

Chapter

Ethnomedicinal Appraisal of Traditionally Used Wild Edible Plants of District Bagh, Azad Jammu & Kashmir, Pakistan

Sadia Shabbir and Muhammad Shoaib Amjad

Abstract

The present study was aim to document the traditional knowledge about medicinal uses of wild edible plants in District Bagh Azad Kashmir. Ethnomedicinal data was gathered from 80 informants using open ended and semi structured interview, field observation and group discussion. A total of 51 wild edible plant species mentioned by informants' as medicinal belonging to 42 botanical genera and 32 botanical families with Legumenaceae (6 spp.) and Rosaceae (5 spp.) being most frequently used. Herbs (45.09%) were most commonly used for preperation of herbal recipies. The preferably used plant part for herbal preparation are leaves (64.7%). The plant species with highest relative frequency of citation are *Morus nigra* (0.9) and *Melia azedarach* (0.9). The highest UV values was recorded for *M. nigra* (1) and *Berberis lycium* (1). The highest RI value was calculated for *Urginea indica* (90). *Berberis lycium* had 100% fidelity level. Wild edible plants species are under high anthropogenic pressure and need immediate conservation through community base management, public awareness and germplasm collection. There is dire need for reappraisal of traditionally knowledge on wild edible plants which not only conserve this traditional heritage but may also contribute in future drug discovery.

Keywords: wild edible plants, Bagh, UV, RFC, ICF

1. Introduction

Humans have quite complex relationship with plants extending far back from the beging of human civilization on the earth. Plants are intially used for food, medicine and shelter. However various other uses are discover by human beging with the passage of time and the dependence of human being on plant increasaed many fold, and in this manner support various other aspects of human proserperity and walfare [1, 2]. Ethnobotany paly key role in understaning the past and present dynamic interrelationship between socioculture system and phytodiversity [3]. The term Ethonotany was first coined by John W. Harsberge in 1896 [4]. However Ford (1978)

developed the ethnobotanical discipline which described the collection, identification and uses of plants by the people [5]. In broader aspect, ethnobotany refers to the discipline which uses various anthropological approaches to understand the knowledge systems. During the current era, the ethnobotany emerges as a multidisciplinary subject which focuses on people-plant relationships not only by collection and documentation of plants and their potential uses but also involves economy, anthropology, botany, pharmacology, public health and various other fields. Thus, people-plant interaction is quite a broader aspect encompassing religious, social, artistic, commercial and symbolic relationships.

Ethnobotanical surveys play a pivotal role in highlighting the important plant species of the particular area. These species may be quite significant in pharmaceutical, farming, medicine and nutraceutical industry. The documentation of traditional knowledge provides the basis for development of various modern drugs. It has been estimated that about 25% of modern medicine are plant based and majority of allopathic medicines are synthetic analogues to the natural compounds isolated from various plant species [6]. About 70–80% population of developing countries still depend upon herbal remedies for curing various ailments. This may be due to their cost effectiveness, less side effect, cultural acceptability and lack of modern health facilities. Herbal remedies are even extensively used in various developed countries e.g. 40–50% population in Germany, 30–50% in China, 42% in the USA, 49% in France and 48% in Australia used plant based medicine as supplementary health care [7–9].

Wild plant species grows in natural or semi natural ecosystem spontaneously and exist independently without any human intervention. In contrast cultivated or domesticated plants have grown under human intervention, such as collection or breeding, and rely on management for their continuing survival. Wild edible plants are gathered throughout the world using traditional practices from different habitats such as forests, wetlands, cultivable fields and roadside. Since ancient times, wild plants have played a pivotal role in the survival and livelihood of numbers of ethnic communities across the world by providing medicine, food, colors, shelter, poisons, textiles and also used in cultural and religious ceremonies [10]. They are preferred by the people because of their aromatic and fresh taste, growing in pollutant free environment, rich mineral nutrients, strong vitality and number of health and medicinal benefits [11].

According to estimates there are about 20,000 wild plant species across the world [12, 13]. In the past, more than 7000 wild edible plant species have been used by humans [14]. Out of total, only 3000 species have been used as agricultural crops and 150 species are commercially cultivated. However 90% of our food is obtained from only 20 species [12, 15, 16]. The usage of wild edible plants as food occurs both in the time of food shortage and surplus and this usage has not completely disappeared even in the agricultural societies where people primarily depend upon crop plants [17, 18]. Throughout the contemporary world, about 200 million people still fill their food and livelihood requirements from forests [12]. Previous reports also documented the therapeutic potential and nutritional value of wild edible plants [15, 16, 19].

The wild edible plants (WEPs) are an integral component of biodiversity and their in situ conservation offers various sociocultural, economic and agriculture benefits [10, 20]. The role of wild edible plants in folk traditions is quite significant. However the most relevant and consistent reason for better management of wild edible plants are their use as food and medicine. Therefore, the ethnobotanical research is

important in identifying new source for food and providing raw material for drug discovery. The presence of high amount of various micronutrients, minerals and vitamin increase the nutritional quality of wild edible as compared to domesticated varieties and hence preferred by ethnic communities [21]. Some areas of the world have particular diversity of plants and animals [15, 16]. District Bagh, is one of such area located in western Himalayan region of Azad Jammu & Kashmir. The area harbored number of wild edible plants, which are use by local in variety of ways. Large numbers of wild edible plants are widely distributed throughout the District and consumed in various ways. Nutritionally, most of these plants are highly important because of presence of fiber contents, minerals and vitamins. Root, nut, tubers, fruit and bark are commonly consumed parts, which were analyzed for carbohydrate, protein, fats and minerals.

Previous epidemiological reports confirmed that diet have key role in curing various chronic ailments. This evidence suggest that change in behavior of diet such as high consumption of grains, fruits and vegetable is a practical strategy in minimizing or controlling the incidence of various chronic ailments. High consumption of wild fruits and vegetables have strong link with low risk of cancer, cardiovascular and inflammatory diseases, Alzheimer's disease, diabetes, Aging, cataracts. The connection between food and health is becoming highly significant as people now demand tasty, healthy and natural functional foods which grow in uncontaminated environment. In different regions of the world the knowledge about such wild edible plants as medicine and food is disappearing. This is because it mainly transferred orally and vertically from generation to generation as a part of traditional knowledge. Hence it is very crucial to document the data about popular uses of such plants before this knowledge become extinct. Therefore, current study is design to (a) document ethnomedicinal knowledge about wild edible plants (b) quantitatively analyze the data by using various indices such as frequency of citation, use value, informant consent factor, relative importance and fidelity level.

2. Material and methods

2.1 Study area

District Bagh is one of the diversity rich area lies in western Himalayan region of Azad Kashmir. Its geographical coordinates are between latitude 33°53'–4°07' N and longitude 73°30' to 74° E. The altitude of the area varies between 600 and 3300 m. The total land area is 770 m² and total population is 0.397 illion. Map of the study area is given in **Figure 1**. The climate of the area is of Mediterranean type with annual precipitation of 1500 mm. January is coldest month with average minimum temperature fall below –2°C and June is warmest month where average maximum temperature remains close to 40°C.

The local inhabitant of the area belongs to diverse ethnic group mainly Maldial, Abbasi, Khawa, Rajpoot, Gujar and Sadaat. The whole population is Muslim. Commonly spoken languages include Hinko, Pahari, Kashmiri and Gojri. The vegetation of the area varies from subtropical to temperate type comprises a wide variety herbs, shrubs, trees and climbers. The people residing at higher altitude have poor socioeconomic condition and have a long abundant and tradition practices of eating wild plants. Due very limited access to modern health facilities, they still use these plants to

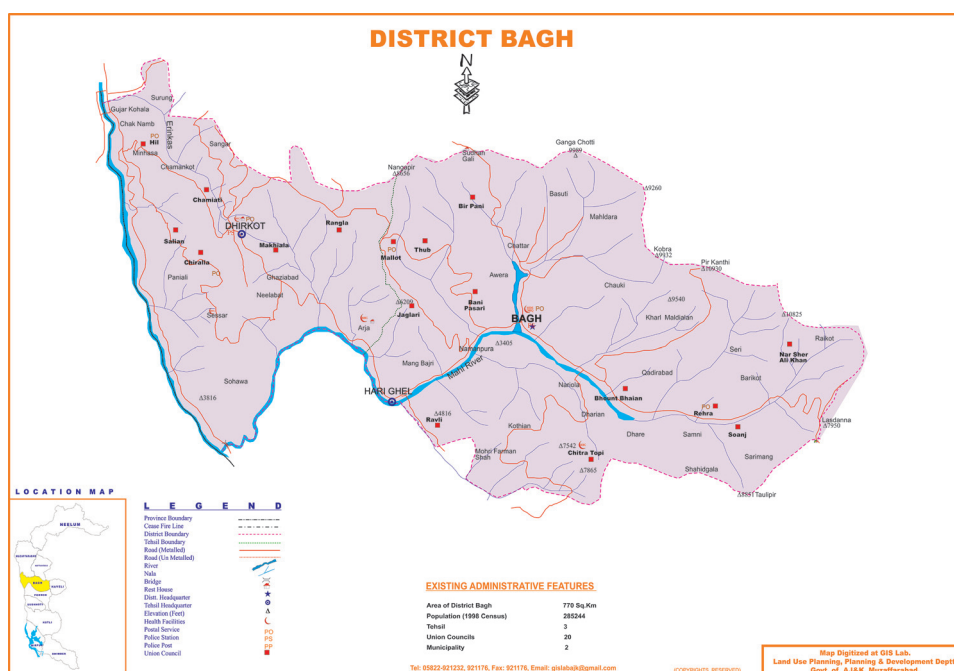


Figure 1.
Map of study area.

cure various ailments. However, knowledge about medicinal and other use of plants are mainly confine to elder peoples and health Practionaire (hakims).

2.2 Ethnobotanical data collection

Ethnomedicinal data about wild edible plants was obtained from 80 informants (35 males; females) open ended and semi structured interviews, field observation and group discussion. The consent was verbally obtained from the participant before starting interview. Ethical codes of American society of Ethnobiology was followed strictly during survey. Ethical permission to conduct survey was obtained from ethical committee of university, while legal permission was obtained from members of municipality. Complete information about wild edible plants such as local name, medicinal usage, part used in herbal recipie, cooking recipe, mode of consumption, disease treated were carefully recorded.

2.3 Plant collection and identification

Field survey was conducted during March 2020 to February 2021. The wild edible plants specimens were collected in triplicate during different season throughout year. The specimens were properly dried, pressed and pasted on herbarium sheets. By using flora of Pakistan (<https://http://www.efloras.org>) the specimens were identified. APG IV (2016) system was adopted for taxonomical verification of families while the correct botanical nomenclature was given by using The Plant List (2013). The identified specimens were further confirmed at Pakistan Agriculture and

Research Council (PARC), Islamabad. The finally identified specimens were submitted finally in herbarium of Botany Department of Women University.

2.4 Quantitative ethnobotanical indices

The collected ethno medicinal data of wild edible plants was quantitatively analyzed by using following indices:

2.4.1 Relative frequency of citation (RFC)

The local significance of particular plant species as cited by the informants was determined by using relative Frequency of Citation. It was figured out after Vijayakumar et al. [22] by given formula:

$$RFC = FC/N \quad (1)$$

whereas, FC is informant who reported specific wild edible plant species and N is total informants. Its value range between 0 and 1.0 when no informant cited use of species as useful and 1 when all the informant cited the species as useful.

2.4.2 Use value index

The relative importance of particular species in region is reflected by use value (UV) and determined by following Vijayakumar et al. [22] by given formula:

$$UV = \frac{\sum U_i}{N} \quad (2)$$

Where, UV are use reports cited by each informant for given wild edible plant species and N are total informants.

2.4.3 Relative importance

It was figured out after Khan et al. [23] by given formula:

$$RI = (Rel PH + Rel BS) \times 100/2 \quad (3)$$

$$Rel PH = \frac{PH \text{ of a given plant}}{\text{maximum PH of all reported species}} \quad (4)$$

Where PH is the pharmacological attribute of the selected plant, Rel PH = relative pharmacological attributes of a given plant.

$$Rel BS = \frac{BS \text{ of a given plant}}{\text{maximum BS of all reported species}} \quad (5)$$

Where BS is body systems healed by given species and Rel BS is relative body systems healed by that species.

2.4.4 Informant consensus factor (ICF)

The consensus among the informants about usage of wild edible plants for treating different disease categories will check by using ICF. It was determined after Heinrich et al. [24] using given formula:

$$ICF = \frac{Nur - Nt}{(Nur - 1)} \quad (6)$$

Where, Nur is use reports in given diseases category, Nt are species numbers used for curing various diseases of that category.

2.4.5 Fidelity level (FL)

It reflect weigtage of particular plant species by informants to heal given ailment and was figured out after Alexiades and Sheldon [25] using given formula

$$FL\% = Np/N \times 100. \quad (7)$$

Where Np are informants citing use of specific wild plant species for a particular ailment and N are the total informants mentioning uses for a particular wild plant species for all disease category.

3. Results and discussion

3.1 Demography and knowledge variation

A total of 80 informants (35 males; 45 females) were selected to gathered knowledge about usage of wild edible plants from District Bagh. The informants were divided into four groups i.e. gender, age, education and profession (**Table 1**). The informants were first classified on the base of gender. Women informants were more in number as compared to men because the interviewee was female and women do not hesitate to share information with her. Besides, the women had high traditional knowledge (average cited species 3.90; average cited uses 5.15) about usage of wild edible plants as compared to male (average cited species 4.56; average cited uses 6.73) This may because the women generally mange the indoor and domestic activities while the males mostly engage in earning and field works. The other reason may be strongly connected network among the women and greater knowledge sharing with high number of central individual. These findings are strongly supported by Kayani et al., Aziz et al., Shaheen et al., Farooq et al. and Amjad et al.

Age was second criteria used for classification of informants. Base on age the informants were categorized into three categories i. e. 20–40, 41–60 and 60–80. The older age people (between 60 and 80) had more knowledge (average cited species 11.32; average cited uses 12.91) about wild edible followed by elder (average cited species 8.16; average cited uses 7.31) and younger (average cited species 3.44; average cited uses 3.67). The older age people had vast experience of practicing wild plants. While the younger had limited interest in learning and practicing traditional

Variables	Informants category	Numbers	Percentage	ANSCI	ANUCI
Gender	Male	35	43.75	3.90	5.15
	Female	45	56.25	4.56	6.73
	Total	80			
Age class	20–40	21	26.25	3.44	3.67
	41–60	46	57.5	8.16	7.31
	60–80	13	16.25	11.32	12.91
Education	Illiterate	26	32.5	7.46	5.35
	Elementary education	19	23.75	10.56	9.67
	Secondary education	16	20	6.33	7.23
	Bachelors degree	11	13.75	5.34	3.42
	Higher education	8	10	3.94	2.37
Profession	Traditional health practionaires	9	11.25	20.48	13.98
	House wives	23	28.75	5.95	7.56
	Teachers	12	15	4.22	4.95
	Farmers	3	3.75	5.25	4.75
	Mid wives	10	12.5	8.15	8.67
	Herders	5	6.25	5.95	7.10
	Doctor	1	1.25	3.34	4.15
	Student	6	7.5	2.30	2.77
	Others	11	13.75	4.58	3.45

Key: ANSCI, average species cited by each informant; ANUCI, average N use cited by each informant.

Table 1.
Demographic characteristic of informants.

knowledge due to change in lifestyle and modernization. Similar trend were also observed by Qaseem et al. in Kotli, Shaheen et al. in Pearl valley and Umair et al. [26] in Hafizabad.

The third significant factor was education. Educated peoples had less knowledge about wild edible plants as compared to educated people. This is due to frequent utilization and direct attachment of uneducated informants with wild edible plants species. Beside they mostly contact with traditional healers during illness. The modern education and culture mostly detach the people from nature. Likewise, the traditional health practitioner (hakim) had more knowledge about wild plants because they remain in touch with them. They have strong academic knowledge about usage of herbs for curing various ailments. Previous reports from other areas of Pakistan and other world also report similar findings.

3.2 Taxonomic diversity of wild edible plants

A total of 51 wild edible plant species distributed among 42 genera and 32 families were documented from District Bagh. Maximum plant species were herbs (24 spp.; 45.09%) followed by shrubs (14 spp.; 27.45%) trees (12 spp.; 23.52%) and climber

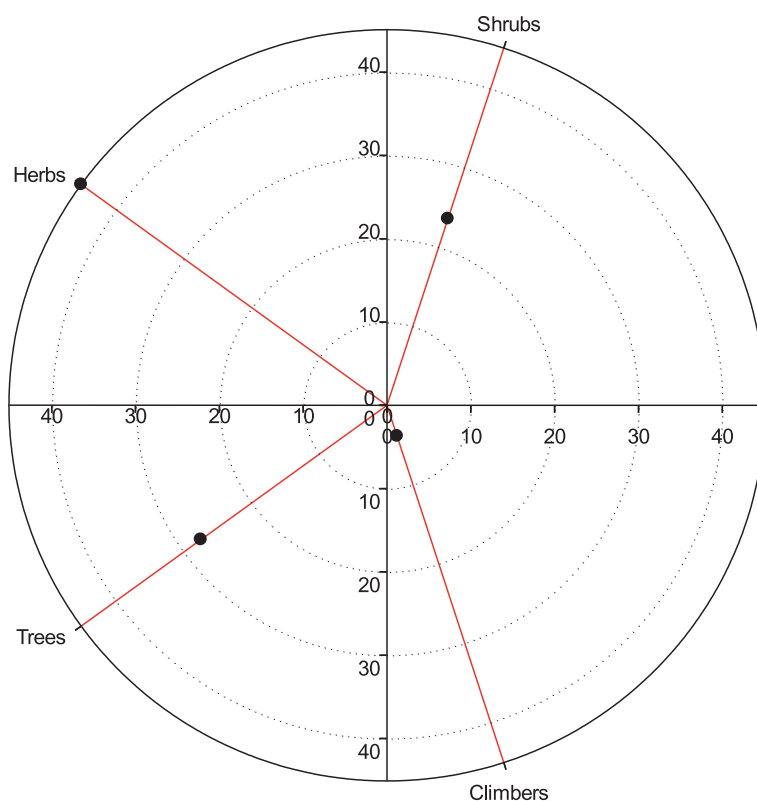


Figure 2.
Life form distribution of wild edible plants.

(2 spp.; 3.92%) (**Figure 2**). The dominance of herbaceous flora is due to location of study area in dense forest at higher altitude where there is high rainfall and moisture content.

Legumenaceae is a dominant family in the area having 6 species followed by Rosaceae (5 spp.) and Moraceae (4 spp.) (**Figure 3**). The dominance of these families in the study area might because the habitat and environmental conditions of the area are favorable for the member of these families. The local inhabitants of the area had great familiarity to the member of these families. The presence of high amount of active ingredients in its members might be another reason for their dominance. Previous reports from other areas of Pakistan and world support our findings [7, 27, 28].

3.2.1 Plants parts used

Local inhabitant of study area used various plants part to prepare different herbal recipes. Leaves were most frequently used plant part (64.7%) for herbal preparation followed by whole plants (5.88%) root (9.8), fruit (27.4), seed (19.6), flowers (7.8) bark (11.7%) bulb (3.92%) bark gal (1.96%) and petals (1.96%) as shown in (**Figure 4**). The high efficacy of leaves in phytotherapy might be due to presence of extractable crude drugs, phytochemicals and many other mixtures. This studies conducted with different regions of Pakistan Bano et al. and Ahmad et al.

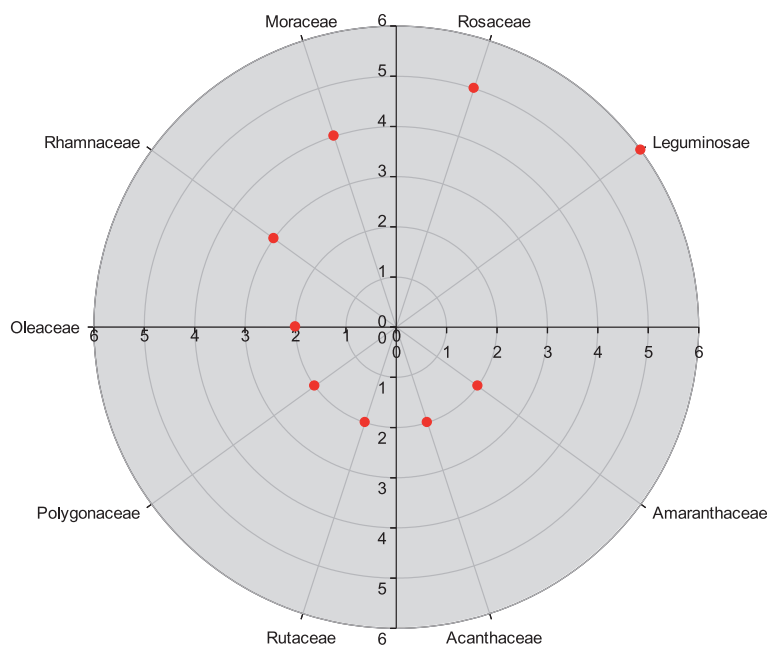


Figure 3.
 Top ranked families of wild edible plant species.

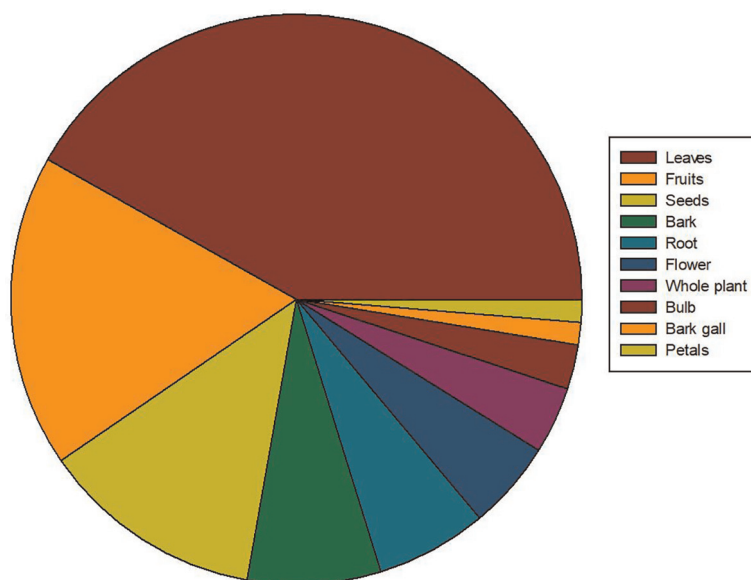


Figure 4.
 Plant used in preparation of herbal recipes.

3.2.2 Mode of consumption

Wild edible plants were consumed in different ways by local inhabitants to cure various ailments. Maximum species (species; 41.1%) were used in cooked form, followed by raw (15 species; 29.4), extract (6 species; 11.7%), soup (6 species; 11.7%)

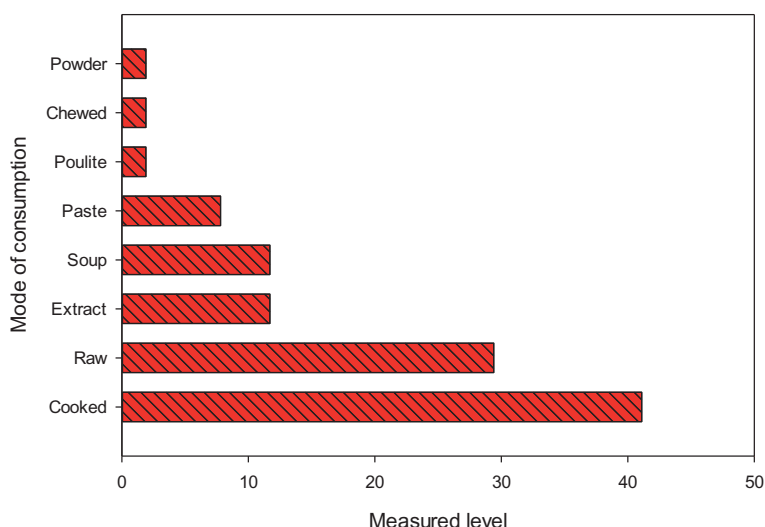


Figure 5.
Mode of consumption of wild edible plant species.

paste (4 species; 7.8%), powder (1 species; 1.9%) chewed (1 species; 1.9%) and poulite (1 species; 1.9) as shown in (Figure 5). Our findings are supported by previous documentation [7, 29–31]). Cooking and eating raw snakes are common practice in food anthropology as described in various previous reports. The specific parts of wild edible plants are directly cooked as a vegetable by mixing with water, soup and milk fruits are eat in raw form. Paste and poulite are apply on skin for various diseases treatment like scabies, skin worms.

3.2.3 Quantitative ethnobotanical indices

3.2.3.1 Use value (UV)

The relative importance of plant species associated with the use of particular species reported by the informants is reflected by use value. The use value of document species ranges from 0.1 to 1. The maximum UV values was reported for *Berberis lycium* Royle (1) and *Morus nigra* (1). Other species with high use value are *Melia azedarach* (0.9), *Ficus palmata* (0.9) and *Dryopertis racemose* (0.8) (Table 2). The high usage of the reported species indicates a strong association and dependence of local communities on surrounding flora, specifically for the treatment of various diseases [32]. Moreover, the plant species which are used excessively are assumed to be biologically more active; therefore, these should be subjected to phytochemical and pharmacological screening to increase sustainable utilization and conservation of plant resources [33].

3.2.3.2 Relative importance (RI)

Relative importance reflect diversity of particular species for curing various ailments in area. The relative importance of the documented species ranges between 12.14 and 90.00. The highest RI value was calculated for *Urginea indica* (90.00) followed by *Elaeagnus umbellata* (77.86), *Pimpinella diversifolia* (73.57) and *Oxalis corniculata* (68.57) [34] (Table 2). The speies having high relative importance are

Sr. no.	Botanical name/Voucher number	UI	UV	FC	RFC	PH	BS	Rel PH	Rel BS	RI
1.	<i>Berberis lycium</i>	80	1	68	0.9	4	3	0.4	0.43	21.43
2.	<i>Ficus carica</i>	60	0.75	50	0.6	1	2	0.1	0.29	14.29
3.	<i>Olea ferruginea</i>	52	0.65	32	0.4	7	3	0.7	0.43	21.43
4.	<i>Oxalis corniculata</i>	44	0.55	22	0.2	6	4	0.6	0.57	28.57
5.	<i>Phyllanthus emblica</i>	32	0.4	20	0.2	2	3	0.2	0.43	21.43
6.	<i>Pimpinella diversifolia</i>	64	0.8	54	0.6	3	3	0.3	0.43	21.43
7.	<i>Pistacia chinensis</i>	12	0.15	6	0.1	7	2	0.7	0.29	14.29
8.	<i>Rosa abietina</i>	36	0.45	28	0.3	2	1	0.2	0.14	7.14
9.	<i>Rumex hastatus</i>	56	0.7	16	0.2	3	2	0.3	0.29	14.29
10.	<i>Solanum americanum</i>	40	0.5	20	0.2	2	5	0.2	0.71	35.71
11.	<i>Zanthoxylum armatum</i>	60	0.75	44	0.5	2	3	0.2	0.43	21.43
12.	<i>Ziziphus nummularia</i>	20	0.25	34	0.4	5	2	0.5	0.29	14.29
13.	<i>Ziziphus oxyphylla</i>	30	0.35	56	0.7	2	3	0.2	0.43	21.43
14.	<i>Rumex dentatus</i>	30	0.35	70	0.8	1	2	0.1	0.29	14.29
15.	<i>Taraxacum officinale</i> F.H.Wigg./SS-15	34	0.43	60	0.7	1	5	0.1	0.71	35.71
16.	<i>Dryopteris racemose</i>	71	0.88	67	0.8	5	2	0.5	0.29	14.29
17.	<i>Lathyrus aphaca</i>	66	0.82	50	0.6	1	5	0.1	0.71	35.71
18.	<i>Portulaca quadrifida</i>	46	0.58	23	0.2	4	2	0.4	0.29	14.29
19.	<i>Trigonella gracilis</i>	22	0.28	45	0.5	2	4	0.2	0.57	28.57
20.	<i>Vicia faba</i>	42	0.53	54	0.6	2	4	0.2	0.57	28.57
21.	<i>Pinus roxburghi</i>	68	0.85	67	0.8	10	3	1	0.43	21.43
22.	<i>Punica granatum</i>	26	0.33	54	0.6	6	4	0.6	0.57	28.57
23.	<i>Melia azedarach</i>	75	0.94	77	0.9	4	6	0.4	0.86	42.86
24.	<i>Morus alba</i>	66	0.83	53	0.6	3	7	0.3	1.00	50.00
25.	<i>Morus nigra</i>	80	1	78	0.9	4	5	0.4	0.71	35.71
26.	<i>Ficus palmata</i>	79	0.99	64	0.8	2	6	0.2	0.86	42.86
27.	<i>Urginea indica</i>	74	0.93	56	0.7	6	3	0.6	0.43	21.43
28.	<i>Rubus fruticosus</i>	56	0.7	45	0.5	8	2	0.8	0.29	14.29
29.	<i>Artemisia maritima</i>	48	0.6	58	0.7	2	2	0.2	0.29	14.29
30.	<i>Allium sativum</i>	63	0.79	46	0.5	5	1	0.5	0.14	7.14
31.	<i>Rosa rubiginosa</i>	61	0.76	58	0.7	3	3	0.3	0.43	21.43
32.	<i>Asystasia gangetica</i> T.Anderson/SS-32	79	0.99	21	0.2	11	1	1.1	0.14	7.14
33.	<i>Elaeagnus umbellata</i>	72	0.9	48	0.6	4	2	0.4	0.29	14.29
34.	<i>Robinia pseudoacacia</i>	65	0.81	33	0.4	5	3	0.5	0.43	21.43
35.	<i>Amaranthus caudatus</i>	50	0.63	25	0.3	8	2	0.8	0.29	14.29
36.	<i>Amaranthus viridis</i>	45	0.56	20	0.2	5	1	0.5	0.14	7.14
37.	<i>Urtica dioica</i>	49	0.61	54	0.6	3	3	0.3	0.43	21.43
38.	<i>Quercus incana</i>	33	0.41	49	0.6	2	2	0.2	0.29	14.29

Sr. no.	Botanical name/Voucher number	UI	UV	FC	RFC	PH	BS	Rel PH	Rel BS	RI
39.	<i>Diospyros lotus</i>	53	0.66	28	0.3	4	4	0.4	0.57	28.57
40.	<i>Zanthoxylum alatum</i>	23	0.29	70	0.8	5	3	0.5	0.43	21.43
41.	<i>Nasturtium officinale</i>	36	0.45	30	0.3	4	5	0.4	0.71	35.71
42.	<i>Canabis sativa</i>	67	0.84	56	0.7	4	1	0.4	0.14	7.14
43.	<i>Justicia adhatoda</i>	12	0.15	14	0.1	8	3	0.8	0.43	21.43
44.	<i>Capsella bursa-pastoris</i> Medik./SS-44	27	0.34	36	0.4	6	2	0.6	0.29	14.29
45.	<i>Melilotus albus</i>	39	0.49	21	0.4	6	1	0.6	0.14	7.14
46.	<i>Veronica arvensis</i>	40	0.5	13	0.1	2	3	0.2	0.43	21.43
47.	<i>Vicia sativa</i>	21	0.26	19	0.2	2	2	0.2	0.29	14.29
48.	<i>Medicago polymorpha</i>	37	0.46	20	0.2	1	1	0.1	0.14	7.14
49.	<i>Duchesnea indica</i>	26	0.33	60	0.7	1	6	0.1	0.86	42.86
50.	<i>Ziziphus sativa</i>	13	0.16	50	0.6	3	2	0.3	0.29	14.29
51.	<i>Prunus domestica</i>	37	0.46	34	0.4	1	3	0.1	0.43	21.43

Key: UV, use value; Ui, the number of uses that account for each species through every number of informants; FC, frequency of citation; RFC, relative frequency of citation; PH, relative number of pharmacological properties attributed to a single plant, BS, Number of body systems treated by a single species; Rel, relative number; RI, relative importance.

Table 2.

Quantitative ethnomedicinal data of wild edible plants.

used in excess by the native and have strong pharmacological potential [2] and their significance increases when used for curing number of ailments [35].

3.2.4 Informant consensus factor

The consensus of informants on wild edible plants to cure various diseases was determined by using ICF. To develop this consensus, all the treated ailments are categorized into 10 diseases groups. The value of ICF varied between 0.4 and 0.94. (Figure 6). The highest value of ICF (0.94) is digestive system and liver disease categories. The most frequently used plants for this category are *Berberis lycium*, *Dryopteris racemose*, *Ziziphus oxyphylla*, *Melia azedarach*, *Ficus palmata*, *Allium sativum*, *Zanthoxylum alatum*, *Medicago polymorpha*, *Ziziphus sativa*, *Prunus domestica*, *Taraxacum officinale*, *Rubus fruticosus*, *Amarantus caudatus*, *Elaeagnus umbellata*, *Morus nigra*. Previous reports from other study area also reflect high ICF for this disease category [2, 36–38]. The prevalence of digestive system disorder might be due to unavailability of clean drinking water and poor hygienic condition in the area. The second highest ICF value was recorded for skin diseases.

3.2.5 Fidelity level

The fidelity level of wild edible plants species for curing different ailments in the study area varies between 30 and 100%. The fidelity level of only *Berberis lycium* was found 100 FL% which was used for the treatment of various diseases like diabetes, jaundice, diarrhea and stomach treatment. It was followed by *Rubus fruticosus* (83.3%) used to cure sore throat, *Ziziphus oxyphylla* (83.3%) used to cure jaundice and *Rumex dentatus* (80%) used to cure jaundice. Other species with high FL value are *Urginea*

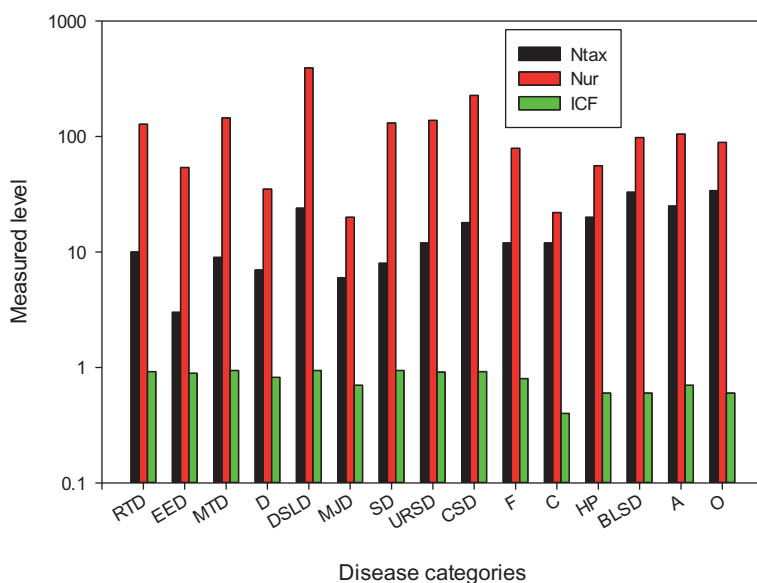


Figure 6. Diseases categories treated by wild edible plant species in District Bagh. Key: RST, respiratory system diseases; EED, eye and ear diseases; MTD, mouth throat diseases; D, diabetes; DSLD, digestive system and liver diseases; MJD, muscular and joint diseases; SD, skin diseases; URSD, urinary and reproductive system diseases; CSD, circulatory system diseases; F, fever; C, cancer; HP, hair problems; BLSD, blood and lymphatic system diseases; A, antidote; O, others.

indica (76.7%), *Artemisia maritima* (76.5%), *Ziziphus nummularia* (76.0%), *Rosa abietina* (75%) and *Trigonella gracilis* (75%) (**Figure 7**). These spp. are mostly use to cure the digestive respiratory skin diseases like cold, dyscentery, diarrhea, fever and ulcer. Some other reserachers also recoded high fidelity level of these species in their

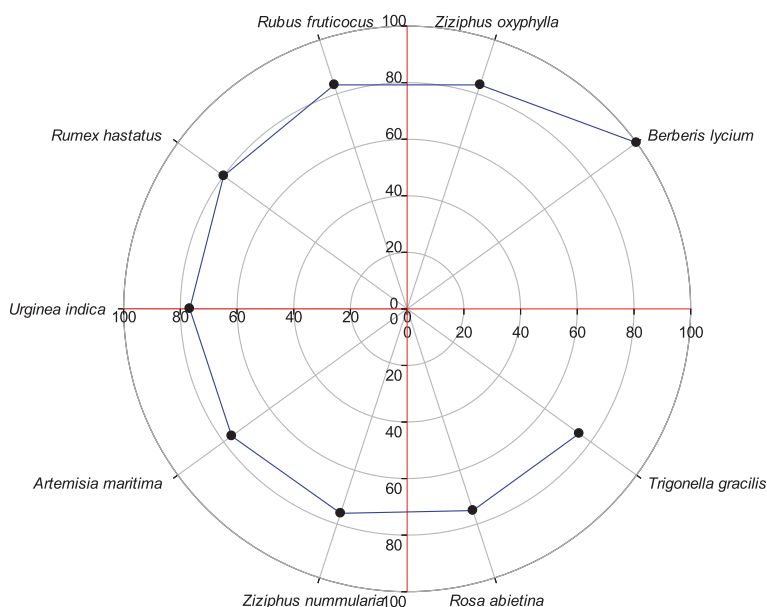


Figure 7. Top ranked species with high fidelity level of wild edible plants.

investigated area [39]. These results reflect the dominance of particular disease in the investigated area, which are cured by using medicinal plant species with high fidelity level [7, 40]. The species with high FL are highly used in the investigated area as compared to the species with low FL value. The species having low FL values are not most important by the native of the study area [36]. The species with high FL value should be subject to further phytochemical and pharmacological investigation to validate the traditional knowledge.

4. Conclusion

The present study revealed that the rural communities of District Baghs still use wild edible plants for medicine, food and other purposes. But this indigenous knowledge on plant usage is disappearing rapidly due to modernization, which should be conserved before it is extinct. The use pattern of wild edible plants is mainly influenced by socio-economic factors instead of climatic factors. Study of the results showed that in the study area, most of the wild edible plants are used by poor families during difficult and normal times. However, there is a rapid decline in the use of several species which may lead to the extinction of this traditional knowledge. The citation and use reports of wild vegetables verified that cultural heritage and cultural worth regarding collection of wild edible plants is analogous because most of the cited species are the same. The majority of the plants were employed to treat digestive system and liver disorders, skin diseases and respiratory tract diseases. The plant species with high RFC, UV, RI and FL should be subject to further pharmacological and phytochemical studies to verify this traditional knowledge which can be used in the future for novel drug development. The current study also revealed that wild edible plant species are under high anthropogenic pressure and need immediate conservation through community-based management, public awareness and germplasm collection. Besides, the contribution of ethnic communities for diversification of medicine and food sources should be recognized at the national and international level. There is a dire need for reappraisal of traditional knowledge on wild edible plants which not only conserve this traditional heritage but may also contribute in future drug discovery.

Appendix

Pictures of wild edible plants reported from study area.



Berberis lycium



Ficus carica



Olea ferruginea



Oxalis corniculata



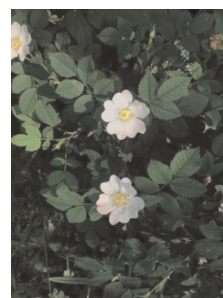
Phyllanthus emblica



Pimpinella diversifolia



Pistacia chinensis



Rosa abietina



Rumex hastatus



Solanum americanum



Zanthoxylum armatum



Ziziphus nummularia



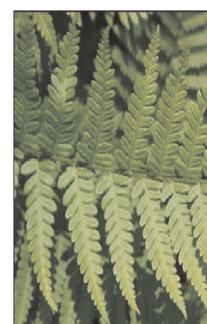
Ziziphus oxyphylla



Rumex dentatus



Taraxacum officinale



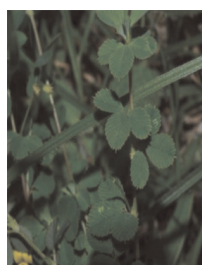
Dryopteris racemose



Lathyrus aphaca



Portulaca quadrifida



Trigonella gracilis



Vicia faba



pinus roxburghi



Punica granatum



Melia azedarach



Morus alba



Morus nigra



Ficus palmata



Urginea indica



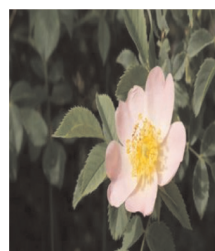
Rubus fruticosus



Artemisia maritima



Allium sativum



Rosa rubiginosa



Asystasia gangetica



Elaeagnus umbellata



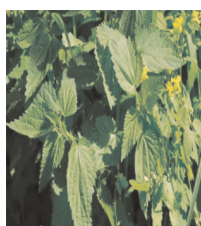
Robinia pseudoacacia



Amaranthus caudatus



Amaranthus viridis



Urtica dioica



Quercus incana



Diospyros lotus



Zanthoxylum alatum



Nasturtium officinale



Cannabis sativa



Justicia adhatoda



Capsella bursa-pastoris



Melilotus albus



Veronica arvensis



Vicia sativa



Medicago polymorpha



Duchesnea indica



Ziziphus sativa



Prunus domestica

Ethnomedicinal uses of wild edible plants of District Bagh.

Sr no.	Botanical name/ voucher number	Vernacular name	Family	Habitat	Part used	Mode of consumption	Mode of administration	Diseases treatment
1.	<i>Berberis lycium</i> Royle/ SS-01	Sumbal	Berberdaceae	Shrub	Root	Extract	Internal	Jaundice
					Bark	Powder		Diabetes, stomach disorder
					Leaves	Raw		Diarrhea
2.	<i>Ficus carica</i> L./SS-02	Jangli ingeer	Moraceae	Tree	Leaves	Cooked	External	Throat
3.	<i>Olea ferruginea</i> Wall.ex Aitch/SS-03	Kao	Oleaceae	Tree	Seed	Extract	Internal	Toothache, Stomach disorder, diarrhea, heart diseases, High cholesterol, high blood pressure
4.	<i>Oxalis corniculata</i> L./SS-04	Khatti booti	Oxalidaceae	Herb	Leaves	Cooked	Internal	Influenza, fever
					Seed	Cooked	Internal	urinary tract infection, wash to rid children hookworms
					Bark	Paste	External	Insect bites
5.	<i>Phyllanthus emblica</i> L./SS-05	Amala	Phyllanthaceae	Tree	Seed	Extract	External	Hair care, skin care
6.	<i>Pimpinella diversifolia</i> DC./SS-06	Sonf	Apiaceae	Herb	Seed	Soup	Internal	Respiratory tract diseases, urinary tract infection, kidney stone
7.	<i>Pistacia chinensis</i> Bunge/SS-07	Karkatshringi	Anacardiaceae	Tree	Fruit	Soup	Internal	Cough, asthma, dysentery, liver, disorders, snake bite
8.	<i>Rosa abietina</i> Gren. ex H. Christ/SS-08	Jangli gulab	Rosaceae	Shrub	Leaf	Extract	Internal	Blood purifier, wound healing
9.	<i>Rumex hastatus</i> D. Don/SS-09	Chukhare	Polygonaceae	Shrub	Fruit	Soup	Internal	Asthma, cough
					Root			Fever
10.	<i>Solanum americanum</i> Mill./SS10	Kachmach	Solanaceae	Herb	Whole plant	Paste	External	Scabies, skin worms
11.	<i>Zanthoxylum armatum</i> DC./SS-11	Timber	Rutaceae	Shrub	Leaves	Paste	Internal	Asthma
					Seed		External	Toothaches
12.	<i>Ziziphus nummularia</i> (Burm.f.) Wight & Arn./SS-12	Karken ber	Rhamnaceae	Shrub	Leaves	Soup	Internal	Cold, dysentery
					Seed			Diarrhea, Fever
					Bark			Ulcer
13.	<i>Ziziphus oxyphylla</i> Edgew./SS-13	Phitni	Rhamnaceae	Shrub	Fruit	Raw	Internal	Diabetes, jaundice

Sr no.	Botanical name/ voucher number	Vernacular name	Family	Habitat	Part used	Mode of consumption	Mode of administration	Diseases treatment
14.	<i>Rumex dentatus</i> L./SS-14	Jungli palak, Hula	Polygonaceae	Herb	Fruit, Root	Cooked	External	Skin diseases
15.	<i>Taraxacum officinale</i> (L.) Weber ex F. H.Wigg./SS-15	Haund	Asteraceae	Herb	Leaves	Cooked	Internal	Diabetes
16.	<i>Dryopteris racemose</i> /SS-16	Kunji	Dryopteridaceae	Herb	Leaves	Cooked	Internal	Diarrhea, headache, heart diseases, respiratory disorder, uterus disorders
17.	<i>Lathyrus aphaca</i> L./SS-17	Jungli matter	Leguminosae	Climber	Seed	Cooked	Internal	Toothache
18.	<i>Portulaca quadrifida</i> L./SS-18	—	Portulacaceae	Herb	Whole plant	Extract	Internal	Diuretic, fever, urinary disorders, dysentery
19.	<i>Trigonella gracilis</i> Benth./SS-19	Not Known	Leguminosae	Herb	Leaves	Cooked	Internal	diabetes, decreasing blood, cholesterol.
20.	<i>Vicia faba</i> L./SS-20	Faba bean	Leguminosae	Tree	Flowers	Cooked	Internal & External	Diuretic, removal of wards
21.	<i>pinus roxburghii</i> /SS-21	Cheer	Pinaceae	Tree	Fruit Resin	Poultice	External	TB Wound healing
22.	<i>Punica granatum</i> L./SS-22	Daru	Lythraceae	Shrub	Fruit	Raw	Internal	Sore throats, coughs, urinary infection, digestive disorders
							External	Skin disorder
23.	<i>Melia azedarach</i> L./SS-23	Darkh	Meliaceae	Tree	Fruit	Soup Raw	Internal	Malarial fever, purify blood, diabetes Gas trouble
24.	<i>Morus alba</i> L./SS-24	Shatoot	Moraceae	Tree	Fruit	Raw	Internal	Dizziness, liver, kidney disorder
25.	<i>Morus nigra</i> L./SS-25	Khaa shattot	Moraceae	Tree	Fruit Leaves	Raw	Internal	Cough, bronchitis Diuretic, Asthma
26.	<i>Ficus palmata</i> Forssk./SS-26	Pagwara	Moraceae	Tree	Fruits Leaves	Cooked Latex	Internal External	Constipation Warts
27.	<i>Urginea indica</i> (Roxb.) Kunth/SS-27	Jungli piazz	Asparagaceae	Herb	Whole plant	Cooked	Internal	Diuretic, cough, asthma
28.	<i>Rubus fruticosus</i> /SS-28	Pahunay/ black berry	Rosaceae	Herb	Fruit	Raw	Internal	Anticancer, dysentery, diarrhea, whopping cough, toothache,

Sr no.	Botanical name/ voucher number	Vernacular name	Family	Habitat	Part used	Mode of consumption	Mode of administration	Diseases treatment
								sore throat, mouth ulcer, mouthwash
29.	<i>Artemisia maritima</i> L./SS-29	Chahu	Compositae	Herb	Leaves	Chewed Cooked	External Internal	Toothache Flavoring
30	<i>Allium sativum</i> L./SS-30	Jungli lashun	Amaryllidaceae	Herb	Whole plant	Cooked	Internal	Diabetes, fever, intestinal worms, dysentery, high blood pressure
31.	<i>Rosa rubiginosa</i> /SS-31	Chal	Rosaceae	Shrub	Flowers	Cooked	Internal	Headaches, dizziness, blood purifier
32.	<i>Asystasia gangetica</i> (L.) T.Anderson/SS-32	Aheer	Acanthaceae	Climber	Fruit	Extract	Internal	Hypertension, asthma, fever, epilepsy, stomach, heart pain, urethral discharge, nose bleeding, dry cough, irritated throat, chest infection
33.	<i>Elaeagnus umbellata</i> Thunb./SS-33	Kankoli	Elaeagnaceae	Shrub	Seed	Raw	Internal	Respiratory diseases, cough, pulmonary infection
34.	<i>Robinia pseudoacacia</i> L./SS-34	Kiker	Leguminosae	Tree	Fruit	Raw	Internal	Calms stomach, burns, eye ailment
35.	<i>Amaranthus caudatus</i> Linn./SS-35	Rata ganayar	Amaranthaceae	Herb	Leaves Seed	Cooked	Internal	Eyes diseases, diuretic, diabetes, Malaria, ulcer, Diarrhea, swelling of the mouth, high cholesterol
36.	<i>Amaranthus viridis</i> L./SS-36	Chetta ganayar	Amaranthaceae	Herb	Leaves	Cooked Paste	Internal External	Ulcer, Throats, headaches, tumors Warts
37.	<i>Urtica dioica</i> L./SS-37	Kengi	Urticaceae	Herb	Leaves Seed	Cooked	Internal	Diabetes, urinary, tract infection, Kidney stone
38.	<i>Quercus incana</i> Bartram/SS-38	Reeyun	Fagaceae	Tree	Leaves Seed	Raw	Internal	Diuretic Diarrhea
39.	<i>Diospyros lotus</i> L./SS-39	Kala amlook	Ebenaceae	Tree	Fruit	Raw	Internal	Fever, diarrhea, constipation, dysentery
40.	<i>Zanthoxylum alatum</i> /SS-40	Timber	Rutaceaceae	Shrub	Fruit	Raw	Internal	Asthma, bronchitis, indigestion, diarrhea, cholera
41.	<i>Nasturtium officinale</i> R. Br./SS-41	Tara mera	Brassicaceae	Herb	Whole plant	Cooked	Internal	Urinary, tract infection, cough, bronchitis, muscular pain

Sr no.	Botanical name/ voucher number	Vernacular name	Family	Habitat	Part used	Mode of consumption	Mode of administration	Diseases treatment
42.	<i>Canabis sativa</i> /SS-42	Bang	Cannabaceae	Herb	Leaves	Extract	Internal	Control nausea, vomiting, Cancer, muscles spasms
43.	<i>Justicia adhatoda</i> L./SS-43	Bhikar	Acanthaceae	Herb	Leaves	Cooked	Internal	Bronchitis, asthma, TB, control bleeding from gums
					Flowers			Cough, diarrhea, dysentery, chest infection
44.	<i>Capsella bursa-pastoris</i> (L.) Medik./SS-44	Berg e bansa, bakar	Brassicaceae	Herb	Whole plant	Cooked	Internal	Nose bleeding, menstrual cycle, headache, heart problems, Diarrhea, urinary problems
45.	<i>Melilotus albus</i> Medik./SS-45	Sag	Leguminosae	Herb	Leaves	—	Internal	Inflammation joint pain, fever, cold, diuretic, wound healing
46.	<i>Veronica arvensis</i> L./SS-46	Honey colve	Plantaginaceae	Herb	Leaves	Cooked	Internal	Skin infection, blood purifier
47.	<i>Vicia sativa</i> L./SS-47	—	Leguminosae	Herb	Leaves	Cooked	Internal	Kidney pain, eye infection
48.	<i>Medicago polymorpha</i> L./SS-48	Jungli phali	Fabaceae	Shrub	Leaves& Fruit	Raw	Internal	Dysentery
49.	<i>Duchesnea indica</i> (Jacks.) Focke/SS-49	Sinjii	Rosaceae	Herb	Leaves	Cooked	External	Skin problems
50.	<i>Ziziphus sativa</i> /SS-50	Budi meva	Rhamnaceae	Herb	Fruit	Raw	Internal	Skin problems, liver disease, ulcer, weight loss
51.	<i>Prunus domestica</i> L./SS-51	Barr	Rosaceae	Shrub	Fruit	Raw	Internal	Constipation

Author details

Sadia Shabbir and Muhammad Shoaib Amjad*

Department of Botany, Women University of Azad Jammu & Kashmir, Bagh,
Pakistan

*Address all correspondence to: malikshoaib1165@yahoo.com

IntechOpen

© 2022 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. 

References

- [1] Ali H, Qaiser M. The ethnobotany of Chitral valley, Pakistan with particular reference to medicinal plants. *Pakistan Journal of Botany*. 2009;**41**(4):2009-2041
- [2] Amjad MS, Qaeem MF, Ahmad I, Khan SU, Chaudhari SK, Zahid Malik N, et al. Descriptive study of plant resources in the context of the ethnomedicinal relevance of indigenous flora: A case study from Toli Peer National Park, Azad Jammu and Kashmir, Pakistan. *PLoS One*. 2017;**12**(2): e0171896
- [3] Hussain W, Badshah L, Ullah M, Ali M, Ali A, Hussain F. Quantitative study of medicinal plants used by the communities residing in Koh-e-Safaid Range, northern Pakistani-Afghan borders. *Journal of Ethnobiology and Ethnomedicine*. 2018;**14**(1):1-18
- [4] Campbell EA, Masuda S, Sun JL, Muzzin O, Olson CA, Wang S, et al. Crystal structure of the *Bacillus stearothermophilus* anti- σ factor SpoIIAB with the sporulation σ factor σ^F . *Cell*. 2002;**108**(6):795-807
- [5] Asch DL, Asch NB. The economic potential of *Iva annua* and its prehistoric importance in the lower Illinois Valley. *The Nature and Status of Ethnobotany*. 1978:300-341
- [6] Cox PA. Will tribal knowledge survive the millennium? *Science*. 2000; **287**(5450):44-45
- [7] Bibi T, Ahmad M, Tareen RB, Tareen NM, Jabeen R, Rehman SU, et al. Ethnobotany of medicinal plants in district Mastung of Balochistan province-Pakistan. *Journal of Ethnopharmacology*. 2014;**157**: 79-89
- [8] Heinrich M, Kufer J, Leonti M, Pardo-de-Santayana M. Ethnobotany and ethnopharmacology—Interdisciplinary links with the historical sciences. *Journal of Ethnopharmacology*. 2006;**107**(2): 157-160
- [9] Kassaye KD, Amberbir A, Getachew B, Mussema Y. A historical overview of traditional medicine practices and policy in Ethiopia. *Ethiopian Journal of Health Development*. 2006;**20**(2):127-134
- [10] Heywood V, Skoula M. The MEDUSA network: Conservation and sustainable use of wild plants of the Mediterranean region. In: Janick J, editor. *Perspectives on New Crops and New Uses*. Alexandria, VA: ASHS Press; 1999. pp. 148-151
- [11] Alam MJ, Ahmed KS, Nahar MK, Akter S, Uddin MA. Effect of different sowing dates on the performance of maize. *Journal of Krishi Vigyan*. 2020; **8**(2):75-81
- [12] Ladio AH, Lozada M. Patterns of use and knowledge of wild edible plants in distinct ecological environments: A case study of a Mapuche community from northwestern Patagonia. *Biodiversity and Conservation*. 2004;**13**(6):1153-1173
- [13] Schaal B. Plants and people: Our shared history and future. *Plants, People, Planet*. 2019;**1**(1):14-19
- [14] Grivetti LE, Ogle BM. Value of traditional foods in meeting macro-and micronutrient needs: The wild plant connection. *Nutrition Research Reviews*. 2000;**13**(1):31-46
- [15] Abbasi AM, Khan MA, Zafar M. Ethno-medicinal assessment of some selected wild edible fruits and vegetables

of Lesser-Himalayas, Pakistan. *Pakistan Journal of Botany*. 2013;**45**(SI):215-222

[16] Abbasi AM, Khan MA, Shah MH, Shah MM, Pervez A, Ahmad M. Ethnobotanical appraisal and cultural values of medicinally important wild edible vegetables of Lesser Himalayas-Pakistan. *Journal of Ethnobiology and Ethnomedicine*. 2013;**9**(1):1-13

[17] Majeed M, Bhatti KH, Pieroni A, Söukand R, Bussmann RW, Khan AM, et al. Gathered wild food plants among diverse religious groups in Jhelum District, Punjab, Pakistan. *Foods*. 2021; **10**(3):594

[18] Pimentel D, Nair MM, Buck L, Pimentel M, Kami J. The value of forests to world food security. *Human Ecology*. 1997;**25**:91-120

[19] Ansari D, Garcia N, Lucas E, Hamon K, Dhital B. Neural correlates of symbolic number processing in children and adults. *Neuroreport*. 2005;**16**(16): 1769-1773

[20] Ahmad K, Pieroni A. Folk knowledge of wild food plants among the tribal communities of Thakht-e-Sulaiman Hills, North-West Pakistan. *Journal of Ethnobiology and Ethnomedicine*. 2016;**12**(1):1-15

[21] Msuya TS, Kideghesho JR, Mosha TC. Availability, preference, and consumption of indigenous forest foods in the Eastern Arc Mountains, Tanzania. *Ecology of Food and Nutrition*. 2010; **49**(3):208-227

[22] Vijayakumar S, Yabesh JM, Prabhu S, Manikandan R, Muralidharan B. Quantitative ethnomedicinal study of plants used in the Nelliampathy hills of Kerala, India. *Journal of Ethnopharmacology*. 2015;**161**: 238-254

[23] Khan MPZ, Ahmad M, Zafar M, Sultana S, Ali MI, Sun H. Ethnomedicinal uses of edible wild fruits (EWFs) in Swat Valley, Northern Pakistan. *Journal of Ethnopharmacology*. 2015;**173**:191-203

[24] Heinrich M, Ankli A, Frei B, Weimann C, Sticher O. Medicinal plants in Mexico: Healers' consensus and cultural importance. *Social Science & Medicine*. 1998;**47**(11):1859-1871

[25] Alexiades MN, Sheldon JW.. Selected guidelines for ethnobotanical research: A field manual (No. Sirsi i9780893274047). 1996

[26] Umair M, Altaf M, Abbasi AM. An ethnobotanical survey of indigenous medicinal plants in Hafizabad district, Punjab-Pakistan. *PloS One*. 2017;**12**(6): e0177912

[27] Arnold BC. Pareto Distribution. *Wiley StatsRef: Statistics Reference Online*; 2014. pp. 1-10

[28] Lulekal E, Asfaw Z, Kelbessa E, Van Damme P. Ethnomedicinal study of plants used for human ailments in Ankober District, North Shewa Zone, Amhara region, Ethiopia. *Journal of Ethnobiology and Ethnomedicine*. 2013; **9**(1):1-13

[29] Ahmad M, Sultana S, Fazl-i-Hadi S, Ben Hadda T, Rashid S, Zafar M, et al. An ethnobotanical study of medicinal plants in high mountainous region of Chail valley (district Swat-Pakistan). *Journal of Ethnobiology and Ethnomedicine*. 2014;**10**(1):1-18

[30] Inta A, Trisonthi P, Trisonthi C. Analysis of traditional knowledge in medicinal plants used by Yuan in Thailand. *Journal of Ethnopharmacology*. 2013;**149**(1): 344-351

- [31] Kadir MF, Sayeed MSB, Setu NI, Mostafa A, Mia MMK. Ethnopharmacological survey of medicinal plants used by traditional health practitioners in Thanchi, Bandarban Hill Tracts, Bangladesh. *Journal of Ethnopharmacology*. 2014; **155**(1):495-508
- [32] Kayani S, Ahmad M, Zafar M, Sultana S, Khan MPZ, Ashraf MA, et al. Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies–Abbottabad, Northern Pakistan. *Journal of Ethnopharmacology*. 2014; **156**: 47-60
- [33] Trotter RT, Logan MH. Informant consensus: A new approach for identifying potentially effective medicinal plants. In: *Plants in Indigenous Medicine & Diet*. Routledge; 2019. pp. 91-112
- [34] Faruque MO et al. Quantitative ethnobotany of medicinal plants used by indigenous communities in the Bandarban District of Bangladesh. *Frontiers in Pharmacology*. 2018; **9**:40
- [35] Albuquerque UP, Lucena RF, Monteiro JM, Florentino AT, Cecília de Fátima CBR. Evaluating two quantitative ethnobotanical techniques. *Ethnobotany Research and Applications*. 2006; **4**: 051-060
- [36] Ahmad KS, Hamid A, Nawaz F, Hameed M, Ahmad F, Deng J, et al. Ethnopharmacological studies of indigenous plants in Kel village, Neelum valley, Azad Kashmir, Pakistan. *Journal of Ethnobiology and Ethnomedicine*. 2017; **13**(1):1-16
- [37] Schlage C, Mabula C, Mahunnah RLA, Heinrich AM. Medicinal plants of the Washambaa (Tanzania): Documentation and ethnopharmacological evaluation. *Plant Biology*. 2000; **2**(1):83-92
- [38] Umair M, Altaf M, Bussmann RW, Abbasi AM. Ethnomedicinal uses of the local flora in Chenab riverine area, Punjab province Pakistan. *Journal of Ethnobiology and Ethnomedicine*. 2019; **15**(1):1-31
- [39] Yineger H, Yewhalaw D, Teketay D. Ethnomedicinal plant knowledge and practice of the Oromo ethnic group in southwestern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*. 2008; **4**(1):1-10
- [40] Srithi K, Balslev H, Wangpakapattanawong P, Srisanga P, Trisonthi C. Medicinal plant knowledge and its erosion among the Mien (Yao) in northern Thailand. *Journal of Ethnopharmacology*. 2009; **123**(2): 335-342