



Ethnomedicinal plants uses of tehsil Khall, district Lower Dir, Khyber Pakhtunkhwa, Pakistan

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Abstract

An ethnomedicinal study of 65 plants taxa having 56 genera and 36 families were carried out from different localities of tehsil Khall, district Lower Dir, Khyber Pakhtunkhwa, Pakistan. There is a huge diversity and floristic composition of ethnomedicinal plants taxa in the studied area. Amongst them 48 taxa were herbs 7 taxa were shrubs and 10 taxa were trees. Asteraceae and Lamiaceae were the largest families having 7 taxa each while brassicaceae was the second largest family having 5 taxa followed by rosaceae having 4 taxa and ranunculaceae and solonaceae having 3 taxa each and berberidaceae, chenopodiaceae, scrophulariaceae, polygonaceae, verbinaceae and violaceae having 2 taxa each while the remaining all families having 1 taxa each. Residents of hilly areas frequently used these taxa. Knowledge wise older people have more awareness regarding these taxa. Mostly the plant taxa were commonly practiced against different diseases like hepatitis, diabetes, infertility, skin problems, hair care and general tonics. Keeping in view their sustainability, these taxa may be utilized for new drugs and commercial purpose. Cultivation of these taxa for food, medicine and ornamental purpose is highly needed.

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Introduction

Tehsil Khall is located in district Lower Dir, Malakand division of Khyber Pakhtunkhwa province, Pakistan. Its geographical coordinates are 34° - 37 / to 35° - 7 / N Latitudes and 71° -31/ to 72° - 14/ E longitudes. Tehsil Khall of district lower Dir is located in the north-west of Khyber pakhtunkhwa and bounded by huge chain of Koh-e-Hindu kush. The climate of district lower Dir is cold and moist. The high peaks of mountains receive snowfall usually in the months of December, January and February. The summer is the favorable season for the tourists. The average rainfall is 700 mm. The important sources of production and economy are forest and Agriculture. A huge population depends upon Crops grown are *Triticum aestivum*, *Zea mays*, *Hordeum vulgare*, *Avena sativa*, *Solanum melongena*, *Solanum tuberosum*, *Lycopersicon esculentum*, *Alium cepa* and *Alium sativa* etc. Fruits produced are *juglens regia*, *Diosporus kaki*, *Malus pumila*, *Vitis vinifera* etc (Anon, 1998). The forests of the area are covered with gymnosperms species. There is greater fluctuation of seasonal temperature the summer is extremely hot and winter extremely cold. Now Government of Pakistan and Forest department has banned over grazing and deforestation to recover the natural resources which are *Cedrus*, *pinus*, herbs and grasses which have great medicinal value (Irfan *et al.*, 2018). The plants which contains active bio chemicals constituent and having some response in the curing of disorders in living organisms are known as medicinal plants (Ali *et al.*, 2017). Since the creations of mankind the use of medicinal and other plants have run parallel, from ancient times plants have been in use to heal wounds and to cure various diseases. Establishment of herbal gardens by ancient man was the initial step towards the cultivation of medicinal plants commonly used by the tribal communities and herbalists to cure different disease. It is fact that synthetic and chemical drugs have caused much harm to the human body. Therefore man is now forced to consult natural methods of treatment (Ajaib *et al.*, 2010). Medicines which are extracted from plants are best for healthier life. Plants plays an important role in our life because they have more biochemical's

that are best against different diseases (Haq *et al.*, 2012). Medicinal plants have been observed to be very effective in the treatment of ailments that defile orthodox medicine. Despite this only few people know the location and uses of most of the plants around them due to inadequate knowledge of their usefulness (Islam *et al.*, 2006).

People have been using these plants to cure disease and ease patients from long time suffering. They acquired this knowledge as a result of trial and error but not documented properly to avoid endorsement and competition in the field. This knowledge is still alive and several hundred species are being used by a large number of herbal doctors as a remedy to practice and promote their indigenous system of medicine. The mountain ranges of Pakistan are known for their rich biodiversity of flora and fauna. Those regions have been regarded as a natural reservoir for the collection of different wild medicinal plants. Some of which has pharmacopical importance while the local use many others in traditional systems as well as in folk medicines.

This region is prime center for evolutionary development of a number of endemic medicinal and economic plants viz. *Artemisia*, *viburnum*, *Rhododendron*, *Saxifraga*, *Lonicera*, *Sophora*, *Picrorhiza*, *Aconites*, Seabuck thorn (Khan *et al.*, 2010). 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

Field trips were made to the different villages of tehsil Khaal viz luqman banda, adokey, galkor, kandow, shalkani, shalfalam, barkali, koz kali, kandaro, malak abad, gomagat, sair, razagram and ajdari were visited

at different seasons of the year from June 2016 to May 2017. Plants specimens were collected properly, dried in blotting papers, tagged, pressed in a presser and mounted on standard herbarium sheets. Plants were identified with the help of flora of Pakistan Nasir and Ali, 1970-89). A questionnaire was prepared for ethno medicinal survey including different information's viz. local names, part/s used against different remedies. Multistage sampling technique was adopted for collection of data. For the purpose of collection of primary data questionnaire was used.

The responses received in the field during structured questionnaire and interviews of the respondents were coded and analyzed.

Results and discussion

Results of the study reveals that a total of 65 ethnomedicinal plant taxa having 56 genera and distributed in 36 families were reported from different localities of tehsil Khall, district Lower Dir, Khyber Pakhtunkhwa, Pakistan (fig.1 & table 1).

Table 1. Ethnomedicinal Uses of the Plants in Tehsil Khall, District Lower Dir, Khyber Pakhtunkhwa, Pakistan.

| Sr.N | Botanical name | Local name | Habit | Family | Part/s used | Ethnomedicinal uses |
|------|--|--------------|-------|----------------|-----------------|--|
| 0 | | | | | | |
| 1 | <i>Achillea millifolium</i> | Ashaan | Herb | Asteraceae | Young leaves | Young leaves used in loose motion, hardenings of bowels & constipation. |
| 2 | <i>Aconite hetrophyllum</i> | Atis | Herb | Rannunculaceae | Roots | Alkaloid viz. aconitine used as stimulant, relive cardiac disorders and rheumatism. |
| 3 | <i>Adhatoda vasica</i> Gees. | Beakar | Shrub | Acanthaceae | Leaves | Leaves used in chest infections viz. cough, bronchitis, emphysema, antiallergic & prevents loose motion. |
| 4 | <i>Adiantum capillus veneris</i> D. Don. | Bishusha | Herb | Pteridaceae | Leaves | Leaves used in relieving pain from facial areas, asthma and diarrhea & is highly aromatic. |
| 5 | <i>Allium sativum</i> L. | Ooga | Herb | Alliaceae | Bulb | Its bulb is antimicrobial, relieves pain and removes mucous from the trachea. |
| 6 | <i>Artemisia cinna</i> | Kirmala | Herb | Asteraceae | Leaves | Leaves used as anthelmintics for children's. |
| 7 | <i>Artemisia kuramensis</i> | Kirmala | Herb | Asteraceae | Leaves | Leaves used as anthelmintics to remove worms from intestinal tract. |
| 8 | <i>Artemisia rutifolia</i> Spreng. | Afsanteen | Herb | Asteraceae | Flowers | Flowers used to remove worms from intestinal tract. |
| 9 | <i>Berberis calliobotrys</i> Aitch. | Chowenj | Shrub | Berberidaceae | Rhizome | Rhizome used to regulate fever, relieve pain of vertebral column. |
| 10 | <i>Berberis nerosa</i> | Kashml | Shrub | Berberidaceae | Rhizome, leaves | Rhizome is tonic, leaves used in jaundice, chronic diarrhea, ulcer and ophthalmic disorders. |
| 11 | <i>Boerhaavia diffusa</i> L. | Insut | Herb | Nyctaginaceae | Roots | Roots increase the passage of urine from urinary bladder. |
| 12 | <i>Cannabis sativa</i> L. | Bhang | Herb | Canabanaceae | Leaves | Leaves used as narcotic which is stimulant for addict persons. |
| 13 | <i>Cedrus deodara</i> (Roxb. ex D.Don) G.Don | Diyar | Tree | Pinnaceae | Oil | Oils are harmless mosquito repellents and applied on the exposed body parts of children's. |
| 14 | <i>Chenopodium foliosum</i> Asch. | Chalware | Herb | Chenopodiaceae | Fruit | Fruits used to cure eye disorders. |
| 15 | <i>Chenopodium murale</i> L. | Chalwai | Herb | Chenopodiaceae | Leaves | Leaves used in stomach pains, increase the passage of urine. |
| 16 | <i>Chrysanthemum cinerariiefolium</i> Trev. | Guledaawoode | Herb | Asteraceae | Leaves | Leaves are boiled in water and used as a cooling agent. |
| 17 | <i>Citrus aurentum</i> | Malta | Tree | Rutaceae | Fruit | Rich in vitamin C, prevents bleeding of gums, |

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| | | | | | | | strengthen teeth and healing of wounds. |
| 18 | <i>Clematis orientalis</i> | L. Ashand | Herb | Rannunculaceae | Flowers, fruits | | Flowers and fruits are used to prevent loose motion and relieve the passage of blood in bowels. |
| 19 | <i>Convolvulus arvensis</i> | L. Pirwathia | Herb | Convolvulaceae | Leaves, roots | | Leaves used in asthma and carminative in action. |
| 20 | <i>Daphne oleoides</i> | Schreb. Anaghonai | Herb | Thymeliaceae | Roots, fruits | | The fruits and roots used to prevent loose motion, diarrhea and nausea. |
| 21 | <i>Delphinium nordhagenii</i> | Cheyychag Wendelbo. | Herb | Rannunculaceae | Roots, flowers | | Flowers and roots used for healthy growth of hairs. |
| 22 | <i>Digitalis purpurea</i> | Berg-e life | Herb | Scrophulariaceae | Leaves | | Leaves used as stimulant, tonic and diuretic. |
| 23 | <i>Ephedra gerrardiana</i> | Parwate | Herb | Ephedraceae | Stem, tubers | | Used in chest infections viz. asthma, bronchitis, emphysema, anti-allergenic & relieves hay fever. |
| 24 | <i>Eruca sativa</i> | Miller. Jamama | Herb | Brassicaceae | Seeds | | Seeds are stimulant and prevent inflammation of eyes. |
| 25 | <i>Eucalyptus globules</i> | Laache | Tree | Myrtaceae | Leaves | | Oil obtained from leaves is used in chest infections, dry cough and is antiseptic. |
| 26 | <i>Euphorbia prostrata</i> | Ait. Lewane botey | Herb | Euphorbiaceae | Latex | | Latex used in skin infections viz. ring worm. |
| 27 | <i>Ferula asefoetida</i> | Hing | Herb | Scrophulariaceae | Gums | | Stimulant, antispasmodic, carminative. Used in asthma as laxative and to treat hysteria. |
| 28 | <i>Hyoscyamus niger</i> | L. Treeh bootey | Herb | Solanaceae | Leaves | | Leaves have alkaloids used as anodyne to relieve pain. |
| 29 | <i>Iberis amara</i> | Halim | Herb | Brassicaceae | Seeds, leaves | | Used in asthma, emphysema and bronchitis. |
| 30 | <i>Lepidium sativum</i> | L. Karhon | Herb | Brassicaceae | Leaves | | Leaves used to prevent abdominal pain and make the stools soft in children's to relieve pain. |
| 31 | <i>Malva neglecta</i> | Wall. Panerak | Herb | Malvaceae | Seeds | | Seeds used in respiratory infections viz. asthma, dry cough. |
| 32 | <i>Marrubium vulgare</i> | L. IstoreZokho | Herb | Lamiaceae | Leaves | | Leaves used to prevent asthma and bronchial disorders. |
| 33 | <i>Melia azedarach</i> | L. Shandai | Tree | Meliaceae | Leaves, Seeds | | Leaves used in diabetes and seeds used in chest infections. |
| 34 | <i>Mentha piperata</i> | Poodina | Herb | Lamiaceae | Leaves | | Contains volatile oils used as carminative. |
| 35 | <i>Mentha royleana</i> | Benth. Bain | Herb | Lamiaceae | Leaves | | Leaves having volatile oils used as carminative and flavoring agent. |
| 36 | <i>Mentha viridis</i> | L. Podina | Herb | Lamiaceae | Leaves | | Leaves boiled in green tea mixed with lemon grass used for nausea. |
| 37 | <i>Micromeria perviviflora</i> | Naray bootay | Herb | Lamiaceae | Leaves | | Leaves used for relieving pain from facial organs. |
| 38 | <i>Morus alba</i> | L. Spen toot | Tree | Moraceae | Bark | | Bark used for the removing worms and other intestinal parasites from the intestine. |
| 39 | <i>Nasturtium officinale</i> | R. Br. Tarmira | Herb | Brassicaceae | Leaves | | Leaves used as tonic, anthelmintic, removes mucous from respiratory tract. |
| 40 | <i>Oxalis corniculata</i> | L. Threwakay | Herb | Oxalidaceae | Leaves | | The juice of fresh leaves used in digestive troubles and diarrhea. |
| 41 | <i>Papaver somniferum</i> | L. Doda | Herb | Papavaraceae | Seeds | | Before the discovery of chloroform it was used as anesthetic as a surgery. But now days they are used to relieve severe pain. |
| 42 | <i>Pinus roxberghii</i> | Roxb. Nakhtar | Tree | Pinaceae | Resins | | Resins increase the efficiency of digestive system. |
| 43 | <i>Plantago major</i> | L. Aspaghol | Herb | Plantaginaceae | Seeds | | Seeds used to remove pain in the removal of bowl |

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| | | | | | | from the large intestine. |
| 44 | <i>Platanus orientalis</i> L. | Chinar | Tree | Platanaceae | Bark | Bark used in joint ache and prevents loose motion. |
| 45 | <i>Punica granatum</i> L. | Anaar | Tree | Punicaceae | Fruit, seeds | Pulp used in constipation and dry seeds used in condiments. |
| 46 | <i>Quercus incana</i> Roxb. | Sarray | Tree | Fagaceae | Bark | Bark used as antiallergic and in urinary infections. |
| 47 | <i>Rosa indica</i> | Gulab | Shrub | Rosaceae | Flowers | Used to make guleqand for digestive troubles. Extract of petals mixed with honey used to treat ophthalmic diseases. |
| 48 | <i>Rosa webbiana</i> L. | Throni | Shrub | Rosaceae | Flowers | Used to make gul-e- qand and extract of petals mixed with honey for the treatment of eye diseases. |
| 49 | <i>Rubus anatolicus</i> L. | Karwara | Shrub | Rosaceae | Fruits | Fruits are tonic, stimulant, carminative and used in diarrhea. |
| 50 | <i>Rumex dentatus</i> D.Don | Thoraki | Herb | Polygonaceae | Leaves | Leaves are purgative. |
| 51 | <i>Rumex hastatus</i> D. Don. | Tarukai | Herb | Polygonaceae | Leaves | Leaves are used to regulate systolic and diastolic blood pressure. |
| 52 | <i>Salvia moorcroftiana</i> Wall. | Kwarghug | Shrub | Lamiaceae | Seeds | Seeds are used to prevent dysentery. |
| 53 | <i>Silene conoidea</i> L. | Mangooti | Herb | Caryophyllaceae | Seeds | A paste is prepared by grinding of seeds and is applied on skin diseases due to fungal attack. |
| 54 | <i>Sisymbrium irio</i> L. | Seesana | Herb | Brassicaceae | Seeds | Seeds are used in the skin infections. |
| 55 | <i>Solanum nigrum</i> L. | Kachmacho | Herb | Solanaceae | Leaves, fruits | Herb is sedative, appetizer, purgative, diuretic and expectorant. Berries are tonic and also effective in hepatitis. |
| 56 | <i>Solanum suuattense</i> | Marghona | Herb | Solanaceae | Roots, seeds | Roots are used to remove mucous from respiratory tract and also used in cough, asthma and chest pain. |
| 57 | <i>Sonchus aspera</i> (L.) Hill | Shoda pai | Herb | Asteraceae | Roots, leaves | Roots are used in the treatment of malaria. |
| 58 | <i>Spirea canescense</i> D.Don. | Gul botey | Herb | Rosaceae | Young leaves | It is found on high mountains and honey bees prepares honey from their nectars which is the most expensive honey used for the curing of eye infections and digestive troubles. |
| 59 | <i>Taraxum officinale</i> | Brangansif | Herb | Asteraceae | Roots, leaves | Roots and leaf decoction is used in the disorders of bowels, kidneys and livers. |
| 60 | <i>Teucrium stocksianum</i> Boss (Airtch & Hemsl.) | Spara Botay | Herb | Lamiaceae | Leaves | Decoction used in diabetes. |
| 61 | <i>Verbena officinais</i> L. | Shamakay | Herb | Verbanaceae | Roots | Roots used against harmful microbes and pathogens. |
| 62 | <i>Viola indica</i> Bkr. | Banafsha | Herb | Violaceae | Leaves, flowers | Extract of leaves are used in wounds and joints disorders. |
| 63 | <i>Viola rupestris</i> Sehm. | Banafsha | Herb | Violaceae | Leaves | Leaves powder used in fever, headache and constipation. |
| 64 | <i>Vitex negundo</i> L. | Marwan | Herb | Verbanaceae | Leaves | Leaves are used to remove worms and other intestinal parasites and removes mucous from respiratory tract. |
| 65 | <i>Ziziphus jujuba</i> Lam. Mill. | Non Beera | Tree | Rhamnaceae | Leaves, fruits | Leaves are used to regulate body temperature, prevents blood and mucous along with stools. |

Amongst them 48 taxa were herbs 7 taxa were shrubs and 10 taxa were trees (fig. 2 & table 1). Asteraceae and Lamiaceae were the largest families having 7 taxa each while brassicaceae was the second largest family having 5 taxa followed by rosaceae having 4 taxa and

ranunculaceae and solonaceae having 3 taxa each and berberidaceae, chenopodiaceae, scrophulariaceae, polygonaceae, verbinaceae and violaceae having 2 taxa each while the remaining all families having 1 taxa each.

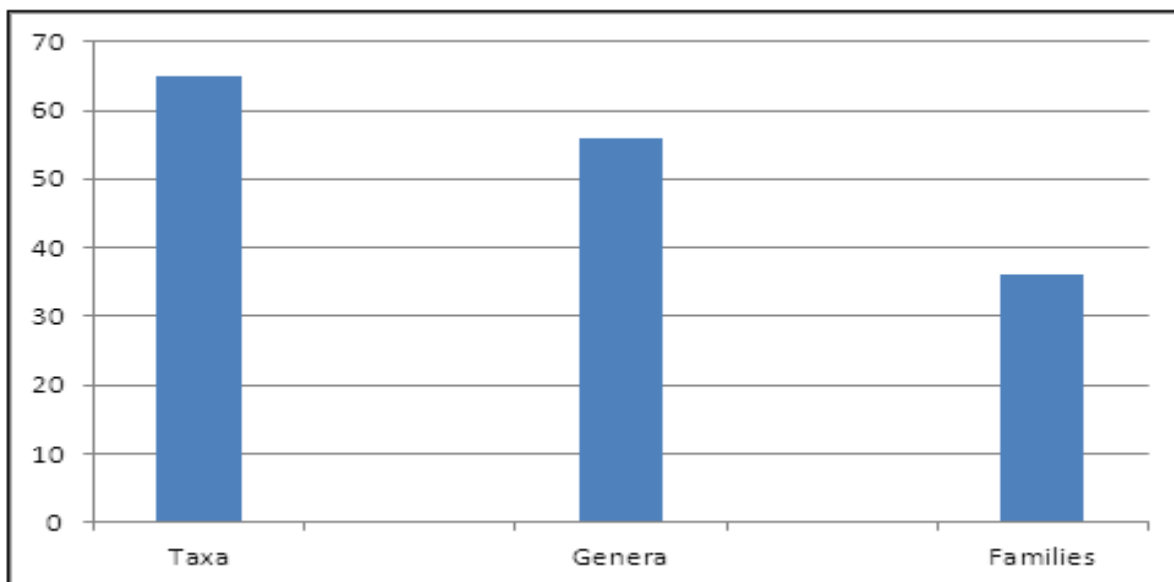


Fig. 1. Representation of ethnomedicinal uses of taxa, genera and families in tehsil Khall, District Lower Dir, Khyber Pakhtunkhwa, Pakistan.

Amongst the part/s used leaves of thirty four taxa, seeds of eleven taxa, roots of nine taxa, fruits of eight taxa, flowers of six taxa, bark of three taxa, rhizome of two taxa were used while the stem, gum, rhizome, oil, bulb and latex of one taxa each were used for different remedies and disorders (fig. 3 & table 1). Knowledge

wise older people of rural areas have more awareness regarding these taxa and were collected for their own uses. Mostly the plant taxa were commonly practiced against different diseases viz. hepatitis, diabetes, infertility, skin problems, hair care and general tonics.

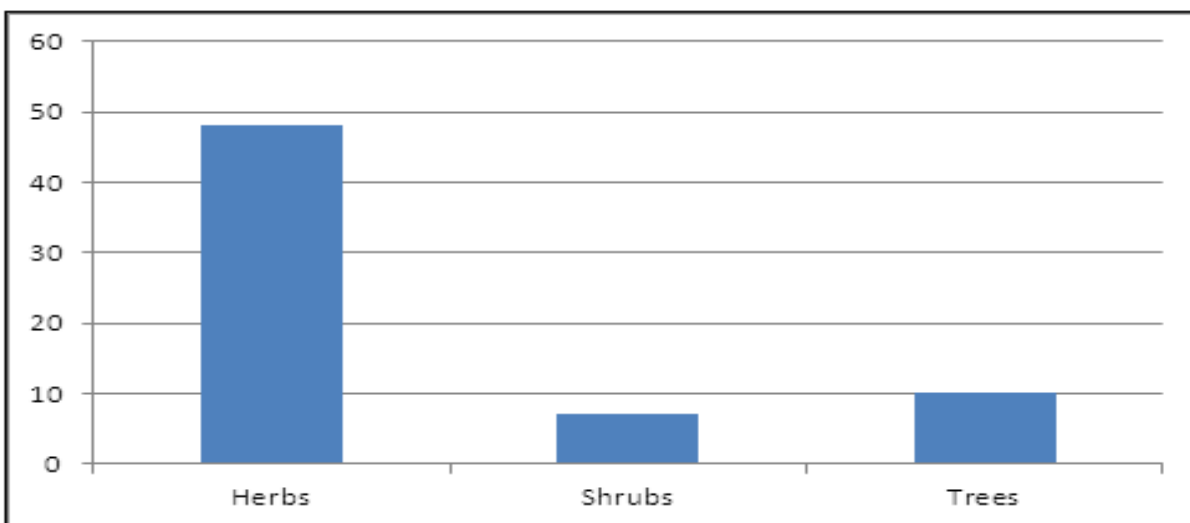


Fig. 2. Representation of ethnomedicinal uses of herbs, shrubs and trees in tehsil Khall, District Lower Dir, Khyber Pakhtunkhwa, Pakistan.

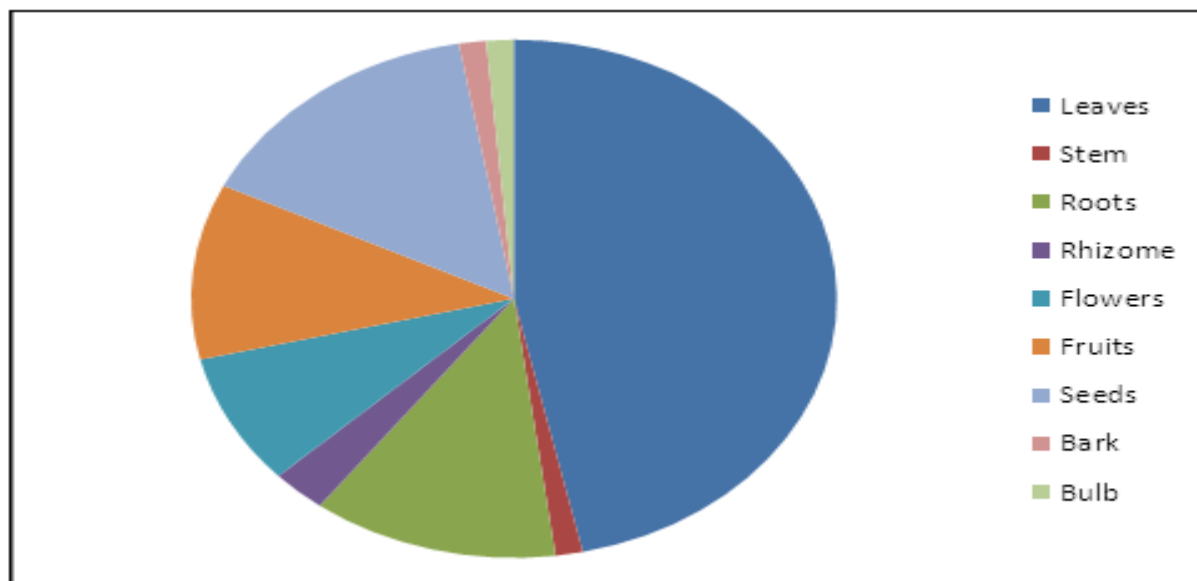


Fig. 3. Representation of ethnomedicinal uses of part/s used in tehsil Khall, District Lower Dir, Khyber Pakhtunkhwa, Pakistan.

The same 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 Shower 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 Rawalpindi, 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 Pakhtunkhwa, 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 Pakhtunkhwa, 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), and ethnobotanical Survey of the Flora of tehsil Balakot, district Mansehra, Khyber Pakhtunkhwa, Pakistan (Irfan *et al.*, 2018).

Author's contribution

MI, N, & MK conducted the experiment and NAK, HK & SK carried out the statistical analysis SU & MS designed the experiment and GJ & WM structured and wrote the manuscript.

Conflict of interest

The authors declared that there is no conflict of interest.

Acknowledgment

We are really thankful to local communities of tehsil Khall, district lower Dir, Khyber Pakhtunkhwa, Pakistan for sharing their precious knowledge with us.

Conclusion

Inhabitants of tehsil Khal, district lower Dir, Khyber Pakhtunkhwa, Pakistan the aged and rural areas peoples has tremendous knowledge for the identification of plant taxa including their method of collection, local names and uses of medicinal plants. Traditional knowledge regarding medicinal plants is gradually decreasing and the new generation has no knowledge about the valuable plants found in the area. Most of the taxa were collected by locals sell them in the local market collecting from the wild. Residents of hilly and rural areas frequently used these taxa. Knowledge wise older people have more awareness regarding these taxa. Mostly the plant taxa were commonly practiced against different disorders viz. hepatitis, diabetes, infertility, skin problems, hair care and general tonics. Keeping in view their

sustainability these taxa may be utilized for new drugs and commercial purpose so their cultivation for medicinal purpose is highly needed.

Recommendations

Keeping in view the sustainability of these plants taxa they should be practiced for new drug discovery. Cultivation of these plants taxa for food, medicine and ornamental purpose is highly recommended at national level.

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