INTERNATIONAL JOURNAL OF APPLIED AND EXPERIMENTAL BIOLOGY
(ISSN PRINT: 2790-6523; ISSN ONLINE: 2790-6531)
2022, Vol. 1, NO. 2, 59-66.
doi: https://doi.org/10.56612/ijaeb.v1i2.9

Ethnobotanical assessment of Hazar Nao Hills, District Malakand, Khyber Pakhtunkhwa, Pakistan

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Abstract

An ethno-botanical study was carried out to consolidate knowledge on folk uses of plant resources of Hazar Nao Hills, District Malakand, Khyber Pakhtunkhwa (KPK), Pakistan. Data were recorded from February 2019 to March 2020 by collecting old information from the local inhabitants including old age males, females and herbalists about different uses of plant resources. Data were collected through a well-structured questionnaire by interviewing 150 local men, women, and herbalists. As per our data, 72 vascular plant species, belonging to 45 different families and 56 genera were used by the local people for diverse native uses. Of all families recorded in this study, except two, all belong to Spermatophyta, a major division of plant kingdom. With regard to the habits of plant species recorded in the area, 36 were herbs, 10 shrubs, 25 trees and one pteridophyte. On a percentage basis, the total plant species (72) collected from the study area comprised 49% herbs, 14% shrubs, 34% trees, and 1% pteridophyte. The highest numbers of species recorded were from families Lamiaceae (5 spp.) and Poaceae (5 spp.) followed by families Euphorbiaceae (4 spp.), Moraceae (4 spp), and Polygonaceae (4 spp). Overall, the field scrutiny showed that overgrazing, deforestation, unscientific collection and agricultural expansion, as well as their considerable use for feed or medicinal purposes are the factors causing a significant decline of native vegetation. Thus, continuous work on plant resources and conservation of Hazar Nao Hills is imperatively needed.

HANDLING EDITOR
Muhammad Ashraf

ARTICLE HISTORY
Received: 21 Nov 2021
Accepted: 19 Feb 2022
Published: 8 Mar 2022

KEYWORDS
Ethno-botanical uses;
Plant conservation;
Hazar Nao hills;
Malakand;
KPK

***NOTE**
Umar Zeb and Asfa Batool equally contributed to this paper

Introduction

The district Malakand is located at N latitude 34° 35′ and E longitude 71° 57′ (Chaghtai and Ghawas, 1976). Malakand district extends from the hard and indurate comparatively pierce mountain ranges of the Hindukush downhill to the northern side of the Peshawar valley. Generally, Malakand lies in the way to district Swat, Chitral and Dir. The Hazar Nao Hills are a natural scenery and important beautiful hills of Malakand. Many visitors visit the hills for prey and enjoyment of the natural habitat of plants and animals (Zabihullah et al., 2006). The elevation of the hills is 2,727 m and these hills, being thickly covered with natural forests, are famous for ethnobotanical and medicinal plant studies. It is positioned 23 km away from West of Dargai and has a thick forest and rich archaeological site. The Malakand people mostly are hardworking farmers by profession. However, due to farming being less productive, the

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TO CITE THIS ARTICLE: Zeb, U., Batool, A., Khan, H., Ullah, H., Gul, B. (2022). Ethnobotanical assessment of Hazar Nao Hills, District Malakand, Khyber Pakhtunkhwa, Pakistan. *International Journal of Applied and Experimental Biology* 1(2):59-66.

inhabitants of the area support their livelihood through collection of medicinal plants, poultry farming, cattle farming at homes, cutting fuelwood and selling all items in the local market (Zakir, 1999). The women inhabitants make handicrafts items like baskets, caps, brooms, bedsheets, kites and wooden utensils, etc., consequently using native plants to produce all these commodities. Such man-made activities have drastically affected the formal structure and form of animal and plant biodiversity of the area under study. However, the people of the area are not familiar with the considerable value of medicinal plants. If these high valued resources are not properly conserved, the area may witness their fast extinction with the passage of time (Ibrar et al., 2007).

The native plants of the study area are being effectively exploited as traditional and allopathic medicine (Smitherman et al., 2005). These plants are being exploited extensively for medicinal use as they are easily accessible, and if procured from the local market, they are very cost intensive. In Pakistan, a total of 6000 species of higher plants has been reported by different botanists, and of them about 600 to 700 species are used for medicinal purpose (Shinwari, 2010).

Some ethnobotanical and phytosociological research works have already been carried out in the adjoining areas of the study region. For example, 83 taxa were recorded from district Chitral (Shinwari et al., 2003a, 2003b; Ali and Qaisar, 2009; Gizemet et al., 2021). Similarly, an ethnobotanical survey of Charkotli Hills, Batkhela was also carried out (Barkatullah et al., 2009). However, these study sites considerably differ from our study site being variable in altitude and vegetation types.

The present site, i.e., Hazar Nao Hills, district Malakand, KPK, Pakistan, has never been explored before. Thus, this is the first research on ethnobotanical aspect about the folk uses of medicinal plants of this specific site. The key objective of the current work was to document plant species and their indigenous uses at Hazar Nao Hills, district Malakand, so as to enrich the knowledge on proper use and conservation of medicinally important native plants of Hazar Nao Hills.

Materials and Methods

Data collection

The ethno-botanical analyses were carried out from February 2019 to March 2020 at the Hazar Nao Hills, district Malakand, KPK. For conducting ethno-botanical study, the area was divided into six fields. Every field was visited after 25 days. Altogether, 150 informants were chosen based on the information given by elder people and the local administrator of the study region. The special doctors locally called ‘hakeems’ were familiar with the community due to their long-term practice therein on traditional health care. The local people living in the investigated area were native-born. Before collecting data through group meetings, we met the native elder people and the villager head, and explained the objective of the current work and to collect traditional information for preserving the plant species of the area.

For recording data on medicinal plants of the study area, a well-structured questionnaire was developed by consulting five experienced local persons well-versed in local knowledge. The questionnaire was so easy to be read by the informants without any difficulty. Interviews of the local inhabitants of the area were conducted in native language (Pushto). Five groups, each of 30 informants, were devised for collecting appropriate information. The questionnaire comprised questions relating to information about medicinal plants, native names of medicinal plants, forms of diseases treated by each medicinal plant, synthesis of medicine from each plant, use of dry or fresh plant parts, use of a mixture or single plants for the synthesis of medicine, dose requirement, method of use and duration of a traditional medicine.

Data organization

The Microsoft Excel software (MS Excel) was used for data analysis. The mode and habits of the plants were categorized into three groups, i.e., herbs, shrubs, and trees using the existing literature (Ali and Qaiser, 2010) (Figure 1). The parts of plants used by the healers/hakeems were classified into 11 groups, such as leaf, fruit, whole plant, seed, bark, gum, root, and so on.

Medicinal plants collection, identification, and preservation

Plant specimens were collected from the field, compressed and dried in newspapers. The newspapers were replaced daily until the plant samples were completely dry. In the field of Hazar Nao Hills, unidentified plants collected were assigned codes for proper identification by the experienced plant taxonomists. The dried plant samples of all species were pressed and brought to the laboratory of Weed Science, the University of Agriculture Peshawar. All plant samples in the compressed form were assigned voucher numbers and deposited at the herbarium of the Department of Weed Science, the University of Agriculture Peshawar, Pakistan. The species identified were re-verified using Flora of Pakistan (Nasir and Ali, 1970-1995; Ali and Qaiser, 1995-2005; Ali and Qaiser, 1993-2009).

Results and Discussion

Ethnobotany is an important branch of science, which provides an access to study traditional knowledge, local culture, and management of indigenous plants. However, rich biodiversity of most areas is being lost due to overpopulation, overgrazing, unawareness of local people about the value of medicinal plants and due to several anthropogenic actions in previous few decades. However, in the present study, the information collected from the local people of Hazar Nao Hills could be useful for keeping the biodiversity in its intact form. In the present investigation, seventy-two (72) plant species belonging to 45 families and 56 genera were collected (**Table 1**). All families belonged to Spermatophytes except one which was a pteridophyte and another a gymnosperm. For these plant species, 150 local inhabitants with varying occupations were interviewed. The plants were categorized into different categories based on their habit, e.g., thirty-six (36) of them were herbs, 10 shrubs, 25 trees and one pteridophyte. The dominant families recorded were: Lamiaceae 5 spp., Poaceae 5 spp., Euphorbiaceae 4 spp., Moraceae 4 spp., Polygonaceae 4 spp., Asteraceae 3 spp., Mimosaceae 2 spp., Verbenaceae 2 spp, Rhamanaceae 2 spp., Pinaceae 2 spp., Fagaceae 2 spp., Violaceae 2 spp., Myrtaceae 2 spp. and Buxaceae 2 spp. (Figure 2). Percentage of each family given below had one species each: Aspergaceae, Apiaceae, Berberidaceae, Nyctaginaceae, Cyperaceae, Sapindaceae, Canabinaceae, Ranunculaceae, Chenopodiaceae, Pteridaceae, Convolvulaceae, Cuscutaceae, Scrophulariaceae, Solanaceae, Punicaceae, Asclepiadaceae, Oxalidaceae, Juglandaceae, Araliaceae, Rosaceae, Apocynaceae, Meliaceae, Brassicaceae, Platanaceae, Vitaceae, Acanthaceae, Tiliceae, Fumariceae, Fabaceae and Oleaceae. These plant species with their relative families and ethnomedicinal uses were classified into herbs, shrubs, and trees (**Table 1**). Plant parts used by the local inhabitants to treat different diseases were stem, leaves, roots, bark, fruits, flowers, and seeds. However, it depends on the disease requirement and types of plants. The local people use herbs as a whole, but shrubs and trees are used by their specific parts. The plant parts were classified into different categories representing overall percentage of different parts of the selected plant species used in Hazar Nao Hills, district Malakand, KPK, Pakistan (**Table 2**). Since the use of an entire plant is difficult for medicinal purpose, so the inhabitants of the study site and local doctors (hakeems) use plant parts for curing different diseases. Number of plant parts investigated for different diseases were: 35 leaves, 25 roots, 15 fruits, 13 whole plants, 7 flowers, 4 stems, 5 bark, 2 wood, 4 seed, 2 oil, 2 branches, 1 gum, 2 latex, 1 milky juice, 1 resin, and 1 cone (**Table 2**). Generally, it was notable that the forms of procedures adopted by common healers using the specific medicinal plants for curing different diseases were: concoction, infusion, decoction and powdering. For the preparation of different medicines for different diseases, the local inhabitants and doctors used to add substances like juices, soap, sugar, mustard oil, honey, wheat flour, desi ghee (butter) and milk to plant powder. For example, Sher et al. (2011) collected 54 plant species from a specific area that are of use as diuretic, carminative, anticancer, stomachic, antipyretic, sedative, and antispasmodic. Earlier, Zeb et al. (2016) collected 24 weed species belonging to 13 families from Hazar Nao Hills, district Malakand, and categorized in terms of floristic composition and phytosociological importance. However, the current study is the first of its kind since it has described a large number of plants of the study site which are medicinally very important.

In the study area, 72 plant species were collected and categorized into different categories based on their habits, e.g., herbs 50%, shrubs 14%, trees 35% and pteridophytes 1% (Figure 1).

Table 2: Extent of utilization different parts/organs of selected plant species in Hazar Nao Hills, Malakand KPK, Pakistan

Part used	Number of plant parts used	Percentage of plants used
Leaves	35	30.97
Roots	18	15.93
Fruit	15	13.27
Whole plant	13	11.50
Flower	7	6.19
Stem	4	3.54
Bark	5	4.42
wood	2	1.77
Seed	4	3.54
Oil	2	1.77
Branches	2	1.77
Gum	1	0.88
Latex	2	1.77
Milky juice	1	0.88
Resin	1	0.88
Cone	1	0.88

Table 1. Ethnobotanical and important medicinal plant resources of Hazar Nao Forest, Malakand, KPK

Botanical name	Local name	Family	Part used	Habit	Medicinal uses
Ajuga bracteosa (Wall. ex Benth.)	Khawaga boot	Lamiaceae	Leaf, flower	Herb	Used as internal colic, jaundice, sore throat, and hypertension
Adiantum philippense L.	Bandakay	Pteridaceae	Leaf	Fern	Paralysis and blood purification
Asparagus racemosus Willd.	Shahghandal	Asparagaceae	Leaf, Root	Herb	Kidney stone and high blood pressure
Acacia modesta Wall.	Palosa	Mimosaceae	Gum, Bark	Tree	Gums used for women after childbirth, back pain and chest infection
Ammi visnaga (L.) Lam.	Spairkai	Apiaceae	Leaf, Seed	Herb	Removal of kidney stones; menstrual pain
Albizia lebbeck (L.) Bentham.	Srikh	Mimosaceae	Bark	Tree	Dysentery and diarrhea
Boerhavia procumbens Banks ex Roxb.	Dakhri/Satti	Nyctaginaceae	Leaf	Herb	Edema and dropsy, dysmenorrhea cough and asthma
Berberis lyceum Royle	Kwarray	Berberidaceae	Leaf, Stem, Root,	Shrub	Stomachic, intestinal colic, expectorant diarrhea, and diuretic internal wound
Buxus wallichiana Baill.	Shamshad	Buxaceae	Leaf	Shrub/small tree	Used as diaphoretic and purgative
Butea monosperma (Lam.) Taub.	Flame tree	Fabaceae	Whole plant	Tree	Skeletal gastrointestinal and urinary diseases
Cymbopogon jwarancusa (Jones) Schult.	Sargaray	Poaceae	Root and Shoot	Herb	Skin diseases, vomiting, abdominal tumors, unconsciousness and fever
Clematis filifera Benth.	Pitchere	Ranunculaceae	Leaf and root	Herb	Throat cancer and other foul ulcers
Chenopodium album L.	Skha kharawa	Chenopodiaceae	Root, stem and leaf	Herb	Anthelmintic, laxative, urinary problems and jaundice
Calotropis procera (Ait.) Ait.	Spalmai	Asclepiadaceae	Young shoot, fruit	Herb	Dog bite
Convolvulus arvensis L.	Prewatai	Convolvulaceae	Whole plant	Herb	Skin disease, purgative and dysentery
Cotoneaster microphyllus Wall. ex Lindl.	Karwarra	Rosaceae	Leaf and Fruit	Shrub	Expectorant, astringent, and stomachache
Cynodon dactylon (L.) Pers.	Kabal	Poaceae	Leaf	Herb	Cuts and bleeding wounds, piles, diuretic, purgative, diarrhea and antipyretic
Canabis sativa L.	Bhang	Canabinaceae	Leaf and flower	Herb	Used as hallucinogenic, hypnotic, sedative, analgesic, and anti-inflammatory agent
Caralluma edulis (Edgew.) Hook.	Pamenkay	Apocynaceae	Succulent stem	Herb	Diabetes and hypertension
Cuscuta reflexa Roxb.	Zelai	Cuscutaceae	Whole plant	Herb	Used for treating liver, constipation, and spleen disease
Digitaria sanguinalis (L.) Scop.	Shamakha	Poaceae	Leaf, Seed	Herb	Gonorrhea
Dodonaea viscosa (L.) Jacq.	Ghwarraskay	Sapindaceae	Bark, Fruit	Tree	Used as astringent as well as for treating swelling and burns
Euphorbia helioscopia L.	Prewatka.	Euphorbiaceae	Root, Shoot, Latex	Herb	Skin diseases, gut parasites, migraine and gonorrhea
Euphorbia indica Lam.	Jangali Spalmai	Euphorbiaceae	Shoot, Latex	Herb	Cough , fever, and ringworm disease.

Botanical name	Local name	Family	Part used	Habit	Medicinal uses
Eriophorum comosum (Wall.) Nees.	Wakha	Cyperaceae	Shoot	Herb	Used as astringent; diarrhea
Eucalyptus globules Labill.	Lachi	Myrtaceae	Leaf, oil, stem	Tall tree	As antiseptic, for treating asthma
Ficus carica L.	Inzar	Moraceae	Fruit	Tree	Piles, constipation and urinary bladder infection
Ficus palmata Forssk.	Inzar	Moraceae	Fruit and milky juice	Tree	Constipation and piles
Fumaria indica (Hausskn.) Pugsley	Papra	Fumariaceae	Whole plant	Herb	Pains, diarrhea, fever, influenza, and liver complaints
Hedera nepalensis K. Koch.	Praivata	Araliaceae	Leaf	Climber/ herb	Skin diseases, ulcers, and dyspepsia
Grewia optiva Drum. ex Burret	Pastawani	Tiliaceae	Root, leaf	Tree	Intestinal infection; stomach problem
Isodon rugosus (Wall. ex Benth.) Codd	Da ghara karachay	Lamiaceae	Leaf and Flower	Herb	Cough and cold
Juglans regia L.	Ghuz	Juglandaceae	Whole plant	Tree	Sexual power and memory; intestinal worms
Justicia adhatoda L.	Baiker	Acanthaceae	Leaf and root	Shrub	Swelling, asthma, cough, bronchitis, rheumatism and as antispasmodic
Lantana camara L.	Amrud gulay	Verbenaceae	Leaf, root and flower	Shrub	Cancer, skin itches, leprosy, rabies, chicken pox, measles, asthma and ulcers
Morus alba L.	Spin toot	Moraceae	Fruit	Tree	Antichloristic, diuretic, anti-tussive. Expectorant and anti-headache
Myrtus communis L.	Manro	Myrtaceae	Leaf and fruit	Shrub	Abdominal pain and diarrhea
Morus nigra L.	Toor toot	Moraceae	Wood, branch, and leaf	Tree	For killing warms
Melia azedarach L.	Tora bikyana, Shandai.	Meliaceae	Whole plant	Tree	Diabetes and blood pressure
Mallotus philippensis (Lam.) Muell. Arg.	Kambela	Euphorbiaceae	Fruit	Tree	Anthelmintic, astringent and diuretic
Micromeria biflora (Buch. Ham. ex D. Don) Benth.	Naray Shamakay	Lamiaceae	Root and leaf	Herb	Toothache; nose bleeds
Nasturtium officinale R. Br.	Talmera	Brassicaceae	Young shoot	Herb	Stomachic, diuretic, and muscle relaxant
Olea ferruginea Royle	Khuna	Oleaceae	Fruit and leaf	Tree	Throat infection, cough, and fever
Oxalis corniculata L.	Zmakay tarookay	Oxalidaceae	Whole plant	Herb	Anti-inflammatory, anthelmintic diuretic, febrifuge, stomachic and styptic
Otostegia limbata (Benth.) Boiss.	Spinazghi	Lamiaceae	Wood and leaf	Shrub	Antispasmodic, antiulcer, antidepressant, anxiolytic, antibacterial, antioxidant, etc.
Punica granatum L.	Ananghorai	Punicaceae	Fruit, bark and leaf	Shrub	Used for blood purification, skin diseases, whooping cough, etc.
Pinus roxburghii Sarg.	Nakhtar	Pinaceae	Resin, cone, and wood	Tree	Snake biting and skin diseases
Polygala abyssinica R. Br. ex Fresen.	Afgani tortose	Polygonaceae	Leaf and root	Herb	As a fumigant; snake bite
Persicaria glabra (Willdenow) M. Gomez	Buck wheat	Polygonaceae	Leaf	Herb	Fever, colic pain

Botanical name	Local name	Family	Part used	Habit	Medicinal uses
Pentanema vestitum (Wallich ex Candolle) Y. Ling	Badaam	Asteraceae	Leaf and root	Herb	Diabetes mellitus, headache, nausea and vomiting
Picea smithiana (Wall.) Boiss	Mangazaey	Pinaceae	Whole plant	Tree	Rich in vitamin C
Platanus orientalis L.	Chinar	Platanaceae	Leaf and bark	Tree	Dysentery, Diarrhea, and ophthalmic diseases
Quercus incana Roxb.	Toor banj	Fagaceae	Wood	Tree	Used as astringent diuretic, antidiarrheal agent, antipyretic, antidiabetic, etc.
Quercus dilatata Royle	Toor banj	Fagaceae	Fruit	Tree	Gonorrhea, diarrhea, asthma and indigestion
Rumex hastatus D. Don	Tarookay	Polygonaceae	Young shoot and leaf	Herb	Used as purgative, carminative, astringent, stomachic, diuretic, and flavoring agent
Ricinus communis L.	Herhanda	Euphorbiaceae	Leaf, seed and, oil	Shrub	Highly purgative
Rumex nepalensis Spreng.	Shalkhay	Polygonaceae	Whole plant	Herb	It is diuretic, demulcent and astringent
Saccharum spontaneum L.	Shargashae/ Kahe	Poaceae	Root	Herb	It is diuretic and purgative and used to treat burning sensation, piles, and sexual weakness
Saccharum filifolium Nees ex Steud.	Khawadala	Poaceae	Whole plant	Herb	Cough, skin problems, urinary tract infections, etc.
Sarcococca saligna (D. Don) Muell. Arg.	Ladan	Buxaceae	Whole plant	Shrub	Laxative, blood purifier, and muscular analgesic
Solanum nigrum L.	Kachmachoo	Solanaceae	Leaf	Shrub	Asthma, dysentery, stomach complaints, etc.
Salvia moorcroftiana Wall. ex Benth.	Kharghwag	Lamiaceae	Root, and leaf	Herb	Colds and coughs; itchy skin
Tagetes minuta L.	Zangali Hamesha	Asteraceae	Flower	Herb	Fragrant and ornamental
Vitex negundo L.	Marvandai	Verbenaceae	Root, leaf and branches	Shrub	To cure pains of chest, back, head. It also acts as anthelmintic and diuretic
Verbascum thapsus L.	Khardag	Scropulariaceae	Leaf and flower	Herb	Bronchitis and dry cough
Viola canescens Wall. ex Roxb.	Banafsha	Violaceae	Whole plant	Herb	Gastrointestinal and other diseases
Vitis jacquemontii Parker	Ghedar kwar	Vitaceae	Fruit	Climber	Gastrointestinal diseases
Viola serpents Wall.	Banafshah	Violaceae	Leaf and flower	Herb	Cough and asthma
Xanthium strumarium L.	Ghut ghiskay	Asteraceae	Leaf, root and fruit	Herb	Fever and malaria
Ziziphus oxyphylla Edgew.	Ber	Rhamnaceae	Fruit and root	Tree	Gas trouble and jaundice
Zanthoxylum armatum DC	Dambara	Rutaceae	Bark, seed and fruit	Shrub	Fever, dyspepsia, cholera, stomach ache, and tooth ache
Ziziphus vulgare Lam.	Markhanai	Rhamnaceae	Whole plant	Tree	Diabetes, insomnia and heart palpitations

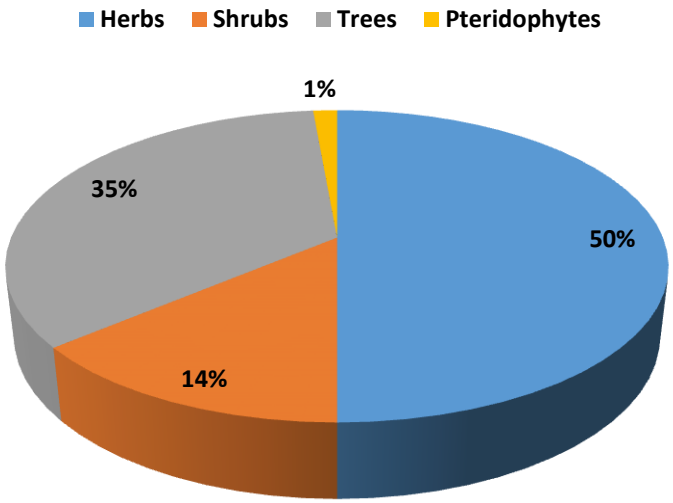

Figure 1. Overall percentage of plants collected from Hazar Nao Hills, District Malakand KPK, Pakistan

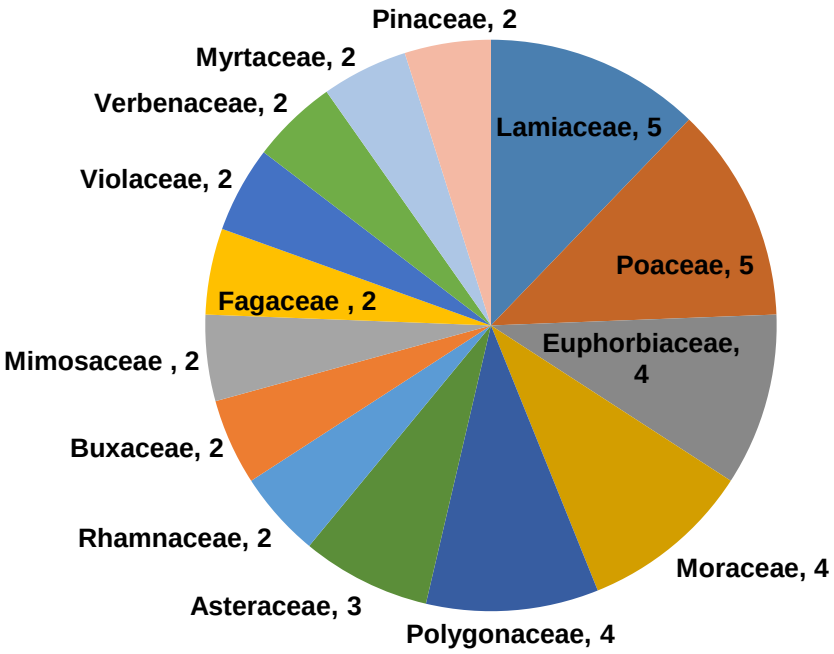

Figure 2. Proportions of the commonly occurring 14 families with their number of plant species in Hazar Nao, Hills, Malakand KPK, Pakistan

It has been noted that some plant species are used individually and some as a mixture of two or many plants for treating different diseases in the study site. The results show that the medicinal plants are used for a variety of diseases like dysentery, diarrhea, stomach-ache, constipation, blood circulatory diseases, skeleton-muscular problems (backache and pain), and cutaneous complaints (**Table 1**). The indigenous people also recognize that there is a considerable decrease in the wild flora of Hazar Nao Hills mainly due to overpopulation, overgrazing, and biotic and abiotic pressure. These taxa need to be conserved urgently, because the medicinal plants and wild species populations are being reduced at fast pace. The young generation is unaware of the importance of these medicinal plants and wild flora. Certain other plants such as *Caralluma edulis, Zanthoxyllum armatum*, and *Ziziphus vulgare* are also near to extinction (Simbo, 2010). Illiterate people, unplanned cutting of plants, uprooting of herbs and shrubs, and cutting of trees are the major limiting factors for reduced number of indigenous taxa of this area. Advanced and effective measures must be adopted to maintain and preserve the biodiversity of the study site, which has characteristic and unique floristic composition.

Conclusion

All the recorded plant species from the study area belong to angiosperms except a single pteridophyte, *Adiantum philippense,* and one gymnosperm species *Pinus roxburghii*. The 72 plant species recorded from the study site belong to 45 families and 56 genera. Based on plant habit, the 72 plants species were categorized into three groups, e.g., 36 herbs, 10 shrubs, and 25 trees. The dominant families recorded from the area were Lamiaceae and Poaceae each having 5 species. *Caralluma edulis, Zanthoxyllum armatum*, and *Ziziphus vulgare* are extinct species, which have been considerably abused by the migrants and indigenous people living in the surrounding areas. Most of the people are uneducated and untrained, and hence, use unscientific methods for harvesting and uprooting medicinal plants. Due to these reasons, most of the plants of the study area are near to extinction. The people of the area need awareness and urgent conservation of these taxa. Agricultural expansion, deforestation, overgrazing, and unscientific collection, preservation and processing of natural vegetation are the chief threats to the medicinal flora and biodiversity of the Hazar Nao Hills. Thus, some stringent measures need to be adopted to save the rich and important biodiversity of the Hazar Nao Hills, district Malakand, KPK, Pakistan.

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