Quantitative ethnobotanical appraisal of plants used by inhabitants of Jelar Valley, Dir Upper, Northern Pakistan

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Ethnobotany Research and Applications 25:66 (2023) - http://dx.doi.org/10.32859/era.25.66.1-21
Manuscript received: 10/04/2023 – Revised manuscript received: 28/05/2023 - Published: 30/05/2023

Research

Abstract

Background: Due to the lack of primary health facilities and poor economic situation, the traditional use of plants for curing diseases is very common in rural areas of developing countries across the globe. The present study aimed to explore people-plant interaction and the conservation status of Jelar Valley, during 2014-2017.

Objectives: The main goals of this research were; to enlist the medicinal flora; to gather indigenous knowledge concerning the medicinal plants; to assess the conservation status of the medicinal flora area.

Methods: To collect information on ethno-botanical uses of plant species, a semi- structure questionnaire was prepared, and information was collected from local knowledgeable peoples of the area including male and female as well from local people. A total of 135 informants were interviewed regarding ethno-medicinal uses of the plants found in the area. The collected plants were classified into various used categories on the basis of information on their ethno-botanical uses. The relative frequency of citation, family importance values and conservation status were also calculated.

Results: In the present study, checklist of 83 plants was prepared and also determined its conservation status. The results revealed that of the 83 medicinal species (62.7%) were herbs, (21.7%) were trees and the remaining (15.7%) species belonged to shrubs. The results showed that mostly the species were used as a whole plant (21.7%), followed by leaves (25.3%), leaves and fruit (9.6%), Based on Family Importance Value (FIV) the best represented used family was Lamiaceae (91.11 %), followed by Asteraceae, while the highest Relative Frequency Citations was recorded for *Mentha longifolia* (0.266) followed by *Olea ferruginea* (0.259). The conservation status of medicinal flora revealed that *Melia azedarach* was found endangered, 35 (42%) species were rare, 15 (18%) species infrequent and 32 (39%) species were recorded as vulnerable in the area. Following the International Union for Conservation of Nature criteria 2001 for conservation none of the population was declared in the dominant category.

Conclusion: The study showed that the area has a great diversity of plants used for different ailments. The plants' utilization and unsustainable use of plants increase day by day for different purposes. The diseases are increasing day by day; they may cause a great threat to the flora of the Valley. The survey aims to make people aware of valuable plants and to protect them from extinction. The old people are aware of the accurate knowledge of medicinal plants and are needed to preserve this knowledge for the next generation.

Keywords: Ethno-botanical, conservation, Jelar, Dir Upper, Pakistan

Background

Ethno-botany is the study of how the peoples of a particular region make the use of indigenous flora for medicinal purposes. Ethno-botany is the relationship of a society with plants (Hameed *et al.* 2023; Hussain *et al.* 2018). The field of ethno-botany is old as human civilization. The interaction of human society with plants varies due to their uses, social, cultural and ethnic factors (Shinwari *et al.* 2011). In addition, medicinal plants have an ancient history of manhood itself; therefore, humans have been involved in the use of plant resources since time immemorial.

It is believed that the concepts behind ethno-botanical medicine began in Greece and were subsequently embraced by the Arabs. After that, these concepts were learned and promoted by Indians and Europeans (Khan and Musharraf 2014). The first ethno-medicinal plants were recorded in Rigveda (4500–1600) BC and Ayurveda (2500–600) BC (Jan *et al.* 2020). Wild plants have been a source of nourishment for humans for thousands of years. These plants were used by the tribal peoples for the production of textiles and for the preparation of medicines to survive in harsh environmental conditions. The term "herbal medicine" refers to the practice of using plants or plant parts such as roots, stems, leaves, flowers, and seeds to treat illnesses (Hameed *et al.* 2023). Medicinal plants are the plants that have been shown to have active biochemical constituents and to help treat illnesses in living beings. These plants have been given the name "medicinal plants" (Ali *et al.* 2017).

Medicinal plants and herbs are used as medicine all over the world, and nearly every country has benefited from their effective healing and medicinal properties. Folk medicinal knowledge of medicinal plants and their usage by indigenous people is valuable for conservation and medication development (Hussain *et al.* 2022). It is estimated that approximately 25% of current drugs are derived from plants. A World Health Organization (WHO) report claimed that 80 percent of people in underdeveloped countries get their basic health care from native medicinal plants because modern health care services are either not available or not good enough (WHO 2002). In most countries, traditional medicine is the primary method of health care. Researchers have found that medicinal plants are helpful in herbal medicine because they are flexible, accessible, low cost, and have minimal harmful effects (Hussain *et al.* 2018b). This verbal conversation helps in spreading indigenous knowledge about medicinal plants, but it also changes over time as it is passed from one person to the next. Ethno-botanical surveys are used to assemble and document the indigenous knowledge of medicinal plants obtained from local elderly people and specialists. This information is then used to describe plants that have the potential to be used as a source of medications to treat various diseases (Shah *et al.* 2020). The local people in Pakistan use many different plants as medicine to treat different health problems (Mahmood *et al.* 2013). For clinical purposes, many studies have been conducted to record the local knowledge of Pakistani people about using medicinal plants as medicine (Ullah *et al.* 2019; Ajaib *et al.* 2010). Nowadays, a wide range of ailments can be treated with traditional medicinal plants (Davidson-Hunt, 2000).

The term "conservation" means doing all actions to ensure a higher probability of survival in the future for a useful thing that must be conserved. Many factors in the plant world need to be conserved, such as plant diversity (Hussain *et al.* 2013; Hussain *et al.* 2018; Hussain *et al.* 2012). Conservation in its passive sense means referring to all of the activities and procedures that have nothing to do with conserving the environment. Passive conservation can readily be turned into active conservation by incorporating conservation measures into people's daily lives (Hussain *et al.* 2022). Human involvement and erroneous behavior have made plant conservation a serious problem. Humans and their actions threaten biodiversity (Ali *et al.* 2022). Several researchers have investigated the conservation status of plants in some regions of Pakistan such as (Jan *et al.* 2014) recorded 43 plant species from Kohistan Valley, Dir Upper. Silmilarly, (Ullah and Rashid, 2014) reported conservation status of 45 threatened medicinal plants from Mankial Valley, Hindukush range, Pakistan. (Ullah *et al.* 2020) explored quantitative assessment and status of ethno-medicinal plants of Sheen Ghar Valley, Lower Dir, Pakistan and reported 51 species for their medicinal uses. Based on conservation criteria 24 species were vulnerable, 22 species were rare and 4 species were recorded as infrequent. Flora conservation was challenging due to a lack of information and proper programs. However, modern experts are looking into the problems, and it is expected that planning for the future will keep the plants from going extinct (Khalid, 2017). The literature shows that science-based work has not been done on ethno-botany and conservation of medicinal plants in the Jelar Valley, Dir Upper.

The objectives of the current study were; to gain an in-depth understanding of ethno-medicinal use of the native flora in the region, to educate the locals about the declining wealth of traditional and medicinal flora from the area; to evaluate the conservation status of plant resources utilized to put policy recommendations for policymaker.

Materials and Methods

Study Area

Jelar Valley is located between 71° 56' 9" to 71°56' 4" longitude and 34° 5' 87" to 34° 58' 54" latitude in Dir Upper. "Jelar" is the combination of two words "*Je*" means mountain and "*Lar*" means track or way. Phytogeographically, it can be counted in Sinojapanese region (Ali & Qaiser 1986). The Valley is situated at a distance of 16 km from Tehsil headquarter, Wari. It is surrounded by Maidan in West, Wari in the East, Molavi hills in the North and Luqman Banda in South (Figure 1). Different topographic and ecological factors influence the climate of the Valley. Annually, four distinct seasons remain the feature of the valley. Winter is harsh while, summer is pleasant and short. The Valley receives sufficient rain and snowfall during December to mid-March. July and August are the hottest while January and February are the coldest months during the year. The Valley is divided into Upper Jelar and Lower Jelar.

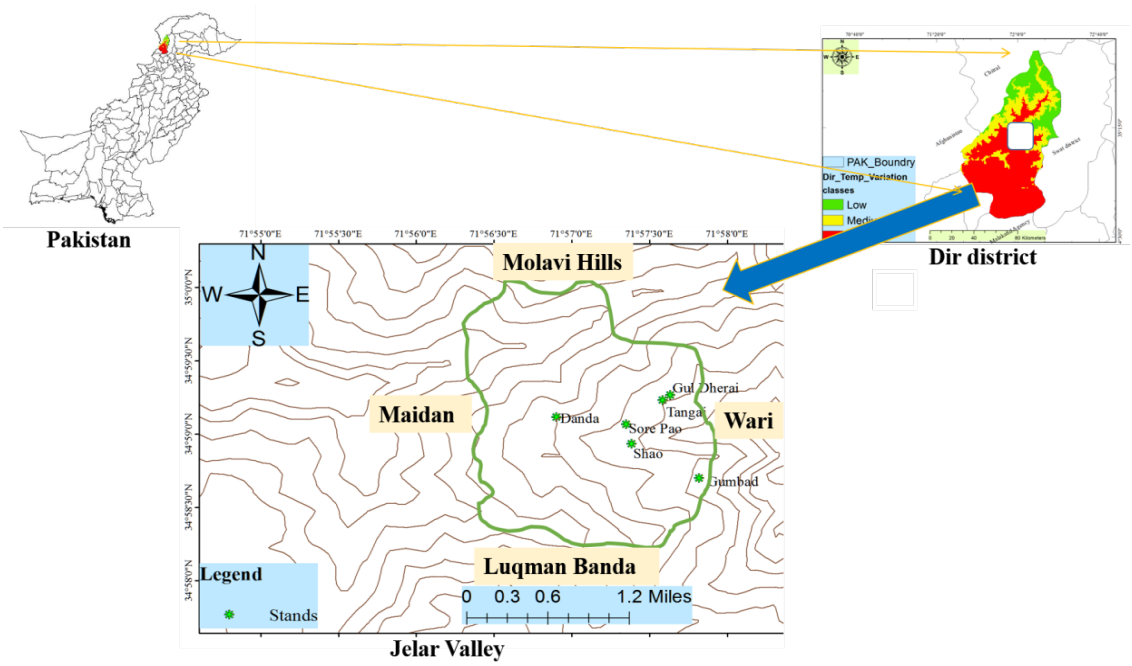

Figure 1. Map of study area

Ethno-botany and conservation

In order to collect information on ethno-botanical uses of plant species, a semi-structure questionnaire was prepared, and information were collected from local knowledgeable peoples of the area including men and women. A total of 135 informants were interviewed for the information regarding ethno-medicinal uses of the plants found in the area. The collected plants were classified into various used categories on the basis of information on their ethno-botanical uses. The relative frequency of citation and family importance values were calculated using the following formulas:

Relative frequency of citation (RFC):

Relative frequency of citation (RFC) was calculated as per following formula:

$$RFC = \frac{FC}{N} (0 < RFC < 1)$$

Where RFC stands for relative frequency of citation and its value is less than one and greater than zero, FC is the number of informants who mentioned the plant species and N is the total number of informants (Hussain *et al.* 2018; Hussain *et al.* 2022; Ullah *et al.* 2023).

Family importance value (FIV):

Family importance valu**e** was calculated as per following formula:

$$FIV = \frac{FC\ (Family)}{N} x\ 100$$

FC is frequency of citation of the family while N is the total number of informants (Hussain *et al.* 2022; Haq *et al.* 2023).

Conservation Status

Conservation status of the medicinal plants was enumerated according to the IUCN standard (IUCN, 2001) (Hussain *et al.* 2018; Hussain *et al.* 2019) as showed in (Table 1).

Table 1. Conservation Classes

Numbers	**Represents**	
A) Availability Class		
1.	Very rare	
2.	Rare	
3.	Occasional	
4.	Abundant	
B) Collection Status		
0.	More than 1000 Kg/Yr	
1.	Consumed from 500-1000 Kg/Yr	
2.	Consumed from 200-500 Kg/Yr	
3.	Consumed from 100-200 Kg/Yr	
C) Growth Behavior		
0	Regrowth in more than 3 Years	
1	Regrowth within 3 Years	
2	Regrowth in 2 Years	
3	Regrowth in 1 Years	
4	Regrowth in the same season	
D) Parts Used		
0.	Whole Plant/Roots	
1.	Bark	
2.	Fruits/Seeds	
3.	Flowers	
4.	Latex/Gum/Leaves	
E) Total Scores		
1.	0-4 Endangered	
2.	5-8 Vulnerable	
3.	9-12 Rare	
4.	13-14 Infrequent	
5.	15-16 Dominant	

Results and Discussion

Medicinal plants and their conservation status

Indigenous knowledge plays a pivotal role in the conservation of biodiversity and is often utilized for the curing of different ailments in local therapeutic systems. Therefore, it is imperative to record plant ecological behavior for better understanding of conservation efforts (Mir *et al.* 2021). In the present study, the medicinal uses and conservation status of 83 plants were determined. Plants are classified based on their habits; parts used, family's important values (FIV), frequency of citation (FC), relative frequency of citation (RFC), ethno-medicinal uses and their conservation status in the area. Data on medicinal uses and conservation status was collected through a semi-structure questionnaire from knowledgeable people in the area. A total of 135 individuals were interviewed for the ethno-botanical information. The results revealed that of the 83 medicinal species (62.7%) were herbs, (21.7%) trees and the remaining (15.7%) species belonged to shrubs. The plants were also classified based on their part used. The results showed that mostly the species were used as a whole plant (21.7%), followed by leaves (25.3%), leaves & fruit (9.6%), leaves & seed (6.0%), flower (4.8%), leaves & root 4.8% (Figure 2).

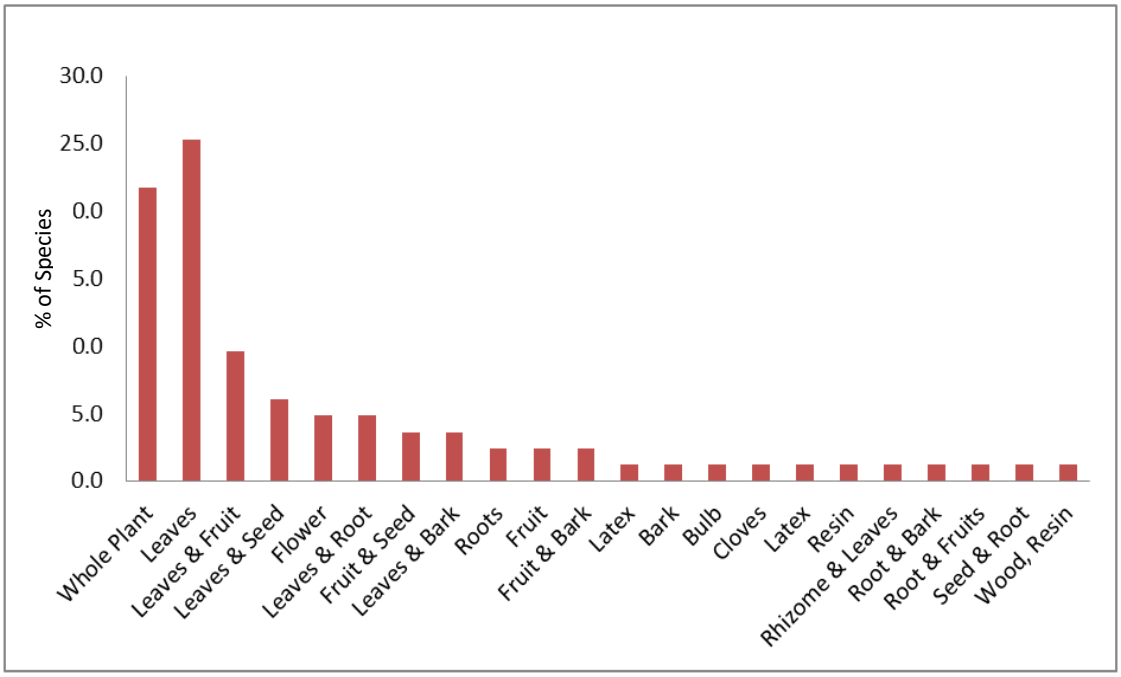

Figure 2. Classification of medicinal plants based on their parts used

Wariss *et al.* (2014) documented 84 medicinal plants from Lal Suhanra national park, Bahawalpur while, Ahmad & Pieroni (2016) reported 51 plants of medicinal uses from Thakht-e-Sulaiman hills North-West Pakistan. Similar study was conducted by Barkatullah and Ibrar (2011) and explored the ethno-botanical uses of 169 plants from Malakand Pass hill and stated that shoots were the most frequently used part (34.91%) in the area followed by leaves (27.21%) and whole plant (21.89%). However, my results are in agreement with Adnan *et al.* (2015) who documented the ethno-botanical uses of medicinal plants in Pashtun tribal areas and found that the inhabitants of the area mostly used whole plants (33%) and leaves (31%) for the treatment of various diseases.

Most common mode of administration was found to be decoction. Some medicinal plants or their effective parts are powdered while in few cases fresh plants were used as crude drug (Table 2). The results show that most of these species were multipurpose in their medicinal uses while, others were used for single type of diseases such as the latex of *Euphorbia peplus* was reported to be effective in scabies, *Taraxacum campylodes* in antidiabetic, *Melilotus officinalis* leaves decoction as anticoagulant, *Malva neglecta* as purgative, *Medicago lupulina* as laxative and *Daphne mucronata* was reported to be useful in treatment of fertility. Some species were administered in the form of decoction, or their effective part was used in powdered form while, others were used directly in fresh form as a crud drug. *Allium cepa*, *Tagetes minuta*, *Dysphania botrys, Micromeria biflora, Ajuga bracteosa*, *Mentha longifolia, Datura stramonium*, *Geranium wallichianum*, *Gerardinia palmata*, *Berberis lycium, Quercus dilatata*, *Ziziphus oxyphylla* and *Pinus wallichiana* were reported to be used for multi types of disorders like skin irritation, cough, asthma, stomachache, expectorant, hepatic disorders, jaundice, hepatitis, antidiuretic, diarrhea, carminative, hepatitis, dog bite, wound healing, abdominal pain, blood pressure, throat sore, constipation, swollen joint, headache and backbone pain. Similarly, the fresh roots of *Cotoneaster nummularius* are used for diabetic patients, dysentery, vomiting, cholera and calculis of kidney. Fruit is expectorant and antidiabetic. The seeds of *Rosa webbiana* are considered effective against chest infection, cough, asthma, hapatitis and vartigo goiter. The leaves of *Thymus linearis* are antispasmodic, carminative and analgesic. Decoction of leaves is considered useful in abdominal pain and to warm up mammals' body after delivery to expel umbilical cord while, the whole plant of *Equisetum arvense* is effective against renal calculi and antilice. The fruit of *Morus nigra* is anthelmintic, refrigerant, expectorant and diuretic. Extract of leaves are useful for high blood pressure. Similar study was conducted by Aziz *et al.* (2016) in Ladha subdivision, South Waziristan agency, Pakistan and reported the medicinal uses of 82 plants for different types of diseases. The ethno-medicinal uses of flora are also reported by other researchers in different parts of the country (Hussain *et al.* 2006; Shah *et al.* 2020). So, my findings are in line with these findings. As an increase in human population, the stress on the collection of medicinal flora increases and the unsustainable collection of these medicinally important species leads to be declining in the area. Beside their collection for

medicinal purposes the inhabitants clearing the forests vegetation for agriculture purposes, fuels demand and houses construction.

Family importance value (FIV)

Family importance values reflects the number of locally important species belong to that particular plants family, while RFC index tells us the local importance of that particular plants found in the area. The results revealed that the best represented used family based on number of species was Lamiaceae with 8 (91.11%) species, followed by Asteraceae with 7 (71.11%) species, Rosaceae with 6 (54.07%) species, Apiaceae with 5 (47.4%) species, Solanceae and Moraceae each with 3 (31.11%) species, Chenopodiaceae with 2 (28.14%) species and Oleaceae with 1 (25.92%) species (Table 2, Figure 3). My findings agreed with Ahmad *et al.* (2014) who found Lamiaceae, Polygonaceae, Amaranthaceae, Apiaceae and Ranunculaceae the best represented families in terms of FIV in Chail Valley.

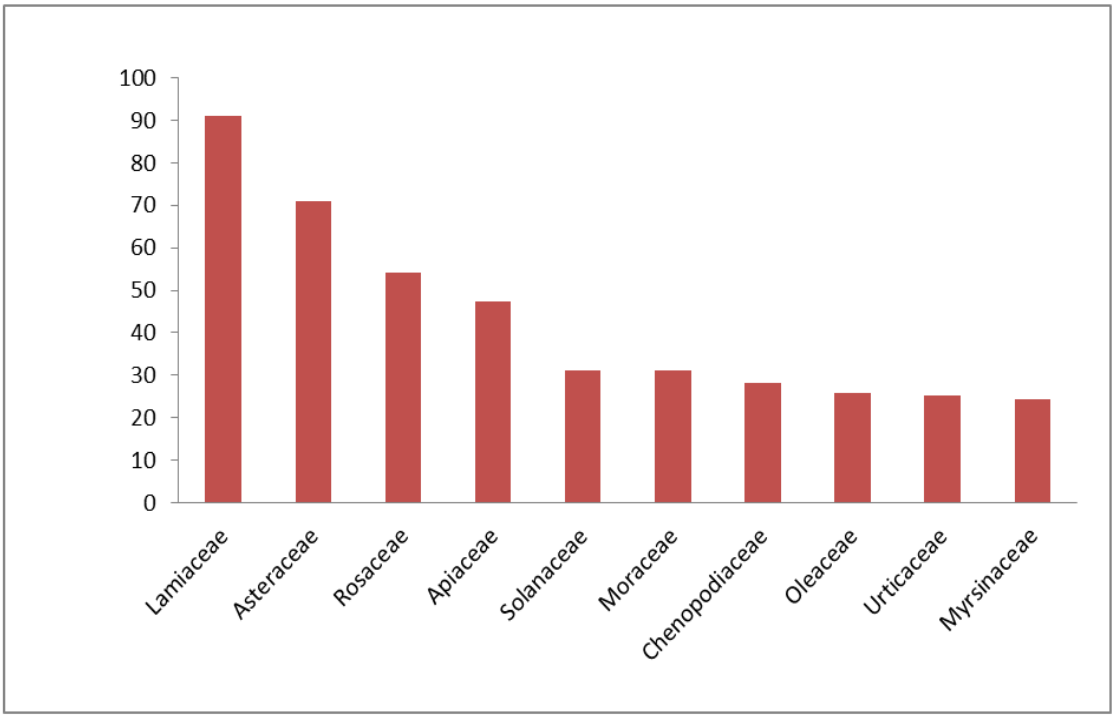

Figure 3. FIV of the top ten families found in the area

Relative frequency of citation (RFC)

Relative frequency of citation tells us about the local importance of the particular plant species for the treatment of various types of diseases. The RFC values also indicate the importance of species relative to the number of local informants taking part in this study as well as reflecting the strong and long-term association of inhabitants with local plants (Ahmad *et al.* 2014). The present study revealed that the highest RFC was recorded for *Mentha longifolia* (0.266) followed by *Olea ferruginea* (0.259), *Myrsine africana* (0.244), *Artemisia biennis* (0.229), *Quercus dilatata* (0.222), *Isodon rugosus* (0.207), *Punica granatum* and *Equisetum arvense* (0.214) each, *Cotoneaster nummularius* (0.195) while that of *Viola canescens* was (0.192) RFC value (Table 2 Figure 4).

Ahmad *et al.* (2014) conducted study on the ethno-botanical information of Chail valley and found the highest RFC values for *Origanum vulgare, Geranium wallichianum* and *Skimmia laureola.* Similarly, Ali (2016) reported the highest RFC for *Skimmia laureola* (0.321), *Juglans regia*, *Olea ferruginea* and *Papaver somniferum* in Chail valley (Swat). These species were used for different disorders like expectorant, emetic, for scorpion bites, laxative, purgative, carminative, jaundice and hepatitis. The uses of these species were also reported by other researchers from different parts of the country (Barkatullah and Ibrar, 2011; Khan *et al.* 2013; Hussain *et al.* 2014; Ahmad *et al.* 2014; Begum *et al.* 2016; Ajaib *et al.* 2016 and Ali *et al.* 2017) for the treatment of these disorders however, a little difference was found in the method of administration and recipes preparation.

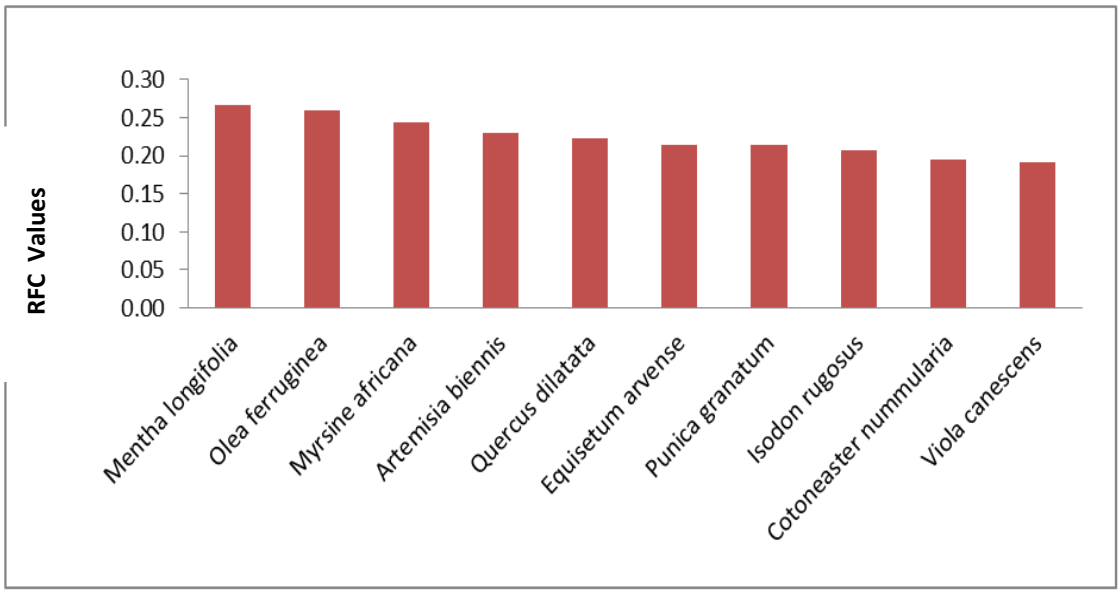

Figure 4. Species with highest relative frequency of citation

Conservation status of medicinal flora

In the present study, a total of 83 medicinal plants were analyzed for its conservation following IUCN (2001).The results revealed that only *Melia azedarach* was found endanger, 35 (42%) species were rare, 15 (18%) species infrequent, and 32 (39%) species were recorded as vulnerable in the area (Figure 5). The result also showed that no species fulfilled the IUCN criteria of dominance (Hussain *et al.* 2022; Hussain *et al.* 2019). Some of the rare were *Micromeria biflora, Thymus linearis, Mentha arvensis, Bergenia ciliata, Mentha longifolia, Plantago major, Plantago lanceolata, Verbascum thapsus, Teucrium stocksianum, Galium stewartii, Tagetes minuta, Foeniculum vulgare, Isodon rugosus, Daphne mucronata, Sarcococca saligna, Pinus roxburghii* and *Ficus carica* (Table 2). Many of the rare species were extensively collected for medicinal purposes such as the leaves of *Micromeria biflora* are used as carminative, laxative, purgative and analgesic. Similarly, the leaves of *Isodon rugosus* are utilized in sore throat, hepatitis, high blood pressure, abdominal pain, diarrhea and dysentery. While the trees species such as *Pinus roxburghii* was utilized for timber purposes. The rare species need special attention for their conservation otherwise; they will be endangered in the near future. Some of the vulnerable species found in the area were *Geranium wallichianum*, *Cirsium falconeri, Myrsine africana, Berberis lycium, Quercus dilatata, Diospyros lotus, Olea ferruginea, Salix tetrasperma, Ziziphus oxyphylla, Juglans regia*, *Punica granatum* and *Morus nigra*. The local community depends on these species for fuel wood and timber purposes. The anthropogenic activities were found to be at peak and threatening the biodiversity to alarming level. Several factors are involved to threaten biodiversity such as habitat loss, habitat fragmentation (Corlett and Westcott, 2013; Steege *et al.* 2015; Corlett, 2016) fuels demand, over collection, over grazing and abiotic stress. While, in the present observation the major threat to biodiversity was fuels demand, marketed values of medicinal plants and conversion of land to farming and agriculture.

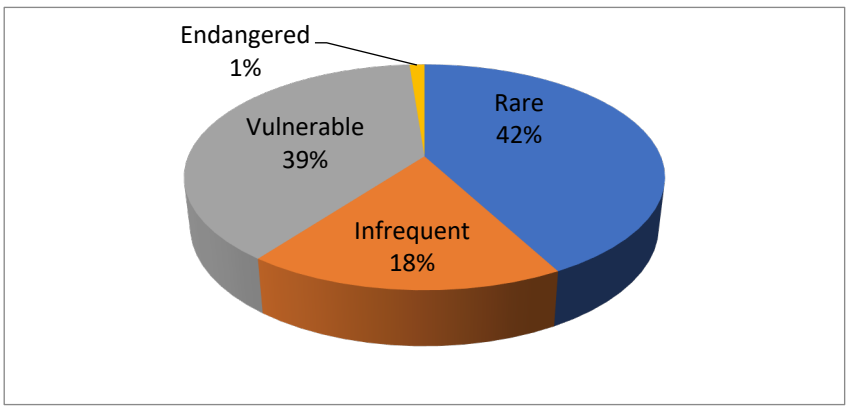

Figure 5. Conservation status of plants in Jelar Valley

Figure 6. A to B: Trees cutting for fodder, fuel and Timber, C: Overgrazing followed by erosion, D; Degraded scrub vegetation

Table 2. Medicinal plants, RFC, FIV and their conservation status

Botanical name, family	Voucher number	Local name	Habit	Part used	C	RFC	FIV	1	2	3	4	5	Conservation Status	Uses and Remedies
Adiantum capillus-veneris L. **Adiantaceae**	Shariatullah Bot. 3 (PUP)	Sumbal	H	Leaflet	5	0.037	**10.37**	3	3	4	4	14	Infrequent	Febrifuge, expectorant and diuretic.
Adiantum venustum D. Don. **Adiantaceae**	Shariatullah Bot. 1 (PUP)	Babozay	H	Frond	9	0.066		2	2	4	4	12	Rare	The fronds crushed and squeezed used as expectorant, emetic and in scorpion bites.
Allium cepa L. **Alliaceae**	Shariatullah Bot. 27 (PUP)	Piyaz	H	Bulb	6	0.044	**12.59**	3	0	4	0	7	Vulnerable	Good for gum, teeth disorders and high blood pressure, expectorant and diuretic.
Allium sativum L. **Alliaceae**	Shariatullah Bot. 26 (PUP)	Oga	H	Cloves	11	0.081		3	1	4	0	8	Vulnerable	Aphrodisiac, diuretic, effective against diabetic and high blood pressure.
Arisaema flavum (Forssk.) Schott. **Araceae**	Shariatullah Bot. 41 (PUP)	Marjarai	H	Seed & Root	5	0.037	**3.7**	2	2	4	2	10	Rare	Seeds are used to treat infertility and digestive problems of livestock. Root is anthelmintic.
Ailanthus altissima (Mill.) Swingle. **Simaroubaceae**	Shariatullah Bot. 231 (PUP)	Watani Shandai	T	Leaves	21	0.155	**15.55**	3	2	0	4	9	Rare	Extract of fresh leaves is used for blood purification and scabies.
Artemisia biennis Willd. **Asteraceae**	Shariatullah Bot. 50 (PUP)	Tarkha	H	Leaves	31	0.229		3	2	4	4	13	Infrequent	Anthelmintic, vomiting, diarrhea and in snake bite.

Berberis lycium Royle. **Berberidaceae**	Shariatullah Bot. 67 (PUP)	Kwaray	S	Root & Bark	24	0.177	**17.77**	3	1	3	0	7	Vulnerable	Refrigerant and carminative. Decoction of dry root bark advised for hepatitis, dog bite, wound healing, jaundice, abdominal pain and high blood pressure. Also used to relieve toothache and throat sore.
Buddleja crispa Benth. **Loganiaceae**	Shariatullah Bot. 132 (PUP)	Banroo Karachai	S	Whole Plant	4	0.029	**2.96**	2	3	4	0	9	Rare	Carminative and purgative. Decoction used for blood purification and BP.
Bergenia ciliata (Haw.) Sternb. **Saxifragaceae**	Shariatullah Bot. 227 (PUP)	Pararwali	H	Leaves	6	0.044	**4.44**	1	3	4	4	12	Rare	Demulcent and astringent.
Cynodon dactylon (L.) Pers. **Poaceae**	Shariatullah Bot. 176 (PUP)	Kabal	H	Whole plant	3	0.022	**2.22**	2	2	4	0	8	Vulnerable	Decoction used for abdominal pain, leg pain, dysentery and as astringent.
Chenopodium album L. **Chenopodiaceae**	Shariatullah Bot. 82 (PUP)	Sakh Botay	H	Leaves	15	0.111	**28.14**	2	3	4	4	13	Infrequent	Carminative, diuretic; dried powdered leaves are used to treat dysentery, vomiting and piles.
Dysphania botrys (L.) Mosyakin & Clemants. **Chenopodiaceae**	Shariatullah Bot. 86 (PUP)	Gouti	H	Leaves	23	0.170		3	3	4	4	14	Infrequent	Latex of leaves mixed with the mother milk is effective in controlling constipation.
Cannabis sativa L. **Cannabaceae**	Shariatullah Bot. 76 (PUP)	Bhang	H	Leaves	19	0.140	**14.07**	3	3	4	4	14	Infrequent	Powdered leaves used as narcotic and sedative. Charas is also prepared from it and is valuable appetizer.
Diospyros lotus L. **Ebanacea**	Shariatullah Bot. 97 (PUP)	Amlook	T	Seed & Fruit	11	0.081	**8.14**	3	3	0	2	8	Vulnerable	Diuretic and sedative. Also used against diarrhea and constipation.

Daphne mucronata Royle. **Thymelaeaceae**	Shariatullah Bot. 242 (PUP)	Laighunai	S	Leaves	2	0.014	**1.48**	2	3	3	4	12	Rare	Decoction is considered useful in infertility.
Dryopteris serratodentata Hayata. **Dryopteridaceae**	Shariatullah Bot. 9 (PUP)	Kwanjay	H	Leaves/ Pinnae	1	0.007	**0.74**	3	2	4	4	13	Infrequent	Poisonous both to human and animals.
Equisetum arvense L. **Equisetaceae**	Shariatullah Bot. 17 (PUP)	Bandakay	H	Whole Plant	29	0.214	**21.48**	0	2	4	0	6	Vulnerable	Plant extracts effective against renal calculi and antilice.
Elaeagnus umbellata Thunb. **Elaeagnaceae**	Shariatullah Bot. 98 (PUP)	Katanr	S	Leaves	25	0.185	**18.51**	3	3	3	4	13	Infrequent	Leaves decoction is used to treat cold and flu.
Euphorbia peplus L. **Euphorbiaceae**	Shariatullah Bot. 101 (PUP)	Mandaro	H	Latex	17	0.125	**12.59**	3	3	4	4	14	Infrequent	Latex effective in scabies.
Foeniculum vulgare Mill. **Apiaceae**	Shariatullah Bot. 37 (PUP)	Kaga	H	Seed & Leaves	20	0.148	**7.4**	3	1	4	2	10	Rare	Dried, powdered seeds mix with sugar used against abdominal pain, digestive problems, dry cough, vomiting and chest infection. Leaves carminative and diuretic.
Coriandrum sativum L. **Apiaceae**	Shariatullah Bot. 38 (PUP)	Dhania	H	Leaves & Fruit	17	0.125		1	1	4	4	10	Rare	Roasted seeds are good remedy for vomiting and diarrhea.
Seseli libanotis (L.) Koch. **Apiaceae**	Shariatullah Bot. 40 (PUP)	Kali Zeeri	H	Leaves & Seeds	6	0.044		0	3	4	4	11	Rare	Decoction of leaves is used to treat urticarial, dry cough and asthma. Fruit as carminative.
Trachydium roylei Lindl. **Apiaceae**	Shariatullah Bot. 35 (PUP)	Zankai	H	Whole Plant	2	0.014		1	2	4	0	7	Vulnerable	Crushed whole plant and paste applied to cure odema. Fruit is laxative.
Ammi visnaga (L.) Lam. **Apiaceae**	Shariatullah Bot. 33 (PUP)	Spairkai	H	Fruit	19	0.14		3	2	4	2	11	Rare	Dried and powdered fruits are used to treat asthma, whooping cough and angina pectoris.

Galium stewartii Nazim. **Rubiaceae**	Shariatullah Bot. 219 (PUP)	Naray Botay	H	Whole Plant	15	0.111	**11.11**	3	2	4	0	9	Rare	Aphrodisiac and refrigerant. Dried and powdered form is used for diarrhea, hair fall, dysentery, abdominal pain, and chest infection.
Geranium wallichianum D. Don. ex Sweet. **Geraniaceae**	Shariatullah Bot. 107 (PUP)	Sara Zeela	H	Root	8	0.059	**5.92**	1	1	4	0	6	Vulnerable	Dried and powdered form of root mixed with halwa recommended for backbone pain, wound healing and arthritis; good aphrodisiac.
Isodon rugosus (Wall. ex Benth.) Codd. **Lamiaceae**	Shariatullah Bot. 116 (PUP)	Karachai	S	Leaves	28	0.207	**91.11**	3	2	3	4	12	Rare	Fresh leaves are chewed effective in sore throat, hepatitis, high blood pressure, abdominal pain, diarrhea and dysentery. Extract of leaf is used against eye infection.
Micromeria biflora (Duch.-Ham ex D.Don.) Benth. **Lamiaceae**	Shariatullah Bot. 122 (PUP)	Shumakay	H	Leaves	15	0.111		2	1	4	4	11	Rare	Laxative, purgative, carminative and analgesic. Leaf extract is recommended for body pain.
Thymus linearis Benth. subsp. *linearis* Jalas. **Lamiaceae**	Shariatullah Bot. 114 (PUP)	Ghar Sperkai	H	Leaves	10	0.074		2	0	4	4	10	Rare	Antispasmodic, carminative and analgesic. Decoction of leaves is considered useful in abdominal pain and to warm up mammals' body after delivery to expel umbilical cord.

Ajuga bracteosa Wall. ex Benth. **Lamiaceae**	Shariatullah Bot. 115 (PUP)	Gooti	H	Leaves	5	0.037		3	3	4	4	14	Infrequent	Decoction is used to treat urticarial, abscess, abdominal pain and erythema. Also used as carminative.
Teucrium stocksianum Boiss. **Lamiaceae**	Shariatullah Bot. 130 (PUP)	Spera Botay	H	Whole Plant	11	0.081		2	3	4	0	9	Rare	Diaphoretic and stimulant. Effective remedy for jaundice.
Mentha arvensis L. **Lamiaceae**	Shariatullah Bot. 113 (PUP)	Podina	H	Leaves	16	0.118		3	0	4	4	11	Rare	Used as stimulant; carminative and diuretic. Effective against constipation.
Mentha longifolia (L.) L. **Lamiaceae**	Shariatullah Bot. 126 (PUP)	Enalay	H	Leaves & Root	36	0.266		3	0	4	4	11	Rare	Laxative, purgative and carminative. Decoction of leaves used to treat vomiting, jaundice, hepatitis and cholera.
Scutellaria chamaedrifolia Hedge & A. J. Paton. **Lamiaceae**	Shariatullah Bot. 127 (PUP)	Zagli Sparkai	H	Whole Plant	2	0.014		1	2	4	0	7	Vulnerable	Nerve tonic and antispasmodic.
Juglans regia L. **Juglandaceae**	Shariatullah Bot. 111 (PUP)	Ghuz	T	Leaves & Fruit	22	0.162	**16.29**	3	1	0	2	6	Vulnerable	Honey plus dried fruit used as a brain tonic. Decoction of leaves useful against diabetic.
Malva neglecta Wallr. **Malvaceae**	Shariatullah Bot. 134 (PUP)	Paneerak	H	Whole Plant	3	0.022	**2.22**	1	3	4	0	8	Vulnerable	Purgative in nature. Leaves used as vegetable.
Myrsine africana L. **Myrsinaceae**	Shariatullah Bot. 142 (PUP)	Marogaya	S	Fruit & Leaves	33	0.244	**24.44**	2	1	1	2	6	Vulnerable	Fruit is anthelmintic. Decoction of leaves used to cure abdominal pain, digestive disorders and vomiting.
Morus nigra L. **Moraceae**	Shariatullah Bot. 138 (PUP)	Tor Toot	T	Fruit & leaves	16	0.118	**31.11**	1	3	0	2	6	Vulnerable	Fruit is anthelmintic, refrigerant, expectorant and diuretic. Extract of leaves are useful for high blood pressure.

Morus alba L. **Moraceae**	Shariatullah Bot. 139 (PUP)	Spin Toot	T	Fruit & Bark	22	0.162		3	2	0	2	7	Vulnerable	Fruit is a good remedy for sore throat, overdose cause diarrhea. Bark as anthelmintic and purgative.
Ficus carica L. **Moraceae**	Shariatullah Bot. 140 (PUP)	Inzar	T	Leaves	4	0.029		2	3	0	4	9	Rare	Milky latex from fresh leaves are used to expel thorn from skin, arthritis and wound healing.
Melia azedarach L. **Meliaceae**	Shariatullah Bot. 135 (PUP)	Tora Shandai	T	Bark	7	0.051	**5.18**	1	2	0	1	4	Endangered	Carminative, decoction of bark is used to treat fever (pyrexia), body ache, leaf extracts used against typhoid.
Oxalis corniculata L. **Oxalidaceae**	Shariatullah Bot. 149 (PUP)	Garday Taruky	H	Leaves	9	0.066	**6.66**	3	3	4	4	14	Infrequent	Leaves decoction effective against jaundice and hepatitis, while poultice used for boils and blood clothing.
Olea ferruginea Royle. **Oleaceae**	Shariatullah Bot. 145 (PUP)	Khona	T	Leaves	35	0.259	**25.92**	3	1	0	4	8	Vulnerable	Decoction used to treat sore throat, jaundice and diabetes; good anodyne.
Pteris vittata L. **Pteridaceae**	Shariatullah Bot. 20 (PUP)	Babozai	H	Rhizome & Leaves	4	0.029	**2.96**	0	3	4	0	7	Vulnerable	Rhizome used to treat hysteria. Fresh leaves cooked as vegetable.
Pinus roxburghii Sarg. **Pinnaceae**	Shariatullah Bot. 22 (PUP)	Nakhtar, Chir Pine	T	Resin	10	0.074	**12.59**	3	2	0	4	9	Rare	Used for the treatment of abses on body and acne on face, astringent and effective against measles.
Pinus wallichiana A.B. Jaks. **Pinnaceae**	Shariatullah Bot. 23 (PUP)	Sraf, Blue Pine	T	Wood, Resin	7	0.051		3	3	0	1	7	Vulnerable	Wood bark effective against skin irritation, cough and asthma. Resin is used to treat stomachache.

Polygonum aviculare L. **Polygonaceae**	Shariatullah Bot. 184 (PUP)	Bandakai	H	Whole Plant	3	0.022	**14.81**	1	2	4	0	7	Vulnerable	Grinded the whole plant in a mortar, then filter through cloth, is a good agent for hepatitis and kidney calculi's. Root as anodyne.
Rumex hastatus D. Don. **Polygonaceae**	Shariatullah Bot. 182 (PUP)	Taruky	H	Root & Leaves	8	0.059		3	3	4	0	10	Rare	Quite effective in diarrhea, bleeding of wound. Refrigerant and diuretic.
Rumex dentatus L. **Polygonaceae**	Shariatullah Bot. 187 (PUP)	Shalkhay	H	Leaves & Bark	9	0.066		3	3	4	4	14	Infrequent	Poultice of leaves used for wound healing and abses. Decoction of the bark is used against arthritis.
Plantago lanceolata L. **Plantaginaceae**	Shariatullah Bot. 169 (PUP)	Ghawajabai	H	Root & Leaves	18	0.133	**22.96**	3	2	4	0	9	Rare	Leaves used to cure asthma, candidacies and also mild purgative.
Plantago major L. **Plantaginaceae**	Shariatullah Bot. 168 (PUP)	Ghawajabai	H	Leaves & Root	13	0.096		2	2	4	4	12	Rare	Leaves used to treat candidacies and inflamed surface.
Pistacia chinensis Bunge subsp. *integrrima* (J. L. Stewart ex Brandis.) Rech. f. **Anacardiaceae**	Shariatullah Bot. 31 (PUP)	Sheenawar	T	Fruit & Leaves	2	0.014	**1.48**	1	3	0	2	6	Vulnerable	Decoction used in dry cough and tuberculosis; and antiseptic.
Punica granatum L. **Punicaceae**	Shariatullah Bot. 190 (PUP)	Anar	T	Fruit & Bark	29	0.214	**21.48**	2	3	0	2	7	Vulnerable	Powdered fruit mix with egg taken orally to control abdominal pain.
Quercus dilatata Royle. **Fagaceae**	Shariatullah Bot. 104 (PUP)	Zareen	T	Fruit	30	0.222	**22.22**	1	2	0	2	5	Vulnerable	Dried roasted fruit is anti-diuretic; effective in diarrhea.
Raphanus sativus L. var. *sativus* **Brassicaceae**	Shariatullah Bot. 73 (PUP)	Mouli	H	Whole Plant	13	0.096	**9.62**	2	1	4	0	7	Vulnerable	Aqueous extract of fresh leaves used against jaundice; laxative and diuretic. Roots effective in dissolving urinary tract stones.

Salix tetrasperma Roxb. **Salicaceae**	Shariatullah Bot. 223 (PUP)	Wala	T	Bark & Leaves	14	0.103	**10.37**	2	2	0	1	5	Vulnerable	Decoction of leaves is used for diabetic and infertility. Bark used in erythema.
Sarcococca saligna Muell. Arg. **Buxaceae**	Shariatullah Bot. 75 (PUP)	Shenolay	S	Leaves & Fruit	18	0.133	**13.33**	3	1	2	4	10	Rare	Refrigerant and carminative. Decoction used against jaundice, hepatitis, odema, skin disorders, mouth ulcers and sore throat.
Solanum nigrum L. var. *nigram* **Solanaceae**	Shariatullah Bot. 240 (PUP)	Karmachu	H	Whole Plant	17	0.125	**31.11**	3	2	4	0	9	Rare	Extract of fresh leaves are applied to treat odema, hepatitis and abdominal pain. Root decoction is effective against urticarial and abscess.
Datura stramonium L. **Solanaceae**	Shariatullah Bot. 241 (PUP)	Batura	H	Leaves & Seed	9	0.066		2	3	4	4	13	Infrequent	Fresh leaves are used as bandages on abscess;
Datura innoxia Mill. **Solanaceae**	Shariatullah Bot. 235 (PUP)	Batura	H	Seed & Leaves	16	0.118		2	3	4	2	11	Rare	Seeds anodyne and sedative in nature. Leaf juice is used to cure gonorrhea.
Tagetes minuta L. **Asteraceae**	Shariatullah Bot. 61 (PUP)	Malooch	H	Flower	11	0.081	**71.11**	1	2	4	3	10	Rare	Flowers used to cure jaundice and hepatitis.
Filago hurdwarica (Wall. ex DC.) Wagenitz. **Asteraceae**	Shariatullah Bot. 64 (PUP)	Warkharay	H	Whole Plant	18	0.133		3	1	4	0	8	Vulnerable	Decoction in dysentery, abscess and body cooling.
Taraxacum campylodes G. E. Haglund. **Asteraceae**	Shariatullah Bot. 53 (PUP)	Ziar Gulay	H	Leaves	14	0.103		3	3	4	4	14	Infrequent	Antidiabetic.
Myriactis wallichii Less. **Asteraceae**	Shariatullah Bot. 57 (PUP)	Spera Botay	H	Whole Plant	7	0.051		2	3	4	0	9	Rare	Decoction of whole plant is very effective for abdominal pain, hepatitis and high blood pressure.
Cirsium falconeri (Hook. f.) Petr. **Asteraceae**	Shariatullah Bot. 47 (PUP)	Azghaky	H	Whole Plant	9	0.066		1	3	4	0	8	Vulnerable	Quite effective in hepatitis and high blood pressure.

Sonchus asper (L.) Hill. **Asteraceae**	Shariatullah Bot. 58 (PUP)	Shuada Pai	H	Flower	6	0.044		3	3	4	3	13	Infrequent	Decoction of flower is used to treat constipation and jaundice.
Urtica dioica L. **Urticaceae**	Shariatullah Bot. 246 (PUP)	Sezunkai	H	Whole Plant	14	0.103	**25.18**	3	2	4	0	9	Rare	Astringent, diuretic and its decoction is used for jaundice and scabies.
Girardinia palmata (Forssk.) Gaudich. **Urticaceae**	Shariatullah Bot. 247 (PUP)	Sezunkai	H	Whole Plant	20	0.148		2	2	4	0	8	Vulnerable	Leaves decoction commonly used for constipation, on swollen joint and headache.
Verbascum thapsus L. **Scrophulariaceae**	Shariatullah Bot. 229 (PUP)	Kharghawag	H	Leaves & Seeds	12	0.088	**8.88**	2	2	4	4	12	Rare	Leaves poultice against boils. Seed as aphrodisiac.
Viburnum cotinifolium D. Don. **Caprifoliaceae**	Shariatullah Bot. 78 (PUP)	Khapyanga	S	Leaves & Bark	16	0.118	**11.85**	0	2	3	4	9	Rare	Dried and powdered form of leaves and bark used against healing of wound.
Viola canescens Wall. **Violaceae**	Shariatullah Bot. 249 (PUP)	Tora Panra	H	Whole Plant	26	0.192	**19.25**	3	1	4	0	8	Vulnerable	Dried and powdered leaves boiled in green tea used for chest infection.
Zanthoxylum armatum DC. **Rutaceae**	Shariatullah Bot. 220 (PUP)	Dambara	T	Fruit & Seed	5	0.037	**3.7**	1	3	0	2	5	Vulnerable	Dried and powdered fruit is used for dry cough; also good carminative.
Ziziphus oxyphylla Edgew. **Rhamnaceae**	Shariatullah Bot. 199 (PUP)	Markhanay	T	Fruit & Leaves	7	0.051	**5.18**	2	2	0	2	6	Vulnerable	Fruit is used as effective expectorant and emollient and also helpful in hepatic disorders. Leaves decoction used against jaundice and hepatitis.

Cotoneaster nummularius Fish. & Mey. **Rosaceae**	Shariatullah Bot. 216 (PUP)	Mamanra	S	Root & Fruits	27	0.195	**54.07**	3	1	3	0	7	Vulnerable	Fresh roots boiled in water then filtered the water through cloth; the filtrate is used for diabetic patients, dysentery and vomiting.
Rosa canina L. **Rosaceae**	Shariatullah Bot. 217 (PUP)	Gulab	S	Flower	5	0.037		3	2	3	3	11	Rare	Flower is anthelmintic and purgative. And good for abdominal pain.
Rosa webbiana Wall. ex Royle. **Rosaceae**	Shariatullah Bot. 207 (PUP)	Khwarach	S	Seed & Fruit	12	0.088		2	2	3	2	9	Rare	Seeds thoroughly boiled in tea are considered effective against chest infection, cough, asthma, hepatitis and vertigo goiter.
Prunus persica (L.) Batsch. **Rosaceae**	Shariatullah Bot. 200 (PUP)	Shaltalu	T	Flower	11	0.081		2	3	0	3	8	Vulnerable	Diuretic, purgative and anthelmintic
Sorbaria tomentosa (Lindl.) Rehdr. **Rosaceae**	Shariatullah Bot. 215 (PUP)	Jalbhang	T	Leaves & Fruit	10	0.074		0	3	0	4	7	Vulnerable	Fresh leaves are boiled in water and the decoction is used against diabetic patients.
Rubus ulmifolius Schott. **Rosaceae**	Shariatullah Bot. 209 (PUP)	Karwara	S	Fruit & Leaves	8	0.059		3	2	3	2	10	Rare	Fresh fruit used to cure cold and sore throat. Leaves decoction effective in the treatment of diarrhea, urticarial.
Desmodium elegans DC. **Fabaceae**	Shariatullah Bot. 163 (PUP)	Aday	S	Root	7	0.051	**16.29**	3	3	3	0	9	Rare	Diuretic and carminative.
Medicago lupulina L. **Fabaceae**	Shariatullah Bot. 157 (PUP)	Shpeshtarlay	H	Whole Plant	10	0.074		3	2	4	0	9	Rare	Laxative/ vegetable food.
Melilotus officinalis (L.) Desr. **Fabaceae**	Shariatullah Bot. 162 (PUP)	Lewanai	H	Leaves	5	0.037		2	3	4	4	13	Infrequent	Decoction is used as anticoagulant.

Key: **C-** Number of respondents citing the plant, **RFC**- Relative frequency of citation, **FIV**- Family importance value

Declarations

Ethics approval and consent to participate: All the participants provided prior informed consent before the interviews.

Availability of data and materials: Data is available from the first author.

Competing interests: The authors declare that they have no competing interests.

Funding: The research did not receive any specific grant from funding agencies in the public, commercial, or not - for-profit sectors.

Acknowledgments

The present work is a part of research project of the first author (Shariat Ullah). The authors are thankful to the local inhabitants of Jelar Valley for their cooperation during data collection.

Author Contributions

All authors contributed to the study, conception and design. The research was design and supervised by LB the field data was collected and wrote the first draft of article by SH while, WH, IH and AA reviewed and edited draft. All the authors read and approved the final manuscript.

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