

Ethnobotanical Importance of Plants (Asteraceae) in the Ramban District of Jammu and Kashmir, India

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ABSTRACT

The present paper is based on the documentation of the ethnobotanical plants belonging to the family Asteraceae used by the people of the Ramban district. As it is the largest family among the flowering plants, several of its species play an important role and are used by the Gujar-Bakrwal, Schedule tribe, Seasonal Migratory people, and local healers. Due to lack of road connectivity and unavailability of modern medical facilities in the hilly terrains of the area of the district people are entirely dependent on herbal medicine. *Anaphalis nepalensis*, *Anaphalis nubigena*, etc. for Laceration, *Carpesium abrotanoides* for (Physical pains), *Silybum marianum*, Inflammation and *Sonchus asper* for Gastrointestinal are recorded 100% fidelity level. The highest use-value is of *Achillea millefolium* & *Taraxacum officinale* (UV=0.51) is highest and *Inula royleana* (UV=0.2) are the lowest, it denotes the high and low use report for a particular plant. The initial step toward the discovery of a drug is to assess or document the traditionally used plant material to treat an ailment. Documentation of ethnomedicinal plants leads to conserving traditional knowledge and facilitates future research on plants to validate the efficacy of traditional use.

Keywords: Ethnomedicine, Asteraceae, Herbalist, Questionnaire, Use value, Informant Consensus Factor, Fidelity level, Ramban district.

1. INTRODUCTION

Life and diseases go together, where there is life, diseases are bound to exist (Rajoriya et al., 2016). Ethnobotany is the study of the direct relationship between man and plants (Bhushan & Kumar, 2013). From ancient times onwards ethnobotanical plants have proven their values as a source of various products, chemicals, and therapeutic potential and nowadays still represent an important pool for the identification of novel drug leads (Atanasov et al., 2015). Besides the ethnobotanical uses, due to the lack of road connectivity and modern medicinal facilities, the inhabitants of the area have been dependent on various natural resources like food, fodder, fuel, fiber, timber, etc. Most of besides ethnomedicinal uses of the plants, people directly or indirectly are dependent on plants for food fodder, timber, etc. for their livelihood. The use of floral resources has been inherited from their forefathers. The inhabitants feel very insecure about sharing traditional knowledge as per their perceptions the traditional should not be in public except for their young ones. Traditional folk medicine uses information, expertise, and observation based on assumptions, convictions, and practices and also holds the legacy of community acceptance and is

exclusively based on the skill gained by local herbalists over some time (Ved & Goraya, 2007). The Indian Union territory of Jammu and Kashmir is endowed with a rich plant biodiversity of immense scientific curiosity and huge economic potential (Singh et al., 1998; Dar et al., 2002). The Kashmir Himalaya is well-known for its scenic beauty throughout the world and it has been aptly referred to as a 'Terrestrial Paradise' on the Earth (Vigne 1842). The Ramban district is situated on the bank of river Chanderbhaga, in Jammu and Kashmir in Northern India, at an altitude range from 688–3332 m which is still unexplored and undeveloped among the other districts of the Union territory of Jammu and Kashmir. The people of the district mostly the inhabitants of hilly villages are still engaged in various traditional occupations such as agriculture, poultry keeping, cattle keeping, and weaving of local woolen blankets. Only one research paper has been published from Neel Valley in Ramban district (Hassan et al. 2018). The Compositae are not only a large family abundant everywhere but, as may be expected, a diverse one. They are distributed over most of the earth and in almost all habitats (Rahman, 2008). A total of 39 plant species in the study area have ethnomedicinal importance and area arranged alphabetically (Table 5) with botanical name, plant parts used, voucher number and ailments cured.

2. Material and Methods

2.1. Study area

The present study was carried out in the Ramban district situated on the foothills of Siwaliks on the banks of river Chanderbhaga, in Jammu and Kashmir in Northern India, at an altitude range from 688–3332 m. and coordinates North latitude 33°14'17.2752" and East Longitude 75°14'23. Ramban district is an important corridor, which connects the Jammu Division with the Kashmir Division via National Highway-NH44 and is an unexplored, undeveloped, and remote district of the Union Territory. The total area of the district is 1329 sq. km including 666.24 sq. km area of forest cover. (<https://diragriju.nic.in/District>). Ramban district lies in the Eastern part of the Jammu division surrounded on the North by the Kulgam district, North- East by the Anantnag district of Kashmir division, East by the Doda district, west by the Reasi district, and South West by Udhampur district of Jammu division. The Ramban have their own distinct culture and enjoy unique traditional living styles. The Dogri language is usually spoken in and around the district headquarters Maitra. However, the hilly ranges of the district have their unique dialects called Sarazii bhasha. It is part of the Pir Panjal range of the North-Western Himalayas. People of the District enjoy the different seasons in the year. Spring season: March-May; Monsoon season: July – September; Winters: November – January. The district receives snowfall during winter months and is covered with snow sheets till March. The inhabitants' dwell in remote villages, some of the informants are shepherds and mostly stay in the alpine temperate from March – October. Most of them are farmers. Due to the lack of modern health facilities in remote areas most of the health-related ailments are cured traditionally by local herbal medicine. Most of the villages are 50-100 km away from the city and people have to travel by walk to get medical facilities. To save money and time people prefer to cure various ailments from their own made herbal medicine.

2.2. Ethnobotanical plants survey and data collection

The ethnomedicinal data on the plants used for the duration of various ailments were collected in (2019 – 2023) by conducting door-to-door, group discussions and by applying semi-structured questionnaires from the 77 informants (47 Males and 30 females) of the study area. A total of 39 plant species of Asteraceae were found to have ethnobotanical importance. The informants were between the ages of 25-102 years. Seasonally different field survey was carried out to get maximum information from traditional healers

related to the various ailments. Although the questionnaires were prepared in English language the informants were communicated in their local Sarazi language for easier understanding and conversation. The list of the plants was prepared with their local name, plant part used, herbal drug preparation method, ailments cured, and mode of administration. For the authenticity of the use of plants for various ailments, different informants were interviewed to crosscheck the authenticity.

The live plant species having ethnobotanical importance were collected and the herbarium specimens were prepared following the standard methods (Vogel, 1987), Bridson & Forman, 1998). The collected plant specimens were identified by using authentic literature, (Polunin & Stainton, 1984; Naithani, 1984; Pusalkar & Singh, 2012; Rana et al., 2003; Singh & Kachroo, 1987; Sharma & Kachroo, 1981; Swami & Gupta, 1998; Kapur & Sarin, 1990; Ishwari et al., 2017; Naithani, 2019; Collett, 1921). The plant names are also checked in “The World Checklist of Vascular Plants” (<https://www.worldchecklistworldchecklistofvascularplants.in>) as well as the” The plant list” (<https://www.theplantlist.org>.) For the confirmation of the identity of the plant samples, the specimens available at herbaria (LWG, DD, BSD) and virtual herbarium RRLH) were examined. The Acronyms of Herbaria were provided according to the Index Herbariorum (Thiers, 2020). The voucher specimens were deposited in the herbarium of CSIR-National Botanical Research Institute (LWG) for future reference. The list of ethnomedicinal plants is given in the table 5. The recorded data are analyzed quantitatively by using indices like use value (UV), Factor consensus Informant (FIC), Fidelity level (F1%), and demographic details of the informants were also recorded.

2.3.Data analysis

The information regarding ethnobotanical plants of the family Asteraceae was collected by using, personal interviews, group discussions as well as well- structured questionnaire methods. The data were quantified by using different quantitative indices viz. use value (UV), Factor consensus Informant (FIC), and Fidelity level (F1%).

The first indices were calculated are use value (Phillips et al., 1994; Bhatia et al., 2014; Rao, et al., 2015). The UV aids in obtaining the relative importance of a plant species for a particular ailment in the locality. The use value is calculated by using the formula:

$$UV = \sum u/n$$

Whereas u is the total number of use reports cited by each informant for a given species, and n is the total number of informants in the study area.

Use value is to know the importance and knowledge about the ethnobotanical uses of plant species.

The second method employed in the data analysis was the Informant Consensus Factor (ICF) was used (Heinrich et al., 1998; Bhatia, et al., 2014; Singh, et al., 2017). The Informant Consensus Factor is calculated by the formula:

$$(ICF) = (Nur - Nt) / (Nur - 1)$$

Nur = Number of uses reported in each category Whereas the Nt is the total number of taxa used in that particular category. The ICF values range from 0 to 1. A high value of ICF (near 1.0) it indicates that few taxa are used by the informants and close to 0 indicates random use of plants by the participants in treating ailments (Sharma, et al., 2012).

The third method employed in data analysis is fidelity percentage (F1 %) in which many species may be used in the same category and it is interesting to determine the most preferred species used in the treatment of a particular ailment in that locality which can be done with the FL % (Friedman et al., 1986). It is calculated by the formula:

$$F1 (\%) = N_p / N \times 100$$

Whereas N_p is the number of use reports cited for a given species for a particular ailment and N is the total number of use reports cited for any given species for all the ailments

In the ethnobotanical studies, many species of Asteraceae in the study area are used to cure the same category and it defines the most species used in the treatment of a particular ailment (Musa et al., 2011).

3. RESULT AND DISCUSSIONS

3.1. Demographic features of Informants

A total of 39 species belonging to the family Asteraceae were collected and 77 people were interviewed (47 Males and 30 females). The data was collected by personal interviews, group discussions, and semi-constructive questionnaire methods. All the informants are categorized into seven age groups i.e., 21-30; 31- 40; 41-50; 51 – 60; 61-70; 71- 80; and 81 – 102 years. The informants were divided into eight age groups. The informants interviewed were between the age of 21 and 102 years. The maximum number of informants (35.06%) were of the age group between 51 to 60 years and followed by (20.77%) were of the age group between 51-60 years. The male informants were 65.27 % and females 38.96%. The young youth were interested in interviewing and group discussions. The old age people were the treasure of traditional knowledge. (Table 1.)

Table 1. Demographic features of Informants

Informants	Female 30 (38.96%)	Male 47(65.27%)	Total informants
Age groups	Female	Male	Percentage of Informants
21 – 30	3(33%)	6(12.76%)	9(11.68%)
31 – 40	3(33%)	7(14.89%)	10(13.8%)
41 – 50	11(36%)	16(34.04%)	27(35.06%)
51 – 60	9(30%)	7(14.89%)	16(20.77%)
61 – 70	2(6.66%)	4(8.51%)	6(7.79%)
71 – 80	1(3.33%)	4(8.51%)	5(6.49%)
81 – 102	1(3.33%)	3(6.38%)	4(5.19%)
	30	47	77

3.2. The education level of the informants

The educational information was collected through interviews and in group discussions. Informants were categorized into seven different categories viz. Illiterate, attended school for 1-5th Standard, attended school for 6-10th Standard, attended school for intermediate, Attended Graduate College, and Postgraduate and Research Scholars. The maximum number of informants of educational qualification is 6 -10th standard i.e., 28.57% followed by Attended school for 1-5th Standard (24.67 %). Most informants are associated with traditional agriculture. Illiterate and attended school for 1-5th Standard were mostly Shepard, cattle, and poultry-keeping people.

Table 2. Educational profile of the informants

Qualification of Informants	Female	Male	Total
Illiterate	9(22.5 %)	4(10.81%)	13(16.88%)
Attended school for 1-5th Standard	12(30 %)	7(18.91%)	19(24.67%)

Attended school for 6-10th Standard	9(22.5 %)	13(35.13%)	22(28.57%)
Attended school for intermediate	5(12.5%)	6(16.21%)	11(14.28%)
Attended for Graduate College	4(10 %)	5(13.51%)	9(11.68%)
Postgraduate	1(2.5 %)	1(2.70%)	2(2.59%)
Research Scholar	0(0%)	1(2.70%)	1(1.29%)
Total	40	37	77

3.3. Floristic characteristics of the medicinal plants

A total of 39 species belonging to 27 genera of the family Asteraceae were collected from the study area having ethnobotanical importance to cure fourteen (14) different ailments categories (Table 5). The plant species were collected either in flowering or fruiting stages. All seasons of the year were targeted to collect the data. The dominating genera were *Anaphalis* (7) species followed by *Artemisia* & *Sonchus* (3), *Bidens* & *Tagetes* (2) were recorded and the rest of the genera having single species used by the informants (Table 3.) The live plant species having ethnobotanical importance were collected and the herbarium specimens were prepared following the standard methods (Vogel, 1987). The voucher specimens were deposited in the herbarium of CSIR-National Botanical Research Institute (LWG) for future reference. The different plant parts of a plant are used for the preparation of herbal medicines viz. whole plant (38%) followed by leaves (23%), root (13%), leaves and root (8%), leaves & flowers (8%), leaves & stem (3%), fruit & leaves (3%), fruit & root (2%) and fruits (2%) (Fig. 1).

3.4. Use-value (UV)

In the recorded data the important species collected from the study range from (UV=0.09 to 0.51). The important use value of species is *Achillea millefolium* & *Taraxacum officinale* (UV=0.51), *Sigesbeckia orientalis* (UV=0.42), *Ageratum conyzoides* (UV= 0.41), *Sonchus oleraceus* (UV=0.35), *Artemisia absinthium* (UV=0.32), *Cirsium wallichii* (UV=0.27), *Anthemis cotula* (UV= 0.23), *Pseudognaphalium luteoalbum* (UV=0.28), *Lactuca dolichophylla* & *Solidago virgaurea* (UV=0.25), *Inula royleana* (UV=0.2) and *Echinops cornigerus* (UV=0.09). The highest and lowest use value denotes the high and low use report for a particular plant (Table 5).

3.5. Informant Consensus Factor (ICF)

The maximum and minimum consensus factor among the informants was (ICF=0.92) for Poisoning (Snakebite) followed by Rheumatism (0.86), Physical pains (ICF=0.87), Gastrointestinal & Malaria (ICF=0.85), Respiratory (ICF=0.84), and Laceration & Liver complaints (ICF=0.83), Urological (ICF=0.81), Dermatological ailments (ICF=0.78), Inflammation (ICF=0.77) and Others (ICF= 0.9) (Table 3).

3.6. Fidelity level (Fl %)

Fidelity level values in this study varied from 5 – 100 %. A total of nine (9) plant species were recorded for 100% fidelity viz. *Anaphalis nepalensis*, *Anaphalis nubigena*, *Anaphalis royleana*, *Anaphalis triplinervis*, *Bidens biternate*, *Galinsoga parviflora* for Laceration (foot and toes, Bleeding, Cuts and wound healing), *Carpesium abrotanoides* for (Physical pains), *Silybum marianum*, Inflammation (Skin & Joint Inflammation) and *Sonchus asper* for Gastrointestinal are recorded 100% fidelity level.

The dermatological ailments (Abscesses, Allergy, Burns, Boils, dandruff, Skin rashes, and infection) are mainly treated by *Saussurea piptathera* (Fl=64.28%), *Anaphalis contorta* (Fl=62.5%), *Ageratum conyzoides* (28.12%), *Anaphalis griffithii* (50%), *Cirsium wallichii* (Fl = 42.85%), *Pseudognaphalium luteoalbum* (Fl=40.9%), *Xanthium strumarium* & *Helianthus × laetiflorus* (Fl=33.33%), *Anaphalis*

margaritacea (30%), *Arctium lappa* (27.27%), *Anthemis cotula* (16%), *Artemisia vulgaris* (15.8%), *Inula royleana* (12.5%), *Sigesbeckia orientalis* (FI=9.09%) and *Tussilago farfara* (FI=33.33%). Fever mainly treated by *Tagetes minuta* (FI=33.33%), *Artemisia vulgaris* (FI=15.38%), *Sonchus oleraceus* (FI=14.81%) *Anthemis cotula* (FI=5.5%). The gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain) are mainly treated by *Tagetes erecta* (78%), *Bidens bipinnata* (FI=70%), *Solidago virgaurea* (FI=45%), *Taraxacum officinale* (FI=35.5%), *Xanthium strumarium* (FI=33.3%), *Achillea millefolium* (FI=30%), *Ainsliaea aptera* (FI=25%), *Cichorium intybus* (FI=17.64%), *Ageratum conyzoides* (FI=15.62%), *Sonchus arvensis* (FI=12.5%), *Lactuca dolichophylla* (FI= 10%) for gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain). Inflammation (Skin & Joint Inflammation) treated by *Silybum marianum* (FI=100%), *Helianthus × laetiflorus* (FI=66.66%), *Inula royleana* & *Lactuca dolichophylla* (FI=25%), *Achillea millefolium* (FI=7.5%), *Taraxacum officinale* (FI=5%). Kidney stones treated by *Echinops cornigerus* (FI=28.57%), *Taraxacum officinale* (FI=7.5%), and Liver complaints (Jaundice) treated by *Artemisia absinthium* (FI=16%). Laceration (foot and toes, Bleeding, Cuts and wound healing) treated by *Anaphalis nepalensis*, *Anaphalis nubigena*, *Anaphalis royleana*, *Anaphalis triplinervis*, *Bidens biternate*, *Galinsoga parviflora* (FI=100%), *Tussilago farfara* (FI=66.66%), *Tagetes minuta* (FI=33.33%), *Ageratum conyzoides* (FI=31.25%), *Ainsliaea aptera*, *Anaphalis griffithii*, *Artemisia nilagirica* (FI=50%), *Anaphalis contorta* (FI=37.5%), *Hippolytia longifolia* (FI=28%), *Inula royleana* (FI=18.75%), *Lactuca dolichophylla* (FI=65%), *Saussurea piptather* (FI=35.71%), *Sonchus arvensis* (FI=27.27%), *Sigesbeckia orientalis* (FI=12.12%) and *Sonchus oleraceus* (FI=11.11%). Malaria (Mosquito repellent) by *Hippolytia longifolia* (FI=71.42%) and *Bidens bipinnata* (FI=30%). Physical pains (toothache, headache, joint pains, body pains, Ear ache are treated by *Achillea millefolium* (FI=25%). Poisoning (Snakebite) was treated by *Sigesbeckia orientalis* (FI=33.33%) and *Achillea millefolium* (FI=7.5%). Respiratory (Whooping cough, Cold & Cough, Asthma) treated by *Inula royleana* (FI=43.75%), *Solidago virgaurea* (FI=40%), *Anthemis cotula* (FI=38.88%), *Achillea millefolium* (FI=20%), *Artemisia nilagirica* (FI=18.75%) and *Artemisia vulgaris* (FI=7.69%). Rheumatism (Arthritis, Bone fracture, Gout) treated by *Arctium lappa* (FI=72.2%), *Taraxacum officinale* (FI=27.5%), *Sonchus oleraceus* (25.92%), *Ageratum conyzoides* (FI=25%), *Cichorium intybus* (FI=17.64%), *Pseudognaphalium luteoalbum* (FI=31.81%), *Sigesbeckia orientalis* (FI=15.15%). Urological (Diuretic, Urinary Infection) treated by *Echinops cornigerus* (FI=71.42%), *Ainsliaea aptera* (FI=50%) and *Achillea millefolium* (FI=10%). Others (Anemia, Anesthesia, Diabetes, Epilepsy, Ophthalmological (Eye disorder), Parasite (external parasites lives) & Typhoid treated by *Cichorium intybus* (FI=64.07%), *Artemisia absinthium* (FI=48%), *Sonchus oleraceus* (FI=37.03%), *Artemisia nilagirica* (FI=31.25%), *Taraxacum officinale* (FI=27.5%) and *Artemisia vulgaris* (FI=23.07%) (Table 4).

4. CONCLUSION

The present study was carried out from 2019 -2023 on the assessment of ethnobotanical plants of Asteraceae growing throughout the Ramban district in Jammu and Kashmir India. A total of 39 species of 27 genera belonging to the family were found to be used by the inhabitants to cure 14 (14) different ailments categories. The study aimed to document the traditional uses of plants of Asteraceae for future generations and also to provide the list of plants that save this indigenous knowledge and protect these medicinally important species, for the next generation. Traditional knowledge is often passed orally from one generation to the next coming generations.

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Fig. 1. Percentage (%) of plant parts of Asteraceae used as ethnomedicine in Ramban District

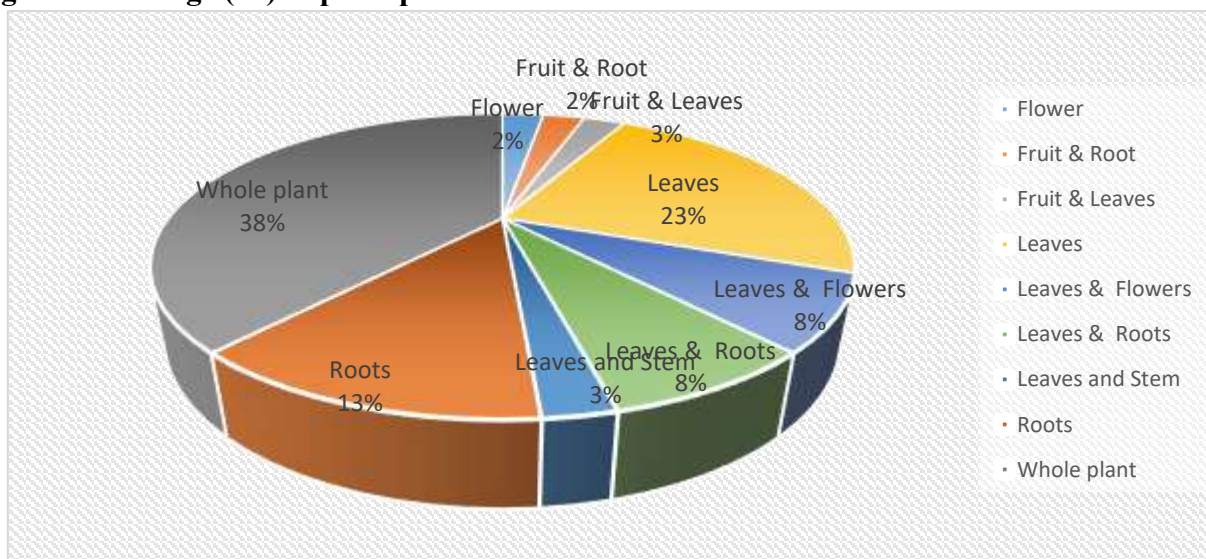


Table 3. Ailment category (diseases) and their Informant Consensus Factor (ICF)

Ailment category (diseases)	Nt	Nur	IFC= (Nur-Nt) / (Nur-1)
Dermatological ailments (abscesses, allergies, Burns, Boils, dandruff, Skin rashes, and infection.	15	67	0.78
Fever (Fever)	4	15	0.78
Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	20	128	0.85
Inflammation (Skin & Joint Inflammation)	6	23	0.77
Kidney stone	2	5	0.75
Liver complaints (Jaundice)	2	7	0.83
Laceration (foot and toes, Bleeding, Cuts, and wound healing)	20	114	0.83
Malaria (Mosquito repellent)	2	8	0.85
Physical pains (toothache, headache, joint pains, body pains, Ear aches,	4	25	0.87
Poisoning (Snakebite)	2	14	0.92
Respiratory (Whooping cough, Cold & Cough, Asthma)	6	34	0.84
Rheumatism (Arthritis, Bone fracture, Gout)	8	54	0.86
Urological (Diuretic, Urinary Infection)	3	12	0.81
Others (Anemia, Anesthesia, Diabetes, Epilepsy, Ophthalmological (An eye disorder), Parasite (external parasites lives) & Typhoid	6	52	0.9

Abbreviations: Nt = Total number of taxa (species) used in that particular category; Nur = Number of uses reported in each category; IFC=Informant consensus Factor

Table 4. Fidelity level of medicinal plants of various ailment categories

Botanical Name	Ailments (disease)	N p	N	F1 (%) =Np/N×100
Achillea millefolium L.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain	12	40	30
	Inflammation (Skin & Joint Inflammation)	3		7.5
	Physical pains (toothache, headache, joint pains, body pains, Ear aches,	10		25
	Poisoning (Snakebite)	3		7.5
	Respiratory (Whooping cough, Cold & Cough, Asthma	8		20

	Urological (Diuretic, Urinary Infection)	4		10
Ageratum conyzoides L.	Dermatological ailments (Abscesses, Allergy, Burns, Boils, dandruff, Skin rashes, and infection.	9	3 2	28.12
	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain	5		15.62
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	10		31.25
	Rheumatism (Arthritis, Bone fracture, Gout)	8		25
Ainsliaea aptera DC.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain	3	1 2	25
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	6		50
	Urological (Diuretic, Urinary Infection)	3		25
Anaphalis contorta (D.Don) Hook. f.	Dermatological ailments (abscesses, allergies, Burns, Boils, dandruff, Skin rashes, and infection.	5	8	62.5
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	3		37.5
Anaphalis griffithii Hook. f.	Dermatological ailments (Abscesses, Allergy, Burns, Boils, dandruff, Skin rashes, and infection.	5	1 0	50
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	5		50
Anaphalis margaritacea (L.) Benth. & Hook. f.	Dermatological ailments (Abscesses, Allergy, Burns, Boils, dandruff, Skin rashes, and infection.	3	1 0	30
	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain	7		70
Anaphalis nepalensis (Spreng.) Hand. - Mazz.	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	7	7	100
Anaphalis nubigena DC.	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	11	1 1	100

Anaphalis royleana DC.	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	13	1 3	100
Anaphalis triplinervis (Sims) C.B.Clarke	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	5	5	100
Anthemis cotula L.	Dermatological ailments (Abscesses, Allergy, Burns, Boils, dandruff, Skin rashes, and infection.	3	1 8	16.66
	Fever (Fever)	1		5.55
	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain	7		38.88
	Respiratory (Whooping cough, Cold & Cough, Asthma	7		38.88
Arctium lappa L.	Dermatological ailments (Abscesses, Allergy, Burns, Boils, dandruff, Skin rashes, and infection.	3	1 1	27.27
	Rheumatism (Arthritis, Bone fracture, Gout)	8		72.72
Artemisia absinthium L.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain	9	2 5	36
	Liver complaints (Jaundice	4		16
	Others (Anemia, Anesthesia, Diabetes, Epilepsy, Ophthalmological (An eye disorder), Parasite (external parasites lives) & Typhoid	12		48
Artemisia nilagirica (C.B.Clarke) Pamp.	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	8	1 6	50
	Respiratory (Whooping cough, Cold & Cough, Asthma	3		18.75
	Others (Anemia, Anesthesia, Diabetes, Epilepsy, Ophthalmological (An eye disorder), Parasite (external parasites lives) & Typhoid	5		31.25
Artemisia vulgaris L.	Dermatological ailments (abscesses, allergies, Burns, Boils, dandruff, Skin rashes, and infection.	2	1 3	15.38
	Fever (Fever)	7		53.84

	Respiratory (Whooping cough, Cold & Cough, Asthma)	1		7.69
	Others (Anemia, Anesthesia, Diabetes, Epilepsy, Ophthalmological (An eye disorder), Parasite (external parasites lives) & Typhoid)	3		23.07
Bidens bipinnata L.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	7	1 0	70
	Malaria (Mosquito repellent)	3		30
Bidens biternata (Lour.) Merr. & Sheriff	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	3	3	100
Carpesium abrotanoides L.	Physical pains (toothache, headache, joint pains, body pains, Ear ache)	9	9	100
Cichorium intybus L.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	3	1 7	17.64
	Rheumatism (Arthritis, Bone fracture, Gout)	3		17.64
	Others (Anemia, Anesthesia, Diabetes, Epilepsy, Ophthalmological (An eye disorder), Parasite (external parasites lives) & Typhoid)	11		64.7
Cirsium wallichii DC.	Dermatological ailments (abscesses, allergies, Burns, Boils, dandruff, Skin rashes, and infection.	9	2 1	42.85
	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	12		57.14
Echinops cornigerus DC.	Kidney stone	2	7	28.57
	Urological (Diuretic, Urinary Infection)	5		71.42
Galinsoga parviflora Cav.	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	3	3	100
Helianthus × laetiflorus Pers.	Dermatological ailments (abscesses, allergies, Burns, Boils, dandruff, Skin rashes, and infection.	1	3	33.33

	Inflammation (Skin & Joint inflammation)	2		66.66
Hippolytia longifolia (Rech.f.) C.Shih	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	2	7	28.57
	Malaria (Mosquito repellent)	5		71.42
Inula royleana DC.	Dermatological ailments (abscesses, allergies, Burns, Boils, dandruff, Skin rashes, and infection.	2	1 6	12.5
	Inflammation (Skin & Joint inflammation)	4		25
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	3		18.75
	Respiratory (Whooping cough, Cold & Cough, Asthma)	7		43.75
Lactuca dolichophylla Kitam.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	2	2 0	10
	Inflammation (Skin & Joint Inflammation)	5		25
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	13		65
Pseudognaphalium luteoalbum (L.) Hilliard & B.L.Burt	Dermatological ailments (abscesses, allergies, Burns, Boils, dandruff, Skin rashes, and infection.	9	2 2	40.9
	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	6		27.27
	Rheumatism (Arthritis, Bone fracture, Gout)	7		31.81
Saussurea piptathera Edgew.	Dermatological ailments (Abscesses, Allergy, Burns, Boils, dandruff, Skin rashes, and infection.	9	1 4	64.28
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	5		35.71
Sigesbeckia orientalis L.	Dermatological ailments (Abscesses, Allergy, Burns, Boils, dandruff, Skin rashes, and infection.	3	3 3	9.09
	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric	10		30.3

	ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain			
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	4		12.12
	Poisoning (Snakebite)	11		33.33
	Rheumatism (Arthritis, Bone fracture, Gout)	5		15.15
Silybum marianum (L.) Gaertn.	Inflammation (Skin & Joint inflammation)	7	7	100
Solidago virgaurea L.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	9	2 0	45
	Physical pains (toothache, headache, joint pains, body pains, Ear ache)	3		15
	Respiratory (Whooping cough, Cold & Cough, Asthma)	8		40
Sonchus arvensis L.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	5	1 1	12.5
	Liver complaints (Jaundice)	3		27.27
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	3		27.27
Sonchus asper (L.) Hill	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	2	2	100
Sonchus oleraceus L.	Fever (Fever)	4	2 7	14.81
	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	3		11.11
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	3		11.11
	Rheumatism (Arthritis, Bone fracture, Gout)	7		25.92
	Others (Anemia, Anesthesia, Diabetes, Epilepsy, Ophthalmological (An eye disorder), Parasite (external parasites lives) & Typhoid)	10		37.03

Tagetes erecta L.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	11	14	78.57
	Physical pains (toothache, headache, joint pains, body pains, Ear ache)	3		21.42
Tagetes minuta L.	Fever (Fever)	3	9	33.33
	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	3		33.33
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	3		33.33
Taraxacum officinale F.H.Wigg.	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	13	40	35.5
	Inflammation (Skin & Joint inflammation)	2		5
	Kidney stone	3		7.5
	Rheumatism (Arthritis, Bone fracture, Gout)	11		27.5
	Others (Anemia, Anesthesia, Diabetes, Epilepsy, Ophthalmological (An eye disorder), Parasite (external parasites lives) & Typhoid)	11		27.5
Tussilago farfara L.	Dermatological ailments (abscesses, allergies, Burns, Boils, dandruff, Skin rashes, and infection.	2	6	33.33
	Laceration (foot and toes, Bleeding, Cuts, and wound healing)	4		66.66
Xanthium strumarium L.	Dermatological ailments (abscesses, allergies, Burns, Boils, dandruff, Skin rashes, and infection.	2	6	33.33
	Gastrointestinal (appetizer, indigestion, oral ulcers, gastric ulcers, constipation, piles, dyspepsia, dysentery, diarrhea, Stomach pain)	4		66.66

Abbreviations: Np = is the number of use reports cited for a given species for a particular ailment; N = is the total number of use reports cited for any given species for all the ailments; Fl = Fidelity level

Table 5: Showing the alphabetically arranged list of plants with botanical name, plant parts used, voucher number and ailments cured.

Botanical Name	Local Name	Habit	Phenology	Voucher number	Mode of administered	Plant part used	Ailments cured	$\sum u$	$UV = \frac{\sum u}{n}$
Achillea millefolium L.	Ghora Trath	H	May – Sept.	323482 (LWG)	O / T	Wp	After washing with water root taken and put on teeth for 10-15 minutes to cure tooth ache and infection (10); root decoction takes orally to cure urinary problems (4); Inflammation (3); Powdered is prepared from whole plant and one tea cup twice in a day for a week is taken to overcome	40	0.51

							from cold and cough (8); root paste is also used against snake bite (3). Leaf infusion are used to overcome constipation in animals (6) and stomach ache in human (6)		
Ageratum conyzoides L.	Peelo Fullu	H	March – Nov.	325153 (LWG)	O / T	L & R	Paste of leaves is applied externally for quick healing of cuts and wounds (4); extracts are made up of leaves and mixed with mustard oil and applied to cure skin infection and	3 2	0.4 1

							<p>rashes (7); and powdered leaves are applied externally on abscesses (2); tea is prepared of leaves and taken thrice in a day to control diarrhea (5); crushed leaves are mixed in mustard oil and boiled for five minutes and applied topically to cure arthritis (8) and leaf juice also used to stop bleeding (6).</p>		
Ainsliaea aptera DC.		H	April – Oct.	324753(L WG)	O / T	R	<p>Roots are dried and powdered are prepared and mixed</p>	1 2	0.1 5

							with oil to cure cuts and wounds (6) stomachache (3), and diuretic (3).		
Anaphalis contorta (D.Don) Hook. f.	Burzull i	H	August – Nov.	325027 (LWG)	T	Wp	The extract of the plant is prepared and applied topically on cuts and wounds (3) and cure allergies (5)	8	0.1
Anaphalis griffithii Hook. f.		H	July – Sept.	325103 (LWG)	T	Wp	Leaves are ground and mixed with butter and applied to cure skin infections (5) and foot and toe diseases in cattle and sheep (5)	10	0.12

Anaphalis margaritacea (L.) Benth. & Hook. f.		H	August – Oct.	336540 (LWG)	O / T	Wp	Leaf juice is used by local people to cure diarrhea (1). The paste of flowers is applied to cure burns (3); ulcers (1) and rheumatic joints (5).	10	0.12
Anaphalis nepalensis (Spreng.) Hand.-Mazz.	Burzull i	H	June – Oct.	336686 (LWG)	T	Wp	The extract of the plant is prepared and applied topically to cure cuts and wounds in Sheep, goats, and cattle (7).	7	0.09
Anaphalis nubigena DC.	Burzull i	H	June – Sept.	336647 (LWG)	T	L	The seasonal migratory people of the hilly terrains used leaves paste to stop bleeding (3) and quick	11	0.14

							wound healing (8). Due to the unavailability of a matchbox, the people used fiber of the leaf usually extracted from the ventral side of the leaf after drying and rubbed with iron to produce fire and to burn cigars.		
Anaphalis royleana DC.	Burzull i	H	July – Sept.	324913 (LWG)	T	L	The juice of leaves is extracted and used to cure the laceration of the toes (13). Usually, this disease occurs during the rainy season in	13	0.16

							higher altitudes. season		
Anaphalis triplinervis (Sims) C.B.Clarke		H	July – Oct.	324979 (LWG)	T	L	Paste of leaves used to cure laceration of toes (5).	5	0.06
Anthemis cotula L.		H	June - September	323500 (LWG)	T	L & F	The paste of the plant is used topically twice a day to cure piles (7) and the paste is mixed with butter and applied externally to cure burns (3). The decoction of flowers is prepared and administered in asthma (4); cold (3) and Fever (1)	18	0.23
Arctium lappa L.		H	July – Sept.	327991 (LWG)	T	L & F	The paste of root and leaves are	11	0.14

							prepared and applied externally to cure Gouts (5); rheumatism (3) and dandruff (3).		
Artemisia absinthium L.		H	June – Aug.	328045 (LWG)	O	L &F	The paste of flowers and leaves is prepared and mixed with a glass of milk and taken orally to overcome stomach pain (9). Dried leaf powder mixed with water and taken once a day before breakfast to cure diabetes (8) and liver infection (4) and also used by old age	2 5	0.3 2

							people to overcome epilepsy (4).		
Artemisia nilagirica (C.B.Clark e) Pamp.		H	June – Sept.	323659 (LWG)	O / T	Wp	The juice of leaves is extracted and applied externally over the wounds and cuts to cure infection and quick healing (8). The paste of leaves mixed with mustard oil is applied externally on cattle to get rid of external parasites (5). The decoction of flowering buds is taken once a day to overcome asthma (3).	16	0.2

Artemisia vulgaris L.		H	June – Sept.	336650 (LWG)	O / T	L	The juice is extracted from the fresh leaves and taken thrice a day against the remedy of fever (7); during summer juice is used to cure itching in the eyes in both humans and mammals (3); cough (1) and skin rashes (2).	1 3	0.1 6
Bidens bipinnata L.		H	July – Sept.	325037 (LWG)	O	Wp	The decoction of plants is used to cure malaria (3) and dysentery (7).	1 0	0.1 2
Bidens biternata (Lour.) Merr. & Sherff		H	May – Oct.	324783 (LWG)	T	L	A pate of leaves is applied over cuts and	3	0.0 3

							wounds (3).		
Carpesium abrotanoides L.		H	August – Dec.	325080 (LWG)	O	L	The decoction of leaves is used to cure headaches (6) and paste is applied externally to overcome body aches (3).	9	0.11
Cichorium intybus L.		H	May-Aug.	336689 (LWG)	O	L&R	The powder of root is prepared and mixed with water and a small quantity of sugar. A half glass of mixed water is taken daily before bed to cure typhoid (11). The fresh leaves are eaten raw after boiling to	17	0.22

							strengthen the muscle and cure arthritis (3) and digestive problems (3).		
Cirsium wallichii DC.		H	May – Oct.	323468 (LWG)	O / T	F&R	After washing the root juice is extracted and taken in constipation (9) and dyspepsia (Indigestion) (3) and Paste is applied topically on skin rashes (4). Fruit is used to cure boils (5).	2 1	0.2 7
Echinops cornigerus DC.		H	July – Nov.	327987 (LWG)	O / T	Wp	The decoction of whole plants is used to remove kidney stones (2) and cure urinary infections (5).	7	0.0 9

Galinsoga parviflora Cav.		H	June – Oct.	328027(LWG)	T	L & S	Paste of leaf and stem are applied on cut and wounds (3)	3	0.03
Helianthus × laetiflorus Pers.	Cananduli	H	July – Sept.	327978 (LWG)	T	F	Flowers are crushed and applied to the skin to cure skin allergy (1) and inflammation (2).	3	0.03
Hippolytia longifolia (Rech.f.) C.Shih		H	April – Aug.	336687 (LWG)	T	Wp	The dried plants are burned in containers smoke emission of smoke repels the mosquitoes in the summer season. Paste of plants is applied externally to cure and heal cuts and wounds (2) and the decoction of plants is used	7	0.09

							against malaria (5).		
Inula royleana DC.		H	July – Sept.	323682 (LWG)	T	R	The crushed root paste is applied topically on skin and joint inflammation (4); quick wound healing (3); skin rashes and pimples (2). The dried powder of root is prepared and taken thrice a day for one week to cure a cold and cough (3), and also cure asthma (4)	16	0.2
Lactuca dolichophylla Kitam.		H	June – Sept.	328025 (LWG)	T	Wp	The paste of the whole plant is used against inflammation (5)	20	0.25

							and ulcers by the people of hilly terrans(2) . The milky sap is used to stop bleeding and quickly healing of wounds (13).		
Pseudognaphalium luteoalbum (L.) Hilliard & B.L.Burt		H	June - Sept.	323411 (LWG)	O / T	L	The decoction of leaves is used as anti-diarrhea (6). The paste of whole plants is topically applied against dandruff and skin allergy (9), and for people in hilly areas paste is applied to heal fractured bones (7).	2 2	0.2 8
Saussurea piptathera Edgew.		H	June - Sept.	336649 (LWG)	T	R	The paste of roots is prepared	1 4	0.1 8

							and applied topically to cure burns (2) boils (7) and quick healing of cuts and wounds (5).		
Sigesbeckia orientalis L.		H	August - Nov.	336530 (LWG)	T	Wp	The juice is extracted from the plants and used externally against skin rashes (3) and wound infections (1). The paste of the plant is taken inside the mouth for 5 minutes without injection to cure ulcers and sores (7). The paste is also applied to cure foot and toe diseases (3). A	3 3	0.4 2

							decoction of the plant is also used in the treatment of rheumatoid arthritis (5). A paste of the root is used in the treatment of indigestion (3). The decoction is also used by the local people against snake bites in mammals (11).		
Silybum marianum (L.) Gaertn.		H	March-May	347919 (LWG)	T	Wp	Paste of the whole plant is used against skin inflammation (7)	7	0.09
Solidago virgaurea L.		H	June – Sept.	324941 (LWG)	O	Wp	The powder is prepared of leaves, flowers, and roots mixed	20	0.25

							with water are taken twice a day after breakfast and before dinner used to overcome asthma (6), whooping cough (2), dysentery (1), and diarrhea (4). The powder is formed after the grinding of leaves used to cure ulcers (4). The fresh root after washing is put on ached teeth to relieve the ache (3).		
Sonchus arvensis L.		H	June – Aug.	336636 (LWG)	O	Wp	Juice of whole plant is prepared and mixed with curd	1 1	0.1 4

							administered in the treatment of dysentery (5) and jaundice (3). The paste is applied on cuts and wounds (3)		
Sonchus asper (L.) Hill		H	March - July	323524 (LWG)	O	R	Root decoction is given in stomach problems (2).	2	0.02
Sonchus oleraceus L.		H	June – Aug.	323655 (LWG)	O / T	R	The root powder is prepared and mixed with mustard used on foot and toe infections (3) and also massaged on joints to cure arthritis (7). A decoction is orally administered to cure	27	0.35

							indigestion (3) and fever (4). The juice of plants is taken orally postdelivery for quick recovery and overcoming anesthesia (10).		
Tagetes erecta L.		H	May – Sept.	336610 (LWG)	O	L	The juice of fresh leaves is taken orally for constipation (11) and juice is used as an eardrop to cure earache (3).	14	0.18
Tagetes minuta L.		H	July – Oct.	325077 (LWG)	O / T	L & F	Paste of immature leaves and flowers applied externally to cure wounds in cattle (3). Decoction of	9	0.11

							flowers is used in cure of indigestion (3) and fever (3).		
Taraxacum officinale F.H.Wigg.		H	March- Aug.	325161 (LWG)	O / T	Wp	Leaves boiled and pasted are prepared and mixed with a small quantity of turmeric powder and salt administered for treating joint pain and bone fracture (11). The extract of leaves is prepared and used in the treatment of kidney stones (3). The decoction of leaves is administered to ladies post-	4 0	0.5 1

							delivery to overcome anemia (11). Leaf paste is topically used against inflammation (2). The plant is taken orally for indigestion gastric ulcers (7) and dysentery (6). The plant is also used as a vegetable.		
Tussilago farfara L.		H	March-Aug.	325060 (LWG)	T	L	Paste of leaves mixed with butter and applied on cuts and wounds and to stop bleeding (4) and against skin allergy (2).	6	0.07

Xanthium strumarium L.		H	June – Nov.	328043(L WG)	O / T	F & L	Paste of fruit is applied topically against skin rashes (2). The paste is mixed with water and taken as grass once a day against gastric ulcers (3) and to initiate appetite (1).	6	0.07
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Abbreviations used in the table: O=Oral; T=Topical; $\sum u$ =Total numbers of use reports (the total number of use-reports cited for any given species for all the ailments); UV= Use reports; L= Leaves; F= Fruits; R= roots; L&R= Leaves and fruits; Wp= Whole plant; F= flower; S=Shoot

Figure 2. Photographs of some medicinally important plants



Inula roveana DC.



Achillea millefolium L.



Ageratum conyzoides L.



Arctium lappa L.



Sonchus



Xanthium strumarium L.



Parthenium hysteranhorus L.



Siaesheckia