

A quantitative medico-botanical expedition of Fairy Meadows National Park, Diamir, Gilgit Baltistan, Pakistan

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Abstract

This study was conducted to investigate the ethnobotanical knowledge of the population of the Fairy Meadow National Park, Diamir, Gilgit Baltistan. The study area was previously ignored due to physical barriers, remoteness and religious extremism. The use of medicinal plants for various maladies, known to the elders of the community and passed orally to the younger generation was documented. A total of 146 informants were interviewed using semi-structured questionnaires. The data was quantitatively analyzed employing frequency of citation (FC), use value (UV), relative frequency of citation (RFC) along with Pearson correlation coefficient (PCC). A total of 90 plants species belonging to 77 genera and 49 different families have been documented. These medicinal plants were used against 55 diseases, especially stomach problems (23.3%), cough (17.7%), asthma and fever (16.6%). For 31 out of 90 plants species which had been reported either, new uses (28 plants) or new use-report (3 plants) were found. New reported medicinal plants include *Allium gilgitensis*, *Astragalus gilgitensis* and *Pedicularia flava*. The majority of the documented plants were wild collected (86%), herbs (60%), and leaves were the most widely used part (27%). The common method of preparation was powder (27%) mainly administered orally (81.7%). The highest use values were found for *Berberis lyceum* (5.47), *Thymus linearis* (5.07) and *Rhododendron anthopogon* (5.0), while the plants with greater relative frequency of citation were *Berberis lyceum* (0.97), *Thymus linearis* (0.89) and *Rhododendron anthopogon* (0.75). The Pearson correlation coefficient is 0.836 between RFC and UV showing high positive association. This study was an extension to the ethnobotanical work done in Pakistan previously. We documented a wealth of traditional knowledge, and could record the uses of various species for the first time from Pakistan. The new use reports and new

plants reported supplement the foundation of pharmacology and new drug development for complex and challenging disease.

Keywords: Ethnobotany, Medicinal Plants, Ethnic Groups, Fairy Meadow, Diamir, Gilgit Baltistan.

Introduction

The concept of ethnobotany was introduced by US botanist John Harshberger in 1896 [1] and attempts to gather, evaluate and analyze plant traditional use information possessed by the population of a certain area [2]. Traditional plant use is a millennial practice focusing on useful plants for the welfare of people including food, treatment against diseases and monetary elevation of society [3, 4]. Members of remote and traditional societies are often well versed in plants knowledge, and the therapeutic qualities of plants, using about 400–600 plants ethnomedicinally in Pakistan [1, 5-7]. Ethnobotanical knowledge mainly is transferred orally from generation to generation over time and has advanced in a multidisciplinary way into a specific discipline manifesting people–plant relationship [8]. Tribal people harbor rich data about the utilization of plants or plant parts as medicine [9].

The high elevation ecosystems of the Himalayas are regarded as hotspot for researchers exploring and documenting ethnobotanical treasures including direct financial benefits rendered to the local community as well as a source of medicine. Most of the medicinal plants documented from Pakistan are thought to be restricted to hilly areas [10-28].

Gilgit Baltistan (GB) is a region of prominent strategic and geographic importance, forming a geo-corridor exploited at times by various forces and empires, and borders contemporary powers

like China, Russia and India. Gilgit Baltistan has an extraordinarily varied landscape, due to the fact that here three famous mountainous ranges, including Himalayas, Karakoram and Hindu Kush meet. Few ethnobotanical studies were conducted in the neighboring parts of these ranges [29]. Fairy Meadow was constantly ignored because of its remoteness, difficult geology, high elevation, and strict social and religious bans for outsiders. The local population gives much significance to plants for their livelihood and medicinal purposes, and thus there was an urgent need to document the medicinal flora and associated traditional knowledge of this area. Such ethnobotanical inventories can provide the starting point for the development of new drugs [30-32]. This study constitutes the first endeavor to explore the study area ethnobotanically with focus on medicinal plants.

Materials and methods

The present study was carried out during June 2015 to September 2016. In this period the study area was visited several times according to the availability of the medicinal flora.

Study area

The study area is a natural alpine meadow at the base of Nanga Parbat, which is located at a latitude of 35°N and longitude of 74 °E. From the Karakorum Highway (KKH), this region is situated towards the south side at a short distance of 15 km, and 443 km from Islamabad, the capital of Pakistan (**Fig. 1**). The area is called “Fairy Meadow,” which originated from the German climber Willy Merkl in 1930, after his unsuccessful endeavor to achieve the summit of Nanga Parbat [33]. However, the local name is “Fantori,” which means “the place where moustaches bearing people live.” Fairy Meadow is popular for its lofty magnificence and is the heart of the northern region of Pakistan. It is also called “Paradise on Earth” because of the incomparable beauty it possesses. The area has been a major attraction for nature lovers as well as researchers, climbers and photographers for a very long period. The rich and lush green forests around fairy meadows provide an excellent habitat for wildlife. Tatu, Jail, Phongtori, Fairy Meadows, Bayal Camp, Bathrait, Bezar and Veterare the main villages of the study area.

Socio-economic conditions of the area

The local community of Diamir is very poor. This is a result of the fact that Diamir is physically isolated, with narrow valleys and high peaks, forcing inhabitants to depend on local resources for food and other essential needs. The flora of the Diamir district is very diverse, with many

medicinal plants and hundreds of other economically important species. Local communities mainly depend upon wild plant resources for their variety of economic purposes. The local livelihood strategy has shifted over time from hunting to agriculture, animal husbandry, forestry, trade and tourism.

Fig. 1. Map of the study area. (A)Pakistan (B) Gilgit Baltistan (C) Diamir.

Ethnographic composition

The study area has a unique composition in terms of ethnography. Different ethnic groups are living in the area, including Sheen, Youshkon, Gujar, Dulasgar, Khelochey and Kashmiri. The dominant ethnic groups are Sheen, followed by Youshkon, Gujar, khelochey, gujar and dulasgar (Table1). All the ethnic groups have their own languages; however, the common and dominant language is Shina (100%).

Table 1

Demographic characteristics of Fairy Meadow.

Demographic feature	Criteria	Number of informants	Percentage
Gender of informants	Male	101	69.18
	Female	45	30.82
Age of informants	Less than 20	30	20.55
	Between 20 to 30	23	15.75
	Between 31 to 40	28	19.18
	Between 41 to 50	29	19.86

	Between 51 to 60	21	14.38
	Above 60	15	10.27
Marital status	Married	104	71.92
	Unmarried	25	17.12
	Widow	2	0.68
Education level	Illiterate	101	69.18
	Elementary School	25	17.12
	Secondary School	7	4.79
	College	9	6.16
	University	4	2.74
Employment Status	Farmer	97	66.44
	Retired	3	2.05
	Shepherd	33	22.6
	Others	13	8.9
Residence	Village	124	84.93
	City	22	15.07
Ethnic group	Youshkon	38	26.03
	Sheen	74	50.68
	Gujar	12	8.22
	Dulasgar	2	1.37
	Khelochey	19	13.01
	Kashmiri	1	0.68
Experience	Herbalists	2	1.37

	Local people	144	98.63
Duration of residence in the surveyed area	Less than 15 years	27	18.5
	More than 15 years	119	81.5

2.4 Ethnobotanical documentation

Different methods including semi-structured interviews, questionnaires, participant observation and walk-in-the-woods were used for the documentation of ethnobotanical data. In addition, focus group discussions were arranged to gain further information on medicinal plants knowledge of the community and authenticity of the data collected through semi-structured interviews. Interviews were conducted after obtaining oral prior informed consent from the participants. All interviews were conducted in Shina.

Plant collection and identification

Interviews and discussions were followed by a voucher specimen collection with the help field assistants. Specimens were systematically tagged, air-dried, pressed and mounted on herbarium sheets, each one labelled and voucher number allotted (**Table 2**). The botanical identification of the specimens was done by Prof. Dr. Rahmatullah Qureshi, a taxonomist at Pir Mehar Ali Shah, Arid Agriculture University Rawalpindi (PMAS AAUR), Pakistan and authenticated with the help of flora of Pakistan (www.eflora.com). The plant follows the International Plant Name Index (IPNI). The specimens were also photographed during collection in the field, shown in (**Fig. 2**) and allocated a voucher number (**Fig. 3**). The mounted specimens were deposited in the Herbarium of Department of Botany PMAS AAUR, Pakistan.

Fig. 2. Medicinal plants collected from the study area. (A) *Berberis lyceum*, (B) *Limonium cabulicum*, (C) *Pinus wallichiana*, (D) *Hippophae rhamnoides*, (E) *Rosa webbiana*, (F) *Datura stramonium*, (G) *Rheum australe* (H) *Rubus ulmifolius*

Fig. 3. Medicinal plants with voucher number. (A) *Saussurea gossypiphora*, (B) *Ephedra gerardiana*, (C) *Cichorium intybus*, (D) *Thymus linearis*, (E) *Rosa webbiana*, (F) *Capparis spinosa*, (G) *Anaphalis nepalensis* and (H) *Betula utilis*

Data management

The data recorded in the field was entered in Microsoft Excel. Data was organized in a tabulated form for presentation. The graphical representation was based on numerical data extracted.

Statistical analysis

The collected ethnomedicinal data was quantitatively analyzed using indices of relative frequency citation (RFC), use value (UV) and Pearson correlation coefficient (PCC).

Relative frequency of citation (RFC)

This index showed the local importance of each species. It is calculated using formula given by [34]:

$$RFC=FC/N$$

Where FC is the number of informants mentioning the use of the species and N is the total number of informants involved in the survey (N=146), without considering the use-categories [35].

Use value (UV)

The Use Value (UV) shows the relative importance of plants known locally. It was calculated using the formula given by [36]:

$$UV= \sum U_i/N$$

Where U_i is the total number of uses mentioned by each informant for a single species and N is the total number of informants interviewed for a given species.

Pearson correlation coefficient (PCC)

For the interpretation of collected data, Pearson Correlation Coefficient was used which is a good measure to numerically quantify the nature of the linear relationship between two variables. It is the ratio of the covariance between two variables to their standard deviations.

Ethical Approval of field Research:

This research was approved by the Advanced Study and Research Board (AS&RB) from PMAS Arid Agriculture University, Rawalpindi, Pakistan in its 45th meeting vide notification No. PMAS-AAUR/DAS/1064 dated 11 June, 2018.

Results and discussion

Ethnographic composition and ethnobotanical documentation

A total of 146 informants of different age groups were interviewed, including 101 (69.16%) men and 45 (30.82%) women. Among these, 30 (20.55%) informants were less than 20 years old, 23 (15.75%) were between 20 to 30 years, 28 (19.18%) were 31 to 40 years, 29 (19.86%) were 41 to 50 years, 21 (14.38%) were 51 to 60 years and 15 (10.27%) were above 60 years old. Among all the informants the oldest was 83 years old and the youngest 15 years old. Most of the informants 104 (71.92%) were married, 25 (17.12%) were unmarried, and 2 (0.68%) were widowed. Out of 146 informants, 101 (70.55%) were illiterate and the rest literate. It was observed that 97 (66.44%) informants were farmers, followed by 3 (2.05%) retired from government jobs, 33 (22.6%) were shepherds and 15 (8.9%) followed other occupations. A majority of 124 (84.93%) of the informants were residing in villages, and only a few (15, 22.07%) in cities. One-hundred-and-nineteen (81.5%) informants had been residing in the surveyed area for more than 15 years, and 27 (18.5%) less than 15 years. The study area has six ethnic groups. Among these, Sheen were in majority 74 (50.68%), followed by Youshkon 38 (26.03%), Khelochay 19 (13.01%), 12 (8.22%) gujars, 2 (1.37%) Dulasgar and 1 (0.68%) Kashmiri. Details on informant composition are given in **Table 1**. The primary local language spoken in the area is Shina (100% of the population) while the other locally known languages include Khilocha, Gujriya, Kashmiri and Dulasgariya.

During the fieldwork it became apparent that the local people self-medicated in case of any disease. Only in case of failure of home remedies, they consulted herbalists, and 2 (1.37%) of the total informants accessed modern health facilities [37].

Medicinal plants diversity and ethnobotanical enrichment

A total of 90 plant species belonging to 77 genera and 49 different families were reported in this study (**Table 2**). The dominant plant families were Asteraceae represented by 9 plant species (10 %) followed by Polygonaceae and Rosaceae with 8 plant species each (8.88 %), Pinaceae and Scrophulariaceae with 4 species each (4.44 %), Apiaceae, Fabaceae and Ranunculaceae with 3 species each (3.33 %), while rest of the families were represented by less than 3 species each (**Fig. 4**). The large number of medicinal plants in Asteraceae in this study agree with a previous study in a neighboring district Skardu [38] and coincide with the findings of [37] and [39]. Eleven different use categories were mentioned by the informants. Among the use categories, medicinal use was highest (**Fig.5**). The dominant life form used was herbs (60%), followed by trees (26%), shrubs (13%), and woody climbers (1%) (**Fig. 6**). These results are in correspondence with a previous ethnobotanical study in India [37]. Most of the ethnomedicinally important plants were wild collected (81%), and the remaining 19% cultivated. The majority of the plants were only used medicinally, but 28 species were used both medicinally and for other purposes in the study area. The most used parts were leaf (27%), followed by fruit (19%), root (16%), stem (12%), bark (8%), flower (6%), whole plant (5%), gum (3%), seed (2%), cone and latex were used rarely (1%) (**Fig. 7**). These results correlate clearly with a previous study in Gilgit Baltistan [38]. Various forms of herbal preparations were used in the study area, the most common preparation methods were powder (27%), decoction (16%), direct use (13%), juice (11%), extract and paste (8%) each, infusion (5%), poultice (4%) saag and smoke/fragrance (3%) each and ash (2%) (**Fig. 8**). These results closely resemble with the studies conducted in different parts of the world where leaves stood out as the used part [40-43]. The reason behind the excessive medicinal uses of leaves is easy collection, as compared to other parts [40]. In

addition, leaves often carry a high variety of different metabolites [44]. The reported plant species were used as herbal medicines for the treatment of 55 different health disorders. Most common diseases treated are stomach problems, cough, asthma, and fever. Details are shown in **(Fig. 9)**. The common route of administration was oral (81.7%), followed by external (8.7%), topical (7.7%) and inhalation (1.9%) **(Fig. 10)**. These findings are contrary to the results of [45]. These similarities and differences may correspond to the cultural similarities and differences leading to the plant part use or purpose of use difference.

Fig. 4. Dominant families in study area

229 **Table 2**

230 Medicinal Plants with botanical name, voucher number, family, local name, habit, part used, medicinal uses, UV, FC, RFC, mode of utilization,
231 administration route and comparison with previous ethnobotanical data.

232

Scientific name Voucher number	Family	Local name	Habit	Part used	Medicinal uses	UV	FC	RFC	Mode of use	Administration	Comparison with previous ethnobotanical data
<i>Allium cepa</i> L. RW-647	Alliaceae	Paloan/ Kasho	H	L, St	Diarrhea, increases blood pressure, spice, salad.	0.8	25	0.17	J, Di	Or	1●2●3●4■5●6●7 ●8●9■10●11●12 ●13●14●
<i>Allium gilgiticum</i> L. RW-648	Alliaceae	Khatpa	H	S	Pain, headache, vegetable, forage.	0.66	39	0.26	Sa	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Pistacia khinjuk</i> L. RW-698	Anacardiaceae	Khakao	T	G, F	Cough, asthma, gum used to remove phlem, gum smoke eye problems, hair removing and broken pots, forage,	1.1	41	0.28	Po, P	Or	1●2●3■4■5●6■7 ■8●9●10●11■12 ●13■14●

					Wood sold as fuel wood.						
<i>Bunium persicum</i> (Boiss) B. Fedtsch. RW-660	Apiaceae	Hayao	H	F	Pneumonia, digestive, Spice, aromatic, appetite stimulant, herbal tea, cough, stomachic, fever, headache, forage, high market price.	3.5	90	0.61	Po, Di	Or	1●2□3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Heracleum</i> <i>candicans</i> Wall. ex DC. RW-680	Apiaceae	Polia	H	L, R	Forage, backbone ache, stomachic, digestive, healing purpose.	1.8	35	0.23	Di, Po	To/Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13■14●
<i>Pimpinella</i> <i>diversifolia</i> DC. .RW-700	Apiaceae	Choro	H	R	Intestinal worms, asthma, reduce blood thickness, stomachic, used to enhance digestion, forage.	2.4	69	0.47	Po	Or	1●2●3●4●5●6●7 ●8●9●10■11●12 ●13●14●
<i>Asparagus</i> <i>officinalis</i> L. RW-653	Asparagaceae	Sharkachey	H	St	Anti-inflammatory, diabetes, anti-oxidant, digestive, anti- cancer, maintains blood glucose level, forage.	0.42	33	0.22	Di, po	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Anacyclus</i>	Asteraceae	Peli ponar	H	Wp	Sore throat, eye wash,	0.33	12	0.08	De,	E/Or	1●2●3●4●5●6●7

<i>pyrethrum</i> L. RW-649					toothache and forage.				Po		●8●9●10●11●12 ●13●14●
<i>Anaphalis nepalensis</i> (Spreng) Hand.-Mazz. RW-650	Asteraceae	Cheki ponar	H	F	Stomachic, aromatic, forage.	0.57	11	0.07	Fu, Po	Or	1●2■3●4●5●6●7 ●8■9●10●11●12 ●13●14●
<i>Artemisia glacialis</i> L. RW-651	Asteraceae	Nerlay zoon	Sh	L	Diarrhea, nausea, intestinal worms, helpful in pregnancy.	1.66	32	0.21	J	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Artemisia maritima</i> L. RW-652	Asteraceae	Zoon	Sh	L	Diarrhea, nausea, fever, Asthma, headache, stomachic, forage, thatching.	3.37	50	0.34	J	Or	1□2●3□4□5□6●7 ●8□ 9●10●11●12■13 ●14□
<i>Aster himalaicus</i> C. B. Clarke RW-654	Asteraceae	Zooti ponar	H	F	Stomachic, aromatic, forage.	0.42	5	0.03	Fu, Po	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Cichorium intybus</i> L.	Asteraceae	Cheti char	H	Wp	Healing of wounds, remove dead cells from wounds,	1.14	29	0.19	Ex	E	1■2●3■4■5■6■7 ■8●9●10●11■12

RW-665					bowlspace is also applied to cure boil, forage.						●13■14●
<i>Echinops echinatus</i> Roxb. RW-669	Asteraceae	Janchey	H	Wp	Stomachic, cough, Arthritis, analgesic, antibacterial, antioxidant, diuretic, forage.	1	17	0.11	De, Ex	Or	1□2●3●4□5●6□7 ■8□9●10●11●12 ●13●14●
<i>Gnaphalium</i> sSpp. RW-679	Asteraceae	Unknown	H	L	Constipation, menses, sciatica, forage.	0.42	15	0.10	Di	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Saussurea gossypiphora</i> D. Don RW-721	Asteraceae	Bushi Ponar	H	F	Asthma, pneumonia, stomach problem, flue, headache, improve circulation, menstrual cycle, discord umbilical cord.	4	77	0.52	Po, In	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Xanthium strumarium</i> L. RW-733	Asteraceae	Dadi poshy char	H	L,St	Swelling, boils.	0.87	15	0.10	P	To	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Berberis lycium</i> Royle RW-656	Berberidaceae	Chorko	Sh	Wp	Bone fracture, pneumonia, headache, stomachic, arthritis, wound healing,	5.47	141	0.96	Po, Pa, De	To/Or	1□2□3□4□5□6■7 ■8□9■10●11□12 ●13●14□

					delivery, forage, economic.						
<i>Betula utilis</i> D. Don RW-658	Betulaceae	Jonji	T	B, St	Religious, spiritual, bark smoke used for removal of placenta after delivery, storage of butter, Thatching, pot making, wood and bark sold in market with high price	1.87	108	0.73	De, Fu	In	1●2□3□4■5●6□7 ■8●9●10□11□12 □13●14●
<i>Onosma hispida</i> Wall. ex G. Don. RW-692	Boraginaceae	Sharong	H	R, L	Throat infection, menses, stomachic, general pain in body, asthma, hair and face coloring, lipstick, forage.	1.75	35	0.23	De	E/Or	1●2●3●4■5●6●7 ●8●9●10●11●12 ■13●14●
<i>Capparis spinosa</i> Juss. RW-661	Capparidaceae	Loi margan	Sh	F, R	Sciatica, rheumatism, backache, diuretic, anti- dandruff, arthritis.	0.42	17	0.11	Di	Or	1●2●3□4■5□6□7 ■8●9■10□11■12 ●13■14□
<i>Silene vulgaris</i> (Moench) Garcke /RW-723	Caryophyllaceae	Unknown	H	L	Cattle forage, intestinal worms, kidney problem.	0.14	13	0.08	Di	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Chenopodium</i>	Chenopodiaceae	Kunaw	H	S	Constipation, forage.	0.37	9	0.06	Sa	Or	1●2●3●4■5□6■7

<i>album</i> L. RW-663											■8●9●10●11□12 ●13■14■
<i>Hylotelephium ewersi</i> (Ledeb.) H. Ohba RW-722	Crassulaceae	Teetar	H	Wp	Constipation, Stomachic.	2	80	0.54	Po	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Juniperus communis</i> L. RW-684	Cupressaceae	Muthari	T	F, st, L	Cold, fever, ash for snuff, roots for stitching of wooden pots, bone fracture, thatching.	1.8	21	0.14	Po, As	Or	1●2■3■4■5●6●7 ●8●9●10■11●12 ●13●14■
<i>Juniperus excelsa</i> M. Bieb. RW-685	Cupressaceae	Chilli	T	F,L, B, St	Berries for diabetes, tuberculosis, Smoke for bad evils, rheumatism, burns, cold fever, arthritis, typhoid fever, wound healing, leaves ash snuff, kidney stone, thatching, fuel, furniture, berries have high market value.	3.07	59	0.40	Pa, Fu	To/Or	1□2●3□4□5●6■7 ■8□9●10□11□12 ●13□14□
<i>Elaeagnus</i>	Elaeagnaceae	Suzoon	T	Fl, F	Cough, cold, asthma, fever,	1.5	31	0.21	Di	Or	1□2●3■4■5■6□7

<i>angustifolia</i> L. RW-670					mental relaxation, fragrant, joshanda.						■8□9●10■11■12 ●13●14□
<i>Hippophae rhamnoides</i> (L.) A. Nelson RW-681	Elaeagnaceae	Buro	Sh	F, L	Anti-cancer, cough, skin care, headache, congestion of bronchi, anti-bacterial and viral, antioxidant, tseeds have high market price, fence.	5	65	0.44	De, Po, In, Pa	To/Or	1□2□3□4□5■6■7 ■8□9■10□11■12 □13□14□
<i>Ephedra gerardiana</i> Wall. ex Stapf RW-671	Ephedraceae	Soontal	Sh	S	Cigarette, cough, cold, flue, nose treatment and in joshanda.	0.28	27	0.18	De, Po	Or	1□2●3●4□5■6■7 □8■9■10□11□12 ■13■14□
<i>Equisetum hyemale</i> L. RW-672	Equisitaceae	Cheyao	H	S	Kidney problems, skin and mouth dryness, forage.	0.87	37	0.25	J	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Astragalus gilgitensis</i> Ali RW-655	Fabaceae	Khukunay	H	F	Digestive, Forage.	0.3	34	0.23	Di	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Cicer microphyllum</i> L.	Fabaceae	Aseel Khukunay	H	F	Forage.	0.85	21	0.14	Di	Or	1●2●3●4●5●6●7 ●8●9●10●11●12

RW-664											●13●14●
<i>Medicago sativa</i> L. RW-688	Fabaceae	Rishka/Ishpit	H	S	lactagogue, saag, fodder and forage.	1	33	0.22	Sa	Or	1●2●3●4■5●6●7 ●8■9●10●11□12 ●13●14■
<i>Quercus incana</i> Bartra mRW-709	Fagaceae	Bani	T	St, L,R	Furniture, cattle forage, fuel wood, thatching, wood is sold in market as fuel and timber wood.	0.14	35	0.23	Di	Or	1●2●3●4●5●6●7 ●8● 9●10●11●12●13 ●14●
<i>Gentiana kurroo</i> Royle RW-677	Gentianaceae	Cheti char	H	S, L, F	Healing, removal of dead cells, boils, headache, cold, fever, malaria, forage.	1.6	50	0.34	Pa, J	E/Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Swertia marginata</i> Royle. RW-726	Gentianaceae	Bangra	H	L	Stomachic, Cancer, fever, diuretic, smoking, forage.	0.42	10	0.06	Po	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13■14●
<i>Geranium pratense</i> L. RW-678	Geraniaceae	Garoo/ratanj ok	H	R	After delivery to reduce abdominal pain, backache, forage and milk production in cattle.	0.6	31	0.21	Po	Or	1●2●3●4□5●6●7 ●8●9●10●11●12 ●13●14●
<i>Ribes alpestre</i>	Grossulariaceae	Mayar	Sh	F	Fever, burns, blisters, coolant	0.37	23	0.15	J	Or	1●2●3■4●5●6●7

Wall.ex. Decne. RW-713		shatoo/Shato o			and forage.						●8●9●10■11■12 ●13●14●
<i>Juglans regia</i> L. RW-683	Juglandaceae	Ashoe	T	B, L, F	Cardiac, Brain tonic, bark for maswak, flesh of fresh fruit as coloring agent, leaves insect repellent, cooking oil, fruit have high market value.	2	61	0.41	De, Di	Or	1●2●3□4●5□6□7 ■8●9●10■11■12 ●13●14●
<i>Mentha longifolia</i> (L.) L. RW-689	Labiataee	Phileel	H	L	Tooth ache, nausea, cough, fever, diarrhea, intestinal worms, blood purifier, used for blood reduction, healing of wounds.	3.71	64	0.43	Pa, Di, Po	Or	1□2□3●4□5□6●7 ●8□9●10●11■12 ●13●14●
<i>Thymus linearis</i> L. RW-727	Labiataee	Tomurom	Sh	L	Oxygenation, flue, stomachic, cough, headache, fever, pneumonia, blood purifier, against obesity, weakness.	5.06	130	0.89	De	Or	1●2□3●4□5●6●7 ●8●9●10●11□12 ●13□14●
<i>Isodon rugosus</i> (Wall. ex. Benth)	Lamiaceae	Burdal	H	L	Eye problem, malaria, forage.	1.11	31	0.21	Ex	Or	1●2●3●4●5●6●7 ●8●9●10■11■12

Codd) RW-682											●13●14●
<i>Ficus carica</i> L. RW-673	Moraceae	Angrezi phang	T	F, La	Kidney stone, blood purifier, asthma, obstruction in liver and spleen, latex used for blisters, healing, fruit sold in local market as a asource of income.	1.12	43	0.29	Di	Or	1●2●3●4■5□6□7 □8■9●10■11●12 ●13●14●
<i>Ficus palmata</i> L. RW-674	Moraceae	Phang	T	F, La	Asthma, Obstruction in liver and spleen, latex used for blisters and healing	1.3	40	0.27	Di	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Morus alba</i> L. RW-690	Moraceae	Peban maroch/sho maroch	T	F	Cough and facial dropsy, throat infection, memory enhancer, jaundice, fruit have high market price.	1.45	54	0.36	J, Po	Or	1●2●3□4□5□6□7 □8●9●10■11●12 ●13●14●
<i>Morus nigra</i> L. RW-691	Moraceae	Kinay maroch	T	F	Jaundice, sore throat, cough, fodder, economic, fruit and wood have market price, forage.	0.57	25	0.17	Di, J, Po	Or	1●2●3●4□5□6□7 □8●9●10●11●12 ●13●14●

<i>Rhododendron anthopogon</i> D. Don RW-712	Oleaceae	Susar	Sh	L	Backbone ache, better after delivery, pneumonia, flue, asthma, joint ache, milk production and blood purifier, dizziness.	5	109	0.74	De, Po	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13□14●
<i>Pedicularis pectinata</i> Wall. ex Benn. RW-696	Orobanchaceae	Unknown	H	L	Stomachic, cardiac, forage.	0.12	31	0.21	Di	Or	1●2●3●4●5●6● 7●8●9●10● 11●12●13●14●
<i>Cedrus deodara</i> (Roxb. ex D. Don) G. Don. RW-662	Pinaceae	Phuloosh	T	St, R, B	Wood extract for external parasites and skin diseases of goat, intestinal worms, gum for asthma, remove pubic hair and welding of broken pots, wood is sold in market as timber and fuel wood with high prices.	1.44	40	0.27	Ex	Or	1●2●3●4●5●6□7 ■8●9●10●11●12 ●13●14●
<i>Picea smithiana</i> (Wall.) Boiss.	Pinaceae	Kachal	T	G	Asthma, diarrhea, tuberculosis, diabetes, gum	1.66	40	0.27	P	EOr	1●2●3●4●5●6●7 ●8●9●10●11●12

RW-699					used to repair broken pots, hair removing.						●13●14●
<i>Pinus gerardiana</i> Wall. ex D. Don nRW-701	Pinaceae	Chalgoza/tho lesh	T	F, G, Co	Fruit for headache, , cone ash detergent, fodder, fuel, furniture, hair removing, wood and fruit have high market value.	1.33	63	0.43	As, Di	Or/E	1●2●3●4■5●6●7 ●8●9●10■11●12 ●13●14●
<i>Pinus wallichiana</i> A. B. Jacks RW-702	Pinaceae	Chee	T	G	Heart attack, gum used to cure wound in kidney, stomach and urinary bladder, bronchial congestion, asthma, removal of pubic hair, wood sold in market as timber wood.	1.8	37	0.25	P	To/Or	1●2●3■4●5●6●7 ●8●9●10■11●12 ●13●14●
<i>Plantago lanceolatae</i> L. RW-703	Plantaginaceae	khapoy patey	H	L	Stops bleeding from nose, animal graze.	1.6	15	0.10	Pa	Or	1●2●3●4●5● 6● 7● 8● 9● 10● 11● 12●13■ 14●
<i>Limonium cabulicum</i>	Plumbaginaceae	Hazrat Daroo	H	Wp	Asthma, pneumonia, tuberculosis, bleeding from	2.66	47	0.32	Po	Or	1●2●3●4●5●6●7 ●8●9●10●11●12

(Boiss.) Kuntze RW-686					gums, piles, thought to be used for thousand diseases, forage.						●13●14●
<i>Zea mays</i> L. RW-734	Poaceae	Makaey	H	F	Paste applied on swelling parts, blisters, as food, fodder, high market price.	1.37	39	0.26	Po/Pa	Or	1●2●3●4●5●6●7 ●8● 9●10●11●12●13 ●14●
<i>Bistorta amplexicaulis</i> (D. Don) Greene RW-697	Polygonaceae	Shey lamay	H	R	Backache, stomachic, lactagogue in cattle, thatching, forage.	1.5	56	0.38	Po	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13■14●
<i>Bistorta vivipara</i> L. RW-659	Polygonaceae	Chenga	H	F, R	Fruit edible, throat infection, root for piles, forage.	0.71	29	0.19	Di, Ex	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Oxyria digyna</i> (L.) Hill RW-693	Polygonaceae	Nerlay Churki	H	L	Cattle fodder, used for better digestion.	0.22	21	0.14	Di	Or	1●2●3●4■5●6●7 ●8●9■10●11●12 ●13■14●
<i>Persicaria affinis</i> D. Don	Polygonaceae	Shoni chenga	H	R	Fever, forage, thatching.	0.28	16	0.10	Ex	Or	1●2●3●4■5●6● 7●8●9●10●11●

RW-704											12●13●14●
<i>Rheum australe</i> D. Don RW-710	Polygonaceae	Margosh chontal	H	R	Intestinal worms both human and cattle, constipation, hair and cloth coloring, forage.	1.5	60	0.41	Po, De	Or/E	1●2■3●4●5●6●7 ●8●9●10●11●12 ●13■14●
<i>Rheum webbianum</i> Wall. RW-711	Polygonaceae	Chontal	H	R	Hair coloring, blood purifier, stomachic, dyspepsia, tonic for goat, sheep, forage.	0.87	17	0.11	Po, J	To/Or	1●2●3●4●5●6●7 ●8□9●10●11●12 ●13●14●
<i>Rumex hastatus</i> D. Don RW-716	Polygonaceae	Chorki	H	Wp	Forage, anti-poison, used for better digestion, anti-rusting.	0.90	29	0.19	J	Or	1■2●3●4■5●6●7 ●8●9●10●11●12 ●13●14●
<i>Rumex nepalensis</i> L. RW-717	Polygonaceae	Hubabol	H	R	Healing, respiratory disorders, extract used for bile reduction, remove worms from wounded sites, cough.	2.28	47	0.32	Po, De	To/Or	1■2■3■4■5●6●7 ●8■9●10●11●12 ●13●14■
<i>Primula macrophylla</i> D. Don RW-705	Primulaceae	Mabera	H	L	Eye problem, tobacco, forage.	1.5	60	0.41	Po	Or	1●2●3●4□5●6●7 ●8●9●10●11□12 ●13●14●
<i>Adiantum</i>	Pteriudaceae	Simbul Char	H	L	Fever, diarrhea, forage.	1.25	30	0.20	Ex	Or	1●2●3●4●5●6●7

<i>raddianum</i> C. Presl IRW-646											●8●9●10●11●12 ●13●14●
<i>Punica granatum</i> L. RW-708	Punicaceae	Danoi	T	F	Exocarp for kidney stone, urinary infection, intestinal worms, cough, edible fruit, increases blood, fruit have high market value.	1.30	49	0.33	Po, di	Or	1●2●3●4□5■6■7 ■8●9■10□11■12 ●13●14●
<i>Aconitum</i> <i>heterophyllum</i> Wall. ex Royle /RW-645	Ranunculaceae	Patrees	H	R, F	Reduce bile, headache, cold fever, cleans digestive tract, forage, sold in market with high price.	3.11	79	0.54	Po	Or	1●2■3●4●5●6●7 ●8● 9●10●11●12●13 ●14●
<i>Delphinium</i> <i>brunonianum</i> Royle RW-668	Ranunculaceae	Saboonay tokay	H	F	Coolant, arthritis, asthma, backbone ache, forage.	0.2	7	0.04	De	Or	1●2●3●4□5●6●7 ●8●9■10●11●12 ●13■14●
<i>Salix tetrasperma</i> Roxb. RW-720	Ranunculaceae	Bayo	T	Wp	Anti-diarrheal, reduce tonsils, forage, maswak.	0.71	27	0.18	De	Or	1■2■3■4●5●6●7 ●8●9●10●11●12 ●13●14●

<i>Fragaria nubicola</i> (Lindl. Ex Hoof.f.) Lacaita RW-676	Rosaceae	Bursay	H	F	Wild fruit, forage	0.22	20	0.13	Di	Or	1●2■3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Malus domestica</i> Borkh. RW-687	Rosaceae	Palo	T	F	Blood purification, Edible, health tonic, fruit is being sold as source of income in market.	1.12	33	0.22	Di	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Prunus amygdalus</i> L. RW-706	Rosaceae	Badam	T	S	Kushta jaat, increases blood, eyesight, skin care, lactagogue, brain tonic, energizer, fruit have high market value.	1.21	39	0.26	Di, Po	Or	1●2●3●4●5●6●7 ●8■9●10□11●12 ●13●14●
<i>Prunus armeniaca</i> L. RW-707	Rosaceae	Joi/Jein	T	F,S	Diarrhea, cough, edible, fruit have high market value.	0.9	36	0.24	Di, J	Or	1●2●3●4■5■6●7 □8●9□10■11●12 ●13●14●
<i>Prunus persica</i> L. RW-725	Rosaceae	Aaro	T	S	Seed coat used for eye problem, fruit edible	0.33	16	0.10	SC	E	1●2●3●4●5●6●7 ●8●9●10●11●12

											●13●14●
<i>Rosa webbiana</i> Wall. RW-714	Rosaceae	Shengai	Sh	R, B, F	Reduce blood pressure, decrease extra blood, tea, edible fruit, forage, dying cloth.	1	46	0.31	De	Or	1●2●3■4■5●6●7 ●8● 9□10●11■12●13 ●14●
<i>Rubus ulmifolius</i> Schott RW-715	Rosaceae	Ounchi	H	F	Hepatitis, Edible.	0.42	10	0.06	Di	Or	1●2●3●4●5●6● 7●8●9●10● 11●12●13●14●
<i>Spiraea canesens</i> D. Don /RW-724	Rosaceae	Darai	Sh	B	Skin care, delivery, forage, making sticks.	0.6	31	0.21	P	E	1●2●3●4□5●6●7 ●8●9●10□11●12 ●13●14●
<i>Salix acmophylla</i> Boiss. RW-718	Salicaceae	Biyao	T	L	Diarrhea, sweet latex on leavereduce extra blood, pot making, thatching.	0.44	17	0.11	Ex	Or	1●2●3●45●5●6● 7●8●9●10■11●1 2●13●14●
<i>Salix alba</i> L. RW-719	Salicaceae	Machor/mori bayao	T	L, St	Leaves use as forage, persistent fever, anti- diarrheal, pot making.	1	39	0.26	J	Or	1□2■3●4■5●6●7 ●8■9●10●11●12 ●13●14●
<i>Bergenia</i> <i>stracheyi</i>	Saxifragaceae	koret/Sabsar	H	R	Tuberculosis, backache, healing, reduce infertility,	3.71	75	0.51	Po	E/Or	1●2□3■4■5●6●7 ●8□9●10●11●12

(Hook.f. & Thomson) Engl. RW-657					stomachic, diarrhea, burns, arthritis, inflammation.						●13□14●
<i>Pedicularis bicornuta</i> L. RW-694	Scrophulariaceae	Unknown	H	L	General body pain, stomachic, sedative, forage.	0.4	7	0.04	De	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Pedicularis flava</i> Pall. RW-695	Scrophulariaceae	Qaziban	H	L	Asthma, forage.	0.37	20	0.13	De	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Verbascum thapsus</i> L. RW-730	Scrophulariaceae	Tonch	H	St, L	Blood purifier or oxygenation, forage.	0.5	6	0.04	Di	Or	1●2■3■4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Datura stramonium</i> L. RW-667	Solanaceae	Tandouro	H	S, Fl, L	Anti dandruf, tooth ache, ear ache, boils, remove worms from wounded sites.	2.64	43	0.29	Po, J, Pa	Or/E	1□2●3■4□5■6●7 ●8□9●10●11●12 ●13●14□
<i>Daphne mucronata</i> Royle RW-666	Thymelaeaceae	Nick	Sh	F, L	Eye problem, toothache, break big stones.	0.8	41	0.28	Di, Ex	Or	1●2●3●4□5●6■7 ■8●9●10□11●12 ●13●14●
<i>Foeniculum</i>	Umbelliferae	Nerlay gizari	H	F	Eyesight, Aromatic,	0.62	30	0.20	De	Or	1●2●3●4●5●6□7

<i>vulgare</i> Mill. RW-675					Carminative, stomachic, digestive, forage.						□8●9□10●11●12 ●13●14●
<i>Urtica dioica</i> L. RW-729	Urticaceae	Jomi	H	L	Arthritis, swollen parts, nausea, vegetable.	1.5	35	0.23	Pa, J	Or	1●2□3■4■5●6●7 ●8●9●10●11●12 ●13●14■
<i>Viola pilosa</i> Blume /RW-731	Violaceae	Lilio	H	F, L	Cough, anti-diarrheal, fever, used for blood reduction, pneumonia, edible, asthma, constipation, stomachic, forage.	0.5	12	0.08	Po	Or	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Vitis vinifera</i> L. RW-732	Vitaceae	Kasheelzach	WC	F	Kidney stone, produce blood, constipation, cough, smoking, improve urine muscle, remove intestinal worms, hair coloration leaves use for forage, fruit has high economic value.	1.30	49	0.33	Po, J	O	1●2●3●4●5●6●7 ●8●9●10●11●12 ●13●14●
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Kunay	H	F	Pimples, menses, blood pressure, kidney stone.	0.88	31	0.21	Pa	To	1●2●3□4□5□6●7 ●8●9■10●11●12

RW-728											●13●14■
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234 L=leaf, R=root, B=bark, S=shoot, St=Stem, F=Fruit, Fl=Flower, La=latex, G=gum, Wp=whole plant, C=cone, Pa=paste, P=poultice, Po=Powder, De=Decoction,

235 In=infusion. As=ash, Fu=fume, Di=Direct, Ex=extract, Sa=saag, J=juice, Sh=shrub, H=herb, T=tree, WC=woody climber E=external, Or=oral, To=topical, In=inhalation,

236 SC= seed coat, RW=Rawalpindi, □=Reported with similar Use, ■=Reported with dissimilar use, ●=Not Reported, **FC**=Frequency of Citation, **RFC**=Relative Frequency of

237 Citation, **UV**=Use Value,**UVI**=Use Value Index.

238 1=[46]; 2=[29] 3=[47] 4=[48] 5=[49]; 6=[50];7=[51]; 8=[52]; 9=[53]; 10=[54]; 11=[17, 55]; 12=[56]; 13=[57]; 14=[58].

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242 **Fig. 5.** Use categories of plants

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244 **Fig. 6.** Dominant life forms of medicinal plants

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246 **Fig. 7.** Plant parts used in traditional medicine

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249 **Fig. 8.** Percent distribution of different herbal preparations

250

251 **Fig. 9.** Most common ailments treated with medicinal plant species

252

253

254 **Fig. 10.** Mode of administration of herbal preparations

255

256 Thirty-one out of 90 plant species were reported for the first time in this study, either with
 257 new uses (28 plants) or new report (3 plants). The newly reported medicinal plant species to
 258 the world of ethnobotany include *Allium gilgitensis*, *Astragalus gilgitensis* and *Pedicularia*
 259 *flava*. The new ethnomedicinal data was compared with the previous studies from the
 260 neighboring areas of district Diamir and other countries. A variety of studies [48]; [50]; [51];
 261 [53]; [17]; [54]; [49]; [46]; [58]; [52]; [29]; [47] indicated that 32.2% of the medicinal plants
 262 were reported for the first time from Fairy Meadow Gilgit Baltistan with similar
 263 ethnomedicinal uses as reported from other areas, whereas 57.7% medicinal plants had
 264 dissimilar uses. *Adiantum raddianum* was reported to cure scabies by [59], while the same

265 species in our study was used for fever, diarrhea, and as forage. *Anacyclus pyrethrum* species
 266 was reported from Jordan to cure colitis (colon inflammation) [60] , while in this study it was
 267 used for sore throat, eye wash, toothache and forage. Similarly, *Asparagus officinalis* was
 268 reported as used for common cold, cough, and influenza by [60], while uses in our study
 269 included anti-inflammatory, ant-diabetic, anti-oxidant, digestive, anti-cancer, maintenance of
 270 blood glucose level, and as forage. The comparative details (reported and novel uses) of all
 271 31 plants species are given in **Table 3.**

272 Table 3

273 Medicinal Plants with novel and already reported uses

Scientific Name	Novel reports	Already reported uses	References
<i>Adiantum raddianum</i>	Fever, diarrhea, forage.	Plant extract is applied on the surface of body to cure scabies.	[59] Reported from India.
<i>Allium gilgitensis</i>	Pain, headache, vegetable, forage.		
<i>Anacyclus pyrethrum</i>	Sore throat, eye wash, toothache and forage.	Stem is used to cure colitis (colon inflammation).	[60] From Jordon
<i>Artemisia glacialis</i>	Diarrhea, nausea, intestinal worms, helpful in pregnancy.	Aerial parts used as digestive	[61] From Varaita valley, Piedmont, Itlay
<i>Asparagus officinalis</i>	Anti-inflammatory, diabetes, anti-oxidant, digestive, anti-cancer, maintains blood glucose level, forage.	common cold, cough, influenza	[60] From Jordon.
<i>Aster himalaicus</i>	Stomachic, aromatic, forage.	Root decoction is used for dysentery	[62] Gilgit Baltistan, Pakistan

<i>Astragalus gilgitensis</i>	Digestive, Forage.	----	----
<i>Bistorta vivipara</i>	Fruit edible, throat infection, root for piles, forage.	Fried seeds are used in checking blood dysentery	[63]. From Nepal
<i>Cicer microphyllum</i>	Fruit edible, forage.	Whole plant is used for increasing milk production and as general tonic for cows.	[64] From Gilgit Baltistan
<i>Equisetum hyemale</i>	Kidney problems, skin and mouth dryness, forage.	Nutrients in the plant may cause skin, hair, teeth and nails to become stronger. Used as ingredient of shampoo, soap and skin care products. Also, used to boost milk production in cow.	Telkes, 2011. From America
<i>Ficus palmata</i>	Asthma, Obstruction in liver and spleen, latex used for blisters and healing	Fruit edible, leaves as fodder and wood used for fuel, fruit paste used in ringworm and skin diseases.	[65]. [66]. [67]. From Nepal.

		The fruit is demulcent, emollient, laxative and poultice. It is used as a part of the diet in the treatment of constipation and diseases of the lungs and bladder. The latex of the plant is used to take out spines lodged deeply in the flesh.	[68]. From Pakistan
		Latex is applied to heal wounds and cuts	[69]. From India
<i>Gentiana kurroo</i>	Healing of wounds, removal of dead cells, boils, headache, cold, fever, malaria, forage.	Roots are dried to make powder and taken along desi ghee for Stomachache.	[70]. Pakistan
		Skin disease, leprosy, leucoderma, constipation	[62]. Gilgit Baltistan, Pakistan
<i>Geranium pratense</i>	After delivery to reduce abdominal pain, backache, forage and milk	These plants are used for internal and external wounds, swellings,	[64]. From Gilgit Baltistan

	production in cattle.	inflammations, tumors, bleeding, uterus problems and nerve problems.	
<i>Gnaphalium spp.</i>	Constipation, menses, sciatica, forage.	Aerial parts used for hypertension and ulcers.	[71]. From China
<i>Hylotelephium ewersi</i>	Constipation, Stomachic.	Aerial parts used as appetizer	[57]. Gilgit Baltistan, Pakistan
<i>Limonium cabulicum</i>	Asthma, pneumonia, tuberculosis, bleeding from gums, piles, thought to be used for thousand diseases, forage.	Fresh leaves boiled in water containing sugar and used as tea.	[72]. Thakht-e-Sulaiman Hills, North-West Pakistan
<i>Malus domestica</i>	Blood purification, Edible, health tonic, financially important as fruit sold in market.	Decoction with <i>Ficus carica</i> pseudofruits, aerial parts of <i>Malva sylvestris</i> and <i>Verbascum thapsus</i> leaves used as antitussive.	[73]. From Italy.
		Tea for common cold and cough.	[74]. From Bosnia

<i>Pedicularis bicornata</i>	General body pain, stomachic, sedative, forage.	Leaf juice used to stop bleeding of cuts.	[69]. From India
<i>Pedicularis flava</i>	Asthma, forage.	----	----
<i>Pedicularis pectinate</i>	Stomachic, cardiac, forage.	Pounded leaves are given for haemoptysis.	[75]. From North Kashmir
<i>Picea smithiana</i>	Gum is used for Asthma, diarrhea, tuberculosis, diabetes, join broken pots, hair removing.	Resin is used for joining different things as well as used for heart problems. Wood is a chief source of timber and fuel	[54]. From Gilgit Baltistan
<i>Prunus persica</i>	Seed coat used for eye problem, fruit edible	The dried fruits and ginger are crushed into powder. This powder is mixed with honey and eaten for body cooling and diabetes. The resin is boiled in water, cool down and used for earache and deafness.	[68]. From Pakistan

		Seed oil used in massage for warmth during extreme cold season.	[69]. From India
<i>Quercus incana</i>	Furniture, cattle forage, fuel wood, thatching, wood/timber sold in market.	Fruits is used as astringent, diuretic, diarrhea and asthma.	[68]. From Pakistan
<i>Rheum webbianum</i>	Hair coloring, blood purifier, stomachic, dyspepsia, tonic for goat, sheep, forage.	Roots crushed, and paste applied on wounds and cuts	Nautiyal et al., 2008. From India
<i>Rubus ulmifolius</i>	Hepatitis, Edible.	Fruits are edible and carminative. Unripe fruit are used as tonic and aphrodisiac. Roots and leaves are used for the treatment f skin diseases.	[69]. From Pakistan
<i>Saussurea gossypiphora</i>	Asthma, pneumonia, stomach problem, flue, headache, improve circulation, menstrual cycle, decoction used to expelumbilical cord easily.	Flower is used for fever	[76]. From India

<i>Silene vulgaris</i>	Cattle forage, intestinal worms, kidney problem.	Aerial parts used for female disorders.	[74]. From Bosnia
		Leaves juice used as Ophthalmia, stomachic, emollient.	[62]. Gilgit Baltistan, Pakistan
<i>Viola pilosa</i>	Cough, anti-diarrheal, fever, maintains the blood in body in normal range, pneumonia, edible, asthma, constipation, stomachic, forage.	Used as expectorant.	[74]. From Bosnia.
		Fresh flowers are boiled in water and decoction is prepared. The decoction is used as tea to cure fever, cough and cold.	[77]. Western Himalaya, Chota Bangal
<i>Vitis vinifera</i>	Kidney stone, produce blood, constipation, cough, smoking, improve urine muscle, remove intestinal worms, hair coloration leaves use for forage, fruit is sold in market for financial aid.	General weakness. Fruit is used for abdominal inflammation.	[60] From Jordon.
		Tea for blood purification, renal and bladder ailments.	[74]. From Bosnia

<i>Xanthium stramonium</i>	Swelling, boils.	Fruit is demulcent and cooling, used in small pox. Leaves decoction is recommended in long standing malarial fever. An infusion of the plant has been used in the treatment of rheumatism, diseased kidneys and tuberculosis. A decoction of the root has been used in the treatment of high fevers and to help a woman expel the afterbirth. A decoction of the seeds has been used in the treatment of bladder complaints. A poultice of the powdered seed has been applied as a salve on open sores.	[68]. From Pakistan
<i>Zea mays</i>	Paste applied on swelling parts, blisters, as food, fodder, economic	Tea for blood purification, renal and bladder ailments	[74]. From Bosnia

		Maize is the second chief source of food and straw and its grain is also used medicinally for dysentery, jaundice and cough problems.	[54]. From Gilgit Baltistan	274
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Quantitative analysis of the data

Use value

Quantitative data about the use value of medicinally important plants were obtained calculating the relative importance of these species in the community. The use values ranged from 5.473 for *Berberis lyceum* to 0.125 for *Pedicularis pectinata*. The use values of the remaining plants were distributed between these two extreme values. Details of all the medicinal plants along with use values are given in **Table 2**. The higher use values might be attributed to the common distribution of medicinal plants and their use awareness of the inhabitants [55] [42].

Relative frequency of citation

Relative frequency of citation indicates the local importance of each species with reference to informants who mentioned these medicinal plant species. The RFC values of all 90 plant species varied from 0.96 for *Berberis lyceum* to 0.03 for *Aster himalaicus* (**Fig. 11 Table 2**).

Fig. 11. Relative Frequency of Citation of different plants

The comparatively higher RFC values may be due to easy availability of the respective plant, wide range of distribution, and frequent/multiple uses. The current results were in contradiction to [78] for most of the plant species in common. The contradiction can be attributed to the developmental difference of the study areas and cultural differences. The medicinal plants with high RFC might be interesting for pharmacological, biological evaluation for the validation of traditional knowledge [79]. Based upon the results, the interesting medicinal plants might be subjected to phytochemical screening in the quest of new drugs candidates.

Fig. 12. Association between Relative Frequency of Citation and Use Value

Pearson correlation coefficient

The Pearson Correlation Coefficient is used to find out the nature of linear relationship between RFC and UV and its numerical value was found to be 0.836 (at P-value <1%). This relationship provides evidence of positive significant association between the local importance of each species and the relative importance of plants use. It reflects that greater the use of the species by the informants tends to increase the number of usable medicinal flora. If patterns across species were matching RFC and UV were positively correlated. However, the values of RFC and UV across some species were different. This variation across species was numerically calculated by r^2 , where by 70 % variations in RFC can be elaborated by that of UV. Thus, results suggest evincing strength among these two indices (**Table 4**). These results are further aided by a graph drawn in the shape of scattered plot giving positive relationship between RFC and UV (**Fig. 12**).

Table 4. Summary Stats for Relative Frequency of Citation (RFC) and Use Value (UV)

	Mean	SD	Min	Max
RFC	0.267	0.1792	0.0342	0.965
UV	1.384	1.208	0.125	5.47
Association between RFC and UV by Using Pearson Correlation Method				
R	0.836			
r²	0.699			

SD =Standard Deviation, Min =Minimum, Max =Maximum

Conclusions

This study was a challenging adventure documenting valuable traditional knowledge left ignored by previous studies. The results obtained included new use reports for many plants and 3 new medicinal plants reported for the first time documented from Pakistan. This indicated that further studies are clearly needed. Further, the findings of this study can broaden the foundation of herbal medicines as well as pharmacology, pharmacy, phytochemistry inviting experimental studies for the validation of traditional and isolation of compounds of therapeutic importance for the development of new drugs against challenging and complex diseases like cancer.

ACKNOWLEDGMENT

The authors gratefully acknowledge local community of the study area for sharing their traditional medicinal knowledge.

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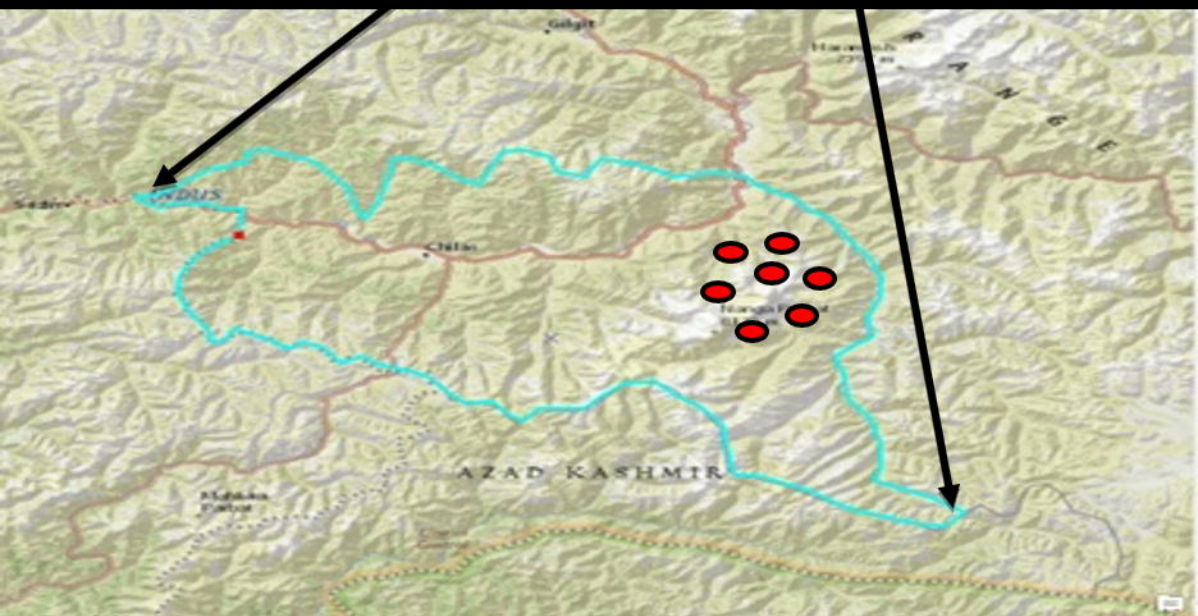
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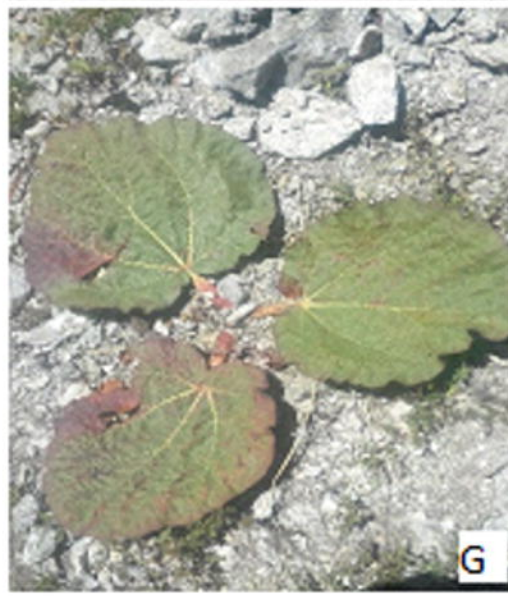
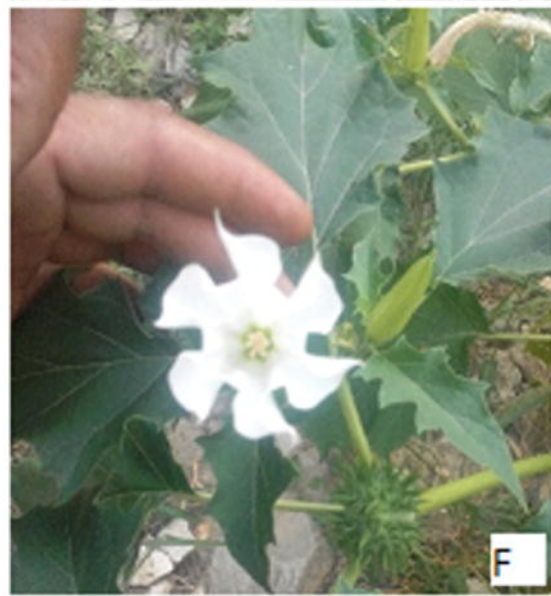
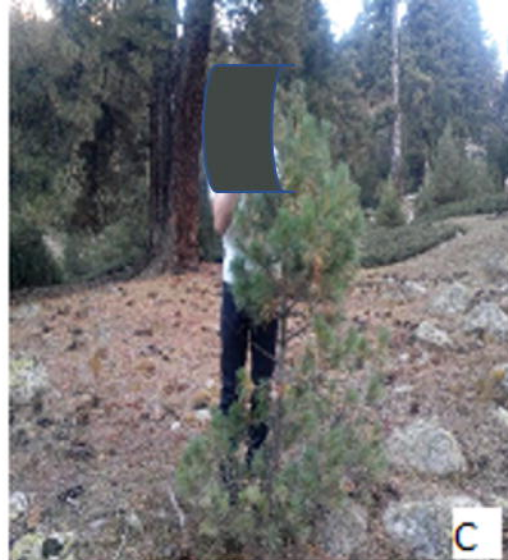
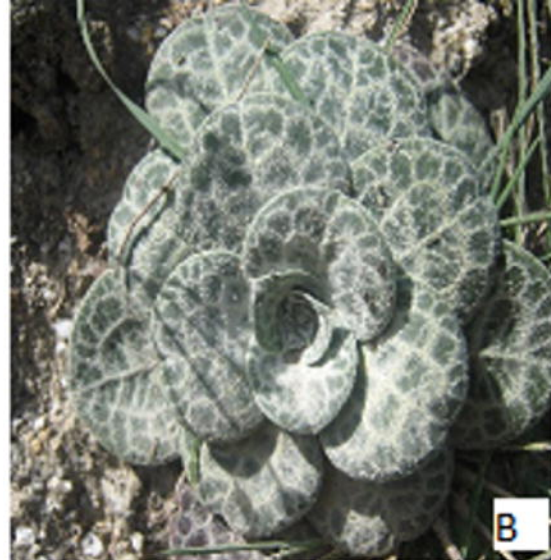
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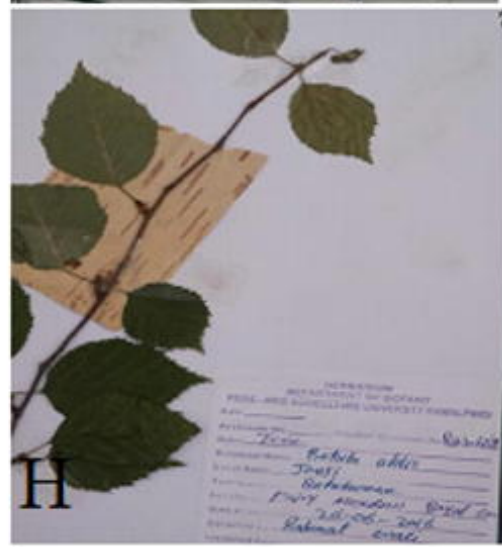
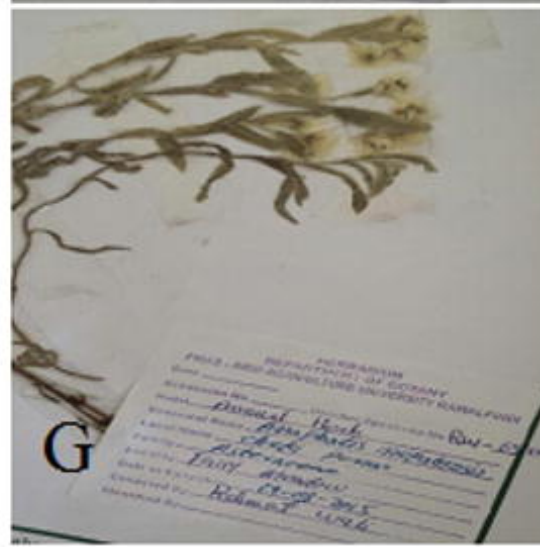
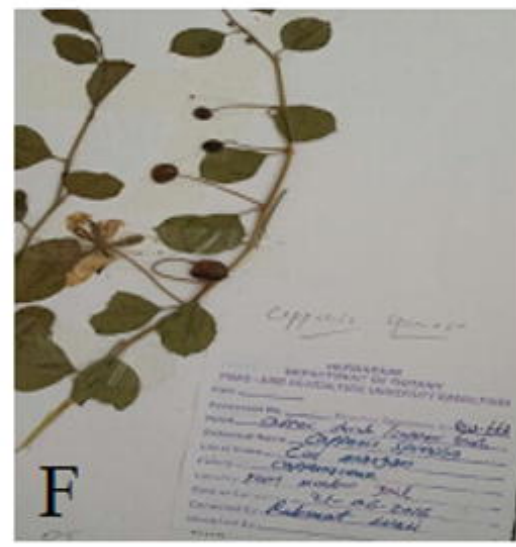
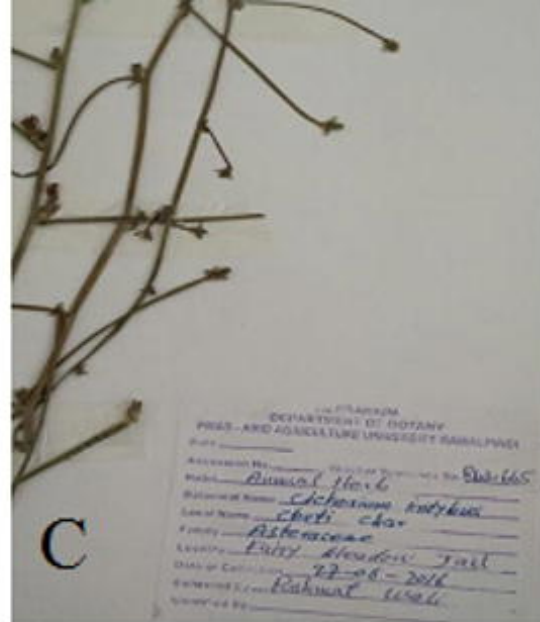
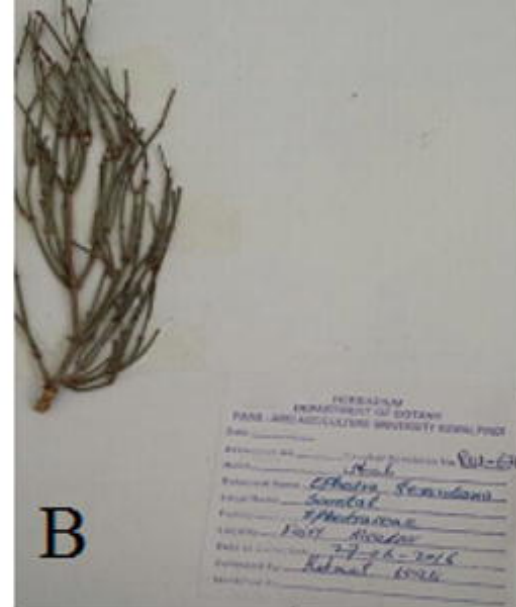
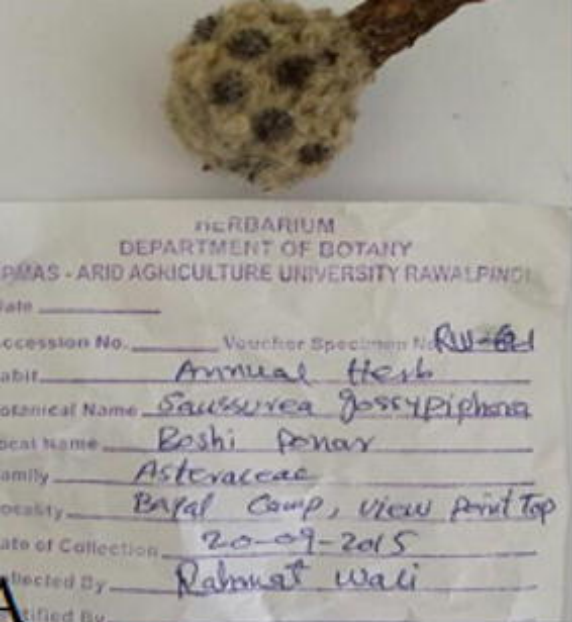
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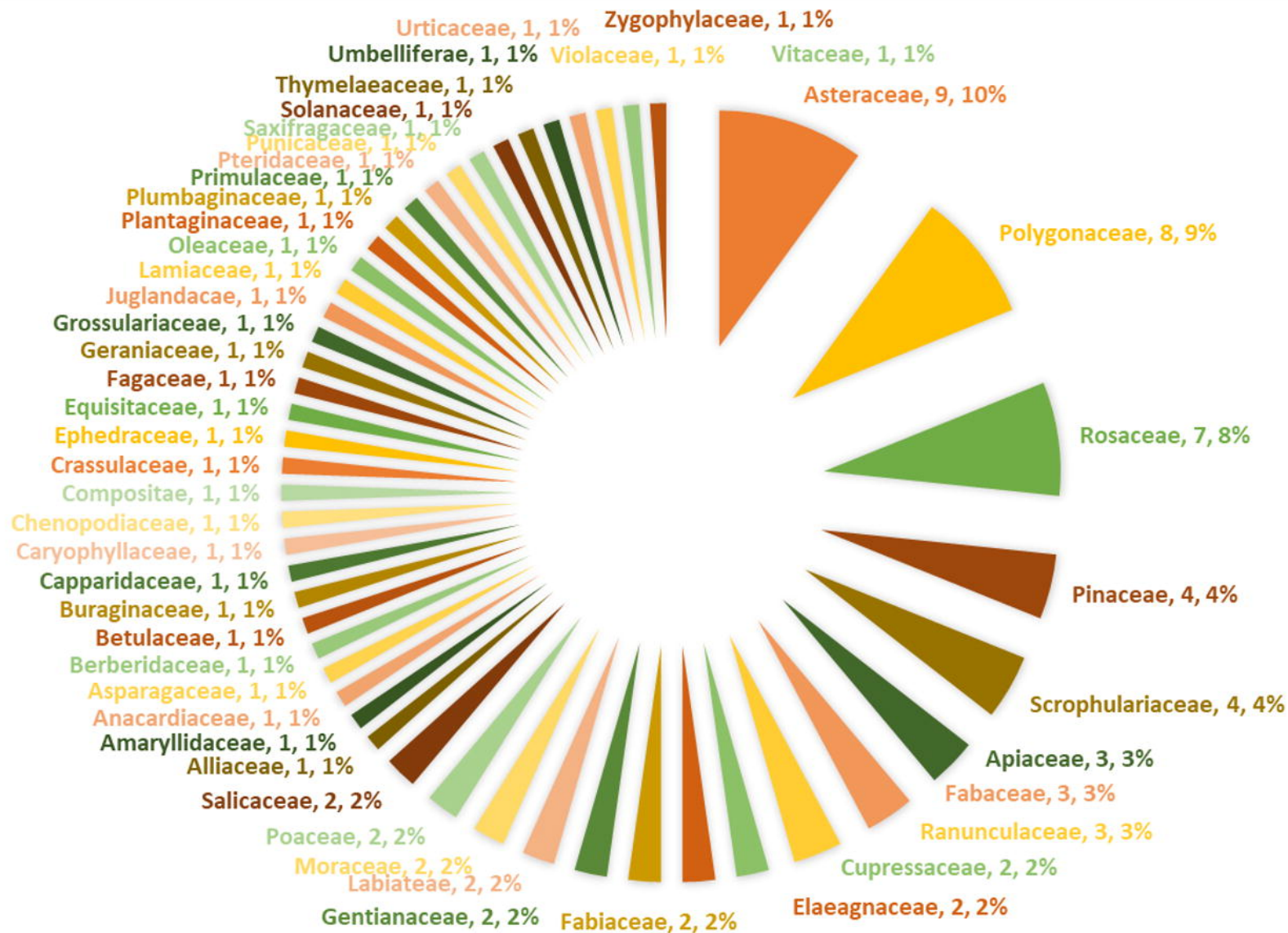
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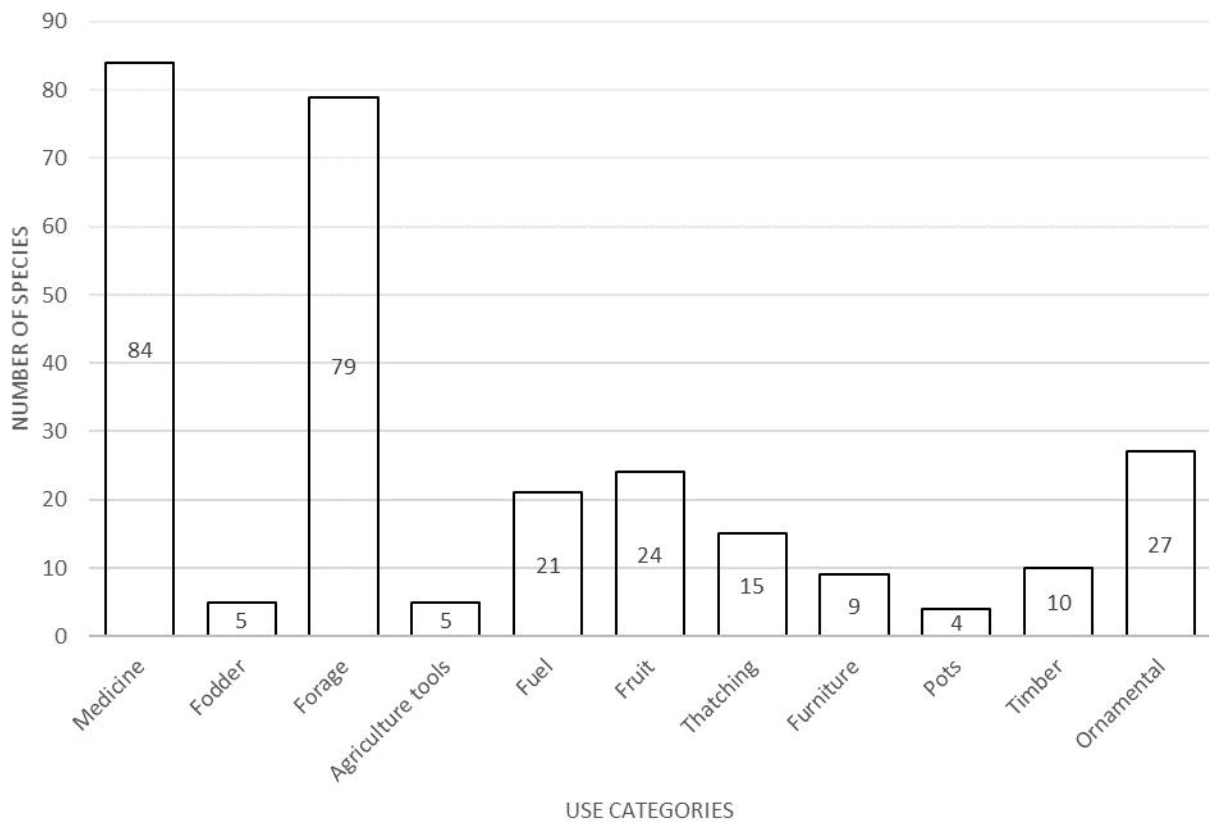
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- 502











LIFE FORM

Woody climbers

Woody climbers

Shrubs

Shrubs

Trees

Trees

Herbs

Herbs

0

10

20

30

40

50

60

NO OF PLANTS PER LIFE FORM (PERCENT VALUE)

