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Exploration and local utilization of medicinal vegetation naturally grown in the Deusai plateau of Gilgit, Pakistan

Kifayat Ullah Khan ^a, Maqarab Shah ^b, Habib Ahmad ^c, Shujaul Mulk Khan ^d, Inayat Ur Rahman ^a, Zafar Iqbal ^a, Raees Khan ^d, Elsayed Fathi Abd_Allah ^{e,*}, Abdulaziz Abdullah Alqarawi ^e, Abeer Hashem ^f, Abdullah Aldubise ^e^a Department of Botany, Hazara University, Mansehra, Pakistan^b Department of Micro Biology, Hazara University, Mansehra, Pakistan^c Department of Genetics, Hazara University, Mansehra, Pakistan^d Department of Plant Sciences, Quaid-i-Azam University, Islamabad, Pakistan^e Department of Plant Production, Faculty of Food & Agricultural Sciences, P.O. Box 2460, Riyadh 11451, Saudi Arabia^f Department of Botany and Microbiology, Faculty of Science, King Saud University, Riyadh 11451, Saudi Arabia

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ABSTRACT

In the study area, the traditional knowledge regarding the uses of local wild medicinal plants for the health care of human and domestic animals is totally in hold of old people. The young ones are unaware about such an indispensable practices. The objective of the current study was to transfer this sort of precious knowledge from old members of the community to young generations in documented form.

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1. Introduction

As far as there is a concern of variety of diseases, it is being a part of our life but remedy from it is a challenge and in this scenario the plants especially the one with some medicinal value play a vital and indispensable role, with having no side effects on the body. Medicinal plants used for the remedy of different diseases and its domestic use is from a very long period of time that have gets its starts from early human civilization for the proper treatment of a variety of diseases and its use frequently pass down from one generation to another one (Lev and Amar, 2000). In accordance to Haq (2004), a total of five thousands and seven hundred plant species are under cultivation in our country in which four hundred

to six hundred plant species have a regular use in medicines in the Unani allopathic and homeopathic medicine system while the rest of medicinal plant species ranging from three hundred to four hundred were frequently use in traditional medicine system. These natural medicines are prescribed by different schools of thought like Hakeem, religious leaders, healers, mulas and akhuns, etc. there by providing the health care for the ruler areas. It is an estimation that round about 80 percent of the ruler population of our country are dependent on the traditional system, which is term as Unanic. This system was primary introduced by the Muslims of subcontinent. The Unani medicine have a total depend on the use of medicinal plant species (Goldman et al., 1985). During the Mughal era another system come into being that is the Greek Arabic medicinal system, an accordance to Rasool (1998), the medicinal plants have important prevailing position in the Gilgit-Baltistan. It has been realized that there is a high risk of loss of this precious indigenous knowledge that is at the verge of extinction. Therefore the valuable tradition and traditional knowledge should be accordingly documented and preserved in scientific manner before it wiped out from the community and also report the total growing plants found in the world. There are more than

* Corresponding author.

E-mail address: eabdallah@ksu.edu.sa (E.F. Abd_Allah).

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Five thousand of medicinal plant species which are used as medicine (Schipmann et al., 2003).

Though there is enough literature regarding the medicinal plant species in the Gilgit-Baltistan Pakistan, however studies carried on various aspects are scattered and did not provide complete information particularly on the medicinal vegetation of Deosai plateau. Therefore it was pertinent to compile all of the important data on different aspect like collection, identification, traditional knowledge, ethnopharmacy, ethnopharmacological uses etc. This project was started in order to cover all these aspects like examination of their availability, biodiversity status, explore indigenous knowledge for traditional uses of plants and get information about their natural habitat and kinds of wild species in the wilderness.

2. Materials and methods

2.1. Study area

Deosai Plains are located on the north slope of the main Himalayan Ranges. They were formerly a part of the old state of Kashmir but it is now controlled by Government of Gilgit-Baltistan. Astore District is surrounded by Gilgit and Skardu districts, in north Daras District of Kashmir towards the west and south district Diamer and Gilgit. The whole area except a small corner towards Daras and Kargil is treeless. The region lies between 76 and 77° east longitude and it is crossed by the 35th parallel. The area is roughly 2500 sq miles with altitude of 13,000 feet. The flora is alpine and much like a bit of arctic tundra. High mountains surrounded the plains on all sides by a rim of and the passes by which one enters are from 13,500 to 16,500 feet in altitude (Stewart, 1972). Most of the plants have very short growing period, which is from June to September. The plant size remains dwarf because of its severe climatic condition. As a result of these severe conditions and the short growing period most species are blooming at the same time. People collect medicinal plants from the high altitude pastures and sell them in the local markets which are useful for local person as an additional source of their income and for country.

The 1st survey was carried out from 25th to 28th August 2008. Frequent field trips were under taken during 2008–2011 in the early, mid and last summer season of each year, and collected plant species during their specific blooming season. Work plan was prepared and general information about the area, cultural practices and vegetation were collected before starting the field work. The project area was DassKhirum, Chilim, ChotiDeosai, Deosai, SardarKothi of District Astore, (Gilgit-Baltistan). During the whole period of the Research work ethno botanical information and traditional uses of plants were documented. Systemic interviewing and filling questionnaires has been done to collect the whole information regard the plants and their usage.

2.2. Necessary equipments

Maps, pencils, note book, plants pressers, blotting papers, polythene bags, knife, GPS and digital Camera were used during preparation of current the research study.

2.3. Collection of medicinal plants

During field survey all of the medicinal plants were collected in a scientific and systematic way and photographs were taken on the spot. The plant specimens were press by means of plant pressor and were identified by an expert taxonomist. Data about local names and uses of experimental plants were collected from experts from Hakims, shepherds, farmers, local herbal practitioners and forest guards.

2.4. Statistical analysis

The UV_i was calculated using the formula proposed by Phillips et al. (1994). UV_i the use value of a species for an informant, where U_i = No. of use reports for each species of given plant. N_i = Total No. of informants interviewed for a given plant species. To calculate the use value of a species for an informant

$$UV_i = \sum U_i / N_i$$

3. Results and discussion

Various medical plants have been used from immemorial time (Stewart, 1972). In Indo-Pak the first compiled record is that of Ayurveda which is between 2500 and 600BC (Haq, 2004).

The predominant system of traditional medicine traces its origin back to Greek medicinal system, which was adopted first by the Arabs, and then spread to the subcontinent and Europe. Even in this present modern age of Science and Technology, the developed countries still depend upon the traditional solution of healthcare because it has very few side effects in addition to the low price, relatively to the modern allopathic medicines with a lot of side effects on the human body, therefore they are still being used in the developing countries extensively compared with other systems of healthcare. The people of the valley have been using plant resources for their various ailments. The local people know the beneficial plants and preparation of raw drugs through personal experience and ancestral prescription and long utility. People of the valley are dependents on plant resources. They collect the plants for medicinal uses, fuel wood, fodder, timber, and many other purposes. A total of 117 local inhabitants (92 men, 25 women) were interviewed via questionnaire, women were 34–65 years old and men were 30–72 years old out of them 8 were local hakims. Photographs of plant were taken during tour and verified with the assists of local people. In present study 51 plant belongs to 26 families were reported, these plants used commonly as an ethnomedicine. There were herbs (82%), trees (6%) and shrubs (12%) (Fig. 1). Upreti et al. (2010) also reported herbaceous life form as the leading for medicinal purposes in Nepal (Upreti et al., 2010).

Ranunculaceae is dominant family that is used for the remedy of different sort of diseases (10 plant spp.) while other researchers (Teklehaymanot and Giday, 2007; Mesfin et al., 2009; Bhattarai et al., 2010) mentioned Asteraceae as the leading family with maximum number of medicinal plants species to cure diseases. However Rannunculaceae was followed by Apiaceae (6 Spp.), Asteraceae (5 Spp.), Papilionaceae (4 Spp.), Alliaceae, Cupressaceae, Lamiaceae and Polygonaceae (2 Spp. each) while rest of 18 families were comprised of single species (Table 1).

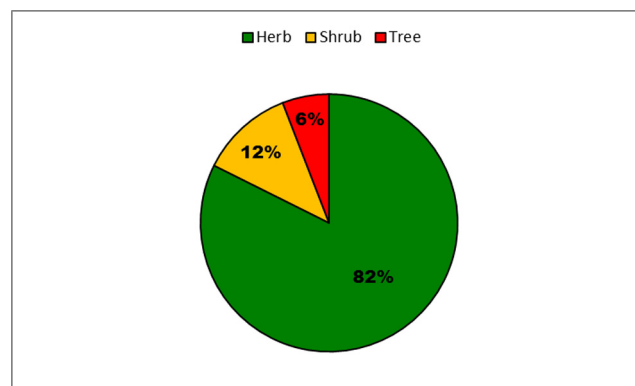


Fig. 1. Life form of plants used for ethno medicinal practices.

Table 1
Taxonomic diversity of medicinal plants in Deusai plateau of Gilgit, Pakistan.

Family	No. of species	Percentage of species	No. of genera	Percentage of genera
Ranunculaceae	10	19.6	5	12.8
Apiaceae	6	11.7	3	7.6
Asteraceae	5	9.8	4	10.2
Papilionaceae	4	7.8	3	7.6
Alliaceae	2	3.9	1	2.5
Cupressaceae	2	3.9	1	2.5
Lamiaceae	2	3.9	2	5.1
Polygonaceae	2	3.9	2	5.1
All other families	18	35.2	18	46.1

Table 2
Diseases treated by number of plant species.

Diseases	No. of species	Percentage
Fever	11	7.38
Skin diseases	15	10.06
Arthritis	8	5.36
Healing	15	10.06
Jaundice	3	2.01
Digestive problems	17	11.4
Cardiac diseases	2	1.34
Asthma	9	6.04
Diabetes	7	4.69
Cough	3	2.01
Pneumonia	2	1.34
cough	10	6.71
Blood pressure	7	4.69
Ring worms	2	1.34
Liver diseases	2	1.34
Dental carries	5	3.35
Kidney stone	3	2.01
Rheumatism	3	2.01
Pain	11	7.38
Reproductive problems	6	4.02
Malaria and typhoid	2	1.34
Milk production in animals	2	1.34
Inflammation	2	1.34
Ulcer	2	1.34
Leukemia	1	0.63
Carminative	5	3.18
Laxative	2	1.27

Table 3
Most frequently used plants of Deusai plateau of Gilgit, Pakistan.

Medicinal plants	Used value	Ranking
<i>Berberisorthobotrys</i> Bien. ex Aitch.	0.88	1
<i>Bergeniastracheyi</i> Boiss.	0.81	2
<i>Ephedra gerardiana</i> Wall.	0.71	3
<i>Bistortaaffinis</i> D. Don	0.63	4
<i>Anaphlisnepalensis</i> DC.	0.62	5
<i>Betulautilis</i> D. Don	0.60	6
<i>Ferula narthex</i> Boiss.	0.59	7
<i>Carumcarvil.</i>	0.55	8
<i>Dactylorhynchahatagira</i> D. Don	0.55	9
<i>Colchicum luteum</i> Baker	0.54	10
<i>Gentianatianschanica</i> Rupr.	0.52	11
<i>Menthalongifolia</i> L.	0.49	12
<i>Codonopsisclematidea</i> (Scherck) C.B Clarke	0.48	13
<i>Delphinium brononianum</i> Royle	0.48	14
<i>Allium fedtschenkoanum</i> Regel	0.44	15

Fifty-one medicinal plants that belongs to 26 families were being used in the treatment of twenty-eight various diseases by the local inhabitants. Table 2 describes that majority of medicinal plant species were used for the remedy of digestive problems (11.4%), skin diseases and wound healing (10.06%), fever, pain, (7.38%), Cough (6.71%), asthma (6.04%), arthritis (5.36%), diabetes (4.69%), reproductive problems (4.02%), dental carries and carminative (3.35%), jaundice, cough, kidney stone and rheumatism (2.01%), followed by cardiac problems, pneumonia, ringworms, liver diseases, malaria and typhoid, milk production in animals, inflammation ulcer and laxative (1.34%) whereas lowest percentage of species were used against leukemia (0.69%) as shown in Fig. 2. All those diseases were treated orally except skin diseases which were treated externally (Table 4). Most of the diseases were treated orally while only skin diseases were externally treated as reported by many other researchers (Upreti et al., 2010; Lulekal et al., 2013; Luitel et al., 2014).

Leaves are mostly used for the remedy of various diseases (27%) followed by Root (21%), flower (17%), whole plant (10%), aerial plant (5%), bulb and rhizome (4%) where minimum parts used were fruits, seeds, stem and bark (3%) (Fig. 3).

The medicinal plant species with greater use values given in Table 4 were *Berberisorthobotrys* Bien. ex Aitch. (0.88) ranked 1st, *Bergeniastracheyi*Boiss. 2nd (0.81) and *Ephedra gerardiana*Wall. (0.71) 3rd, *Bistortaaffinis*D. Don (0.63), *Anaphlisnepalensis*DC.

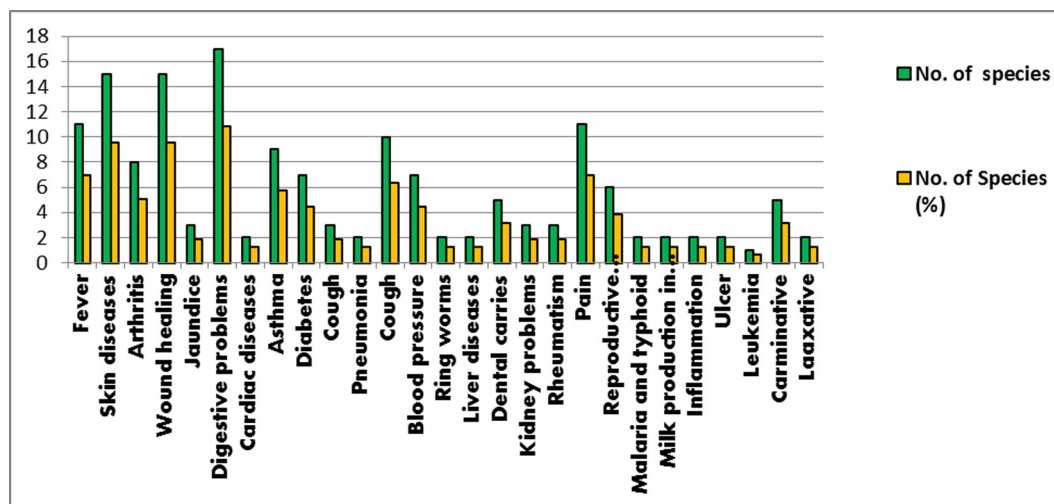


Fig. 2. No. of plant species used for various diseases.

Table 4
Results obtained during the survey of the study area are listed below.

Ser. no	Botanical name	Family name	Vernacular name (Shina)	Habit	Part used	Altitudinal range	Disease cured	Used value
1	<i>Aconitum hetrophyllum</i> Wall. ex Royle	Ranunculaceae	Patris	Herb	R	2500–4200	Fever, dyspepsia, dysentery	0.32
2	<i>Aconitum violaceum</i> Jacq.	Ranunculaceae	Bishmoulo	Herb	R, Wp	3074–4000	Leucoderma, skin diseases, arthritis	0.37
3	<i>Anaphlisnepalensis</i> DC.	Asteraceae	Chikee	Shrub	L, F	4000–5000	After delivery rapid healing, scars	0.62
4	<i>Angelica glauca</i> Edgew	Apiaceae	Choro	Herb	L, R	3000–4500	Jaundice, fever	0.21
5	<i>Angelica archangelicavar. himalaica</i> Clarke	Apiaceae	Chora	Herb	R	3800–4000	Digestive problems, acidity, cardiac diseases	0.18
6	<i>Arnebiabentharii</i> Wall. ex G. Don	Boraginaceae	Kazaban	Herb	L, F	3300–5000	Asthma, diabetes, pneumonia, cough	0.27
7	<i>Artemisia maritima</i> (Berg.) Wellkomm	Asteraceae	Zoon	Shrub	L, F	2100–2700	Blood pressure, ring worms, digestive problems, liver diseases	0.41
8	<i>Artemisia absanthium</i> L.	Asteraceae	Khakamos	Herb	L, F	3700	Diabetes, ring worms, malaria, blood pressure, digestive problems	0.36
9	<i>Astragalusbicuspis</i> Fisch.	Papilionaceae	Hapocho	Shrub	R	2800–3000	Fever, dental carries, asthma	0.27
10	<i>Astragaluspeduncularis</i> Royle	Papilionaceae	Hapochi	Herb	R	3000–3200	Fever, diarrhea, dental carries	0.30
11	<i>Aquilegia fragrans</i> Benth.	Ranunculaceae	ShaiMakhoti	Herb	L, F	3900	Pneumonia	0.19
12	<i>Aquilegia nivalis</i> Hook. f&Thoms.	Ranunculaceae	HatiMakhoti	Herb	L, F	4000–4500	Fever, kidney stone, jaundice	0.22
13	<i>Allium carolinianum</i> Regel	Alliaceae	Phaloon	Herb	L, Bb	4000–6000	Rheumatism, blood pressure	0.38
14	<i>Allium fedtschenkoanum</i> Regel	Alliaceae	Phaloon	Herb	L, Bb	4000–6000	Anti-diarrhea, carminative, epigastria disorder, anti-emetic, anti-flatulence	0.44
15	<i>Achilleamillefolium</i> L.	Asteraceae	Akirkarrha	Herb	L, F	4000–4500	Liver disease, digestive disorder, pain	0.29
16	<i>Anemone rupicola</i> Camb.	Ranunculaceae	Kumkotee	Herb	L, F	3500–5000	Arthritis, skin diseases, allergic conditions	0.33
17	<i>Anemone tetrasepala</i> Royle	Ranunculaceae	Bulejaiphonar	Herb	Wp	3500–5000	Arthritis, skin disease, wounds	0.25
18	<i>Anemone obtusiloba</i> D. Don	Ranunculaceae		Herb	F, L	3500–5000	Arthritis, skin diseases	0.20
19	<i>Berberisorthobotrys</i> Bien. ex Aitch.	Berberidaceae	Ishkeen	Shrub	L, Fr, R, B	1500–3000	Broken bones, injuries, immediate healing of tissues after delivery, blood pressure, diabetes, ophthalmic disease	0.88
20	<i>Bergeniastracheyi</i> Boiss.	Saxifragaceae	Sanspar	Herb	R, L	4000–4500	Headache, blood pressure, vomiting, vertigo, joint pain, backache, immediate healing of tissues after delivery, hepatitis, in animals for diarrhea, dysentery	0.63
21	<i>Bistortaaffinis</i> D. Don	Polygonaceae	Chomoi	Herb	L, Rh	2000–3000	Diarrhea, fever, urinary tract infection, pain, backache, skin diseases, ulcer, rheumatic pains, arthritis	0.63
22	<i>Betulautilis</i> D. Don	Betulaceae	Jongi	Tree	B	2700–4300	Women after delivery for a period of forty (40) days, backache, tonic	0.60
23	<i>Colchicum luteum</i> Baker	Liliaceae	Hinniphono	Herb	Bb	3800	Arthritis, gout, itchiness, neuralgia, leukemia, carminative, laxative	0.54
24	<i>Codonopsisclematidea</i> (Schernk) C.B Clarke	Campanulaceae	Tumta q	Herb	R	4000–5000	Aphrodisiac, male potency, tonic, sexual stimulant	0.48
25	<i>Carumcarvil</i> L.	Apiaceae	Hayyo	Herb	Sd	3000–4000	Carminative, appetite stimulant, indigestion, colic, flatulence, diarrhea, tonic, severe cold, flue, cough	0.55
26	<i>Corydalis govaniana</i> Wall.	Fumariaceae	LaskarButi	Herb	R	3000–5000	Enlargement of hairs, cosmetics	0.13
27	<i>Caltha alba</i> L.	Ranunculaceae	Dropy	Herb	Wp	2500–3000	Headache, fever, sedative	0.16
28	<i>Chearophyllumvillosum</i> Wall.	Apiaceae		Herb	R	2700–4000	Tonic, backache, arthritis, skin diseases	0.21
29	<i>Colutea paulsonii</i> Freyn	Papilionaceae	Bejoo	Shrub	R, L, F	2000–3000	Pesticide, enlargement of hairs, dandruff, cosmetic purposes	0.27
30	<i>Chenopodium foliosum</i> Asch.	Chenopodiaceae	Suyaro, Iskanachi	Herb	Wp	2000–3200	Laxative, anthelmintic, appetizer, diabetes, liver diseases, intestinal amoebae in veterinary practice	0.41
31	<i>Dactylorhiza hatagira</i> D. Don	Orchidaceae	Narmada	Herb	Rh	2400–3600	Nerve tonic, aphrodisiac used in impotence, intestinal pain, bleeding, sexual stimulant, chronic diarrhea, dysentery, diabetes, tonic	0.55
32	<i>Delphinium cashmirianum</i> Royle	Ranunculaceae	Mukhoti	Herb	Wp	3500–4500	Asthma, cough, typhoid, malaria	0.29
33	<i>Delphinium brononianum</i> Royle	Ranunculaceae	Mukhoti	Herb	Wp	4000–6000	Cough, sore throat, fever, jaundice, asthma, typhoid, malaria, pneumonia typhoid bronchitis, hyperglycemic agent, fever, diabetes	0.48
34	<i>Equisetum arvensis</i> L.	Equitaceae	Chiyo	Herb	Ap	2500–3500	Kidney stone, cystitis, prostatitis, strengthening and enlargement of hairs	0.39
35	<i>Epilobium angustifolium</i> L.	Onagraceae		Herb	F, L	2700–4000	Skin diseases, in cattle for milk production, tonic	0.31
36	<i>Ephedra gerardiana</i> Wall.	Ephaderaceae	Soom	Shrub	Ap	2438–4266	Asthma, bronchitis, hay fever, nasal congestion, bronchitis	0.71
37	<i>Euphorbia thomsoniana</i> Boiss.	Euphorbiaceae	Tentree	Herb	Wp	3000–3300	Gonorrhoea, bleeding, leucorrhoea, dandruff	0.19
38	<i>Ferula narthex</i> Boiss.	Apiaceae	Sup	Herb	R, S	1800–3000	Scorpion sting, whooping cough, toothache, carminative anti-dyspeptic coregent, reduce blood pressure, making of ghee, promote milk production in domestic animals	0.59
39	<i>Ferula jaeschkeana</i> Vatke	Apiaceae	Sup, palongo	Herb	Rh, S, L	1800–3500	Wounds, ulcerative tissue, malignant ulcer	0.31
40	<i>Fragaria nubicola</i> L.	Rosaceae	Ichja, Bursay	Herb	Wp	1800–3000	Tonic, cough, asthma, bronchitis	0.27
41	<i>Mentha longifolia</i> L.	Lamiaceae	Phileel	Herb	Ap	2000–3000	Stomach trouble, digestion, purification of blood, headache, diarrhea, anti-emetic, carminative, blood pressure, diarrhea	0.49

(continued on next page)

Table 4 (continued)

Ser. no	Botanical name	Family name	Vernacular name (Shina)	Habit	Part used	Altitudinal range	Disease cured	Used value
42	<i>Nepeta discolor</i> Benth.	Lamiaceae	ChurChumroo	Herb	Ap	3000–4000	Haemostatic, backache, delivery bleeding, healing	0.26
43	<i>Gentiana tianschanica</i> Rupr.	Gentianaceae	Bangra	Herb	L, F	2000–4000	Purification of blood, pain in hemorrhoids, inflammation, astringent, antiseptic, wounds, injuries, diabetes mellitus	0.52
44	<i>Geranium pretense</i> L.	Geraniaceae	Plamat	Herb	R	3000–5000	Diarrhea, dysentery, wounds	0.31
45	<i>Hyocymus niger</i> L.	Solanaceae	Bazarbung	Herb	L, Sd	3000–4000	Toothache, sedative, narcotic, anti-spasmodic, asthma, whooping cough	0.27
46	<i>Iris hookeriana</i> Foster	Iridaceae	Gusman	Herb	R	2500–4000	Skin diseases, production of milk in animals	0.38
47	<i>Juniperus excelsa</i> M. B	Coniferae/cupressaceae	Chilli	Tree	Fr	3000–3500	Kidney stone, Diuretic, stimulant, anti-inflammatory, wound, kidney diseases, cough, asthmatic attacks	0.41
48	<i>Juniperus communis</i> L.	Coniferae/cupressaceae	Muthari	Tree	Fr	2000–3000	Inflammation, urinary tract infection, leucorrhoea, gonorrhoea	0.21
49	<i>Jurinea macrocephala</i> Royle	Asteraceae	Gogaldhoop	Herb	R	3000–4000	Burnt wound, fever, tonic, aromatic smell, colic, puerperal fever, poultice to eruptions	0.41
50	<i>Oxyria digyna</i> L.	Polygonaceae	Churki	Herb	L, F	2500–3500	Backache, delivery bleeding, healing	0.25
51	<i>Oxytropis glabra</i> DC	Papilionaceae	Hapoocho	Herb	R	2500–3000	Antipyretic, dental caries, hair strengthening, dandruff	0.19

Abbreviations for part used: R—root, L—leaves, S—stem, F—flower, Fr—fruit, B—bark, Wp—whole plant, Ap—aerial part, Bb—bulb, Rh—rhizome.

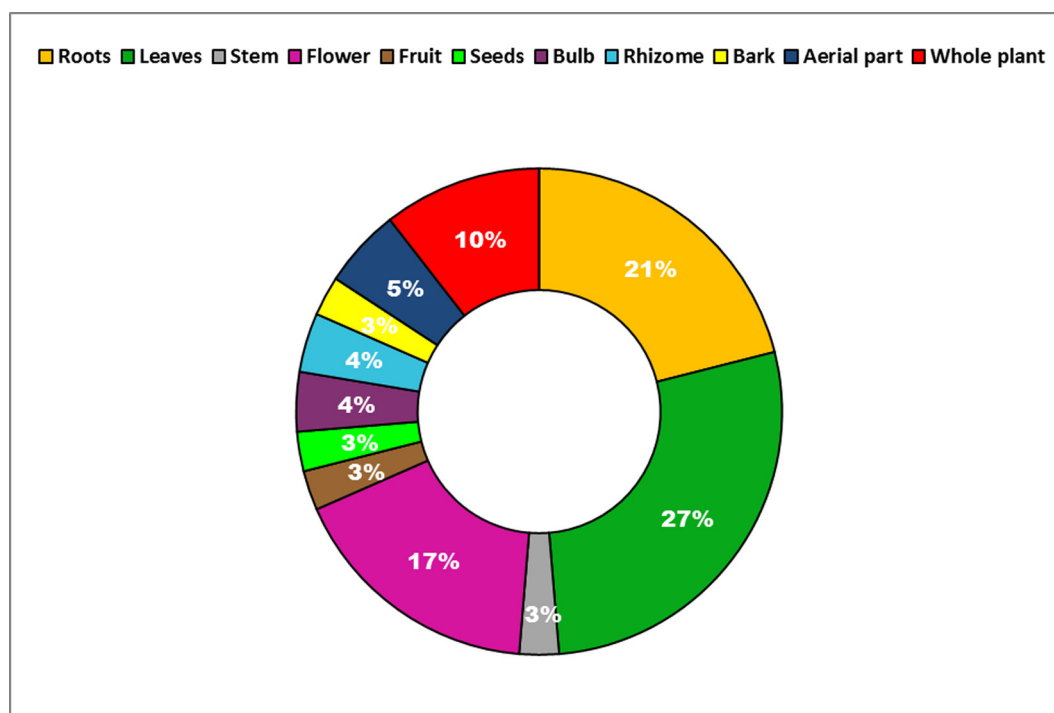


Fig. 3. Plants parts used in traditional treatment of different diseases.

(0.62) and *Betula utilis* D. Don (0.60), respectively. Whereas lowest used value among the collected medicinal plants was of *Corydalis govaniensis* Wall. (0.13) as given in Table 3. Greater used values of mentioned medicinal plants might be due to their common distribution and also due to local practitioner's awareness which makes those plants as the first choice for remedy of disease (Ullah et al., 2014). Table 4 describes all of the plants listed with their respective indications, used value, method of use and parts used to prepare the ethno medicines.

4. Conclusions and recommendations

Field observation showed that vegetation of the area was generally threatened with the unwise of local communities. The biotic

and abiotic challenges such as over grazing, deforestation, unscientific extraction of natural vegetation, habitat fragmentation, an introduction of the exotic taxa and habitat loss were the visible risks. It is recommended that the local community should be educated regarding the importance, pre and post-harvest methods. In addition, they should also be trained regarding the cultivation of these highly valuable medicinal plants on commercial basis, and thereafter their trade and marketing. This will ultimately generate extra sources of income and will reduce pressure on the extraction of these valuable medicinal plants. In Dasskhirum, Chilim, Choti Deosai, Deosai, Sardar Kothi of District Astore, (Gilgit-Baltistan), the use of plant resources is also a source of income, besides fulfilling their various utilitarian needs. Settlements of majority of the population are subject to the seasonal changes in

the valley. In winter they come down to the valley bottoms due to the unavailability of fodder for their cattle, and at the onset of summer as the snow melts and new plants start sprouting, they move towards the higher altitudes. The local people are ignorant about the importance of these plants at global level. Sometimes they collect plants in excess quantity and in most cases the whole plant is uprooted. They do not know about the proper methods and time of plant collection, as a result most of their collection is useless. On the other hand they are ignorant about the drying, storing or preserving techniques, which ultimately lead to wastage of plant resource.

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