



## Article

# Therapeutic Uses of Wild Plants by Rural Inhabitants of Maraog Region in District Shimla, Himachal Pradesh, India

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**Abstract:** The main aim of this study is to document important ethnomedicinal plants from the Maraog region, located in the district of Shimla in Himachal Pradesh, India. A total of 110 medicinal plant species belonging to 102 genera and 57 families were reported from the study site. All of the species were collected from wild habitats. The rural people of the Maraog region were surveyed through interview methods, group discussions, and participatory observations. In the current study, data were collected from 88 informants through the snowball method. A total of 110 plant

species were collected from the study area, including 64 herbs, 24 shrubs, 9 trees, 5 climbers, 3 grasses, and 5 ferns. Most of the plant species, reported from the study area, belong to the Rosaceae and Asteraceae families, each contributing 12 plant species, followed by the Lamiaceae family with 6 plant species. The most used part of the plant in the preparation of herbal medications is the leaves, which have been reported in 62 plants, followed by roots in 14 plants, and flowers and other aerial parts in 9 plants. The ethnomedicinal data were analyzed using “Use Value,” a statistical quantitative method, with *Artemisia vestita* having the highest use value (1.00), followed by *Cannabis sativa* (0.79), *Rhododendron arboreum* (0.79), and *Datura stramonium* (0.71). Older people were found to have a vast knowledge of wild medicinal plants, while the younger generation’s knowledge was lacking. As a result, traditional knowledge about the use of plants as a source of medicine has decreased day-by-day. Therefore, there is a need to document traditional ethnobotanical knowledge. The data could serve as a basis for research by pharmacological and nutraceutical industries for the development of novel drugs.

**Keywords:** medicinal plants; traditional knowledge; use value; rural inhabitants

## 1. Introduction

Since ancient times, wild or naturalized plants have provided social security to millions of people globally, in the form of fuel, food, fodder, supplements, raw materials for industries, medicines, and especially a source of additional income [1, 2, 3]. According to the World Health Organization, about 65–80% of people in developing countries are reliant on herbal remedies made from medicinal plants [4]. About 90% of the plant species used in the Indian herbal industry come from the Western Himalayas [5]. The Indian Himalayan region was well-known for its floristic diversity, with approximately 1748 medicinal plant species reported from the region [6], which were used in various fields of chemistry, pharmacological research, pharmacognosy, and clinical therapeutic studies [7, 8]. Himachal Pradesh is the northeastern state of India, geographically divided into three distinct regions; the outer Himalayas (Shivalik range), the mid-hills, and the greater Himalayas, which cover an area of 55,673 km<sup>2</sup> [9, 10]. Due to its diverse climatic, topographic, and geographical position or altitude, the state of Himachal Pradesh represents a rich source of biodiversity [11, 12]. According to the data of the Ayurvedic Pharmacopoeia Committee (Government of India), out of 1100 single-ingredient drugs, 350 plant species belong to native therapeutic groups, among which 225 species bloom in the state of Himachal Pradesh and were obtained commercially [13].

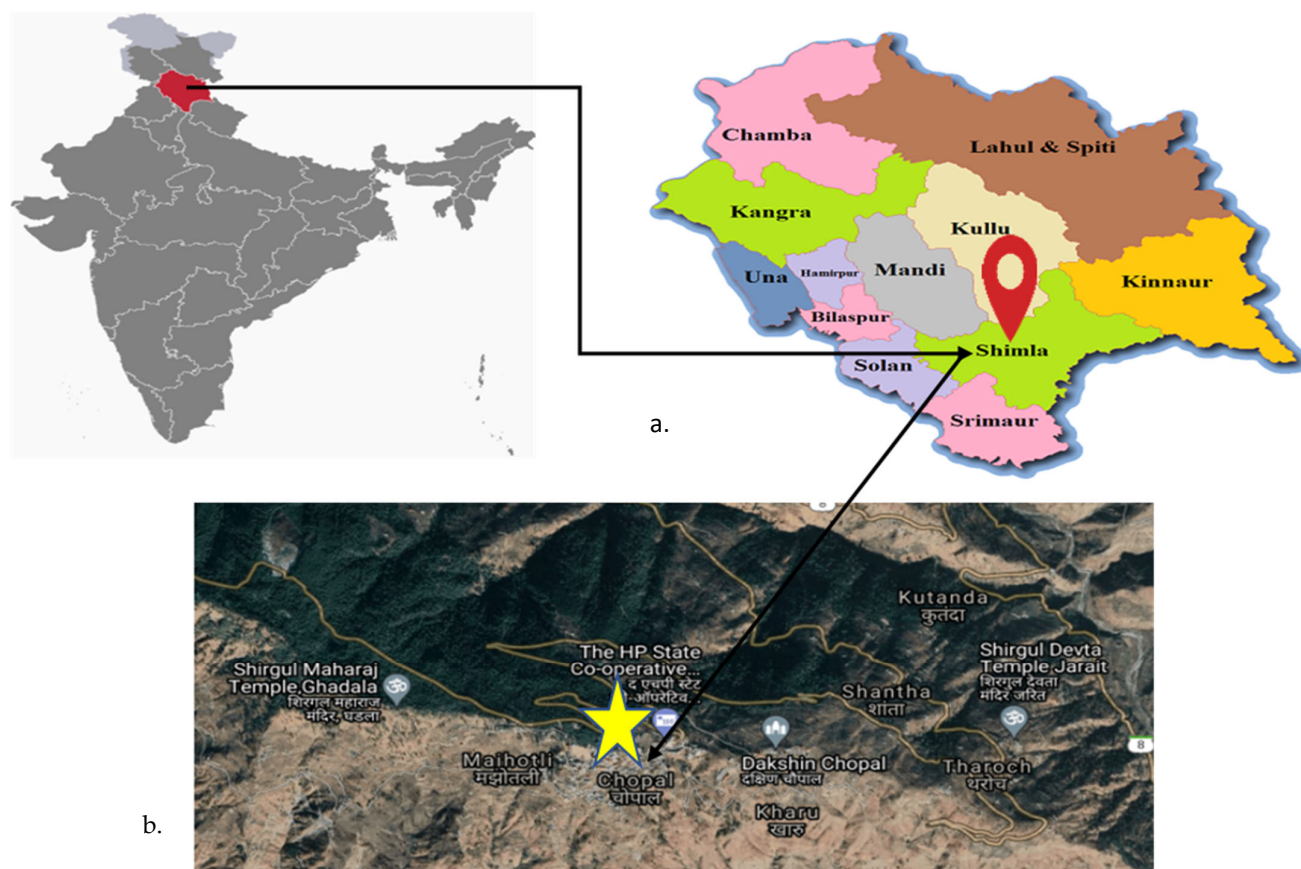
Shimla, the capital of Himachal Pradesh, is in the southwestern region of the Himalayas, lies at 31.61° N and 77.10° E and has a wide range of floristic diversity [11, 12, 13, 14, 15]. The area was represented by 1326 plant species belonging to 639 genera. Angiosperms, including 1003 species of dicotyledons, belonging to 498 genera and 313 species of monocotyledons, belonging to 133 genera. Whereas, the gymnosperms are characterized by only 10 species and 8 genera in the state [11, 13]. The contribution of dicotyledons and monocotyledons to the world flora is approximately 81.3 and 18.7 percent, respectively, with the Shimla district accounting for 23.3 percent of monocotyledon species [11, 13]. Approximately 500 species of medicinal plants have been reported from Himachal Pradesh [11, 13]. From the very beginning of human civilization, people have been developing their knowledge of plant use, management, and conservation [16, 17]. Indigenous people seem to have a hierarchical knowledge of these traditional medicinal plants for a variety of human diseases, and this knowledge has been passed on from one generation to the next [18, 19, 20, 21]. This study documents the accumulated knowledge regarding plants in the Maraog region that has traditionally been employed for the treatment of different human diseases.

No such study has been conducted previously in this area, thus it will assist in providing valuable information to the ethnomedicinal research field, and such information is expected to be useful in the discovery of drugs [22]. Such studies have been done in different parts of the world, including Pakistan, Nepal, Africa, America, Europe, Poland, Argentina, Australia, Iran, New Zealand, Turkey, Japan, Taiwan, Pakistan, China, Nepal, as well as different parts of South, North and East India. The declining rate of ethnomedicinal knowledge amongst younger generations was found to be a common problem in all the reported countries [23, 24, 25]. As the economic condition of people living in rural areas is improving day-by-day, people are becoming less dependent on traditional medicinal practices, thus knowledge in the use of medicinal plants is also diminishing [26]. Therefore, it is important to document ethnomedicinal knowledge of plants before it vanishes completely.

## 2. Materials and Methods

### 2.1. Study Site

The current survey was conducted in the rural areas of the Maraog region in the Shimla district, which is in the southwestern part of Himachal Pradesh [27, 28], as shown in Figure 1. This area lies in the subtropical to temperate zone and is blessed with floristic diversity [29]. The Maraog village of tehsil Chopal is a far-flung area of the district of Shimla and is located between 77°24'30" and 77°49'00" East Longitudes and 30°46'30" to 31°04'30" North latitudes, having regular temperature fluctuations between 33 °C and 5 °C. This area witnesses up to 1200 mm of rainfall and winter snow annually [28, 29].



**Figure 1.** (a) Geographical identification of the study area; (b) satellite map.

## 2.2. Sampling Informants

During the survey, a total of 88 informants (57 males and 31 females) were interviewed by the snowball method. The age and educational background of informants were also recorded during the interview. The informants were divided into 5 groups on the basis of their age (Table 1).

**Table 1.** Demography and literacy among informants.

Sr. No.	Age Groups	No. of Informants				
1.	22–30	10				
2.	30–40	27				
3.	40–50	16				
4.	50–60	20				
5.	60–70	15				
Literacy among informants:		Age Groups				
		22–30	30–40	40–50	50–60	60–70
1.	Never attended school	0	0	0	03	05
2.	Attended school up to primary level (1–5 class)	0	02	03	09	08
3.	Attended school up to middle level (6–8)	0	05	06	05	02
4.	Attended school up to metric level (9–10 class)	10	20	07	03	0

## 2.3. Ethnomedicinal Data Collection and Ethical Considerations

The aim of the present study was to explore and identify wild medicinal plants, and to document their ethnomedicinal use as practiced by the rural inhabitants of the study area. The survey was conducted in July 2020 to June 2021. The information was gathered from 88 people, ranging in age from 22 to 65 years old. We briefly informed the locals about the study and asked them for their valuable knowledge of wild medicinal plants. Direct interviews, pre-tested questionnaires, group discussions, and field observations were the major information gathering methods from the inhabitants. The questionnaire was divided into 3 sections: Demographic data, ethnomedicinal plant uses, and the informant's declaration (Table 2). They were asked to share common names of plant species, parts used, and their application for various ailments. The samples of plants were collected from the study site and identified by BSI, Dehradun, Uttarakhand, India, then mounted on standard herbarium sheets and submitted to the herbarium of Shoolini University, India [30].

**Table 2.** Questionnaire for Conducting the Ethnomedicinal Study

### (A) DEMOGRAPHIC DATA

Name of Tehsil..... Name of Village.....Rural.....

Sr. No.....Age..... Education.....

1.

2.

### (B) ETHNOMEDICINAL PLANT USES

1. Plant (Local / Vernacular name)

2. Plant identified as..... (Botanical name)

3. Habit of the plant (Trees/Shrubs/Herbs/Climbers/Grasses/Other)

4. Part(s) of plant used.....

5. Nature of ailment treated.....

6. Route of administration (a) Oral (b) Topical.

7. Response of the informant(s).

(a)Effective/Good..... (b) Fair..... (c) Poor.....

### (C) INFORMANTS DECLARATION

We, the above-mentioned, have voluntarily agreed to participate in this study with our full consent, and we declare that the information and knowledge given in the interview and discussion is correct and complete to the best of our knowledge.

Dated: .....

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#### 2.4. Data Analysis

Ethnomedicinal data were gathered from 88 randomly selected informants from the Maraog region in Tehsil Chopal. The ethnomedicinal collected data were analyzed using use value. The analysis of ethnomedicinal data, obtained from the informants, was done statistically by using the “use value”, which is a quantitative approach for demonstrating the relative importance of a particular species known to folks. It was calculated using the following formula:

$$UV = \sum U_i/n$$

where UV is the use value of a species  $U_i$ , the number of citations per species and  $n$  is the number of informants. The high number of use value indicates the importance of that plant species, while the lower number of use value indicates that plant species was relatively less used [31, 32].

### 3. Results

It was found that the inhabitants of the study area used different plant species for the treatment of a wide range of diseases. The most reported diseases from this study area, include coughs, colds, skin infections, stomach disorders, oral diseases, and diarrhea. Data about traditional medicinal uses of plants were collected from 88 informants, including 57 males and 31 females. The local communities residing in the study area were highly dependent on forest produce to fulfil their daily requirements of fuel, food, fodder, shelter, and medicines. After noting the demographic data and literacy rate of the inhabitants, it was found that aged people possessed an immense knowledge of ethnomedicinal plants compared to the younger generation.

The rural people of the study area used 110 plant species from 102 genera belonging to 57 families for ethnomedicinal purposes. In this study, it was found that Rosaceae, Asteraceae, and Lamiaceae were the most reported families. The Rosaceae and Asteraceae families had 12 plant species each, followed by the Lamiaceae family with 6 plant species. The Apiaceae, Pinaceae, Brassicaceae, and Solanaceae families each contributed 3 plant species, while the Fabaceae, Ranunculaceae and Polygonaceae families each contributed 4 plant species. The Amaranthaceae, Berberidaceae, Oxalidaceae, Poaceae, Primulaceae, Pteridaceae, Plantaginaceae, Scrophulariaceae and Utricaceae contributed 2 species (Figure 2).

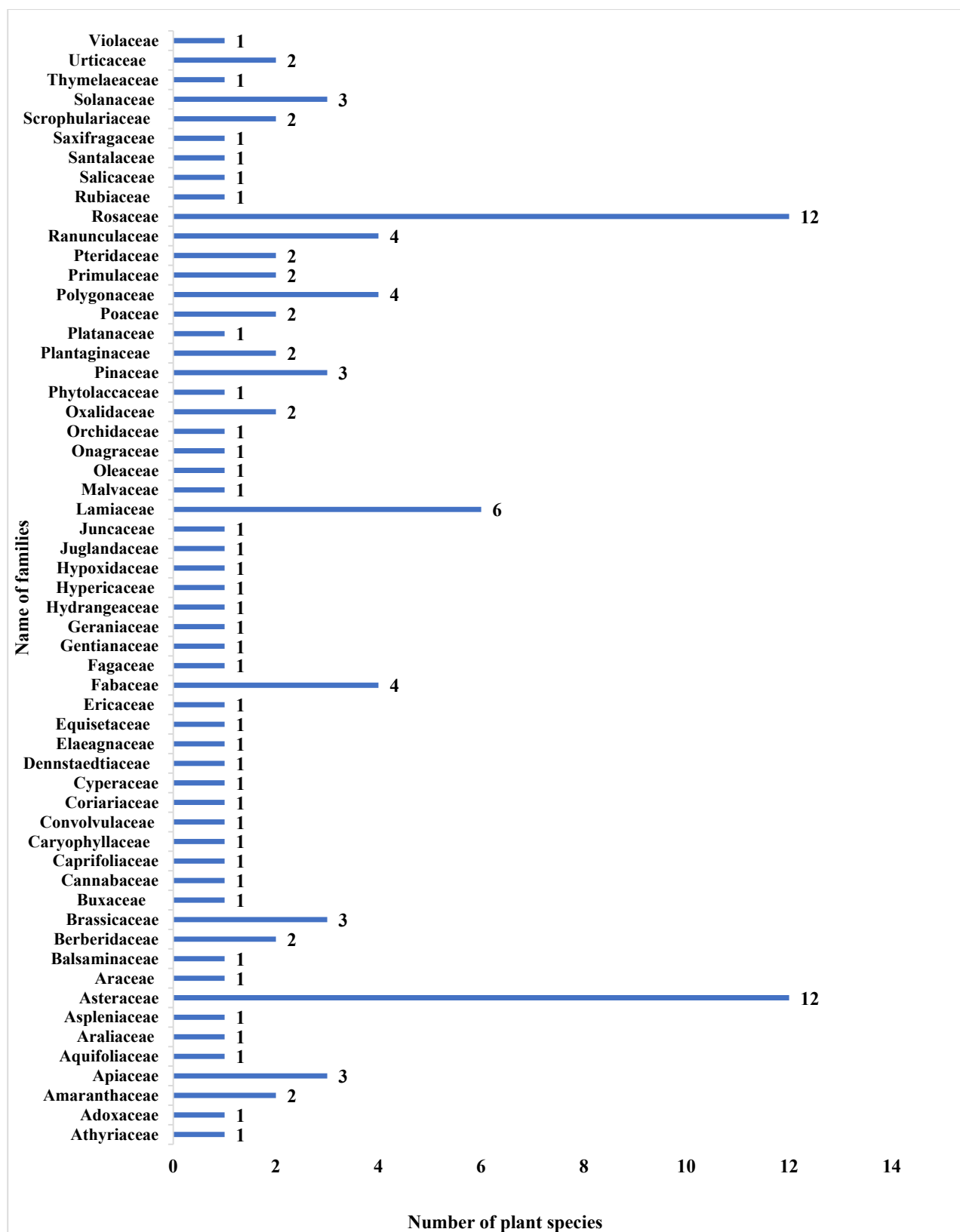
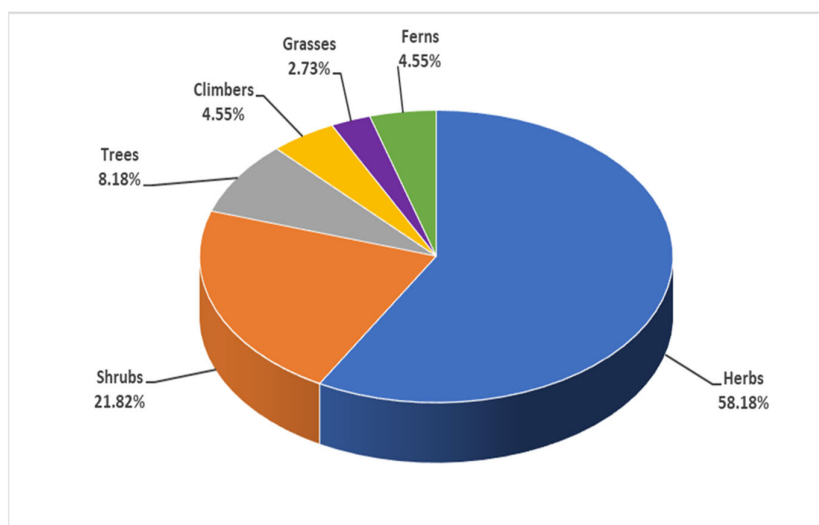


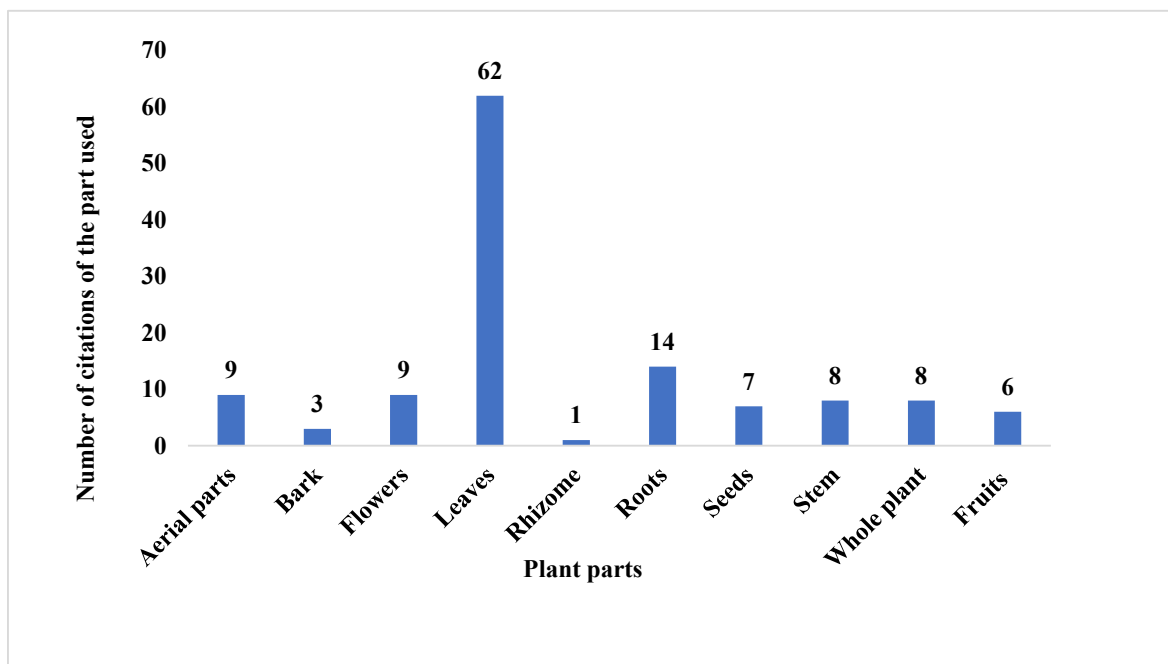
Figure 2. Representation of the number of species per family found in the study area.

The plants identified from the study area were herbs (64), shrubs (24), trees (9), climbers (5), grasses (3) and ferns (5) (Figure 3).



**Figure 3.** Percentage of growth forms of plant species at study site.

While documenting the data, it was found that, in the preparation of herbal medications, leaves were the most used plant part, followed by roots and flowers (Figure 4).



**Figure 4.** Representation of the number of citations of plant parts used.

Plant parts were used in the form of paste, juice, decoction, and infusion. Table 3 arranges the information about the collected plants in a systematic order with botanical names, family, common names, habits or growth forms, parts used as medicine, and mode of administration with description.

Table 3. Ethnomedicinal plants used in study area.

Sr. No.	Botanical Name	Family	Vernacular Names Name	Voucher No.	Habit	Parts Used	Ailment Treated	Mode	Medicinal Use and Number of Citations	Use Value
1	<i>Abies pindrow</i> (Royle ex D. Don) Royle	Pinaceae	Tonss	SUBMS/BOT-4184	Tree	Leaves	Cough	Oral	Juice of fresh leaves is used to cure cough (14).	0.15
2	<i>Adiantum venustum</i> D. Don	Pteridaceae	Dmni tilli, Jamna	SUBMS/BOT-4185	Fern	Leaves	Cough, Headache	Oral, Topical	Fresh leaves with hot water are used to cure cough. Paste of leaves is used to get relief from headache (9).	0.10
3	<i>Ajuga parviflora</i> Benth.	Lamiaceae	Neelkanthi	SUBMS/BOT-4186	Herb	Aerial parts	Wounds, Diabetes	Topical, Oral	Paste of fresh leaves is applied on wounds. Fresh leaves are chewed by diabetic person to cure diabetes (45).	0.51
4	<i>Amaranthus blitum</i> L.	Amaranthaceae	Sukhichalayi	SUBMS/BOT-4187	Herb	Whole plant	Tonic, Blood circulation	Oral	Juice of whole plant is used to improve circulation and also as tonic (8).	0.09
5	<i>Androsace sarmentosa</i> Wall.	Primulaceae	Phoolru	SUBMS/BOT-4188	Herb	Leaves, Flowers	Skin infections	Topical	A paste of whole plant is used to cure skin infections (9).	0.10
6	<i>Arisaema concinnum</i> Schott	Araceae	Jangish	SUBMS/BOT-4349	Herb	Whole plant	Snake bite	Oral	Decoction of whole plant is used in the treatment of snake bite (10).	0.11
7	<i>Artemisia vestita</i> Wall. Ex Besser	Asteraceae	Chamber	SUBMS/BOT-4189	Herb	Leaves	Wounds	Topical	Paste of fresh leaves is applied on cuts or wounds to stop bleeding. Extract of leaves is used to get relief from inflammation (88).	1.00
8	<i>Aruncus dioicus</i> (Walter) Fernald	Rosaceae	Pothee	SUBMS/BOT-4190	Herb	Roots	Internal bleeding, Diarrhea, Tonsillitis	Oral, Topical	Juice extract of roots is used to treat internal bleeding and diarrhea. Dry roots are used to cure tonsillitis in children (11).	0.12
9	<i>Asplenium dalhousiae</i> Hook.	Aspleniaceae	Nanwein	SUBMS/BOT-4191	Fern	Whole plant	Skin infections	Topical	Paste of fresh as well as dried plant is used to cure skin infections (8).	0.09
10	<i>Berberis lycium</i> Royle	Berberidaceae	Kashmal	SUBMS/BOT-4192	Shrub	Leaves, Roots, Stem, Bark	Wound, Fever, Jaundice, Dysentery, Piles	Oral, Topical	Paste of bark is used to cure wounds and dysentery and fever. Fresh leaves are used against jaundice. Decoction is used to treat piles (40).	0.45
11	<i>Berberis aristata</i> DC.	Berberidaceae	Chatra	SUBMS/BOT-4193	Shrub	Leaves	Skin infections, Wound healing,	Topical	Paste of dried roots is used to cure skin infection and wounds (36).	0.40
12	<i>Bergenia ciliata</i> (Haw.) Sternb	Saxifragaceae	Daclambu	SUBMS/BOT-4194	Herb	Roots	Common cold	Oral	The powder of dry roots with hot water is used to treat common cold (28).	0.31
13	<i>Bromus hordeaceus</i> L.	Poaceae	Jawi	SUBMS/BOT-4195	Grass	Leaves	Constipation	Oral	Leaves are used to cure constipation (7).	0.07
14	<i>Buddleja crispa</i> Benth.	Scrophulariaceae	Taakla	SUBMS/BOT-4196	Shrub	Leaves	Skin infections	Topical	Paste of fresh leaves is used against skin infections (13).	0.14
15	<i>Cannabis sativa</i> L.	Cannabaceae	Bhang	SUBMS/BOT-4197	Herb	Leaves, Seeds	Inflammation, Skin burns	Topical	Paste of fresh leaves is used to cure skin infections. Oil extracts of seeds is used to heal burns (70).	0.79
16	<i>Capsella bursa-pastoris</i> (L.) Medik.	Brassicaceae	Khandwa	SUBMS/BOT-4198	Herb	Aerial parts	Internal bleeding, Inflammation	Oral	Juice extracts from aerial part of plant with hot water is used in the treatment of internal bleeding. The plant is crushed and applied on inflammations (13).	0.14



17	<i>Cedrus deodara</i> (Roxb. ex D.Don) G. Don	Pinaceae	Devdar, Kelti	SUBMS/BOT-4199	Tree	Bark	Gastric ulcers	Oral	Powdered bark is used to cure gastric ulcers (16).	0.18
18	<i>Chenopodium album</i> L.	Amaranthaceae	Shnathu	SUBMS/BOT-4200	Herb	Leaves	Constipation	Oral	Fresh leaves are beneficial for people suffering from constipation (20).	0.22
19	<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	Bhenda	SUBMS/BOT-4201	Herb	Roots	Toothache	Oral	Dry roots are used as a remedy for toothache (13).	0.14
20	<i>Clematis buchananiana</i> DC.	Ranunculaceae	Silra	SUBMS/BOT-4202	Climber	Roots	Cough, Cold, Swelling,	Oral, Topical	Juice extracts of roots are used to get rid of cough and cold. A paste of dry roots is used to cure swellings in the body (11).	0.12
21	<i>Clematis vitalba</i> L.	Ranunculaceae	Garol	SUBMS/BOT-4203	Shrub	Leaves	Skin infections	Topical	Paste of fresh leaves is used to treat skin infections (12).	0.13
22	<i>Coriaria nepalensis</i> Wall.	Coriariaceae	Rachare, Gandhla	SUBMS/BOT-4204	Shrub	Roots	Toothache	Oral	Powdered roots are used as medication for toothache (9).	0.10
23	<i>Cotoneaster microphyllus</i> Wall. ex Lindl.	Rosaceae	Jampradua	SUBMS/BOT-4205	Shrub	Stem	Oral infections	Oral	The stem is used as toothbrush to get rid of many oral problems (8).	0.09
24	<i>Curculigo orchoides</i> Gaertn.	Hypoxidaceae	Lehsun-phool	SUBMS/BOT-4206	Herb	Leaves, Flowers	Joint pains	Topical	Paste of fresh leaves and flowers is used to get relief from joint pains (10).	0.11
25	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Joob	SUBMS/BOT-4207	Grass	Whole plant	Jaundice, Skin infections	Oral, Topical	Fresh plant is used to treat jaundice. Leaves are crushed and applied on skin infections (20).	0.22
26	<i>Cyperus cyperoides</i> (L.) Kuntze	Cyperaceae	Kadreen, koda ghass	SUBMS/BOT-4208	Grass	Leaves	Diarrhea	Oral	Fresh leaves are used to cure diarrhea (11).	0.12
27	<i>Daphne papyracea</i> Wall. ex G. Don	Thymelaeaceae	Baruvaa	SUBMS/BOT-4209	Shrub	Leaves	Skin infections	Topical	Leaves as paste is used against skin infections (6).	0.06
28	<i>Datura stramonium</i> L.	Solanaceae	Datura	SUBMS/BOT-4210	Herb	Leaves, Seeds	Headache, Hair fall	Topical	A paste of leaves is used to cure headache. Oil of seeds is used as a remedy for baldness (27).	0.30
29	<i>Delphinium denudatum</i> Wall. ex Hook.f. & Thomson	Ranunculaceae	Nirbishi	SUBMS/BOT-4350	Herb	Roots	Toothache	Oral	Paste of powdered root is effective in treatment of toothache (21).	0.23
30	<i>Desmodium elegans</i> DC.	Fabaceae	Murta	SUBMS/BOT-4237	Shrub	Leaves	Skin infections	Topical	Leaves are crushed and applied on skin infections (6).	0.06
31	<i>Deutzia scabra</i> Thunb.	Hydrangeaceae	Suniya	SUBMS/BOT-4211	Shrub	Leaves	Skin infections	Topical	A paste of leaves is used against skin infections (11).	0.12
32	<i>Diplazium esculentum</i> (Retz.) Sw	Athyriaceae	Lingar	SUBMS/BOT-4239	Fern	Aerial parts	Muscular pains	Oral	Decoction of aerial part is used to cure muscular pains in the body (27).	0.30
33	<i>Elaeagnus umbellata</i> Thunb.	Elaeagnaceae	Genhi	SUBMS/BOT-4212	Shrub	Seeds	Cough	Oral	Powdered seeds are used to cure cough (15).	0.17
34	<i>Epilobium hirsutum</i> L.	Onagraceae	Dandri	SUBMS/BOT-4213	Herb	Leaves, Flowers	Urinary infections, Menstrual disorders	Oral	Leaves are used as tea, which is beneficial in the treatment of urinary and menstrual problems (8).	0.09
35	<i>Equisetum arvense</i> L.	Equisetaceae	Ramban	SUBMS/BOT-4214	Herb	Aerial part	Cough, Joint pain	Oral, Topical	A paste of fresh aerial parts is used in the treatment of cough and joint pains (49).	0.55
36	<i>Erigeron alpinus</i> L.	Asteraceae	Chipru	SUBMS/BOT-4215	Herb	Leaves	Urinary infections	Oral	Leaves are used to treat urinary infections (9).	0.10
37	<i>Erigeron bonariensis</i> L.	Asteraceae	Kupru	SUBMS/BOT-4216	Herb	Leaves	Piles	Oral	Infusion of leaves is helpful in curing piles (9).	0.10

38	<i>Evolvulus nummularius</i> (L.) L.	Convolvulaceae	Ghareu	SUBMS/BOT-4217	Climber	Leaves	Skin infections	Topical	A paste of fresh leaves is used against skin infections (17).	0.19
39	<i>Fagopyrum acutatum</i> (Lehm.) Mansf. ex K. Hammer	Polygonaceae	Fafri	SUBMS/BOT-4218	Herb	Leaves, Stem	Chilblains, High blood pressure	Oral	Juice extracted from leaves and stem along with hot water is consumed to cure chilblains and high blood pressure (11).	0.12
40	<i>Foeniculum vulgare</i> Mill.	Apiaceae	Sounph	SUBMS/BOT-4219	Herb	Leaves, Seeds	Gastric problems	Oral	Infusion of leaves and seeds is a medication for gastric problems (21).	0.23
41	<i>Fragaria virginiana</i> Mill.	Rosaceae	Bhumal	SUBMS/BOT-4220	Herb	Fruits, Roots, Leaves	Sunburn, Indigestion	Topical, Oral	Juice of fruits is used to cure sunburn. Powdered roots and leaves are used to treat the digestion problems (15).	0.17
42	<i>Galinsoga quadriradiata</i> Ruiz & Pav.	Asteraceae	Sheliya	SUBMS/BOT-4221	Herb	Leaves	Wounds, Bleeding	Topical	Fresh leaves paste is used to stop bleeding and heal wounds (16).	0.18
43	<i>Gentiana argentea</i> (Royle ex D.Don) Royle ex D.Don	Gentianaceae	Bhuin neem	SUBMS/BOT-4222	Herb	Whole plant	Appetite, Mensuration	Oral	Whole plant paste is used to induce appetite and mensuration (20).	0.22
44	<i>Geranium nepalense</i> Sweet	Geraniaceae	Bhrago-ro-naush	SUBMS/BOT-4223	Herb	Leaves	Acne, Pimples	Topical	A paste of fresh leaves is helpful in curing acne and pimples (11).	0.12
45	<i>Girardinia diversifolia</i> (Link) Friis	Urticaceae	Lindu bhaber	SUBMS/BOT-4224	Shrub	Roots	Boils	Topical	A paste of roots is used as a medication for boils (43).	0.48
46	<i>Goodyera repens</i> (L.) R.Br.	Orchidaceae	Kaligatti	SUBMS/BOT-4225	Herb	Stem	Cold, Fever	Oral	A paste of stem is used to cure cold and fever (21).	0.23
47	<i>Hedera nepalensis</i> K.Koch	Araliaceae	Kanewari	SUBMS/BOT-4226	Climber	Leaves	Jaundice	Oral	Powered leaves are used as a remedy for jaundice (18).	0.20
48	<i>Helichrysum arenarium</i> (L.) Moench	Asteraceae	Dhareri	SUBMS/BOT-4227	Herb	Flowers	Skin infections	Topical	Fresh or powdered flowers are useful against skin infections (16).	0.18
49	<i>Heracleum maximum</i> W. Bartram	Apiaceae	Patla	SUBMS/BOT-4228	Herb	Roots	Respiratory disorders	Oral	Dry root is used for the treatment of respiratory ailments (11).	0.12
50	<i>Hypericum perforatum</i> L.	Hypericaceae	Dhai	SUBMS/BOT-4229	Shrub	Leaves	Skin infections	Topical	Leaves are used against skin infections (9).	0.10
51	<i>Ilex diphyrena</i> Wall.	Aquifoliaceae	Khareu	SUBMS/BOT-4230	Tree	Leaves	Cough	Oral	Powdered leaves are used for treating cough (13).	0.14
52	<i>Impatiens glandulifera</i> Royle	Balsaminaceae	Binchi, Rdheu	SUBMS/BOT-4231	Herb	Leaves	Warts	Topical	A paste of fresh leaves is a remedy for warts (17).	0.19
53	<i>Indigofera gerardiana</i> Baker	Fabaceae	Kathi	SUBMS/BOT-4232	Shrub	Leaves	Scorpion bites	Topical	Juice extracts of fresh leaves is used against scorpion bites (14).	0.15
54	<i>Jasminum humile</i> L.	Oleaceae	Chameli	SUBMS/BOT-4351	Shrub	Leaves	Toothache	Oral	Leaves are chewed to get relief from toothache (10).	0.11
55	<i>Juglans regia</i> L.	Juglandaceae	Akhrot, khodh	SUBMS/BOT-4233	Tree	Whole plant	Dental problems, Skin infections	Oral, Topical	Whole plant is useful against dental problems and skin infection (25).	0.28
56	<i>Juncus effusus</i> L.	Juncaceae	Kirala, Sulu	SUBMS/BOT-4234	Herb	Stem	Sore throat	Oral	Stem juice with hot water is used to cure sore throat (8).	0.09
57	<i>Lepidium campestre</i> (L.) R.Br.	Brassicaceae	Khoru	SUBMS/BOT-4236	Herb	Aerial parts	Constipation	Oral	A paste of aerial parts is effective in the treatment of constipation (9).	0.10
58	<i>Malva verticillata</i> L.	Malvaceae	Shochla	SUBMS/BOT-4238	Herb	Leaves	Urinary problems	Oral	Juice extracts of leaves is used to cure urinary problems (20).	0.22

59	<i>Mentha viridis</i> (L.) L.	Lamiaceae	Pahari pudina	SUBMS/BOT-4241	Herb	Leaves	Dysentery, Acidity	Oral	A paste of fresh leaves is effective in dysentery and acidity (60).	0.68
60	<i>Nicotiana tabacum</i> L.	Solanaceae	Tambakhoo	SUBMS/BOT-4240	Herb	Leaves	Boils	Topical	Fresh leaves are used as a remedy against boils (30).	0.34
61	<i>Origanum vulgare</i> L.	Lamiaceae	Sathra	SUBMS/BOT-4352	Herb	Leaves	Internal wounds	Oral	Leaves are used to treat internal wounds (23).	0.26
62	<i>Oxalis articulata</i> Savigny	Oxalidaceae	Shash	SUBMS/BOT-4242	Herb	Leaves	Snake bite, Burns	Topical	A paste of fresh leaves is used to treat snake bites and burns (16).	0.18
63	<i>Oxalis corniculata</i> L.	Oxalidaceae	Amrul, Shash	SUBMS/BOT-4243	Herb	Leaves	Snake poisoning, Burns	Topical	Paste of fresh leaves is used to treat snake bites and burns (16).	0.18
64	<i>Petridium aquilinum</i> (L.) Kuhn	Dennstaedtiaceae	Barna	SUBMS/BOT-4244	Fern	Rhizome	Body pains	Oral	Juice extracts of young rhizome along with hot water is given to person suffering from body pains (13).	0.14
65	<i>Phytolacca acinosa</i> Roxb.	Phytolaccaceae	Jalag	SUBMS/BOT-4353	Herb	Leaves	Constipation, Urinary infections	Oral	Well-cooked leaves are used as remedy for constipation and urinary disorders (36).	0.40
66	<i>Pinus wallichiana</i> A. B. Jacks.	Pinaceae	Kail	SUBMS/BOT-4354	Tree	Leaves	Cracks in feet	Topical	Fresh leaves are crushed and applied on cracked feet (29).	0.32
67	<i>Plantago major</i> L.	Plantaginaceae	Baartng	SUBMS/BOT-4355	Herb	Leaves, Seeds	Diarrhea, Dysentery, Fever	Oral	A paste of leaves is used in the treatment of diarrhea and dysentery. Powdered seeds are used in fever (10).	0.11
68	<i>Platanus orientalis</i> L.	Platanaceae	Kimti	SUBMS/BOT-4245	Shrub	Leaves	Chilblains, Wounds	Topical	A paste prepared from leaves is used to get relief from chilblains and heal wounds (13).	0.14
69	<i>Potentilla indica</i> var. <i>wallichii</i> (Franch. & Sav.) Th.Wolf	Rosaceae	Bhumbhal	SUBMS/BOT-4246	Herb	Leaves	Skin infections	Topical	A paste of leaves is helpful in curing skin infections (9).	0.10
70	<i>Potentilla tabernaemontani</i> Asch.	Rosaceae	Diyuda	SUBMS/BOT-4247	Herb	Aerial parts	Gastric problems	Oral	Decoction of aerial parts is used to get relief from gastric problems (7).	0.07
71	<i>Primula denticulata</i> Sm.	Primulaceae	Lattar-phul	SUBMS/BOT-4248	Herb	Leaves	Blood in urine	Oral	Powdered leaves are used to treat the problem of blood in urine (7).	0.07
72	<i>Primsepia utilis</i> Royle	Rosaceae	Bhekhal	SUBMS/BOT-4249	Shrub	Seeds	Muscular pain	Topical	Oil obtained from the seeds is used to treat muscular pain (25).	0.28
73	<i>Prunus cerasoides</i> Buch-Ham. ex D.Don	Rosaceae	Pajja	SUBMS/BOT-4356	Tree	Leaves	Burning sensations, Abortion	Oral	Leaves are used to calm down the burning sensations of the body. Infusion of young twigs is used to stop abortions (18).	0.20
74	<i>Pteris cretica</i> var. <i>laeta</i> (Wall. ex Ettingsh.) C. Chr. & Tardieu	Pteridaceae	Barne	SUBMS/BOT-4250	Fern	Leaves	Skin infections	Topical	A paste of leaves is effective against skin infections (6).	0.06
75	<i>Pyrus pashia</i> Buch-Ham. ex D.Don	Rosaceae	Kainth	SUBMS/BOT-4251	Tree	Fruits	Diarrhea	Oral	Ripened fruits are used to cure diarrhea (21).	0.23
76	<i>Quercus floribunda</i> Lindl. ex A.Camus	Fagaceae	Mohru	SUBMS/BOT-4252	Tree	Leaves	Diarrhea	Oral	Unmatured leaves are used in the treatment of diarrhea (9).	0.10
77	<i>Ranunculus repens</i> L.	Ranunculaceae	Panja	SUBMS/BOT-4357	Herb	Leaves	Acne, Pimples, Fever	Topical, Oral	A paste of fresh leaves is helpful in curing acne and pimples. Powdered leaves are used in mild fever (10).	0.11
78	<i>Rhododendron arboreum</i> Sm.	Ericaceae	Buransh	SUBMS/BOT-4253	Tree	Flowers	Stomachache	Oral	Paste of dry flowers is used against stomachache (70).	0.79

79	<i>Rosa brunonii</i> Lindl.	Rosaceae	Kuja	SUBMS/BOT-4254	Shrub	Fruits	Constipation	Oral	Ripened fruits are used to cure constipation (16).	0.18
80	<i>Rosa sericea</i> Wall. ex Lindl.	Rosaceae	Junglee gulab	SUBMS/BOT-4255	Shrub	Fruits, Leaves	Jaundice, Fever	Oral	Dry fruits are used in the treatment of jaundice and fever (8).	0.09
81	<i>Rubia cordifolia</i> L.	Rubiaceae	Kathiya	SUBMS/BOT-4256	Shrub	Roots	Menstrual disorders	Oral	Juice extracts of roots is used to cure menstrual disorders (9).	0.10
82	<i>Rubus ellipticus</i> Sm.	Rosaceae	Hinser	SUBMS/BOT-4257	Shrub	Fruits	Tonic, Blood circulation	Oral	Fruits are used as tonic and induce blood circulation in the body (17).	0.19
83	<i>Rubus niveus</i> Thunb.	Rosaceae	Kamrai	SUBMS/BOT-4258	Shrub	Roots	Menstrual bleeding, Tonsillitis	Oral, Topical	Juice extracts of roots is given to control excess bleeding during menstruation. Dry roots are used as remedy for curing tonsillitis (16).	0.18
84	<i>Rumex obtusifolius</i> L.	Polygonaceae	Kransh	SUBMS/BOT-4259	Herb	Leaves	Burns	Topical	Paste of fresh leaves is applied to heal the burns on skin (6).	0.06
85	<i>Rumex tuberosus</i> L.	Polygonaceae	Pachora	SUBMS/BOT-4260	Herb	Leaves	Constipation	Oral	Fresh leaves are used in the treatment of constipation (11).	0.12
86	<i>Rumex hastatus</i> D. Don	Polygonaceae	Bhanora	SUBMS/BOT-4261	Herb	Leaves	Constipation, Nettle sting	Oral, Topical	Fresh leaves are used in the treatment of constipation. A paste of fresh leaves is used against nettle sting (20).	0.22
87	<i>Salix triandra</i> L.	Salicaceae	Bhaill	SUBMS/BOT-4262	Shrub	Bark	Joint pain	Topical	Paste of bark is used to get relief from joint pain (11).	0.12
88	<i>Salvia lanata</i> Roxb	Lamiaceae	Kuku-ro-bath	SUBMS/BOT-4263	Herb	Leaves	Wound, Bleeding	Topical	A paste of fresh leaves is used to stop bleeding and heal wounds (8).	0.09
89	<i>Sarcococca saligna</i> Mull.Arg.	Buxaceae	Shangal	SUBMS/BOT-4264	Shrub	Leaves	Constipation	Oral	Leaves are effective against constipation (9).	0.10
90	<i>Scutellaria scandens</i> D.Don	Lamiaceae	Kadwi	SUBMS/BOT-4266	Herb	Leaves	Skin infections	Topical	A paste of fresh leaves is effective against skin infections (10).	0.11
91	<i>Selinum wallichianum</i> (DC.) Raizada & H.O. Saxena	Apiaceae	Chamber ghass	SUBMS/BOT-4267	Herb	Leaves	Skin infections	Topical	Leaves are crushed and applied on skin for repelling mosquitoes (20).	0.22
92	<i>Silene vulgaris</i> (Moench) Garcke	Caryophyllaceae	Baghori	SUBMS/BOT-4268	Herb	Roots	Stomachache, Skin infections	Oral, Topical	Powdered roots are used to get rid of stomachache. Leaves are crushed and applied on skin to cure rashes (15).	0.17
93	<i>Solanum nigrum</i> L.	Solanaceae	Banchuti, Genhi, Pindlu	SUBMS/BOT-4269	Herb	Fruits	Piles, Eye infections	Oral, Topical	Ripened fruits are used in the treatment of piles. The juice extracts of leaves are used to cure eye infections (27).	0.30
94	<i>Sonchus asper</i> (L.) Hill	Asteraceae	Dudhiya	SUBMS/BOT-4270	Herb	Aerial parts	Skin infections	Topical	Aerial parts are crushed and applied on skin infections (12).	0.13
95	<i>Sonchus brachyotus</i> DC.	Asteraceae	Sadhi	SUBMS/BOT-4271	Herb	Aerial parts	Skin infections	Topical	Aerial parts are used to cure the skin infections (11).	0.12
96	<i>Sonchus oleraceus</i> (L.) L.	Asteraceae	Pili dudhali	SUBMS/BOT-4272	Herb	Stem	Boils	Topical	Latex from stem is used to clean the puss from boils (9).	0.10
97	<i>Stemmacantha rhapontica</i> (L.) Dittrich	Asteraceae	Kusumphool	SUBMS/BOT-4273	Herb	Roots	Stress	Oral	Powdered roots are used to suppress the stress and increase energy levels of body (19).	0.21
98	<i>Tagetes minuta</i> L.	Asteraceae	Jangli gainda	SUBMS/BOT-4358	Herb	Flowers	Appetite	Oral	Infusion of flowers is used to increase appetite (10).	0.11
99	<i>Taraxacum officinale</i> (L.) Weber ex F.H.Wigg	Asteraceae	Kanphool, Dudhla	SUBMS/BOT-4359	Herb	Whole plant	Jaundice, Acne	Oral, Topical	A paste of the plant is used to cure jaundice. Latex obtained from the plant is used to cure acne (12).	0.13

100	<i>Thlaspi arvense</i> L.	Brassicaceae	Mahula	SUBMS/BOT-4274	Herb	Aerial parts	Tonic, Urinary infections	Oral	Infusion of plant is used in the treatment of urinary disorders and consumed as blood tonic (10).	0.11
101	<i>Thymus linearis</i> Benth.	Lamiaceae	Marcha	SUBMS/BOT-4275	Herb	Flowers, Leaves	Common cold, Fever	Oral	Tea of leaves and flowers is used to cure common cold and fever (29).	0.32
102	<i>Trifolium repens</i> L.	Fabaceae	Khatti shash	SUBMS/BOT-4276	Herb	Leaves	Joint pain	Oral	A paste of leaves is used to treat joint pains (11).	0.12
103	<i>Urtica dioica</i> L.	Urticaceae	Kunkshi, Kukua	SUBMS/BOT-4277	Herb	Leaves	Jaundice, Skin infections	Oral, Topical	Fresh leaves boiled with water is used as remedy for jaundice. A paste of dry leaves is used to cure skin infections (21)	0.23
104	<i>Valeriana jatamansi</i> Jones	Caprifoliaceae	Mushki	SUBMS/BOT-4278	Herb	Leaves, Stem	Stress	Oral	Infusion of leaves and stem is used to get relief from stress (17)	0.19
105	<i>Verbascum thapsus</i> L.	Scrophulariaceae	Richo-ro-tambakhu, Kukurdara	SUBMS/BOT-4279	Herb	Flowers	Burns	Topical	A paste of flowers is applied on burns on skin (16).	0.18
106	<i>Veronica persica</i> Poir.	Plantaginaceae	Raat ki kali	SUBMS/BOT-4280	Herb	Leaves	Sore throat, Wounds	Oral, Topical	Fresh leaves are helpful in curing sore throat. A paste of leaves is effective in curing wounds (10).	0.11
107	<i>Viburnum grandiflorum</i> Wall. ex DC.	Adoxaceae	Pekhi	SUBMS/BOT-4281	Shrub	Flowers	Menstruation	Topical	Tea of flower is useful in maintaining menstruation cycle in females (21).	0.23
108	<i>Vicia sativa</i> L.	Fabaceae	Akra, Matari	SUBMS/BOT-4282	Climber	Seeds	Stomach problems	Oral	Dry seeds are used in the treatment of stomach problems (6).	0.06
109	<i>Viola canescens</i> Wall.	Violaceae	Banaksha	SUBMS/BOT-4283	Herb	Whole plant	Common cold, Acne	Oral, Topical	Tea of aerial parts is used to cure common cold. A paste of aerial parts is used to treat acne (50).	0.56
110	<i>Viscum album</i> L.	Santalaceae	Banda	SUBMS/BOT-4360	Climber	Stem, Leaves	Chilblains	Oral	A decoction from the branches is used to treat chilblains (9).	0.10

According to the informants, the mode of administration can be oral or topical, and certain plants can be used both internally and externally. The use value was also reported as it measures the relative importance of a specific plant species. The highest use value was found in *Artemisia vestita* (1.00), *Cannabis sativa* (0.79), *Datura stramonium* (0.71), *Rhododendron arboreum* (0.79), *Mentha viridis* (0.68), *Viola canescens* (0.56), *Ajuga parviflora* (0.51) and *Phytolacca acinosa* (0.40). The most reported diseases or disorders from the study area, include skin infections, diabetes, diarrhea, fever, cold, and cough. The local informants reported that these 110 plant species were readily available throughout the study area. These plants were highly recommended by the informants for treating different human diseases. Some plant species, found in the study area, are well-known for their medicinal properties for instance, *Artemisia vestita*, *Ajuga parviflora*, *Bergenia ciliata*, *Cannabis sativa*, *Cynodon dactylon*, *Delphinium denudatum*, *Foeniculum vulgare*, *Taraxacum officinale* and *Urtica dioica* [20, 26, 31–39].

#### 4. Discussion

Plants remain necessary for people's well-being, as they provide a significant number of traditional and modern treatments or techniques used in healthcare. Today, the knowledge of wild plants can play an important role worldwide, not only because of their therapeutic properties, but also because they can represent a source of innovative products in many sectors, such as defense of plants from pest disease, bio-preservatives, nutraceuticals, functional foods, cosmetics, and agrochemical industries [36, 40]. The wild plants are used by the inhabitants of the state for the treatment of diseases related to human beings [38]. Traditional medicines are preferred over modern medicines or drugs for a variety of reasons. These include ease of access, therapeutic efficacy, and a low cost of health services [39, 41]. Medicinal plants are the primary source of traditional medicine for people living in backward or remote areas of developing countries [42]. Traditional healers have been found to play an essential part in rural people's primary health care system, as healthcare in these regions treat those with limited affordability and access to modern medication. Plants have always been important to indigenous communities as they provide food, shelter, and fodder. Plants contain a variety of pharmacologically active chemical compounds which are the reason for their medicinal potential [43, 44, 45, 46, 47].

The present study documented different types of diseases such as curing colds, coughs, diarrhea, jaundice, stomach disorders, diabetes, skin infections, eye infections, and fever. The goal of this study is to document and assess traditional ethnomedicinal plant knowledge, as well as to compare knowledge distribution and investigate where research efforts are concentrated, in order to get a sense of current research requirements and future research possibilities in the region. In present study folks remarkably informed that their preferences for ethnomedicinal plants are, *Artemisia vestita*, *Ajuga parviflora*, *Berberis lycium*, *Bergenia ciliate*, *Cannabis sativa*, *Chenopodium album*, *Delphinium denudatum*, *Equisetum arvense*, *Rumex hastatus*, *Rhododendron arboreum*, *Thymus linearis*, *Urtica dioica*, *Valeriana jatamansi* and *Viola canescens*. The plant species such as *Delphinium denudatum*, *Gentiana argentea*, *Goodyera repens* and *Valeriana jatamansi* are becoming rare and very difficult to find from study area. Some ethnomedicinal plants used by local people were reported earlier by many scholars from different parts of the state named as *Bergenia ciliata*, *Berberis lycium*, *Juglans regia*, *Prunus cerasoides*, *Rhododendron arboreum*, *Rumex hastatus*, *Urtica dioica* and *Valeriana jatamansi* [12, 26, 39].

Along with the medicinal uses of plant species, we have statistically proved the importance of these plants. For this, we used a quantitative method called "Use Value" that determines the relative importance of plant species [31, 32]. The most commonly used and important species had a high use value, and plants of less importance remarkably had a lower use value. It was noticed that few plant species had greater use value, for example,

*A. vestita* (UV = 1.00), *C. sativa* (UV = 0.79), *D. stramonium* (UV = 0.71), *R. arboreum* (UV = 0.79), *M. viridis* (UV = 0.68), *Rhododendron arboreum* (UV = 0.79), *V. canescens* (UV = 0.56), *A. parviflora* (UV = 0.51) and *P. acinosa* (UV = 0.40), whereas some were reported to be less important as they have lesser use value.

The bioactive substances such as flavonoids, lignin, coumarins, alkaloids, sterols, glycosides, and terpenoids, present in these ethnomedicinal plant species, might contribute to their therapeutic activities [21, 26, 35, 38, 48]. For example, alkaloids, glycosides, rumicin, nepalin, nepodin, and rumicin in *R. hastatus*, flavonoids, phenolic acids, protocatechuic acid, fatty acids, and carbohydrates in *S. nigrum* [49]. Taraxacin, taraxacrine, cerylalcohol, lactuce-roltaraxacin, choline, inulin, tannin, etereal oil, vitamin C, xanthophylls, potassium and vitamin A in *T. officinale* [50]. Alkaloids, amino acids, carbohydrates, protein polymer, carotenoids, and saponins in *U. dioica* [35], Curculigenin in *C. orchoides* [51]. All of these compounds are responsible for their bioactivity, such as antibacterial, antidiabetic, wound healing, hepatoprotective, and anti-inflammatory properties [21, 35, 43, 48, 52, 53, 54, 55, 56]. The essential oil extracted from the aerial part of *A. vestita* is very well-known for its anti-inflammatory properties [57]. The cannabinoids in *C. sativa* have anti-inflammatory properties [58], and the compounds extracted from the parts of *C. bursa-pastoris* confirm its anti-inflammatory properties [54]. The phytochemical study of *C. dactylon* revealed details of its constituents like flavonoids, glycosides, alkaloids, tannins, flavonoids etc. are responsible for its dermatological action [59]. Similarly, the anti-diabetic activities of *A. parviflora* have been confirmed by various researchers [60]. Several studies have revealed that today's youth are uninterested in the traditional medical system [61]. They have little or no knowledge of plants, not even about the species of plants found in their surroundings. Only a few old people are left to pass on their knowledge to the next generation, but it has not been very effective [19, 33, 34, 35, 36, 37]. The knowledge of medicinal plants of the Himalayan region has been reduced due to the absence of proper documentation and knowledge in the present-day generation [42, 19, 61, 62, 63, 64]. Therefore, it is important to preserve ethnomedicinal knowledge by documenting literature and by proper interaction with the younger generation.

## 5. Conclusions

The traditional knowledge about the use of medicinal plants passes from one generation to the next without being properly documented. Due to modernization, the traditional knowledge of the medicinal properties of plants is declining. The current study was conducted in the Maraog region to document medicinally important wild plant species used by local communities. Herbs and shrubs were the most reported ethnomedicinal categories of plants by the native informants. The study on wild medicinal plants has never been reported before from the Maraog region of the district of Shimla. A total of 110 wild plants were collected from the study site, and reportedly used for various human ailments and administered either externally or internally. Modernization could be a reason for this.

The plants from the study site need to be evaluated through phytochemical and pharmacological studies to discover their potential against diseases and discovery of new drugs. Therefore, it is necessary to document wild ethnomedicinal plants used to cure diseases. Documentation of traditional knowledge also helps in the conservation of medicinally important plant species and natural resources. This study provides helpful insight into indigenous knowledge of wild medicinal plants for healthcare practitioners, students, researchers, and scientists in developing new medicines.

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