients in the treatment of various ailments are known as medicinal plants *(*Ali *et al.,* 2017). Pakistan having a diverse flora having about six thousands species reported amongst them six hundreds species shows medicinal importance. It is a fact that chemical and synthetic drugs have caused many side effects as compared to traditional uses of Plants. Unani system was dominant in Pakistan but the ethno- medicine is being practiced in the remote areas of Pakistan. Medicinal plants are mostly used by the local medical experts' viz. Hakims, wound healers, aged women's and local inhabitants in various hilly and remote areas. There are different kinds of hormones used by the local communities for the rapid growth and better yield of medicinal plants (Irfan *et al.,* 2017: Irfan *et al.,* 2018). Disease resistant medicinal plants are also grown by the local inhabitants of the area (Irfan & Imran, 2018). Due to the uses of these medicinal plants by the local communities various pharmaceutical companies are interested to isolate certain active compounds from them in making of various modern medicines (Tareen *et al.,* 2010).

Materials and method

The ethnomedicinal knowledge of tehsil Adenzai, district Lower Dir, Khyber Pakhtunkhwa, Pakistan were investigated during March 2017 to February 2018 having richestdiversity of medicinal plants. Different localities viz. Chakdara, Badwan, Gul Abad, Shawa, Tazagram, Kityarai, Salem Shah, Ouch, Khanpur, Asbanr, Both Qillh, Kumbar, Matoor, New-kaly, Narai manzai, Bombolai, Sergey and Laram top by questionnaire and interviewing from local inhabitants of the area viz. farmers, aged women, religious peoples, medicinal plants dealers and hakims. Mostly older people and herbal practitioners were consulted for obtaining the valuable information as they were found to possess a lot of knowledge about the local uses of plants and their important medicinal and traditional uses. The investigated area was divided into different zones with the help of map. The materials used during field work were note book, map of the area, plant-presser, old newspapers, shapers, knife, and camera. The plant specimens were collected with their local names, part used and used against various remedies, photographs were taken in the field, tagged, pressed, dried and mounted properly on standard herbarium sheets and finally identified with the help of Flora of Pakistan (Nasir & Ali, 1970-1989). Finally the plants specimens were deposited in the herbarium of Abdulwalikhan University Mardan, Khyber Pakhtunkhwa Pakistan (AUP).

Results and discussion

Ethnomedicinal applications of plant taxa by the local communities of tehsil Adenzai, district lower Dir,

Khyber Pakhtunkhwa, Pakistan was conducted to collect the valuable information from the local inhabitants. A total of 60 ethnomedicinal taxa were distributed in 57 genera and 39 families which were utilized by the local people for various disorders (fig.1 & table 1).

Table 1. Ethnomedicinal applications of Plant taxa by the local communities of tehsil Adenzai, District Lower Dir, Khyber Pakhtunkhwa, Pakistan.

S.No	Botanical Name	Local Name	Habit	Family	Part/s used	Ethnomedicinal uses
1	*Acacia modesta*	Palosa	Tree	Mimosaceae	Gum	Tonic & used for joints pain
2	*Ajuga bractiosa*	Booti	Herb	Lamiaceae	Leaves	Abdominal pain, itching, blood purification, kidney stones & sore throat
3	*Allium cepa*	Piaz	Herb	Alliaceae	Bulb	Cholera, tonic, anti-vomiting
4	*Allium sativum*	Ogga	Herb	Alliaceae	Bulb	Lowers cholesterol level & earache
5	*Aloe vera*	Kamal Panra	Herb	Liliaceae	Gum	Skin infections
6	*Amaranthus viridis*	Chalwai	Herb	Amaranthaceae	Whole plant	Scorpion sting & snake bite
7	*Artemisia maritima*	Tharkha	Herb	Asteraceae	Whole plant	Diuretic, asthma, Bronchitis & cough
8	*Berberis lyceum*	Kowary	Shrub	Berberidaceae	Roots	Astringent & used in wound healing
9	*Brassica compestris*	Sharsham	Herb	Brassicaceae	Seeds & leaves	Refrigerant, stimulant
10	*Calotropis procera*	Spalmai	Herb	Asclepiadaceae	Leaves & roots	Skin diseases
11	*Cannabas sativa*	Bhang	Herb	Cannabaceae	Leaves, flower	Narcotic, stimulant & diuretic
12	*Carthamus oxycantha*	Kareeza	Herb	Asteraceae	Seeds	Urine, for stomach
13	*Chenopodium album*	Spairkhari	Herb	Chenopodiaceae	Whole plant	Urinary diseases & snake poison
14	*Chenopodium murale*	Skha booty	Herb	Chenopodiaceae	Leaves	Abdominal pain & warm expulsion
15	*Convolvulus arvensis*	Pirwathai	Herb	Convolvulaceae	Roots & leaves	As a purgative
16	Coriandrum sativum L.	Dania	Herb	Apiaceae	Leaves & seeds	As a purgative
17	*Cynodon dactylon*	Kabal	Herb	Poaceae	Leaves	Dysentery , wounds for animals
18	*Datura stramonium*	Bathora	Herb	Solanaceae	Leaves & seeds	Astringent in bowl, fever & skin diseases
19	*Diospyrus lotus*	Amlook	Tree	Ebenaceae	Fruits	Used as a tonic & nutritious
20	*Dodonea viscosa*	Ghoraski	Shrub	Sapindaceae	Seeds & Leaves	Wound healing & stimulant
21	*Eucalyptus camadulensis*	Lachi	Tree	Myrtaceae	Leaves	Astringent, dysentery & diarrhea
22	*Euphorbia helioscopia*	Mandano	Herb	Euphorbiaceae	Latex	Remove warts & is poisonous
23	*Ficus Carica*	Inzer	Tree	Moraceae	Fruits	Mouth ulcer
24	*Foeniculun vulgare*	Kaginali	Herb	Apiaceae	Leaves	Carminative & stimulant
25	*Geranium wallichianum*	Sra zaly	Herb	Geraniaceae	Roots	Mouth ulceration, dysentery & diarrhea
26	*Hedera nepalenses*	Parvatha	Herb	Hederacea	Leaves	Abdominal pain, diuretic & ulcer
27	*Indigofera articulate*	Ghuraja	Herb	Papilionaceae	Root & Seeds	As a tonic, hair black
28	*Isodon rugosus*	Karachi	Herb	Lamiaceae	Leaves	Blood purifier, antiseptic & insecticide
29	*Juglans regia*	Ghoz	Tree	Juglandaceae	Leaves, Nuts & Bark	Cleaning teeth, tonic & astringent
30	*Justicia adhatoda*	Bikand	Shrub	Acanthaceae	Leaves & flowers	Cough ,wounds & dysentery

31	*Lagenaria siceraria*	Kaddo	Herb	Cucurbitaceae	Fruits	Cooling, headache & as a tonic
32	*Luffa acutangula*	Thoree	Herb	Cucurbitaceae	Fruits	Throat and lungs problems
33	*Malva neglecta*	Panerak	Herb	Malvaceae	Leaves	Dysentery, cough & stomach ulcer
34	*Melia azadarach*	Tora Shandai	Tree	Meliaceae	Leaves & fruit	Astringent, tonic & vomiting
35	*Mentha arvensis*	Pudina	Herb	Lamiaceae	Leaves	Refrigerant, stimulant & aromatic
36	*Mentha longifolia*	Enalay	Herb	Lamiaceae	Leaves	Antiseptic, stimulant & carminative
37	*Micromeria biflora*	Kashmalai	Herb	Lamiaceae	Leaves	Toothache, earache & headache
38	*Morus alba*	Spentot	Tree	Moraceae	Leaves & fruits	Refrigerant & sore throat
39	*Punica granatum*	Anangoray	Tree	Punicaceae	Fruits	Diarrhea & dysentery
40	*Nasturtium officinale*	Tarmera	Herb	Brassicaceae	Leaves	Salad, vegetable, fodder
41	*Nerium odorun*	Ganderai	Shrub	Apocynaceae	Bark	Anticancer ,ulceration & fever,
42	*Olea ferruginea*	Khona	Tree	Oleaceae	Fruit & Leaves	Toothache, throat sour, astringent & antiseptic.
43	*Otostegia limbata*	Pishkand	Herb	Lamiaceae	Leaves	Wound healing
44	*Oxalis Corniculata*	Threvakai	Herb	Oxalidaceae	Whole plant	Stomach trouble, toothache & wounds
45	*Papaver somniferum*	Affem	Herb	Papaveraceae	Seeds	Headache, cough & pain killer
46	*Pinus roxburghii*	Nakhtar	Tree	Pinaceae	Resin	Chest pain, ulcer, skin disorder, snake bite & scorpion sting
47	*Pinus wallichiana*	Sarf	Tree	Pinaceae	Resin	Expulsion of worms & itching
48	*Plectranthus rugosus*	Spairkay	Herb	Lamiaceae	Seeds & Leaves	Sore throat, cough
49	*Prunus armeniaca*	Khobanai	Tree	Rosaceae	Fruits	Laxative , purgative & nutritious
50	*Ricinus communis*	Aranda	Shrub	Euporbiaceae	Seeds	Constipation & healing of wounds
51	*Rosa webbiana*	Zangali gulab	Shrub	Rosaceae	Flowers	Perfumes, fever & asthma
52	*Rubus ulmifolius*	Karvara	Shrub	Rosaceae	Leaves & Fruits	Diarrhea , cough. Fever & diuretic.
53	*Rumex hastatus*	Tarokai	Herb	Polygonaceae	Whole plant	Stop bleeding, astringent, fever & abdominal pain
54	*Salvia moorcroftiana*	Kharghwag	Shrub	Lamiaceae	Leaves	Abdominal pain & urinary infections
55	*Skimmia laureola*	Namer	Herb	Rutaceae	Leaves	Used in small pox
56	*Solanum nigrum*	Karmacho	Herb	Solanaceae	Whole plant	Diarrhea, fever, tonic & cardiac disorders
57	*Viola serpens*	Binaosha	Herb	Violaceae	Flowers & Leaves	Fever ,cough, asthma & cooling agent
58	*Xanthium strumarium*	Geshy	Herb	Asteraceae	Whole plant	Small pox, fever & headache
59	*Zanthoxylum armatum*	Dambara	Herb	Rutaceae	Seeds	Tonic, fever & increase cow milk
60	*Zizyphus sativa*	Markhanai	Tree	Rhamnaceae	Fruits	Blood purifier, wounds & sores.

Amongst them fifty eight taxa (96.66%) were Angiosperms including fifty four Dicotyledonous and four taxa of Monocotyledonous and two taxa (3.33%) were Gymnosperms. Habit wise thirty nine taxa (65.0%) were herbs, eight taxa (13.33%) were shrubs and thirteen taxa (21.67) were trees (fig. 2 & table 1) . Lamiaceae were the largest family having eight taxa (13.33%), Asteraceae and Rosaceae were the second largest family having three taxa (10.0%), followed by Alliaceae, Apiaceae, Brassicaceae, Chenopodiaceae, Cucurbitaceae, Euphorbiaceae, Moraceae, Pinnaceae, Rutaceae and Solanaceae having two taxa (33.33%) each while the remaining all families viz. Acanthaceae, Amaranthaceae, Apocynaceae, Asclapadaceae. Berberidaceae, Canabiaceae, Convolulaceae, Ebanaceae, Fagaceae, Geraniaceae, Hederaceae, Juglandaceae, Liliaceae, Malvaceae, Meliaceae, Mimosaceae, Myrtaceae, Oleaceae, Oxalidaceae, Papaveraceae, Papilionaceae, Poaceae, Polygonaceae, Punicaceae, Sapindaceae, Violaceae and Rhamnaceae having one taxa (45.0%) each used by the local inhabitants of the studied area.

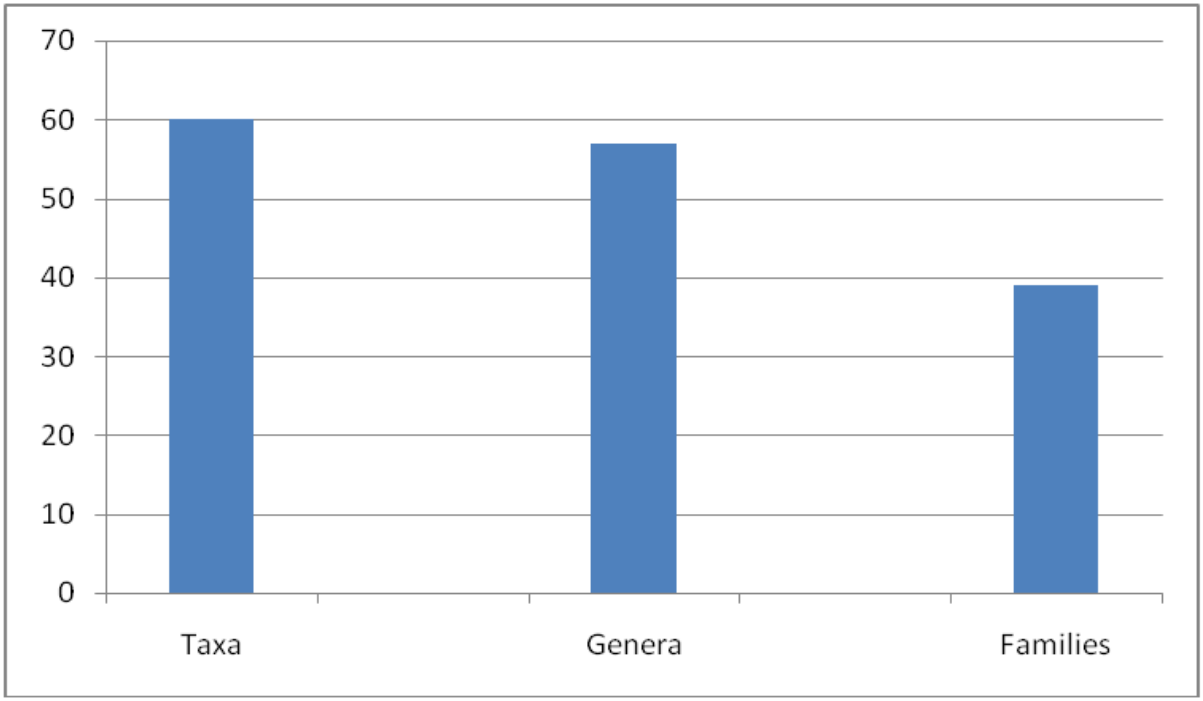

Fig. 1. Representation of ethnomedicinal applications of plants taxa, genera and families in tehsil Adenzai, District Lower Dir, Khyber Pakhtunkhwa, Pakistan.

Some plants were used singly, while many others were used in combination with other plants. Similarly some medicinal plants were specified only for one disease where as several others plants taxa having multiple therapeutic uses. Amongst them twenty taxa (33.33%) were cultivated while the remaining 40 taxa (66.66%) were grown in wild. Leaves, roots, seeds, whole plant and fruits of various taxa were mainly used for extraction and treatment of disease.

A total of one hundred and fifty local inhabitants were interviewed in which one hundred and twenty five (83.33%) were men's and twenty five (16.67%) were women's.

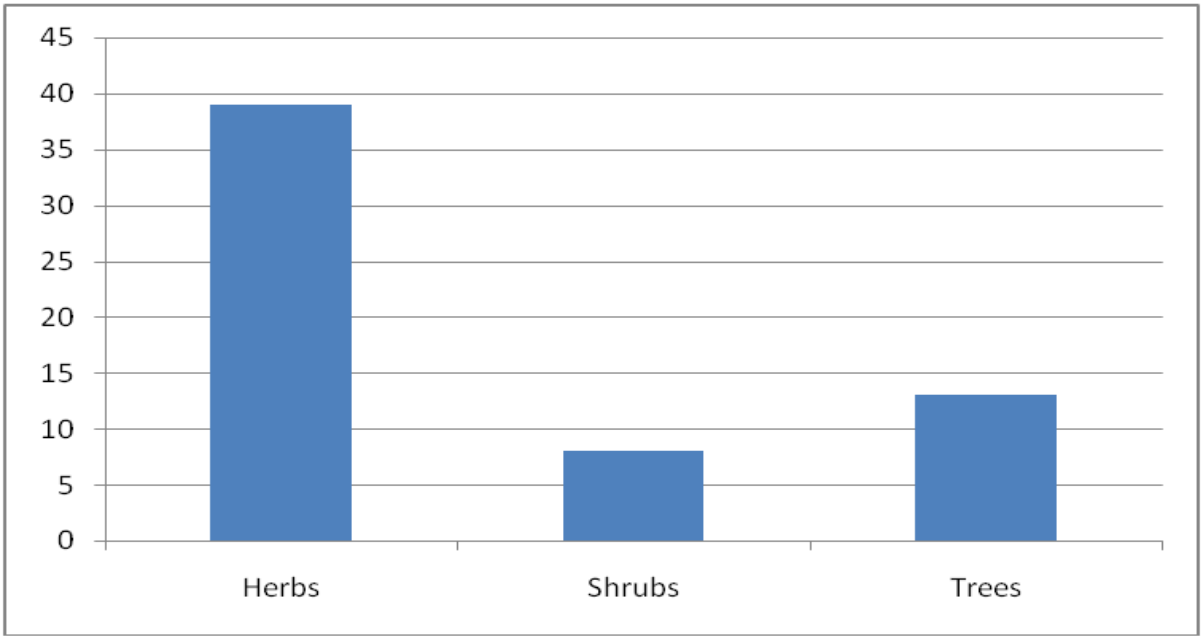

Fig. 2. Representation of ethnomedicinal applications of herbs, shrubs and trees in tehsil Adenzai, District Lower Dir, Khyber Pakhtunkhwa, Pakistan.

Mostly the aged peoples have more information's about the traditional uses of plants. They were engaged with the profession of Hakeems, wound healers, farmers, teachers and house wife old women's. The species were available freely in nature and used by local inhabitants from many years. *Berberis lycium, Mentha arvensis* and *Punica granatum* were used for stomach problems, *Oxalis carniculata* and *Allium sativa* for cardiac disorders, *Helianthus annus, Brassica campestris* and *Olea ferruginea* seeds oil were used as analgesic while the remaining species were used for various remedies viz. Diarrhea, Abdominal Pain, Blood Purifier, Dysentery, Diuretic, Antispasmodic, as a stimulant, ring worm etc.

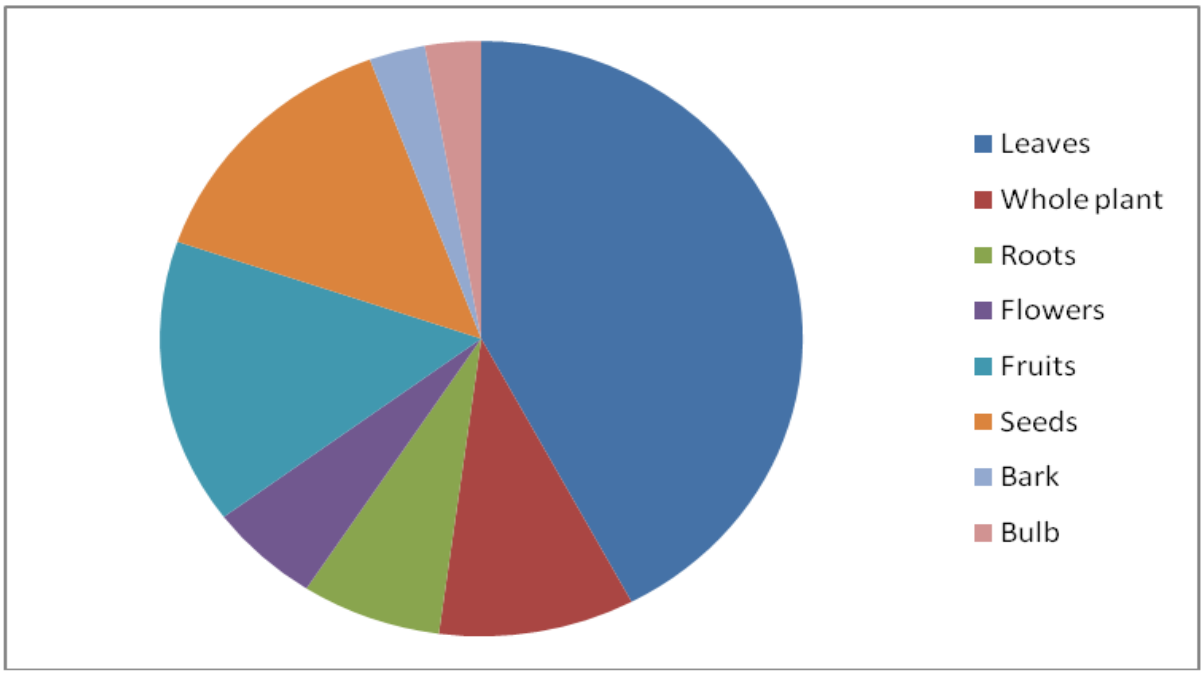

Fig. 3. Representation of ethnomedicinal applications of part/s used in tehsil Munda, District Lower Dir, Khyber Pakhtunkhwa, Pakistan.

The same kinds of results agrees with the earlier work viz. common medicinal plants from Chapursan valley, Gojal, Gilgit Baltistan, Pakistan (Wazir *et al.,* 2004), ethnobotanical profile of plants from Shawer Valley, District; Swat, Khyber Pakhtunkhwa, Pakistan (Hussain *et al.,* 2006), medicinal value of Ranunculaceae from Dir valley, Khyber Pakhtunkhwa, Pakistan (Hazrat *et al.,* 2007), ethnobotanical study of common weeds from Dir Kohistan valley, Khyber Pakhtunkhwa, Pakistan (Jan *et al.,* 2010), ethnobotanical study from Kahuta, District Rawalpidni, Punjab, Pakistan (Qureshi & Khan, 2001), diversity of medicinal plants from Wari, district Upper Dir, Khyber Pakhtunkhwa, Pakistan (Manan *et al.,* 2007), ethnobotanical study from tehsil Kabal, Swat District, Khyber Pakhtunkhwa, Pakistan (Ahmad *et al.,* 2011), ethnobotanical survey of plants from Neelum valley, Azad Jammu & Kashmir, Pakistan (Mahmood *et al.,* 2011), Indigenous knowledge and folk use of medicinal plants by the tribal communities of Hazar Nao Forest, Malakand District, Khyber Pakhtunkhwa, Pakistan (Murad *et al.,* 2011), the ethnobotany of Chitral Valley, Khyber Pakhtunkhwa, Pakistan (Ali & Qaiser, 2009), traditional medicinal plant knowledge of some spermatophytes of Samar Bagh Valley, Lower Dir district, Khyber Pakhtunkhwa, Pakistan (Irfan *et al.,* 2017), checklist of some medicinal plants of district Lower Dir, Khyber Pakhtunkhwa, Pakistan (Ahmad *et al.,* 2016), an updated checklist of Pteridophytes of district Mansehra, Khyber Pukhtunkhwa, Pakistan (Gul *et al.,* 2016), Indigenous medicinal plants used by local women in southern Himalayan regions of Pakistan (Qureshi *et al.,* 2009),

check list of medicinal Plants from Siran Valley, district Mansehra, Khyber Pakhtunkhwa, Pakistan (Shah & Khan, 2006), economically and ecologically important plant communities in high altitude coniferous forest of Malam Jabba, district Swat, Khyber Pakhtunkhwa, Pakistan (Sher & Alyemeni, 2011), ethnobotanical study of some elite plants belonging to Dir Kohistan valley, district Dir upper, Khyber Pukhtunkhwa, Pakistan (Hazrat *et al.,* 2011), ethnobotanical studies of plants of Charkotli Hills, Batkhela District, Malakand, Khyber Pakhtunkhwa, Pakistan (Barakat *et al.,* 2009), traditionnal resource evaluation of some plants of Mastuj, District Chitral, Khyber Pakhtunkhwa, Pakistan (Husain *et al.,* 2007), ethnobotanical survey of the flora of Maidan Valley, Lower Dir District, Khyber Pakhtunkhwa, Pakistan (Irfan *et al.,* 2018), first Floristic Checklist of Dilbori, District Mansehra, Khyber Pakhtunkhwa, Pakistan (Ahmed *et al.,* 2017), Preliminary Checklist of Upper Tanawal, District Mansehra, Khyber Pakhtunkhwa, Pakistan (Farooq *et al.,* 2017), Floristic List and Indigenous Uses of Poaceae Family in District Tor Ghar, Khyber Pakhtunkhwa, Pakistan (Mehmood *et al.,* 2017), ethnomedicinal Uses of Plants from tehsil Laalqilla District Lower Dir, Khyber Pakhtunkhwa, Pakistan (Irfan *et al.,* 2018), ethnomedicinal Plants used for gastrointestinal ailments by the rural communities of Kaghan Valley, district Mansehra, Khyber Pakhtunkhwa, Pakistan (Jamal *et al.,* 2017), ethnobotanical Survey of the Flora of tehsil Balakot, district Mansehra, Khyber Pakhtunkhwa, Pakistan (Irfan *et al.,* 2018) and study of pinnate diatoms from tehsil Landilotal, district Khyber, Khyber Pakhtunkhwa Pakistan (Irfan *et al.,* 2018).

Conclusion

The current study concluded that inhabitants of tehsil adenzai, district Lower Dir, Khyber Pakhtunkhwa, Pakistan were involved at large scale in the uses of these valuable medicinal plants. Normally the taxa were used in different disorders viz. respiratory infections, urinary problems, sterility, skin disorders, tonic, hepatitis, diabetes, fever and for the care of hair. Keeping in mind the sustainability of these species can be consumed for the drugs discovery at commercial level. Cultivation of these species at large scale for different purposes viz. food, medicine, shelter and ornamental purpose is greatly required.

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Author's contribution

MI, N & MK conducted the experiment and NAK, AA & ZU carried out the statistical analysis MI, IA & AA designed the experiment and SU, FS & UK structured and wrote the manuscript.

Conflict of interest

There is no conflict of interest amongst the authors.

References

Ahmad I, Ibrar M, Barkatullah Ali N. 2011. Ethnobotanical study of tehsil Kabal, Swat District, KPK, Pakistan. Hindawi Publishing Corporation. Journal of Botany 1-9.

Ahmad I, Irfan M, Ali I, Khan J, Saeed SH, Gulfaraz A. 2016. Checklist of some medicinal plants of district Lower Dir, Pakistan, IASET: Journal of Agricultural & Bio-Chemical Science (IASET: JABS) ISSN(P): Applied; ISSN(E): Applied **1(1),** 15-22.

Ahmed J, Rahman I, Shah AH, Ijaz F, Khan Z, Ali N, Muhammad S, Ahmed Z, Afzal M. 2017. First Floristic Checklist of Dilbori (OGHI), District Mansehra, KP, Pakistan. Journal of Applied environmental & biological Sciences **7(3),** 41-48.

Ali A, Rashid M, Sultan A, Irfan M. 2017. Anisochilus carnosus (L. f.) Wall. ex Benth. (Lamiaceae) a new generic record for Pakistan. Plant Science Today **4(3),** 102-105. http://dx.doi.org/10.14719/pst.2017.4.3.316.

Ali H, Qaisar M. 2009. The Ethnobotany of Chitral Valley, Pakistan with Particular Reference to Medicinal Plants. Pakistan Journal of Botany **41(4),** 2009-2041.

Ali SI, Qaiser M, Nasir E. 1970-2004. Flora of Pakistan, Department of Botany, University of Karachi, Pakistan 1-210.

Annonymous. 1998. District Census report of District Mansehra, Beureu of Statistics government of Pakistan, Islamabad, Pakistan.

Barkatullah Ibrar M, Hussain F. 2009. Ethnobotanical studies of plants of Charkotli Hills, Batkhela District, Malakand, Pakistan. Frontiers of Biology in China **4(4),** 539-548.

Farooq M, Hussain M, Saqib Z, Shah AH, Khan KR, Shah M, Rahman I. 2017. Preliminary Checklist of Upper Tanawal, District Mansehra, KP, Pakistan. Journal of Applied Environmental& Biological Sciences. **7(6),** 158-168.

Gul A, Alam J, Ahmad H, Irfan M. 2016. An updated checklist of Pteridophytes of district Mansehra, Khyber Pukhtunkhwa-Pakistan. Plant Science Today **3(2),** 237-247. http://dx.doi.org/10.14719/pst.2016.3.2.220.

Hazrat A, Shah J, Ali M, Iqbal I. 2007. Medicinal value of Ranunculaceae of Dir valley. Pakistan Journal of Botany **39(4),** 1037-1044.

Hazrat A, Nisar M, Shah J, Ahmad S. 2011. Ethnobotanical study of some elite plants belonging to Dir Kohistan valley, Khyber Pukhtunkhwa Pakistan. Pakistan Journal of Botany **43(2),** 787-795.

Hussain F, Islam M, Zaman A. 2006. Ethnobotanical profile of plants of Shawer Valley, District; Swat, Pakistan. International Journal of Biotechnology **3,** 301-307.

Hussain F, Shah M, Sher H. 2007. Traditionnal resource evaluation of some plants of Mastuj, District Chitral, Pakistan, Pakistan Journal of Botany **39(2),** 339-354.

Irfan M, Ahmad I, Saeed SH. 2017. Traditional medicinal plant knowledge of some spermatophytes of Samar Bagh Valley, Lower Dir district, Pakistan. Plant Science Today 2017; **4(4),** 151-153. http://dx.doi.org/10.14719/pst.2017.4.4.334

Irfan M, Ali I, Kashf RA. 2018. Ethnobotanical survey of the flora of Maidan Valley, Lower Dir District, Khyber Pakhtunkhwa Province, Pakistan. Plant Science Today **5(2),** 68- 71. https://dx.doi.org/10.14719/pst.2018.5.2.379

Irfan M, Imran A. 2018. The effect of heat stress on Morpho physiological traits of Triticum aestivum L. genotypes. Science Arena Publications Specialty Journal of Agricultural Sciences, ISSN: 2412-737X, **4 (1),** 13-23.

Irfan M, Kan H, Faiz M, Khan R, Ahmad H, Sheikh NY, Khan S, Nabeela, Kamil M, Ilyas M, Ullah S, Ishaq M. 2018. Taxonomic studies of pennate diatoms from Tehsil Landikotal, District Khyber, Khyber Pakhtunkhwa, Pakistan. International Journal of Biosciences **13(4),** 128-138, 2018. http://dx.doi.org/10.12692/ijb/13.4.128-138.

Irfan M, Alam J, Jan G, Gul H. 2018. Influence of brassinosteroid (BRs) in roots and foliar spray against salinity on physiological parameters and micro nutrients upon tomato (Lycopersicon esculentum (Mill.) Science Arena Publications Specialty Journal of Biological Sciences ISSN: 2412-7396, **4(2),** 18-27.

Irfan M, Alam J, Ahmad I, Ali I, Gul H. 2017. Effects of exogenous and foliar applications of Brassinosteroid (BRs) and salt stress on the growth, yield and physiological parameters of Lycopersicon esculentum (Mill.). Plant Science Today **4(3),** 88-101. http://dx.doi.org/10.14719/pst.2017.4.3.218.

Irfan M, Khan I, Ali A, Khan R, Ali A, Jan G. 2018. Ethnomedicinal Uses of the Plants of Tehsil Laalqilla, District Lower Dir, Khyber Pakhtunkhwa, Pakistan. Journal of Applied Environmental and Biological Sciences **8(6),** 61-66.

Irfan M, Ali D, Jan G, Murad W. 2018 Ethnobotanical Survey of the Flora of Tehsil Balakot, District Mansehra, Khyber Pakhtunkhwa, Pakistan: Science Arena Publications Specialty Journal of Biological Sciences ISSN: 2412-7396 Available online at www.sciarena.com 2018, **4(3),** 7-14.

Irfan M, Nabeela I, Khan M, Kamil S, Ullah S, Khan, Shah M, Ali A, Rehman SU, Khan R, Ali D, Kausar R, Jan G, Murad W. 2018, Ethnobotanical Survey of the Flora of Tehsil Balakot, District Mansehra, Khyber Pakhtunkhwa, Pakistan; Journal of Applied Environmental and Biological Sciences **8(8),** 1-13.

Jamal Z, Pervez A, Hussain M, Shah GM, Shah SH, Ahmed M. 2017. Ethnomedicinal Plants used for Gastrointestinal Ailments by the Rural Communities of Kaghan Valley, Mansehra, Pakistan. Journal of Applied Environmental and Biological Sciences **7(12),** 41-48.

Jan G, Khan MA, Gul F, Ahmad M, Jan M, Zafar M. 2010. Ethnobotanical study of common weeds of Dir Kohistan valley, Khyber Pakhtunkhwa, Pakistan. Pakistan Journal of Weed Science **16(1),** 81-88.

Mahmood A, Malik RN, Shinwari ZK, Mahmood A. 2011. Ethnobotanical survey of plants from Neelum, Azad Jammu & Kashmir, Pakistan. Pakistan Journal of Botany **43,** 105-110.

Manan Z, Sirajuddin A, Razzaq M, Islam Ikramullah. 2007. Diversity of medicinal plants in Wari subdivision district Upper Dir, Pakistan. Pakistan Journal of Plant Sciences **13(1),** 21-28.

Mehmood A, Shah AH, Shah AH, Khan SM, Ur Rahman I, Ahmad H. 2017. Floristic List and Indigenous Uses of Poaceae Family in District Tor Ghar, Khyber Pakhtunkhwa, Pakistan. Journal of Applied Environmental and Biological Sciences., **7(6),** 169-177.

Murad W, Ahmad A, Abdullah Gilani S, Khan MA. 2011. Indigenous knowledge and folk use of medicinal plants by the tribal communities of Hazar Nao Forest, Malakand District, North Pakistan. Journal of Medicinal Plants Research. **5(7),** 1072-1086.

Nasir E, Ali SI. 1970-1989. Flora of Pakistan, Nos. 1-193 Department of Botany, Karachi, University, Karachi. Pakistan Agricultural Research Council, Islamabad.

Qureshi RA, Ghufran MA, Gilani SA, Yousaf Z, Abbas G, Batool A. 2009. Indigenous medicinal plants used by local women in southern Himalayan regions of Pakistan. Pakistan Journal of Botany **41,** 19–25.

Qureshi SJ, Khan MA. 2001. Ethnobotanical study of Kahuta from Rawalpidni district, Pakistan. Online Journal of Biological Sciences **(1),** 27-30.

Shah GM, Khan MA. 2006, Check List of Medicinal Plants of Siran Valley Mansehra-Pakistan. Ethnobotanical Leaflets **(10),** 63-71.

Sher H, Al_yemeni M. 2011. Economically and ecologically important plant communities in high altitude coniferous forest of Malam Jabba, Swat, Pakistan. Saudi Journal. of Biological. Science **18,** 53–61.

Tareen RB, Bibi T, Khan MA, Ahmad M, Zafar M. 2010. Indigenous knowledge of folk medicine by the women of Kalat and Khuzdar regions of Baluchistan, Pakistan. Pakistan Journal of Botany., **42(3),** 1465-1485.

Wazir SM, Dasti AA, Shah J. 2004. Common medicinal plants of Chapursan valley, Gojal II, Gilgit-Pakistan. Journal of Research (Science) Bahauddin Zakariya University, Multan, Pakistan **15,** 41-43.