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Floral Wealth of Hindukush: Ethnobotanical Insights into Indigenous Plant Uses and Conservation Challenges

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Abstract

*The indigenous communities in the Hindukush mountains are deeply connected to their environment and biodiversity, which spans centuries. They have been utilizing plant resources in traditional ways to meet their daily needs and sustain their livelihoods. However, with the advancement of technology and social changes, this ancient traditional knowledge is at risk of extinction. The present study in the "Dokat Hills" of District Swat, was aimed to document the traditional uses of plants by local communities. Data was collected from local informants using standard procedures and analyzed through various ethnobotanical indices such as Use values, Relative frequency of citation, Informant consensus factor, and Relative importance. The study identified 117 plant species from 54 different species used for various purposes, with the highest proportion of medicinal plants comprising 70.9%. The Lamiaceae and Asteraceae families were the most speciose. Plants like *Foeniculum vulgare*, *Juglans regia*, and *Acacia nilotica* were notable for their use value. *Berberis lycium*, *Ajuga integrifolia*, and *Mentha longifolia* were frequently cited. Similarly, *Foeniculum vulgare*, *Acacia nilotica* and *Olea ferruginea* (0.96) were the top-ranked species in terms of relative importance. The highest consensus factor was recorded for Gastrointestinal diseases. Despite the rich diversity of medicinal and useful plants, the area was facing several threats, like fuelwood collection and overexploitation. The study suggested several recommendations, including raising public awareness, promoting sustainable resource use, conservation, and commercialization of indigenous drugs in the study area.*

Key words: Ethnobotany, Scrub forest, Traditional knowledge, Dokat Hills, Hindukush Mountains ecosystem.

1. Introduction

Ethnobotany

The term "Ethnobotany" was coined by an American botanist William Hershberger in 1896. The term 'ethno' refers to people, and botany pertains to the study of plants. Ethnobotany, therefore, is the scientific exploration of the interaction between people and plants, where indigenous knowledge of plants has been used for various purposes over different periods (Khan et al., 2015). The primary focus of ethnobotanical research is twofold. Firstly, it aims to examine the role of plant biodiversity, considering both the diversity of plant life and people's knowledge regarding the utilization, applications, and conservation of natural resources. Secondly, it seeks to leverage this knowledge for social and scientific investigations (Ahmad et

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al., 2011). In essence, ethnobotany can be summarized as the study of Human, Plants, Interactions, and their Uses (Shinwari et al., 2006). In the early 90s, limited work was done in this field, but there has been a shift in focus among botanists, foresters, and field scientists towards exploring the traditional uses of plants in the modern world (Gilani et al., 2003). This research area holds great potential, especially in studying the mutual association between plants and traditional communities, considered the treasures of ethnobotany and traditional knowledge (Cotton, 1996). The study of ethnobotany explore that how inhabitants of specific regions and cultures utilize native plants. Ethnobotanists investigate the uses of plants for various purposes such as food, clothing, medicine, hunting, and rituals (Hamayun et al., 2005). Ethnobotanical studies are crucial in establishing community priorities to ensure optimal resource use, active biodiversity conservation, and preservation of traditional knowledge (Ibrar et al., 2007).

Pakistan has been blessed with rich floral diversity, with approximately 6,000 wild plants and 1572 genera, predominantly found in the Hindukash, Himalaya, and Karakoram regions. Numerous studies have documented over 600 medicinal plants used by native populations for treating various diseases (Ahmad et al., 2014). Many of these plants are traded in national and international markets, supporting the livelihoods of local communities. The subtropical areas of Pakistan, particularly in the Hindukush and lesser Himalayas, host diverse plant species. However, the natural resources in the Hindukush-Himalayas are depleting rapidly compared to other regions globally (Shinwari et al., 2006). These mountainous areas are considered rich sources of ethnobotanical information. Locally plants are utilized for animal feed, dietary and vitamin supplements, traditional remedies, tools, and indicators of seasonal change (Goodman and Ghafoor, 1992). Globally, one in three plant species is found in mountain areas (Hassan et al., 2018). Due to the high prices of allopathic medicine, many people in mountainous regions, including 84% of the population in Pakistan's mountainous areas, rely on medicinal plants for their availability, affordability, and perceived lack of side effects (Hassan et al., 2018). Given the significant impact of the association between humans and plants on social life and culture, there is a critical need to compile information about the traditional uses of therapeutic plants and other associations. Indigenous knowledge, usually passed down orally, is at risk of being lost forever if not preserved (Akhtar et al., 2013).

Numerous authors worldwide and across the country have reported on the traditional uses of plants by indigenous people like Lulekal et al., 2008; Jabeen et al., 2009; Taklehaymanot and Giday 2010; Sher and Al-yemeni 2010; Ahmad et al., 2011; Ilyas et al., 2013; Ahmad et al., 2014; Khan et al., 2015; Ijaz et al., 2016; Ali et al., 2017; Sajid et al., 2018; Tariq et al., 2019; Sukumaran et al., 2020; Sher et al., 2020; Ahmad et al., 2021; Aziz et al., 2021; Odebnmi et al., 2022 and Rahman et al., 2022. However, the available literature indicates a lack of detailed studies on the traditional uses of plants in the study area. Therefore, the present study aims to fill this gap for future needs and assessments.

2. Material and Methods

2.1 Study Area

The study area “Dokat” is located in the Hindukush mountain ranges between 34.8139° North and 72.2451° East in Kabal Valley of District Swat, from 3500 to 5350 feet ASL. It is a hub of great culture, ancient civilization, with a great geographical, observational, and strategic importance. Climatically the valley falls in Subtropical zone with four distinct seasons. The

study area is covered by Scrub forests with partial patches of chir pines. The dominant plant species are *Dodonaea viscosa*, *Olea ferruginea*, *Isodon rugosus*, *Berberis lycium*, *Cotoneaster microphyllus*, *Cotoneaster nummularia*, *Rubus sanctus*, *Justicia adhatoda*, *Rumex hastatus*, *Artemisia scoparia*, etc. Shah et al., (1983), Hussain and Shah (1989), and Hussain et al., (1993) analysed the plant communities of the Dokat hills in Swat and concluded that the main indicator species of the forest were oak and chir pine at lower altitude and blue pine at higher altitude; however, these plants communities were subjected to anthropogenic activities. Some of the common wildlife species found there are *Lepus nigricollis*, *Canis aureus*, *Hystrix indica*, *Alectoris chukar*, *Francolinus francolinus*, *Myophonous caeruleus*, etc.

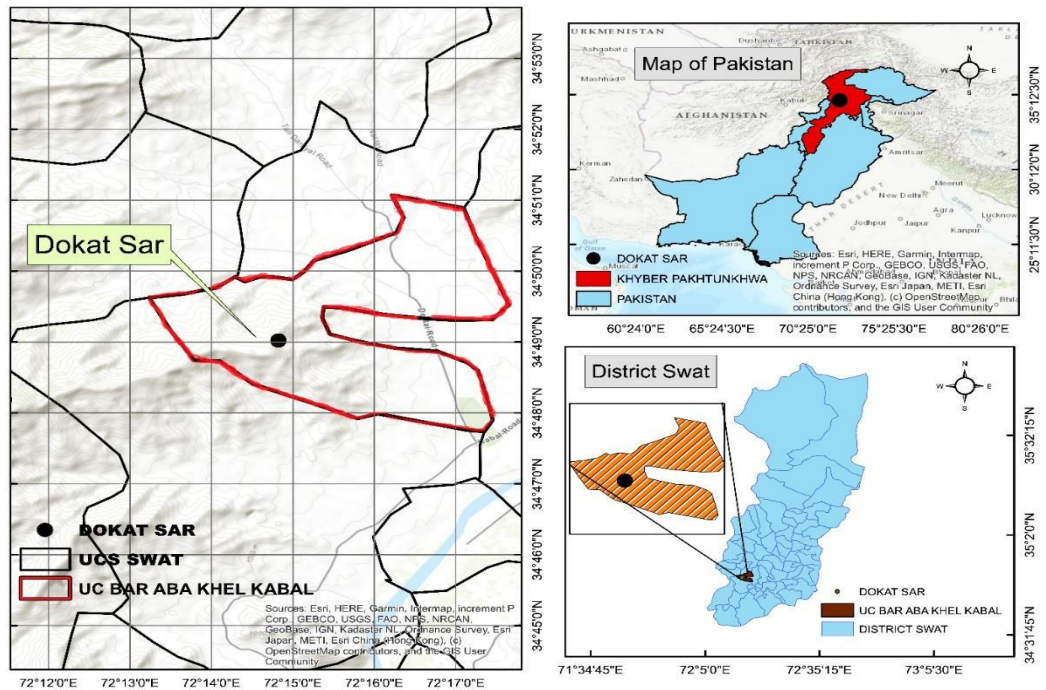


Fig 1: Map of the Study Area.

2.2 Field Work

The present study was conducted from June 2021 to June 2022. Field work consisting of interviews, open discussion, observations and guided field visit were conducted in order to inquire the ethnobotanically important plant diversity of Dokat Hills, District Swat. During the field work the following two methods were frequently used.

a) Observations

During this method general observations and visual estimation were made while visiting different areas of the hills. Local procedure for the collection, storage, drying, harvesting, processing and uses of medicinal and other plants were noticed and recorded. Simultaneously, all of the plants during their flowering/fruiting time, were collected, pressed, preserved, and mounted on standard herbarium sheets. These plants were identified with the help of *Flora of Pakistan* (Nasir and Ali, 1970-1995; Ali and Qaiser, 1993-2017). The specimens were subsequently placed at Swat University Herbarium “SWAT”.

b) Interviews

During field work, a semi-structured questionnaire was used for random interviews from local people of the area who were belonging to different profession, age, and genders. Questionnaire method adopted as a mean of obtaining an accurate and comprehensive approach of the plant resources and their use by the local communities, as used by (Hamayun, 2005; Alam et al., 2011; Khan et al., 2015). A total 50 informants (including 13 women and 37 males) were interviewed for ethnobotanical knowledge. The ages of the informants ranged between 20-80 years.

2.3 Statistical Analysis

The collected data was exported into Excel spreadsheets and was assessed through various ethnobotanical indices including Use value (UV), Informant consensus factor (ICF), Relative frequency of citation (RFC), and Relative importance index (RI), results were presented in proportions and percentages.

a) Use Value (UV)

Use value (UV) evaluates the relative significance of each plant species based on their relative importance among informants. It was calculated by using the following formula as described before (Philips and Genry 1993; Muhammad et al., 2019).

$$UV = \sum U/N$$

Where U is the Number of use reports cited for a given plant species, and N is Total number of informants interviewed for a given plant species.

b) Relative Frequency of Citation (RFC)

Relative frequency of citation indicates the local importance of each species in an area (Vitalini et al., 2013), and it was calculated by using the formula (Tardio et al., 2008).

$$RFC = FCs/N \quad (0 < RFC < 1).$$

Where FC is the Number of informants who reported traditional use of a plant specie, while N is the total number of informants in the study.

c) Informants Consensus Factor (ICF)

Informant consensus factor analyzes the level of agreement between informants of the study area and the use of plants for various sort of illness. The formula given below was used to calculate it (Bhat et al., 2013; Heinrich et al., 2009).

$$ICF = \frac{Nur - Nt}{Nur - 1}$$

Where Nur denotes the Number of usage citations for a particular ailments' category, while Nt represents the total number of plant species utilized for that category. ICF values range from 0-1. The Maximum value ICF value, which is near to 1, indicates that the informants are in favor of using plant species to treat particular ailments, while a low value indicates that plant species are selected randomly to treat a disease (Heinrich et al., 1998).

d) Relative Importance Index (RI)

This index, established by (Pardo-de-Santayana, 2007), considers the relative proportion of a species within the range of maximum usage values as well as the relative proportion of a species within use categories.

$$RI = \frac{NUC + NT}{2}$$

Where NUC represents the number of use categories of a specific species divided by maximum number of use categories of the most versatile species NUC_{max}, while NT represents the species' use value divided by the highest use value of the taxon that is most frequently cited (Bennett and Prance, 2000).

3. Results and Discussion

3.1 Demographic Information of the Informants

A total of 50 informants were interviewed for ethnobotanical knowledge, of whom 74% were male and 26% were female informants (Table 1). Based on age the informants were divided into 3 major classes, i.e., informants having age between 20-35 years (28%), 36-50 years (24%), and 51 years and above (48%). The majority of the informants were old aged. Among the participants, 62% were illiterate, while the rest of the informants were educated to different degrees, such as primary (6%), middle (4%), matric (4%), intermediate (6%), graduate and postgraduate (18%). It was found that, on average, the older and illiterate informants had more ethnobotanical knowledge. This might be due to the fact that these people have high levels of experience in farming and livestock rearing and have had long-term direct contact with plants. Whereas, the educated and young generation are less interested in traditional knowledge because they are so accustomed to advance technology. Similar observations were reported by (Shah et al., 2016 & Rahman et al., 2022). According to our findings, 38% of the informants were farmers, 20% were domestic cattle's owner, 10% were laborers, 4% were beekeepers, 10% were government employees, 4% were local herbal practitioners, and 16% were housewives.

Table 1: Demographic Information of the Respondents.

Variables	Demographic Categories	Total	Percentage (%)
Gender	Men	13	26
	Women	37	74
Age Groups	20-35	14	28
	36-50	12	24
	51 & Above	24	48
Education	Primary	3	6
	Middle	2	4
	Matric	2	4
	Intermediate	3	6
	Graduate/Post Graduate	9	18
	Illiterate	31	62
Occupation	Farmers	19	38
	Domestic Cattle's Holder	10	20
	Laborers	5	10
	Beekeeper	2	4
	Govt. Employees	5	10
	Local Herbal Practitioner	2	4
	Housewives	8	16

3.2 Ethnobotanical Evaluation of the Study Area

In the current study, a total 117 plants belonging to 60 different families were documented. These plants were utilized by the local inhabitants of the area for 10 major ethnobotanical

purposes (Fig. 3). among these plants 2 species were Gymnosperm, 112 species of Angiosperms, single species of Pteridophytes, and 2 species of fungi. Considering the habit, the highest number of species used were herbs with 72 species, followed by 24 shrubs, 15 trees, 4 climbers and then 2 species of fungi (Fig. 2). The largest families were Lamiaceae and Asteraceae contributing 11 species, followed by Rosaceae with 8 spp, Amaranthaceae with 7 spp, Poaceae, Fabaceae, Apiaceae, and Euphorbiaceae each with 4 spp, Brassicaceae, Polygonaceae, Amaryllidaceae and Rhamnaceae each with 3 spp, Cyperaceae, Urticaceae, Moraceae, Pinaceae, Ranunculaceae, Solanaceae, Cannabaceae, Scrophulariaceae, Malvaceae, and Crassulaceae each with 2 spp and then Agaricaceae, Buddlejaceae, Morchellaceae, Pteridaceae, Asparagaceae, Berberidaceae, Simarubacaceae, Boraginaceae, Cuscutaceae, Colchichaceae, Sapinodaceae, Thymelaceae, Myrtaceae, Papaveraceae, Celasteraceae, Convulvulaceae, Acanthaceae, Juglandaceae, Primulaceae, Nyctaginaceae, Meliaceae, Platanaceae, Rubiaceae, Zygophyllaceae, Portulacaceae, Oleaceae, Oxalidaceae, Plantaginaceae, Violaceae, Salicaceae, Rutaceae, and Lathyraceae families each with single species. From the current study, it was obvious that shoots were the main part used for different purposes followed by leaves, whole plant, fruits, branches & stem, wood, flowers/inflorescence, seeds, bark, latex, roots, resins & gums, bulb, and rhizome (Fig. 4).

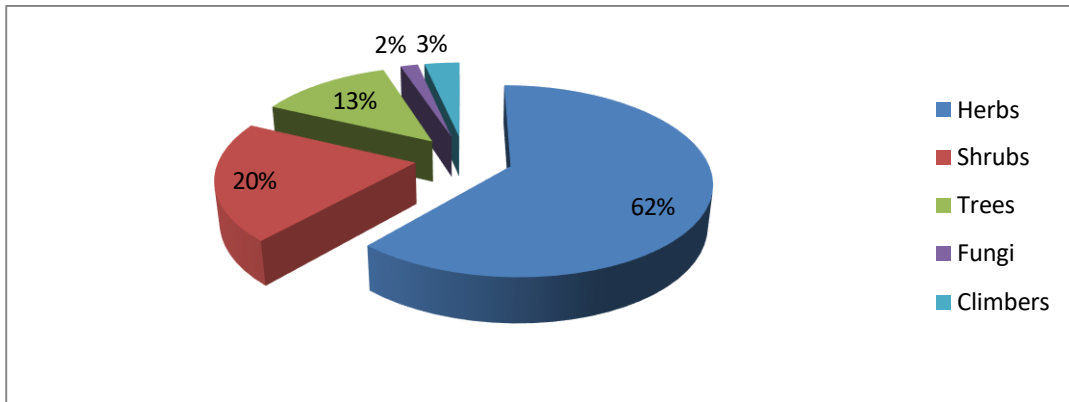


Figure 2: Life form Representation of Plants.

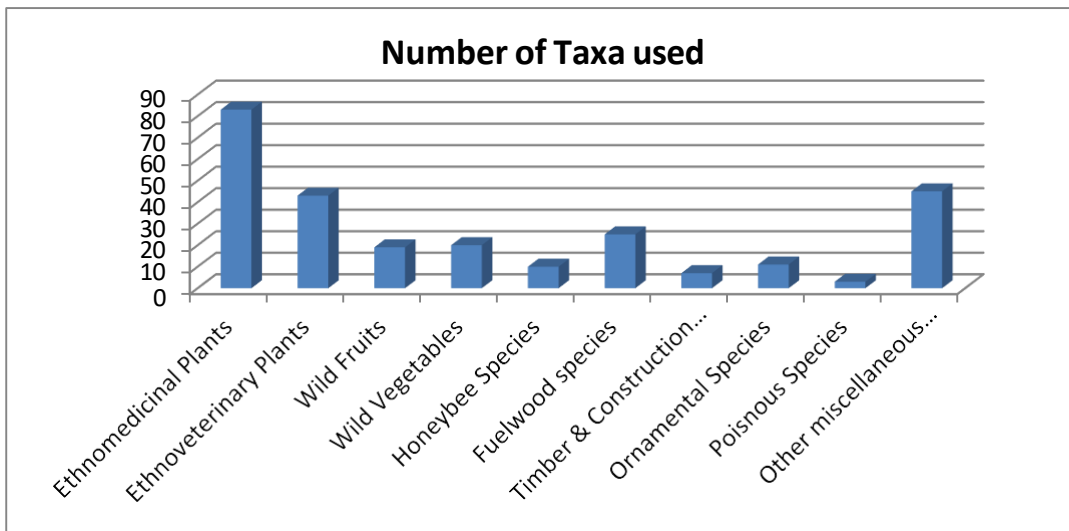


Figure 3: Plant Species Used for Different Ethnobotanical Purposes.

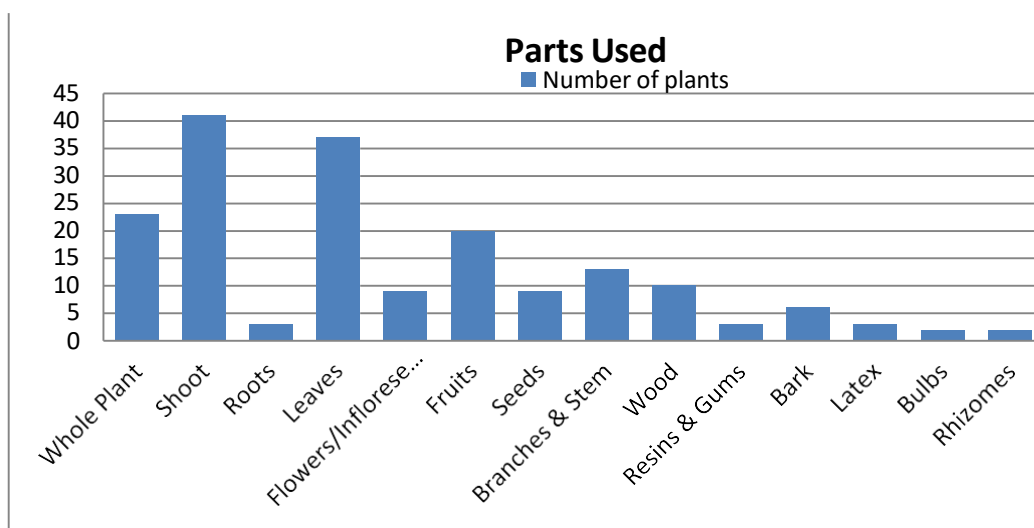


Fig 4: Plants Parts Used for Different Purposes.

Table 2: Ethnobotanical Evaluation of the Study Area.

S. no.	Botanical Names	Local Names	Family	Habit	Part(s) Used	Ethnobotanical Uses
1.	4. <i>Acacia nilotica</i> L.	Zangali Kikar	Fabaceae	Tree	Gums, bark, leaves, wood	Antidiabetic, Laxative, Blood purifier, Anthelmintic, Toothache, Gums diseases, Gynecological problems (Postpartum recovery, Body tonic) Agriculture tools, Fuelwood, Fodder, Tooth brush
2.	6. <i>Achyranthes aspera</i> L.	Jishkay	Amaranthaceae	Herb	Whole Plant	Laxative, Diuretic, Kidney Stone
3.	1. <i>Adiantum capillus-veneris</i> L.	Sumbal	Pteridaceae	Herb	Whole Plant	Anti-snake & Scorpion bite, Cough, Antipyretic
4.	2. <i>Agaricus campestris</i> L.	Kharerhay	Agaricaceae	Fungi	Whole Plant	Body tonic; Wild vegetable
5.	12. <i>Ailanthus altissima</i> L.	Beckanrha	Simaroubaceae	Tree	Leaves, Bark, Stem	Anthelmintic, Antidiabetic, Ophthalmic, Fodder; Fuelwood; Furniture; Construction
6.	3. <i>Ajuga integrifolia</i> Buch.	Botee	Lamiaceae	Herb	Shoot	Hypertension, Throat infection, Jaundice, Stomachic, Malarial fever
7.	14. <i>Allium oreoprasum</i> Sch.		Amaryllidaceae	Herb	Bulb	Hypertension; Wild vegetable
8.	13. <i>Allium porrum</i> L.	Oogakaii	Amaryllidaceae	Herb	Leaves, Bulb	Hypertension, Cholesterol lowering; Wild vegetable
9.	8. <i>Amaranthus hybridus</i> L.	Ganhar	Amaranthaceae	Herb	Shoot	Wild vegetable, Fodder
10.	9. <i>Amaranthus spinosus</i> L.	Chalwayee	Amaranthaceae	Herb	Shoot	Lactation enhancer in cattle; Wild vegetable, Fodder
11.	7. <i>Amaranthus viridis</i> L.	Chalwaye	Amaranthaceae	Herb	Shoot	Dysentery, Anti-inflammatory, Body tonic, Blood purifier, Digestive; Wild vegetable, Fodder
12.	10. <i>Artemisia scoparia</i> Waldst. & Kit.	Jaukay	Asteraceae	Herb	Shoot	Respiratory problems, Stimulant, Anthelmintic, Purgative, Antipyretic
13.	5. <i>Asparagus capitatus</i> Baker.	Teendonay	Asparagaceae	Herb	Shoots	Body tonic, Wild vegetable
14.	11. <i>Avena sativa</i> L.	Jamdar	Poaceae	Herb	Whole Plant	Nerve tonic, Antiseptic, Laxative; Fodder

S. no.	Botanical Names	Local Names	Family	Habit	Part(s) Used	Ethnobotanical Uses
15.	15. Berberis lycium Roy.	Kwaray	Berberidaceae	Shrub	Leaves, Fruits, Root bark, Branches	Hepatitis, Throat infection, Wounds healing, Liver disorders, Blood purification, Body cooling agent; Wild fruit, Fuelwood, Fencing
16.	16. Buddleja crispa Benth.	Speerwane	Scrophulariaceae	Shrub	Whole Plant	Hypertension, Obesity, Stomachic; Fuelwood
17.	17. Bupleurum falcatum L.	Gillo	Apiaceae	Herb	Root, Shoot	Jaundice, Antipyretic; Fodder
18.	24. Calendula arvensis L.	Ziar gualay	Asteraceae	Herb	Flower, leaves	Scrofula, Astringent, Blood purifier, immune booster, Anthelmintic
19.	18. Calotropis procera W.T. Aiton	Spalmai	Apocynaceae	Herb	Leaves, Latex	Antidiabetic, Piles, Skin problems, Anti-snake and dog bite
20.	28. Cannabis sativa L.	Bang	Cannabaceae	Herb	Leaves, inflorescence, Seeds	Sedative, Narcotic, Body tonic, Anodyne, labor pain; Fuelwood, Evil eyes repellent
21.	26. Carthamus oxyacantha M. Bieb.	Kareeza	Asteraceae	Herb	Leaves, Seeds	Antiseptic, Skin problems; Wild vegetable
22.	22. Cetic eriocarpa Decne.	Tagha	Cannabaceae	Tree	Wood, Leaves, fruits	Wild fruit, Agriculture tools, Fuelwood, Fodder
23.	29. Chenopodium album L.	Sarmay	Amaranthaceae	Herb	Shoot	Lactation enhancer in cattle; Wild vegetable
24.	27. Cichorium intybus L.	Hanr	Asteraceae	Herb	Whole Plant	Antipyretic, Anti jaundice, Diuretic, Liver tonic, Cholesterol and sugar level lowering, Kidney stone; Wild vegetable
25.	34. Cirsium vulgare Savi.	Wrijakai	Asteraceae	Herb	Whole Plant	Nervous disorders, Liver tonic; Edible seeds
26.	23. Clematis grata Wall.	Chinjun zeela	Ranunculaceae	Woody Climber	Shoot	Wounds healing in cattle; Fodder
27.	31. Clinopodium umbrosum M. Bieb.	Kamasla pudina	Lamiaceae	Herb	Shoot	Wounds healing, Fodder
28.	35. Colchicum luteum Baker	Qeemat Gualay	Colchicaceae	Herb	Rhizome	Blood purifier, Laxative, Aphrodisiac, Alterative
29.	32. Cotoneaster microphyllus Wall.	Mamanrha	Rosaceae	Shrub	Whole plant	Wild fruit, Fodder, Fencing, Fuelwood
30.	33. Cotoneaster nummularius Fisch. & Mey.	Kharawa	Rosaceae	Shrub	Whole plant	Wild fruit, Thatching, Fencing, Fodder, Fuelwood
31.	30. Cuscuta reflexa Roxb.	Zeelai	Cuscutaceae	Climber (Herb)	Whole plant	Anti-jaundice, Blood purifier, Anthelmintic, Anti-infertility, Anti-lice agent
32.	19. Cynodon dactylon L.	Kabal	Poaceae	Herb	Shoot	Ornamental, Fodder
33.	25. Cynoglossum lanceolatum Forsk.	Ghatgualay	Boraginaceae	Herb	Whole Plant	Wounds healing, Eye ailments; Fodder
34.	20. Cyperus niveus Retz.	Da ghra deela	Cyperaceae	Herb	Leaves	Fodder
35.	21. Cyperus rotundus L.	Deela	Cyperaceae	Herb	Rhizome, leaves	Stomachic; Fodder
36.	39. Dabregeasia saeneb F.	Ijlai	Urticaceae	Shrub	Fruits, Branches	Diarrhea, Dysentery, Earache; Wild fruit, Fodder, Hedging, Fuelwood
37.	38. Daphne mucronata Royle	Laighoonay	Thymelaeaceae	Shrub	Fruits, branches	Purgative, Anthelmintic, Ticks and mite's repellent; Wild fruits, Fuelwood
38.	37. Dodonaea viscosa L.	Ghwarasky	Sapinadaceae	Shrub	Shoot	Anthelmintic, Astringent, Wounds healing, Skin problems; Thatching, Fencing, Fuelwood, Broom
39.	36. Duchesnea indica Andr.	Da zmakay tooth	Rosaceae	Herb	Shoot, Fruits	Stomachic, Antipyretic, Body tonic, Eye infection; Wild fruit; Fodder

S. no.	Botanical Names	Local Names	Family	Habit	Part(s) Used	Ethnobotanical Uses
40.	41. <i>Dysphania ambrosioides</i> L.	Kamasal bhang	Amaranthaceae	Herb	Leaves, seeds	Diarrhea, Dysentery, Malarial fever, Wound healing, Insect bites
41.	40. <i>Dysphania botrys</i> L.	Skha kharawa	Amaranthaceae	Herb	Leaves	Wound healing, Cough, Asthma
42.	46. <i>Erigeron canadensis</i> L.	Malloch	Asteraceae	Herb	Shoot	Diuretic, Homeostatic, Astringent, Hepatitis, Diarrhea, Dysentery; Fodder
43.	42. <i>Eryngium caeruleum</i> M. Bieb.	Mazari panja	Apiaceae	Herb	Whole plant	Hemorrhoids, UTI's, Kidney and bladder stone, Diuretic
44.	47. <i>Eulaliopsis binata</i> Retz.	Barwaza	Poaceae	Herb	Shoot	Bedding, Slippers
45.	43. <i>Euphorbia helioscopia</i> L.	Preewatkaii	Euphorbiaceae	Herb	Shoot	Poisonous
46.	44. <i>Euphorbia indica</i> Lam.	Chaghzey Botay	Euphorbiaceae	Herb	Latex, Shoot	Skin problems; Fodder
47.	45. <i>Euphorbia prostrata</i> Ait.	Warmaga/Jaghje	Euphorbiaceae	Herb	Shoot	Eczema, Ringworms, Kidney stone
48.	48. <i>Ficus palmata</i> Forssk.	Inzar	Moraceae	Tree	Fruit, Latex	Laxative, Piles, UTI's, Body tonic, Expectorant, Demulcent; Wild fruit, Sacred plant
49.	50. <i>Foeniculum vulgare</i> Mill.	Kaga Enalay	Apiaceae	Herb	Leaves, Seeds	Digestive, Stimulant, Brain tonic, Aphrodisiac, Stomachic, Carminative, Diuretic, Improve eyesight, Antiemetic, Gynaecological problems (Menses regulation, enhance lactation, aphrodisiac); Flavoring agent
50.	49. <i>Fumaria indica</i> Pug.	Krachey	Papaveraceae	Herb	Shoot	Blood purification, Skin problems, Diabetes, Cooling agent, Inflammation of heels & palms
51.	51. <i>Gymnosporia royleana</i> Wall.	Sur azghay	Celastraceae	Shrub	Whole plant	Male impotency; Fencing, Hedging, Fuelwood
52.	53. <i>Indigofera heterantha</i> Wall.	Ghwareeja	Fabaceae	Shrub	Shoot	Colic pain; Honeybee specie, Fencing, Fodder
53.	54. <i>Ipomoea purpurea</i> L.	Prewatkay	Convolvulaceae	Climber (Herb)	Shoot	Fodder, Ornamental
54.	52. <i>Isodon rugosus</i> Wall. Ex Benth.	Sperkay	Lamiaceae	Shrub	Shoot	Toothache, Cholesterol lowering agent; Honeybee specie, Fuelwood
55.	56. <i>Juglans regia</i> L.	Ghuz	Juglandaceae	Tree	Wood, Nut, Bark	Anthelmintic, Cholesterol lowering agent, Cardiovascular diseases, Brain tonic, Memory booster, Backache, Sexual tonic & Aphrodisiac; Wild fruit, Furniture, Timber, Natural Lipstick
56.	55. <i>Justicia adhatoda</i> L.	Baikarh	Acanthaceae	Shrub	Leaves, Root, Flowers	Cold, cough, Pneumonia, Asthma, Cardiovascular diseases, Cholesterol lowering agent; Honeybee specie
57.	57. <i>Lepidium pinnatifidum</i> Ledeb.	Zangali halam	Brassicaceae	Herb	Seeds	Abdominal pain, Stomachic, Colic, Digestive, Anti-flatulent in cattle
58.	61. <i>Malva neglecta</i> Wallr.	Paneerak	Malvaceae	Herb	Shoots	Wild vegetable, Fodder
59.	65. <i>Malvastrum coromandelianum</i> L.	Tarpanrra	Malvaceae	Herb	Shoots	Dysentery; Fodder

S. no.	Botanical Names	Local Names	Family	Habit	Part(s) Used	Ethnobotanical Uses
60.	67. Melia azedarach L.	Tora becanrah	Meliaceae	Tree	Bark, Leaves, fruits	Antidiabetic, Antihypertensive, Antirheumatic, Cathartic, anti-hysteria, anti-lice & Antidandruff, Eczema, Ringworms; Fuelwood, Furniture
61.	58. Mentha longifolia L.	Veenalay	Lamiaceae	Herb	Shoots	Diarrhea, Dysentery, Stomachic, digestive, Carminative, appetizer; Spice Flavoring agent
62.	59. Mentha spicata L.	Phodeena	Lamiaceae	Herb	Shoots	Stomachic, Carminative, Digestive, Antiemetic; Spice, Flavoring agent
63.	60. Micromeria biflora Benth.	Naray shamakay	Lamiaceae	Herb	Whole plant	Flu, toothache; Honeybee specie, Aromatic
64.	64. Mirabilis jalapa L.	Gul-e-Badah	Nyctaginaceae	Herb	Whole plant	Wounds healing, Anodyne, Typhoid
65.	68. Morchella esculenta L.	Goojay	Morchellaceae	Fungi	Whole plant	Body tonic & Aphrodisiac; Wild food
66.	66. Morus nigra L.	Toot	Moraceae	Tree	Fruits, Leaves, Wood	Cough, Cold, Flu, Asthma, Chest infection; Wild fruit, Furniture, Timber, Agriculture tools, Construction, Fodder
67.	62. Myrsine africana L.	Monrgoaya	Primulaceae	Shrub	Leaves, Fruits	Carminative, Anthelminthic, Stimulant; Wild fruit, hedging, Fuelwood
68.	63. Myrtus communis L.	Manrho	Myrtaceae	Shrub	Leaves, Fruits	Carminative, Stimulant, Diarrhea, Dysentery, Cough, Throat infection, Colic, Chest congestion; Wild fruit, Herbal tea, Ornamental, Flavoring agent
69.	69. Narcissus tazetta L.	Gul-e-Nargis	Amaryllidaceae	Herb	Flowers	Aromatic, Ornamental
70.	70. Nasturtium officinale W.T. Aiton	Tarmeera	Brassicaceae	Herb	Shoot	Stimulant, Diuretic, Blood purifier, Body tonic; Wild vegetable
71.	71. Ocimum basilicum L.	Kashmalay	Lamiaceae	Herb	Leaves, Seeds	Cough, Cold, Flu, Digestive, Stomachic, Cooling agent; Ornamental, Aromatic
72.	73. Olea ferruginea Royle	Khoona	Oleaceae	Tree	Leaves, wood, Fruits	Antidiabetic, Anodyne, Antiseptic, Toothache, Throat infection, cracked tongue, Sore gums, internal bleeding, Cholesterol lowering agent, hepatitis & Jaundice; Wild fruit, Oil, Agriculture tools, Sacred tree, Timber
73.	72. Origanum vulgare L.	Ghat Shamakay	Lamiaceae	Herb	Shoots	Antiseptic, Digestive, antiemetic, Influenza, Fever, Cold, Arthritic & Muscular pain, Gynaecological diseases (discomfortable menses)
74.	74. Oxalis corniculata L.	Manzakay Tarookay	Oxalidaceae	Herb	Shoots	Refrigerant, Anthelminthic, Stomachic, Fever, Dysentery, Anti scorpion & insect bite; Anticorrosive
75.	78. Pinus roxburghii Sarg.	Nakhtar	Pinaceae	Tree	Wood, resin, seeds, spurs	Stimulant, Blood purifier, Skin disease, Ulcer; Timber, Furniture, Edible seeds, Packing, Brooms, Torchwood

S. no.	Botanical Names	Local Names	Family	Habit	Part(s) Used	Ethnobotanical Uses
76.	79. <i>Pinus wallichiana</i> A.B. Jack.	Sraf	Pinaceae	Tree	Wood, resin, spurs	Skin diseases, Respiratory Problems, Wound & burns healing; Timber, Furniture, Packing, Torchwood, Bedding
77.	75. <i>Plantago lanceolata</i> L.	Ghuai Jabbai	Plantaginaceae	Herb	Leaves, seeds	Toe web infection, Sores, Diarrhea; Fodder
78.	76. <i>Platanus orientalis</i> L.	Platanaceae	Platanaceae	Tree	Wood	Timber, Furniture, Fuelwood
79.	80. <i>Polygonum aviculare</i> L.	Bandakay	Polygonaceae	Herb	Shoot	Wild vegetable, Fodder
80.	81. <i>Portulaca oleracea</i> L.	Warkharay	Portulacaceae	Herb	Shoots	Wild vegetable, Fodder
81.	77. <i>Punica granatum</i> L.	Ananghoray	Lythraceae	Shrub	Fruits, bark, leaves	Astringent, Blood purifier, Cooling agent, Digestive problems, UTI's, Antipyretic, Anthelmintic, Expectorant, Bedwetting, Nocturia; Wild fruit
82.	82. <i>Pyrus pashia</i> Buch.	Tanga	Rosaceae	Tree	Fruits, branches	Wild fruit, Stick
83.	86. <i>Ranunculus repens</i> L.	Ziar gualay	Ranunculaceae	Herb	Shoot	Poisonous
84.	87. <i>Ricinus communis</i> L.	Harhanda	Euphorbiaceae	Shrub	Leaves, Seeds	Narcotic, laxative, Cough, Fever, Headache; Oil
85.	92. <i>Robinia pseudoacacia</i> L.	Kikar	Fabaceae	Tree	Wood, flowers, leaves	Honeybee specie, Fencing, Hedging, Fodder, Fuelwood, Soil binder
86.	83. <i>Rorripa islandica</i> Oeder.		Brassicaceae	Herb	Shoots	Wild vegetable, Fodder
87.	88. <i>Rosa indica</i> L.	Gulab	Rosaceae	Shrub	Flowers, branches	Ornamental, Fencing, Hedging, Honeybee specie
88.	89. <i>Rosa macrophylla</i> L.	Khurach	Rosaceae	Shrub	Fruits, Flowers, Branches	Honeybee specie, Hedging, Fencing, Ornamental
89.	90. <i>Rosa moschata</i> Herm.	Pulwarhi	Rosaceae	Shrub	Flowers, Leaves, Branches	Ornamental, Honeybee specie, Fencing, Fodder
90.	93. <i>Rubia cordifolia</i> L.	Karghan mewa	Rubiaceae	Climber (Herb)	Whole Plant	Acne, Eczema, Pimples, Allergy, Kidney stone
91.	91. <i>Rubus sanctus</i> Schreb.	Karwara	Rosaceae	Shrub	Fruits, Leaves, branches	Carminative, Laxative, Body tonic, Cooling agent; Wild fruit, Fencing
92.	85. <i>Rumex dentatus</i> L.	Shalkhay	Polygonaceae	Herb	Leaves	Diuretic, Demulcent, Astringent, Laxative in cattle, Wild vegetable, Fodder
93.	84. <i>Rumex hastatus</i> D. Don	Tarookay	Polygonaceae	Shrub	Shoots	Carminative, Diuretic, Purgative, Liver tonic; Spice
94.	94. <i>Rydingia limbata</i> Benth.	Speen azghay	Lamiaceae	Shrub	Shoot	Mouth sore, Gums diseases: Fencing, Fuelwood, Fodder
95.	95. <i>Sageretia thea</i> Osbeck	Mamanrha	Rhamnaceae	Shrub	Fruits, Leaves, Branches	Wild fruit, Fodder, Thatching, Fuelwood
96.	103. <i>Salix tetrasperma</i> Roxb.	Walla	Salicaceae	Tree	Whole Plant	Anodyne, Antipyretic; Ornamental, Fuelwood, Soil binder
97.	99. <i>Salvia moorcroftiana</i> Wall.	Khar dag	Lamiaceae	Herb	Leaves	Wounds healing, Anodyne, Rheumatism
98.	96. <i>Sedum orientale</i> Boiss.	-	Crassulaceae	Herb	Shoots	Ornamental
99.	97. <i>Silybum marianum</i> L.	Wrijakai	Asteraceae	Herb	Leaves, Seeds	Anti-Jaundice & Hepatitis, Liver cancer, Tuberculosis; Oil
100.	100. <i>Solanum nigrum</i> Auct.	Kachmachu	Solanaceae	Herb	Fruits, Leaves, Shoots	Anti-inflammatory, Liver problems, Stomachic, Malarial fever; Wild fruit, Wild vegetable
101.	101. <i>Solanum surratense</i> Burm.	Manrghonay	Solanaceae	Herb	Whole plant	Stomachic, Cough, fever, Anti jaundice, Migraine
102.	98. <i>Sonchus asper</i> L.	Shauda paii	Asteraceae	Herb	Shoot	Lactation enhancer in cattle; Fodder

S. no.	Botanical Names	Local Names	Family	Habit	Part(s) Used	Ethnobotanical Uses
103.	102. Sorghum halepense L.	Dadam	Poaceae	Herb	Leaves	Fodder, Poisonous
104.	106. Tagetes minuta L.	Kamasla hameesha	Asteraceae	Herb	Flowers	Ornamental
105.	104. Taraxacum officinale F.H. Wigg.	Ziar gualay	Asteraceae	Herb	Whole Plants	Diuretic, Tonic, Antidiabetic, Kidney problems; Fodder
106.	105. Teucrium stocksianum Boiss.	Speera botay	Lamiaceae	Herb	Shoots	Stomachic, Cooling agent, Antidiabetic
107.	107. Tillaea alata Viv.	-	Crassulaceae	Herb	Whole Plant	Ornamental
108.	109. Trachyspermum ammi L.	Kamasli sperkaii	Apiaceae	Herb	Fruits, shoots	Digestive, Carminative, colic pain, Menses regulation
109.	110. Tribulus terrestris L.	Markondaii	Zygophyllaceae	Herb	Fruits	UTI's, Male impotency, male fertility, kidney stone, Bedwetting
110.	108. Trifolium repens L.	Zangali shautal	Fabaceae	Herb	Shoots	Lactation enhancer in cattle; Wild vegetable, Fodder, Honeybee species
111.	111. Urtica dioica L.	Seezunkay	Urticaceae	Herb	Leaves	Diuretic, Anti-jaundice; Wild vegetable
112.	112. Verbascum thapsus L.	Khar ghwag	Scrophulariaceae	Herb	Leaves	Anodyne, Wounds healing
113.	113. Viola canescens Wall.	Banafsha	Violaceae	Herb	Whole plant	Antipyretic, Diaphoretic, Anti-cancer, Cold, Cough, Fever, Headache, Chest infection; Herbal tea
114.	114. Xanthium strumarium L.	Ghat jishkay	Asteraceae	Herb	Leaves	Malarial fever, Asthma; Fuelwood
115.	115. Zanthoxylum armatum DC.	Dambara	Rutaceae	Shrub	Fruits, branches	Stomachic, Carminative, Stimulant, Toothache, Antipyretic, Nausea, Appetizer; Spice, Flavoring agent, Fencing, Fuelwood, Stick
116.	117. Ziziphus jujuba Mill.	Markhanraii	Rhamnaceae	Shrub	Leaves, Fruits, wood	Blood purifier, Antidiabetic, Digestive, Anti hypertension, Kidney & Liver tonic, Diarrhea, Dysentery, Stress, Anxiety; Wild fruit, Fodder; Honeybee specie, Fencing, Fuelwood
116.	Ziziphus oxyphylla Edgew.	Elanaii	Rhamnaceae	Tree	Whole plant	Antidiabetic & hepatitis; Fuelwood

Table 3: Categories of Ailments and Informant Consensus Factor (ICF) for Each Category.

Disease Categories	Number f taxa used (Nt)	Used reports (Nur)	Nur-Nt	Nur-1	ICF
Respiratory	31	178	147	177	0.83
Gastrointestinal	44	265	221	264	0.84
Musculoskeletal	23	109	86	108	0.80
Cardiovascular	11	49	38	48	0.79
Hepatobiliary	34	174	140	173	0.81
Nervous system	30	112	82	111	0.74
Urinogenital	12	48	36	47	0.77
Ophthalmic	4	11	7	10	0.70
Dermatological	16	59	43	58	0.74
Gynaecological	5	17	12	16	0.75
Antidote	4	12	8	11	0.73

1. Ethnomedicinal Plants

In the current study 83 (70.9%) plant species were being locally used as an herbal remedy for curing 11 different categories of diseases. The inhabitants of the area use these plants as a whole or their part individually, or in combination with other plants for the treatments of diseases. There were some plants which were used for one disease and others were used for curing many diseases, for example *Ajuga integrifolia*, *Berberis lycium*, *Cichorium intybus*, *Gymnosporia royleana*, *Mentha spicata*, *Myrtus communis*, *Olea ferruginea*, *Punica granatum*, *Viola canescens*, and *Ziziphus oxyphylla* were commonly used against various ailments (Table, 3). Similar kinds of studies are reported by various authors within and outside the country. For example, Ugulu et al., (2009) documented 108 medicinal plants from Izmir Province Turkey. Razzaq et al., (2010) reported 50 different medicinal plants from Changa Valley, District Shangla. Khan et al., (2015) reported 45 medicinal plants from Kabal Valley, District, Swat.

Khan et al., (2015) reported that flowers of *Silybum marianum* is used for the treatment of hepatitis, jaundice, and tuberculosis. Our findings are in line with the results of (Khan et al., 2015), that seeds of *Silybum marianum* are used to cure hepatitis and tuberculosis. Sher and Al- Yemeni (2010) documented that the root of *Berberis lycium* is used to treat wounds, liver disorder, stomachic and intestinal colic. The findings of our research show corroboration with (Sher and Al-Yemeni, 2010), that the bark of root is used for curing hepatitis, throat infection, internal wounds, and liver disorders. Tariq et al., (2019) documented that *Lepidium sativum* is used for the treatment of abdominal problem and as colic. Present study shows that the seeds of *Lepidium pinnatifidum* are used for relieving stomachache, colic, and laxative. Akhtar et al., (2013) reported that seeds oil of *Ricinus communis* is demulcent and evacuate bowels in children. Our current study shows that seeds of the same plant are used to cure cough, fever, and headache while its oil acts as laxative and are used for body massage as well. Hussain et al., (2006) documented that the fruits of *Ficus palmata* are antispasmodic. As per our findings its fruits are laxative and expectorant.

As per medicinal use the plants were grouped into 11 major therapeutic classes (Table. 3) in which 44 (53.01%) were used against gastrointestinal problems, 34(40.96%) against hepatobiliary diseases, 31(37.35%) against respiratory diseases, 30(36.14%) against nervous disorders, 23(27.71%) as musculoskeletal, 16(19.28%) against dermatological problems, 12(14.46%) against urinogenital problems, 11(13.25%) for treating cardiovascular diseases, 5(6.02%) against gynaecological diseases, and 4(4.82%) used as ophthalmic and antidote. For the preparation of herbal medicines, the inhabitants use decoction (33%), infusion (18), powder (14%), juice and paste (9%) while raw form (7%), cooked form (4%), oil and herbal tea (3%), (Fig. 6). The results agree with Ahmad et al., (2017) and Ahmad et al., (2014) where mostly herbal medicines are taken in decoction form. Maybe because its easier to digest and more effective. A number of the medicinal plants were considerably utilized by the local inhabitants for a variety of ethno-botanical purposes.

According to the current findings many of the plants were used for multiple purposes. For instance, gums of *Acacia nilotica* were used for curing diabetes, dysentery, diarrhea, and was blood purifier and antihelmenthic. Its tooth brush (miswak) was used against gums bleeding, toothache and strengthening of gums and teeth. Leaves were used a fodder for cattle. Wood was utilized for making agricultural tools and as fuelwood. Similarly fruits of the *Ziziphus jujuba* were edible being used for blood purification, indigestion, diabetes, and to reduce tension and anxiety. Leaves were used as a fodder for goats. The plant was also used as honey bee specie and for fencing, hedging, and fuelwood. This agrees with Khan et al., (2003) who reported the multiple uses of plants from Gokand Valley, Buner.

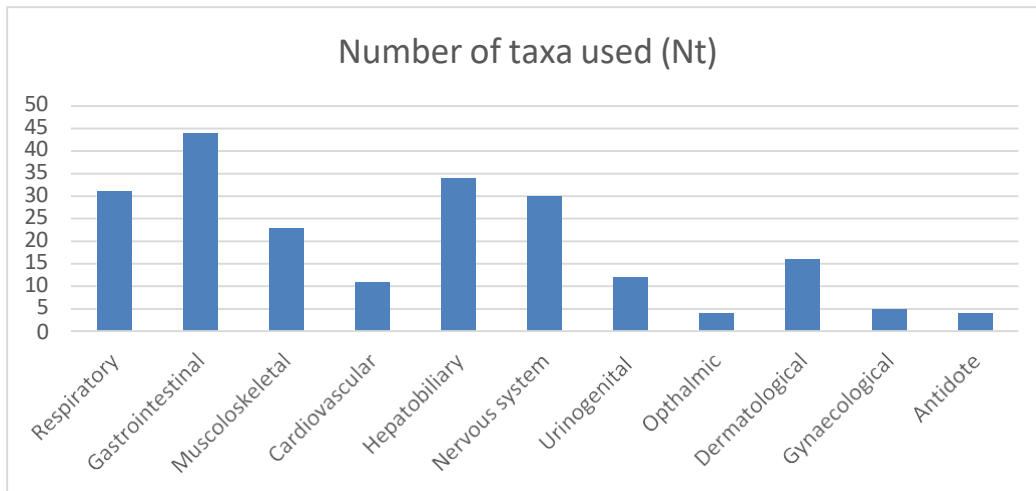


Figure: 5 Different Categories of Ailments Treated by Medicinal Plants.

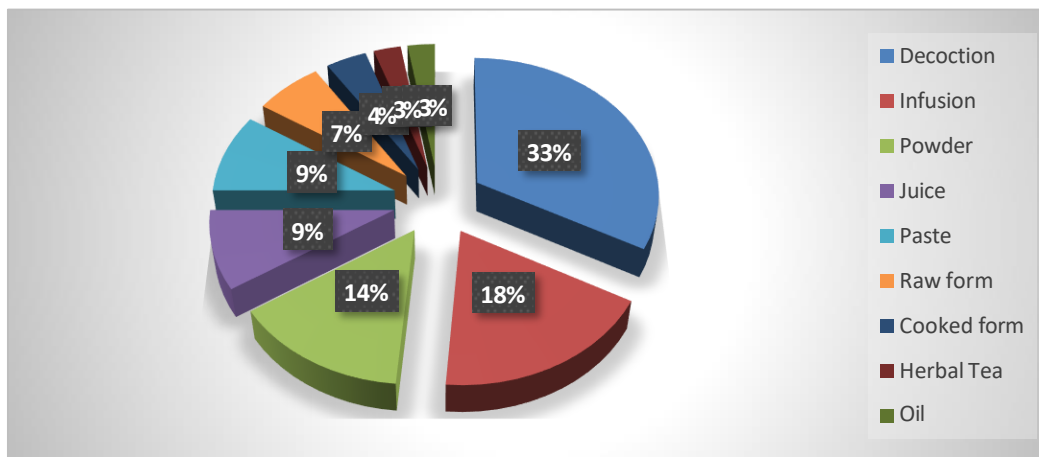


Figure: 6 Mode of Drug Preparation of Medicinal Plants.

2. Ethnoveterinary Plants

Since ancient time, plants have been used in the area to treat various veterinary ailments. Present study revealed that 43(36.8%) plant of ethnoveterinary importance. Some of these plants were *Sonchus asper*, *Clematis grata*, *Avena sativa*, *Amaranthus spinosus*, *Lepidium pinnatifidum*, *Cynodon dactylon*, *Rumex dentatus*, *Chenopodium album*, *Daphne mucronata*, and *Trifolium repens* (Table 2). For instance, *Avena sativa* plant was preferred fodder for cattle in fresh, dried as well as straw form. *Clematis grata* was used as antiseptic against germs and for healing of wounds in domestic animals. It was also grazed by sheep and goats. Seeds of *Lepidium pinnatifidum* were given orally to all livestock to treat flatulence. Similarly, *Sonchus asper* was given to cattle to increase lactation. Similar studies have been reported by different authors like Muhammad et al., (2019) reported 48 ethnoveterinary plants from Melagah Valley, district Swat. Rahman et al., (2020) carried out an ethnoveterinary study of Khadang Valley Chakesar, and documented 68 plant species. According to the findings of Tariq et al., (2014) the decoction of *Sonchus asper* plant has been given to cattle for increase in milk production, which show corroboration with our study. Similarly, our findings agree with the study of Sher et al., (2004) and Shoaib et al., (2021).

3. Wild Vegetables

The people of study area were mostly poor and dependent upon wild vegetables for their food requirements. About 20 species of plants were being used as wild vegetables comprising about 17.1% of the total reported plants. These plants species were *Agaricus compestris*, *Amaranthus viridis*, *A. hybridus*, *A. spinosus*, *Asparagus capitatus*, *Allium porrum*, *Allium oreoprasum*, *Carthamus oxyacantha*, *Cichorium intybus*, *Chenopodium album*, *Malva neglecta*, *Nasturtium officinale*, *Polygonum aviculare*, *Rorripa islandica*, *Rumex dentatus*, *Solanum nigrum*, *Urtica dioica*, *Morchella esculenta*, *Trifolium repens* and *Portulaca olearacea*. These plants were either cooked alone or in combination with other plants. Such types of studies have been done by various authors. For example, Ahmad et al., (2019) reported 25 wild vegetable species from northwest Pakistan. Abbasi et al., (2013) reported 45 wild vegetables from Lesser Himalayas-Pakistan. Abbas (2020) documented 55 wild vegetables from Kurram District, KPK. Similarly, Hussain et al., (2006) reported a total 11 vegetables consisting of 6 wild vegetables, from Shawar Valley, District, Swat.

4. Wild Fruits

There were 19 (16.2%) plant species of wild fruits in the area. These wild fruits were *Cotoneaster microphyllus*, *C. nummularia*, *Duchesnea indica*, *Pyrus pashia*, *Rubus sanctus*, *Sageretia thea*, *Debregeasia saeneb*, *Ficus palmata*, *Solanum nigrum*, *Berberis lycium*, *Myrtus communis*, *Juglans regia*, *Olea ferruginea*, *Celtis eriocarpa*, *Punica granatum*, *Sageretia thea*, *Myrsine africana*, *Morus nigra* and *Ziziphus jujuba*. Some of them were economically important, and were traded in the local market like *Punica granatum*, that's why these plants species showed rare distribution due to over exploitation. Various authors reported different number of wild fruits. Ilyas et al., (2013) reported 25 species of wild fruits from Qalagai hills, Kabal Valley, Swat. Naveed et al., (2018) reported 9 fruit plants (including 4 cultivated fruits) from District Swabi, KPK. Similarly, Khattak et al., (2021) reported 11 wild edible fruits from Tehsil Takht-e-Nasrati, Pakistan.

5. Honey Bee Species

Among the studied plant it was found that 10 (8.5%) plant species were being visited by honeybees. That is the reason that the area was famous for wild honey. These plants were *Isodon rugosus*, *Ziziphus jujuba*, *Justicia adhatoda*, *Rosa indica*, *R. moschata*, *R. macrophylla*, *Robinia pseudoacacia*, *Indigofera heterantha*, *Micromeria biflora*, and *Trifolium repens*. The plant of *Micromeria biflora* was rubbed inside the earthen pot to attract honey bees. Honey obtained from *Isodon rugosus* was considered to be the most favourite in Kabal Valley, which was extensively used in the preparation of traditional medicines and was sold expensively in the local market. Our current findings are justified by various authors like, Hamayun et al., (2005) who reported 8 honey bees' attractant species from Utror and Gabrals Valley, District Swat. Likewise, Ibrar et al., (2007) during his study in Ranyal Hills, District Shangla, reported 4 honey bee species. Ilyas et al., (2013) reported 7 honey bee plants from Qalagai Hills, Kabal Valley, district Swat.

6. Fuelwood Species

As per our finding 25 (21.4%) of the total recorded plant species were used as fuel wood. These plants were *Isodon rugosus*, *Berberis lycium*, *Cotoneaster spp*, *Rydingia limbata*, *Ailanthus altissimus*, *Dodonaea viscosa*, *Robinia pseudoacacia*, *Indigofera heterantha*, and many more (Table 2). The scrub forests of the study area were under immense pressure of fuelwood

collection. Shinwari and Khan (1999) documented that *Acacia modesta*, *Acacia nilotica*, *Buxus pipiosa* and *Dodnaea viscosa* are experiencing collection pressure in Margalla hills National Park, Islamabad.

Present study also found that about 800 tons of fuelwood is utilised monthly in the study area, but this amount rises during winter owing to the extra requirements like warming food, water, and home. A similar situation was also reported by Hamayun et al. (2005), where 25kg of fuelwood is utilised by every individual per month during the summer season, but 60kg during the winter.

7. Timber Wood and Construction Species

According to our finding 7 plant species (6%) were being used in the region as timber species and various products of furnitures and agricultural tools were prepared from their wood. These plants were *Pinus roxburghii*, *Pinus wallichiana*, *Morus nigra*, *Juglans regia*, *Platanus orientalis*, *Ailanthus altissimus*, and *Melia azedarach*.

8. Ornamental Plant Species

In the current study 11 (9.4%) plants were being used as ornamental plants. These plants were *Tagetes minuta*, *Rosa indica*, *R. moschata*, *R. macrophylla*, *Cynodon dactylon*, *Myrtus communis*, *Ipomea purpurea*, *Narcissus tazetta*, *Sedum orientale*, *Salix tetrasperma* and *Tillaea alata*. Though, ornamental plants could not be exploited commercially but it could be grown on a commercial scale to generate income.

9. Poisonous Plants

Only 3 (2.6%) plant species including *Euphorbia helioscopia*, *Ranunculus repens*, and *Sorghum halepense* were being considered poisonous to cattle and humans.

10. Plants with Other Miscellaneous Uses

The plants classified in this category were included the plants used for fencing and hedging 16 spp (13.7%), flavoring agent 5 spp (4.3%), agricultural tools and spice each with 4(3.4%) spp, thatching, essential oils, brooms and edible seeds each having 3(2.6%) spp, aromatic, torchwood, packing materials, tooth brush(miswak), bedding and slippers, holy/sacred, soil binders, sticks and herbal tea each with 2(1.7%) spp, and lipstick, anticorrosive and evil eyes repellent each with only 1 specie (0.9%).

Table 4: Plants with Their Use Report, Use Value, Relative Frequency of Citation, and Relative Importance Index.

Plants	UR	FC	RFC	UV	NUC	NT	RI
<i>Adiantum capillus-veneris</i> L.	3	16	0.32	0.19	0.25	0.45	0.35
<i>Agaricus campestris</i> L.	2	24	0.48	0.08	0.17	0.20	0.18
<i>Ajuga integrifolia</i> Buch.	5	40	0.8	0.13	0.42	0.30	0.36
<i>Acacia nilotica</i> L.	10	23	0.46	0.43	0.83	1.04	0.93
<i>Asparagus capitatus</i> Baker.	2	19	0.38	0.11	0.17	0.25	0.21
<i>Achyranthes aspera</i> L.	3	13	0.26	0.23	0.25	0.55	0.40
<i>Amaranthus viridis</i> L.	6	18	0.36	0.33	0.50	0.79	0.65
<i>Amaranthus hybridus</i> L.	2	14	0.28	0.14	0.17	0.34	0.25
<i>Amaranthus spinosus</i> L.	3	13	0.26	0.23	0.25	0.55	0.40
<i>Artemisia scoparia</i> Waldst. & Kit.	7	18	0.36	0.39	0.58	0.93	0.75
<i>Avena sativa</i> L.	4	18	0.36	0.22	0.33	0.53	0.43
<i>Ailanthus altissimus</i> L.	8	23	0.46	0.35	0.67	0.83	0.75
<i>Allium porrum</i> L.	3	21	0.42	0.14	0.25	0.34	0.30
<i>Allium oreoprasum</i> Sch.	1	6	0.12	0.17	0.08	0.40	0.24

Plants	UR	FC	RFC	UV	NUC	NT	RI
Berberis lycium Roy.	9	42	0.84	0.21	0.75	0.51	0.63
Buddleja crispa Benth.	4	14	0.28	0.29	0.33	0.68	0.51
Bupleurum falcatum L.	3	11	0.22	0.27	0.25	0.65	0.45
Calotropis procera W.T. Aiton	5	22	0.44	0.23	0.42	0.54	0.48
Cynodon dactylon L.	2	14	0.28	0.14	0.17	0.34	0.25
Cyperus niveus Retz.	1	13	0.26	0.08	0.08	0.18	0.13
Cyperus rotundus L.	1	11	0.22	0.09	0.08	0.22	0.15
Cetis eriocarpa Decne.	5	18	0.36	0.28	0.42	0.66	0.54
Clematis grata Wall.	2	10	0.2	0.20	0.17	0.48	0.32
Calendula arvensis L.	4	14	0.28	0.29	0.33	0.68	0.51
Cynoglossum lanceolatum Forssk.	3	13	0.26	0.23	0.25	0.55	0.40
Carthamus oxyacantha M. Bieb.	3	18	0.36	0.17	0.25	0.40	0.32
Cichorium intybus L.	7	30	0.6	0.23	0.58	0.56	0.57
Cannabis sativa L.	7	32	0.64	0.22	0.58	0.52	0.55
Chenopodium album L.	2	18	0.36	0.11	0.17	0.26	0.22
Cuscuta reflexa Roxb.	6	17	0.34	0.35	0.50	0.84	0.67
Clinopodium umbrossum M. Bieb.	2	10	0.2	0.20	0.17	0.48	0.32
Cotoneaster microphyllus Wall.	4	25	0.5	0.16	0.33	0.38	0.36
Cotoneaster nummularius Fisch. & Mey.	5	27	0.54	0.19	0.42	0.44	0.43
Cirsium vulgare Savi.	4	16	0.32	0.25	0.33	0.60	0.46
Colchicum luteum Baker	5	16	0.32	0.31	0.42	0.74	0.58
Duchesnea indica Andr.	7	20	0.4	0.35	0.58	0.83	0.71
Dodonaea viscosa L.	8	36	0.72	0.22	0.67	0.53	0.60
Daphne mucronata Royle	5	21	0.42	0.24	0.42	0.57	0.49
Dabregeasia saeneb F.	6	23	0.46	0.26	0.50	0.62	0.56
Dysphania botrys L.	2	22	0.44	0.09	0.17	0.22	0.19
Dysphania ambrosioides L.	3	20	0.4	0.15	0.25	0.36	0.30
Eryngium caeruleum M. Bieb.	4	14	0.28	0.29	0.33	0.68	0.51
Euphorbia helioscopia L.	1	17	0.34	0.06	0.08	0.14	0.11
Euphorbia indica Lam.	2	13	0.26	0.15	0.17	0.37	0.27
Euphorbia prostrata Ait.	2	11	0.22	0.18	0.17	0.43	0.30
Erigeron canadensis L.	5	19	0.38	0.26	0.42	0.63	0.52
Eulaliopsis binata Retz.	1	27	0.54	0.04	0.08	0.09	0.09
Ficus palmata Forssk.	6	27	0.54	0.22	0.50	0.53	0.51
Fumaria indica Pug.	5	19	0.38	0.26	0.42	0.63	0.52
Foeniculum vulgare Mill.	11	26	0.52	0.42	0.92	1.01	0.96
Gymnosporia royleana Wall.	3	15	0.3	0.20	0.25	0.48	0.36
Isodon rugosus Wall. Ex Benth.	4	35	0.7	0.11	0.33	0.27	0.30
Indigofera heterantha Wall.	4	18	0.36	0.22	0.33	0.53	0.43
Ipomoea purpurea L.	2	12	0.24	0.17	0.17	0.40	0.28
Justicia adhatoda L.	3	30	0.6	0.10	0.25	0.24	0.24
Juglans regia L.	10	25	0.5	0.40	0.83	0.95	0.89
Lepidium pinnatifidum Ledeb.	4	24	0.48	0.17	0.33	0.40	0.37
Mentha longifolia Linn.	4	37	0.74	0.11	0.33	0.26	0.30
Mentha spicata L.	4	34	0.68	0.12	0.33	0.28	0.31
Micromeria biflora Benth.	4	18	0.36	0.22	0.33	0.53	0.43
Malva neglecta Wallr.	2	18	0.36	0.11	0.17	0.26	0.22
Myrsine africana L.	5	16	0.32	0.31	0.42	0.74	0.58
Myrtus communis L.	7	23	0.46	0.30	0.58	0.72	0.65
Mirabilis jalapa L.	3	23	0.46	0.13	0.25	0.31	0.28
Malvastrum coromandelianum L.	1	10	0.2	0.10	0.08	0.24	0.16
Morus nigra L.	6	21	0.42	0.29	0.50	0.68	0.59
Melia azedarach L.	7	22	0.44	0.32	0.58	0.76	0.67
Morchella esculenta L.	3	20	0.4	0.15	0.25	0.36	0.30
Narcissus tazetta L.	1	20	0.4	0.05	0.08	0.12	0.10
Nasturtium officinale W.T. Aiton	3	25	0.5	0.12	0.25	0.29	0.27
Ocimum basilicum L.	6	20	0.4	0.30	0.50	0.71	0.61
Origanum vulgare L.	8	21	0.42	0.38	0.67	0.91	0.79
Olea ferruginea Royle	12	34	0.68	0.35	1.00	0.84	0.92
Oxalis corniculata L.	6	19	0.38	0.32	0.50	0.75	0.63

Plants	UR	FC	RFC	UV	NUC	NT	RI
<i>Plantago lanceolata</i> L.	4	18	0.36	0.22	0.33	0.53	0.43
<i>Platanus orientalis</i> L.	2	19	0.38	0.11	0.17	0.25	0.21
<i>Punica granatum</i> L.	9	34	0.68	0.26	0.75	0.63	0.69
<i>Pinus roxburghii</i> Sarg.	10	33	0.66	0.30	0.83	0.72	0.78
<i>Pinus wallichiana</i> A.B. Jack.	7	19	0.38	0.37	0.58	0.88	0.73
<i>Polygonum aviculare</i> L.	2	13	0.26	0.15	0.17	0.37	0.27
<i>Portulaca oleracea</i> L.	2	16	0.32	0.13	0.17	0.30	0.23
<i>Pyrus pashia</i> Buch.	2	20	0.4	0.10	0.17	0.24	0.20
<i>Rorripa islandica</i> Oeder.	2	11	0.22	0.18	0.17	0.43	0.30
<i>Rumex hastatus</i> D. Don	4	21	0.42	0.19	0.33	0.45	0.39
<i>Rumex dentatus</i> L.	5	19	0.38	0.26	0.42	0.63	0.52
<i>Ranunculus repens</i> L.	1	13	0.26	0.08	0.08	0.18	0.13
<i>Ricinus communis</i> L.	6	17	0.34	0.35	0.50	0.84	0.67
<i>Rosa indica</i> L.	3	23	0.46	0.13	0.25	0.31	0.28
<i>Rosa macrophylla</i> L.	3	15	0.3	0.20	0.25	0.48	0.36
<i>Rosa moschata</i> Herrm.	4	17	0.34	0.24	0.33	0.56	0.45
<i>Rubus sanctus</i> Schreb.	5	25	0.5	0.20	0.42	0.48	0.45
<i>Robinia pseudoacacia</i> L.	5	20	0.4	0.25	0.42	0.60	0.51
<i>Rubia cordifolia</i> L.	2	16	0.32	0.13	0.17	0.30	0.23
<i>Rydingia limbata</i> Benth.	5	20	0.4	0.25	0.42	0.60	0.51
<i>Sageretia thea</i> Osbeck	4	22	0.44	0.18	0.33	0.43	0.38
<i>Sedum orientale</i> Boiss.	1	8	0.16	0.13	0.08	0.30	0.19
<i>Silybum marianum</i> L.	3	18	0.36	0.17	0.25	0.40	0.32
<i>Sonchus asper</i> L.	2	17	0.34	0.12	0.17	0.28	0.22
<i>Salvia moorcroftiana</i> Wall.	3	24	0.48	0.13	0.25	0.30	0.27
<i>Solanum nigrum</i> Auct.	6	20	0.4	0.30	0.50	0.71	0.61
<i>Solanum surratense</i> Burm.	4	16	0.32	0.25	0.33	0.60	0.46
<i>Sorghum halepense</i> L.	2	16	0.32	0.13	0.17	0.30	0.23
<i>Salix tetrasperma</i> Roxb.	5	18	0.36	0.28	0.42	0.66	0.54
<i>Taraxacum officinale</i> F.H. Wigg.	4	15	0.3	0.27	0.33	0.63	0.48
<i>Teucrium stocksianum</i> Boiss.	3	30	0.6	0.10	0.25	0.24	0.24
<i>Tagetes minuta</i> L.	1	18	0.36	0.06	0.08	0.13	0.11
<i>Tillaea alata</i> Viv.	1	4	0.08	0.25	0.08	0.60	0.34
<i>Trifolium repens</i> L.	4	17	0.34	0.24	0.33	0.56	0.45
<i>Trachyspermum ammi</i> L.	3	26	0.52	0.12	0.25	0.27	0.26
<i>Tribulus terrestris</i> L.	3	16	0.32	0.19	0.25	0.45	0.35
<i>Urtica dioica</i> L.	3	15	0.3	0.20	0.25	0.48	0.36
<i>Verbascum thapsus</i> L.	2	23	0.46	0.09	0.17	0.21	0.19
<i>Viola canescens</i> Wall.	3	25	0.5	0.12	0.25	0.29	0.27
<i>Xanthium strumarium</i> L.	3	16	0.32	0.19	0.25	0.45	0.35
<i>Zanthoxylum armatum</i> DC.	9	26	0.52	0.35	0.75	0.82	0.79
<i>Ziziphus oxyphylla</i> Edgew.	3	32	0.64	0.09	0.25	0.22	0.24
<i>Ziziphus jujuba</i> Mill.	11	30	0.6	0.37	0.92	0.87	0.89

3.3. Relative Importance of Ethnobotanical Species Using Quantitative Indices

a) Use Values

A quantitative approach for data analysis that measures the type of uses associated with certain plants species and relative significance of species in an area (Ahmad et al., 2017). In our study, the use values of plants species ranged from 0.04 to 0.42 (Table 2). The top 10 species on the basis of used values were *Foeniculum vulgare* (0.42), *Juglans regia* (0.40), *Acacia nilotica* (0.39), *Artemisia scoparia* (0.39), *Origanum vulgare* (0.38), *Ziziphus jujuba* (0.37), *Pinus wallichiana* (0.37), *Melia azedarach* (0.36), *Ailanthus altissimus* (0.35), *Cuscuta reflexa* (0.35), *Duchesnea indica* (0.35), *Olea ferruginea* (0.35), *Ricinus communis* (0.35), *Zanthoxylum armatum* (0.35), *Amaranthus viridis* (0.33), *Oxalis corniculata* (0.32), *Colchicum luteum* (0.31), and *Myrsine africana* (0.31). High use values of a specie indicate that the local inhabitants are well familiar with the plant species and finds it useful for a variety of ethnobotanical uses (Ahmad et al., 2017). On the other hand, plants species with low used values are not practically important and

may indicate the unfamiliarity and lack of knowledge of locals about the proper ethnobotanical use of those plants' species in that area (Camou-Guerrero et al., 2008).

b) Relative Frequency of Citation

Relative frequency of citation was calculated to evaluate the most frequently utilized plants for medicinal and other ethnobotanical purposes as stated by the local informants. In the current study it varied between 0.08 to 0.84 (Table 2). The top 10 species in this category were *Berberis lycium* (0.84), *Ajuga integrifolia* (0.80), *Mentha longifolia* (0.74), *Dodonea viscosa* (0.72), *Isodon rugosus* (0.7), *Mentha spicata* (0.68), *Olea ferruginea* (0.68), *Punica granatum* (0.68), *Pinus roxburghii* (0.66), *Ziziphus oxyphylla* (0.64), *Cannabis sativa* (0.64), *Cichorium intybus* (0.6), *Justicia adhatoda* (0.6), *Ziziphus jujuba* (0.6), *Ficus palmata* (0.54), *Cotoneaster nummularia* (0.54), and *Eulaliopsis binnata* (0.54). Various prior studies had listed these plants with high RFC values (Muhammad et al., 2019; Shah et al., 2016; Rahman et al., 2022). Among the locals, plants with high RFC values were highly renowned. These plants could be used as a baseline for studies to assess phytochemical profiling, and the discovery of new drugs in the future (Vitalini et al., 2013). The sustainable conservation of such species ought to be given top priority due to high anthropogenic stress (Ahmad et al., 2017).

c) Informant Consensus Factor

Informant consensus coefficient varied between 0.70 and 0.84. The diseases were categorized into 11 major classes (Table. 4). The category with highest consensus factor was gastrointestinal diseases (0.84). It may be due to the high use value of the said category. It was followed by respiratory problems (0.83), and musculoskeletal problems (0.80). Similar observations of high ICF value were recorded by (Ahmad et al., 2017; Shah et al., 2016). Similarly, the lowest ICF values were recorded for ophthalmic (0.70), followed by antidote (0.73) and skin diseases (0.74). Low ICF values suggest less consistency of informant's knowledge (Ahmad et al., 2017). ICF values were generally good for all categories, which may be attributable to the rich traditional knowledge of the informants of the study area. The high ICF values are a sign that most informants are aware of the particular medicinal plants and their application in treating ailments. Information is more reliable when the informant consensus values are greater and vice versa (Rahman et al., 2022).

d) Relative Importance

The relative importance determines the importance of a species uses in relation to the most significant species in the surveys and the usage of a plant in particular ethnobotanical category in comparison to the most significant plant species utilized in a variety of ethnobotanical categories (Rahman et al., 2022). Based on Relative importance (RI) the top 10 species were *Foeniculum vulgare* (0.96), *Acacia nilotica* (0.93), *Olea ferruginea* (0.92), *Juglans regia* (0.89), *Ziziphus jujuba* (0.89), *Origanum vulgare* (0.79), *Zanthoxylum armatum* (0.79), *Pinus roxburghii* (0.78), *Ailanthus altissimus* (0.75), *Artemisia scoparia* (0.75), *Pinus wallichiana* (0.73), *Duchesnea indica* (0.71), and *Punica granatum* (0.69). Since these plants' species were used for a variety of ethnobotanical purposes, hence cited by large number of informants.

3.4. Conclusion and Recommendations

The current work documented the various traditional uses of plants by the indigenous inhabitants; at the same time, our findings show that the study area was under severe threat of fuelwood collection, overexploitation of medicinal plants, deforestation, overgrazing, agriculture expansion, and fire. Hence, there is a dire need to conserve the prestigious

biodiversity of the area for sustainable use by the local community; otherwise, the forests and other natural resources will vanish forever in the near future. Based on our results, we suggest educating locals on the importance of plant biodiversity, ecosystem conservation, and the socioeconomic impacts of resource depletion. Additionally, it emphasizes the urgent need to document and preserve indigenous knowledge, encourage sustainable resource use, recognize the value of ethnobotanical knowledge, promote reforestation, control mining activities to prevent environmental degradation, and boost the rural economy through the commercialization of indigenous drugs.

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