

Important Ethnomedicinal Arboreal Flora in Nogli Watershed of Sutlej River Catchment, District Shimla, North-West Himalaya, India

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Abstract

India is one of the foremost countries not only in Asia, but worldwide famed as far as the wealth of traditional knowledge and floristic richness is concerned. Within India, the state of Himachal Pradesh is rich in plant diversity and in addition is also gifted with rich and diverse heritage of cultural traditions. Arboreal plants form an integral source of readily available, traditional medicines to the indigenous communities of the far-flung remote regions. This study pertains to the important woody flora in the Nogli watershed area of Sutlej River Catchment, which are being utilized by the local communities. Ethnobotanical surveys carried between the years 2020 and 2022 are based on semi-structured questionnaires and group discussions, while reconnaissance survey was carried out in all seasons to understand and analyze the vegetation of the region. Response from 50 respondents covering all age groups was recorded. As an outcome, 44 plant species (26 trees and 18 shrubs) of ethno-medicinal importance were identified from the study area. The plant species are spread across 24 families with Rosaceae being the most dominant. The outcome from this study shall form the baseline data for ethnopharmacological research in future. In addition to this a conservation and management plan can also be chalked out for the species which are heavily extracted from the forests. Such systematic and researched information will add up to an extensive database of the plants used by native communities, and this information could be dispersed to the new generation for awareness and sustainable utilization of plants.

Keywords: Ethno pharmacology, Himalayan region, Indigenous communities, Traditional knowledge

Introduction

The Indian Himalayan Region (IHR) is extraordinarily rich in biological diversity (Myers, 2000). It includes about 18% area of India, 2,800 km long and 220 to 300 km wide, with elevation ranging from 200 m to 8000 m (Anonymous, 1992). The flora comprises of 8,000 species of angiosperm (40% endemic), 44 species of gymnosperm (16% endemic), 600 species of pteridophyte (25% endemic), 1737 species of bryophyte (33% endemic), 1,159 species of lichen (11% endemic) and 6,900 species of fungi (27% endemic) (Samant et al., 1998; Singh & Hajra 1996). This region not only harbours abundant floral wealth but also is a storehouse of ethnobotanical knowledge. As much as 85% of the traditional medicines used in primary healthcare are extracted from plants around the globe (Fransworth, 1988). These varied original habitats all over the Himalayan Region are source of plant diversity that are used for a varied uses i.e., food, fibre, fodder, medicine, spices, dyes, making

agriculture implements, religious, fuel, timber etc. Many plants from the wild/cultivated are widely used in traditional systems of medicine and a few are traded as well. Around 1,748 medicinal plants, 675 wild edibles, 155 plants of sacred belief, 118 essential oil yielding medicinal plants and 279 fodder plants have been documented from the IHR (Samant, 1998; Samant & Dhar, 1997; Samant & Palni, 2000; Samant & Pant, 2003; Samant et al., 1998).

Deforestation, cattle grazing, fire, tree felling for agriculture, illegal extraction etc. have altered the vegetation diversity and their regeneration pattern (Fujisaka et al., 1998). Due to lack of cultivation and prevailing ruthless *in-situ* harvesting, populations of these valuable plants are diminishing day by day coupled with loss of genetic diversity, habitat degradation and facing high risk of extinction. Conservation and protection of biodiversity was realized due to its ecological, aesthetic, economical, and scientific values. Conservation of the available

information on flora assumes immense significance and requires immediate attention. In recent times, traditional knowledge on ethnobotany has declined in indigenous communities indicating risk of extinction. Economic developments, upswing to the market economy and modernization of infrastructure have flipped the traditional lifestyle of indigenous communities that is leading to the wearing out of traditional knowledge in many parts of the Himalaya (Agarwal, 1997). More the number of endemics, rare and native species in an area explain their importance in conservation. The main objective of the study is to document plants and traditional knowledge associated with them in far-flung area of district Shimla, Himachal Pradesh, India.

Materials and Methods

Study area

Area under study forms the part of eco-sensitive zone around Daranghati Wildlife Sanctuary which is situated between 77°44'00" to 77°51'22" E longitude and 31°04'36" to 31°19'42" N latitude. The sanctuary is divided into part I and part II. Part I is situated about 17 km from Sarahan town and 40 km from Rampur. Part II is situated on the left bank of Nogli about 45 km from Rampur. Total area of Daranghati Wildlife Sanctuary is 167 km² (Urvashi, 2009). The villages of Nogli Watershed under study were namely Nogli, Tacklech, Kasha, Pat, Sharnal, Kukhi and Darkali (Figure 1, Table 1).

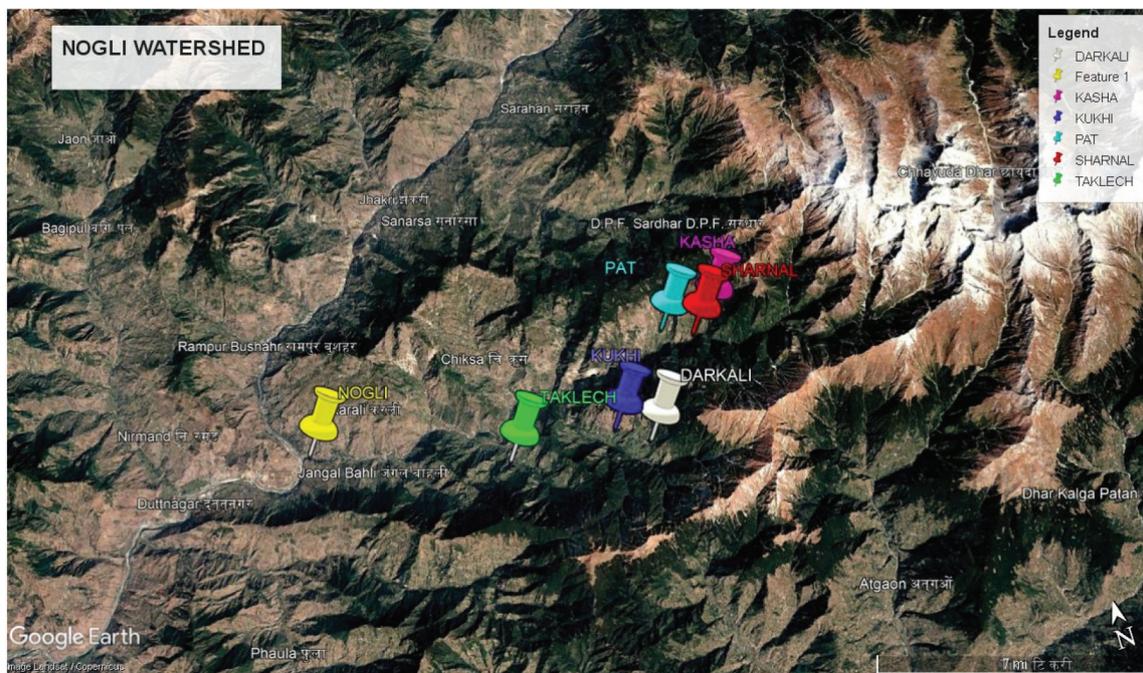


Figure 1: Google map showing the study area

Table 1: List of villages under study along with their geographical location

S.N.	Village	Latitude	Longitude	Elevation	Aspect
1	Nogli	31°23.3779' N	77°41.2993' E	1274 m	SW
2	Tacklech	31°22.4709' N	77°43.7547' E	1536 m	SW
3	Pat	31°24.4149' N	77°48.2129' E	2295 m	W
4	Sharnal	31°24.2943' N	77°49.7895' E	2361 m	NW
5	Kasha	31°24.6233' N	77°50.1577' E	2574 m	SW
6	Darkali	31°21.8816' N	77°47.6895' E	2438 m	N
7	Kukhi	31°21.1025' N	77°47.8201' E	2572 m	S

Note: SW = South west; W = West; NW = North west; N = North; S = South

Data collection and herbarium preparation

A number of primary and secondary sources were used to document the information of the study area. Primarily, a general reconnaissance of the study area to familiarize with the topographic features, broad vegetation types, floristic components and logistics was undertaken. The primary surveys comprised of documenting floral wealth of the region. The survey was carried out during 2021-2022. A questionnaire was framed for the collection of data on ethnobotany. The villagers were interviewed, and group discussions were also organized. Informal interactions were carried out with the inhabitants of the villages, targeting elder folks in particular. Traditional knowledge in relation to the use of plants for medicine was documented. Majority of information was gathered from the elderly people as their experience in this context is more relevant. Standard methods of herbarium preparation as suggested by Jain & Rao (1993) were adopted during collection and processing of plant specimens collected during field surveys. Plant specimens and enumeration of information was done with the help of various floras and other published literature (Collett, 1902; Hooker, 1875; Nair, 1977). Attempts have been made to adopt the most recent and correct nomenclature by referring to Plants of the world online (www.plantsoftheworldonline). The herbarium specimen will be deposited in Himalayan Forest Research Institute Herbarium, Shimla. The area was surveyed with the help of local people possessing knowledge pertaining to plants. The villages selected in the Nogli Watershed are the major villages of the area adjoining the forests.

Results and Discussion

Overall 44 plant species were documented from the study area (Table 2) along with their varied ethnomedicinal usage. Response from 50 villagers was collected based on semi-structured questionnaires and group discussions. The plants belonged to 24 families; most dominant family being Rosaceae (9 spp.) followed by Pinaceae (5 spp.), Moraceae (3 spp.), Betulaceae (3 spp.), Ulmaceae (2 spp.), Rhamnaceae (2 spp.), Ericaceae (2 spp.), Berberidaceae (2 spp.), and Acanthaceae, Adoxaceae, Anacardiaceae, Buxaceae, Coriariaceae, Elaeagnaceae, Fabaceae, Juglandaceae, Lauraceae, Lythraceae, Myrtaceae, Phyllanthaceae, Rutaceae, Sapindaceae, Scrophulariaceae, Taxaceae each representing 1 species (Figure 2). The habit of the plants comprised a majority of 16 shrubs and 28 trees (Figure 3). Among them, 9 plant species were utilized as fruits, seeds (6 spp.), leaves (5 spp.), bark (5 spp.), wood (2 spp.), roots (2 spp.), flowers and leaves (2 spp.) and other parts namely flowers, gall, latex and resin each representing 1 species used for various day to day purpose (Figure 4). Some of the important plants from the study area are *Neolitsea pallens* (D.Don) Momiy. & H.Hara, *Prinsepia utilis* Royale, *Rosa macrophylla* Lindl., *Rosa sericea* Lindl., *Cedrus deodara* (Roxb. ex D.Don) G.Don, *Cotoneaster microphyllus* Wall. ex Lindl., *Elaeagnus umbellata* Thunb., *Aesculus indica* (Wall. ex Cambess.) Hook. and *Berberis aristata* DC. (Figure 5). These plants were the most often cited plants from the study area.

Table 2: List of flora along with their habit and utilization pattern

S.N.	Scientific name	Common name/Local name	Family	Habit	Usage	Collection no.
1	<i>Abies pindrow</i> (Royle ex D.Don) Royle	West Himalayan Fir/Pandrai	Pinaceae	Tree	Decoction of bark is given in case of cold and cough. Paste of leaves applied to udder of cow in case of its swelling and milk clotting.	HFRI-Herbarium:68 16
2	<i>Aesculus indica</i> (Wall. ex Cambess.) Hook.	Horse chestnut/Khanor	Sapindaceae	Tree	Fruits are dried and beaten to make flour (Khasai), washed in water to remove the bitter taste and <i>halwa</i> (Khasai is roasted with ghee) is prepared and generally given to ladies. It is known to increase body strength after childbirth. This <i>halwa</i> is useful in treating blood dysentery	HFRI-Herbarium:68 18

S.N.	Scientific name	Common name/Local name	Family	Habit	Usage	Collection no.
3	<i>Alnus nitida</i> (Spach) Endl.	West Himalayan Alder/Kunish	Betulaceae	Tree	Bark is boiled and applied on skin allergies	
4	<i>Berberis aristata</i> DC.	Indian barberry/Kashmani	Berberidaceae	Shrub	Roots are dipped overnight in water and the water is taken the next day to treat piles	HFRI-Herbarium:6820
5	<i>Berberis lycium</i> Royle	Indian lycium/Kashmal	Berberidaceae	Shrub	Leaves are powdered and known to treat diabetes (Powder is taken with water in empty stomach) and roots are boiled in water and the water is taken by diabetes patients and this water is also known to treat jaundice. A decoction/ liquid is also prepared by boiling roots and is known to treat ophthalmic disorders	HFRI-Herbarium:6820
6	<i>Betula utilis</i> D.Don	Himalayan Birch/Bhooj	Betulaceae	Tree	Flaking bark is used to treat cataract (Bark is burnt and smoke is known to treat cataract) and wood chips are used to prepare tea which treats cold and cough	HFRI-Herbarium:6822
7	<i>Buddleja crispa</i> Benth.	Himalayan butterfly bush	Scrophulariaceae	Shrub	Leaf pastes are applied on skin infections	HFRI-Herbarium:6817
8	<i>Cedrus deodara</i> (Roxb. ex D.Don) G.Don	Himalayan cedar/Devdar, kelo	Pinaceae	Tree	Essential oil from wood and roots is used to get relief from joint pain. The essential oil is extracted from nearby market where an extraction unit is set up	HFRI-Herbarium:6821
9	<i>Celtis australis</i> L.	European nettle tree/Khirak	Ulmaceae	Tree	The bark is made into paste and applied on physical injury	HFRI-Herbarium:6823
10	<i>Coriaria napalensis</i> Wall.	Masuri berry/Masuda	Coriariaceae	Tree	Fruits are emetic	HFRI-Herbarium:6824
11	<i>Corylus jacquemontii</i> Decne.	Himalayan Hazel/Shadoi	Betulaceae	Tree	Seeds are edible with high nutritional value and are known to treat body weakness	HFRI-Herbarium:6826
12	<i>Cotoneaster microphyllus</i> Wall. ex Lindl.	Rockspray cotoneaster	Rosaceae	Shrub	Root paste is applied on wounds	HFRI-Herbarium:6827
13	<i>Dalbergia sissoo</i> Roxb. ex DC.	North Indian Rosewood/Shisham	Fabaceae	Tree	Leaves crushed and mixed with Himalayan pink salt and applied on sprain affected area	HFRI-Herbarium:6825
14	<i>Elaeagnus umbellata</i> Thunb.	Autumn olive/Ghein	Elaeagnaceae	Shrub	Powdered seeds are known to treat cough	HFRI-Herbarium:6828
15	<i>Eucalyptus</i> hybrid	Eucalyptus/ Safeda	Myrtaceae	Tree	Leaves are boiled in water and steam is taken to get relief from cold	HFRI-Herbarium:6830
16	<i>Ficus auriculata</i> Lour.	Roxburgh fig/Tramble	Moraceae	Tree	Latex applied on cuts	HFRI-Herbarium:6829
17	<i>Ficus palmate</i> Forssk.	Punjab fig/Phedu	Moraceae	Tree	Stem exudates is applied to extract deep rooted thorn in human skin. It is also directly applied on skin to treat warts. Treats throat ulcers in cattle	HFRI-Herbarium:6831

S.N.	Scientific name	Common name/Local name	Family	Habit	Usage	Collection no.
18	<i>Juglans regia</i> L.	Walnut/Akhrot/Khod	Juglandaceae	Tree	Tooth cleaning and treats oral ailments (twigs and root bark) and seeds are taken to improve memory	HFRI-Herbarium:6834
19	<i>Justicia adhatoda</i> L.	Malabar nut/Basuti, bensti	Acanthaceae	Shrub	Flowers and leaves are dried and powdered and orally taken with honey to get relief from cough (A spoonful daily)	HFRI-Herbarium:6835
20	<i>Morus serrata</i> Roxb.	Himalayan mulberry/Kemu	Moraceae	Tree	Bark is chewed to get relief from toothache	HFRI-Herbarium:6836
21	<i>Neolitsea pallens</i> (D.Don) Momiy. & H.Hara	Pale litsea/Narkhi	Lauraceae	Tree	Oil is extracted from seeds and applied externally in case of body pain	HFRI-Herbarium:6833
22	<i>Phyllanthus emblica</i> L.	Indian gooseberry/Amla	Phyllanthaceae	Tree	Fruit paste is applied on burns and fruits are also eaten in powdered form to treat constipation	HFRI-Herbarium:6837
23	<i>Picea smithiana</i> (Wall.) Boiss.	Himalayan spruce/Rai	Pinaceae	Tree	Bark extract has antibacterial properties (paste applied directly on affected areas)	HFRI-Herbarium:6838
24	<i>Pinus roxburghii</i> Sarg.	Chir pine/Chil	Pinaceae	Tree	Resin is mixed with wax and is then heated to be applied on cracked feet	HFRI-Herbarium:6832
25	<i>Pinus wallichiana</i> A.B. Jacks.	Blue pine/Kail	Pinaceae	Tree	Resin is applied on cracked heels and bark peels of sapling is used as bandage to join broken bones	HFRI-Herbarium:6839
26	<i>Pistacia chinensis</i> subsp. <i>integerrima</i> (J.L.Stewart) Rech.f	Crab's claw/ Kakkarsinghi	Anacardiaceae	Tree	The gall is burnt, and ash is mixed with honey and taken in case of whooping cough (till symptoms persist)	HFRI-Herbarium:6840
27	<i>Prinsepia utilis</i> Royle	Himalayan cherry prinsepia/Bekhal	Rosaceae	Shrub	Oil extracted from seed is applied to get relief from muscular pain.	HFRI-Herbarium:6841
28	<i>Prunus cerasoides</i> Buch.-Ham. ex D.Don	Wild Himalayan cherry/Pajja	Rosaceae	Tree	The leaves are rubbed on skin to get relief from burning sensation	HFRI-Herbarium:6842
29	<i>Prunus armeniaca</i> L.	Apricot/chuli	Rosaceae	Tree	Seed oil is put in ears to get relief from earache. The oil is poured in food like ghee by the females after childbirth to provide strength to the body. Oil is also good for hair and massaged on body especially on infant's body to give strength	HFRI-Herbarium:6843
30	<i>Prunus mira</i> Koehne	Tibetan peach/Bemi	Rosaceae	Tree	Oil is edible and used for body massage and eases muscular cramps	HFRI-Herbarium:6844
31	<i>Punica granatum</i> L.	Pomegranate/ Anar	Lythraceae	Tree	Fruit rind is roasted, powdered and mixed with honey and galls of <i>Pistacia</i> and eaten to get rid of cold and cough	HFRI-Herbarium:6845
32	<i>Rhododendron arboreum</i> Sm.	Red rhododendron/ Buransh	Ericaceae	Tree	Flowers treat dysentery, diarrhoea, stomach-ache and increase blood Haemoglobin and used to treat nose bleeding	HFRI-Herbarium:6846
33	<i>Rhododendron campanulatum</i> D. Don	Pink rhododendron/ Simbar	Ericaceae	Shrub	Leaves and flowers are crushed, and paste is applied to treat skin diseases	HFRI-Herbarium:6847

S.N.	Scientific name	Common name/Local name	Family	Habit	Usage	Collection no.
34	<i>Rosa macrophylla</i> Lindl.	Himalayan rose/ jungaligulab	Rosaceae	Shrub	Fruits eaten in case of stomach-ache	HFRI- Herbarium:68 48
35	<i>Rosa sericea</i> Lindl.	Silky rose/ Jungaligulab	Rosaceae	Shrub	Fruit treats headache and liver complaints (direct consumption)	HFRI- Herbarium:68 51
36	<i>Rubus ellipticus</i> Sm.	Yellow Himalayan raspberry/Hinsar	Rosaceae	Shrub	Edible fruits rich in vitamin-C and treat stomach flatulence	HFRI- Herbarium:68 49
37	<i>Rubus niveus</i> Thunb.	Mysore raspberry/Hinsalu, Kadse	Rosaceae	Shrub	Fruit is useful in dysmenorrhoea (direct consumption)	HFRI- Herbarium:68 50
38	<i>Sarcococcaligna</i> (D. Don) Mull. Arg.	Willow leaf sweet box	Buxaceae	Shrub	Leaves are crushed and directly applied on skin to treat skin allergies	HFRI- Herbarium:68 52
39	<i>Sorbaria tomentosa</i> (Lindl.) Rehder	False spirea/kungtra	Rosaceae	Shrub	Fruits smoked to treat asthma. (Fruits dried, crushed, burnt and smoked)	HFRI- Herbarium:68 53
40	<i>Taxus contorta</i> Griff.	Himalayan yew/Thoono, rakhau	Taxaceae	Tree	Tea is prepared using bark which is known to treat cold and cough	HFRI- Herbarium:68 56
41	<i>Ulmus wallichiana</i> Planch.	Himalayan elm/Parmandi, pamal	Ulmaceae	Tree	Bark of younger trees is used as plaster and support for broken bones	HFRI- Herbarium:68 55
42	<i>Viburnum grandiflorum</i> Wall.ex DC.	Grand viburnum/Thlain	Viburnaceae	Shrub	Bark decoction treats hepatic ailments	HFRI- Herbarium:68 58
43	<i>Zanthoxylum armatum</i> DC.	Winged prickly ash/Timbar, tirmir	Rutaceae	Shrub	Used as toothbrush and prevents oral cavities (twigs). Fruits are taken in case of mouth ulcers	HFRI- Herbarium:68 57
44	<i>Zizyphus mauritiana</i> Lamk.	Indian jujube/Ber	Rhamnaceae	Tree	Decoction of fruits and bark is taken with milk which is known to treat stomach ailments	HFRI- Herbarium:68 59

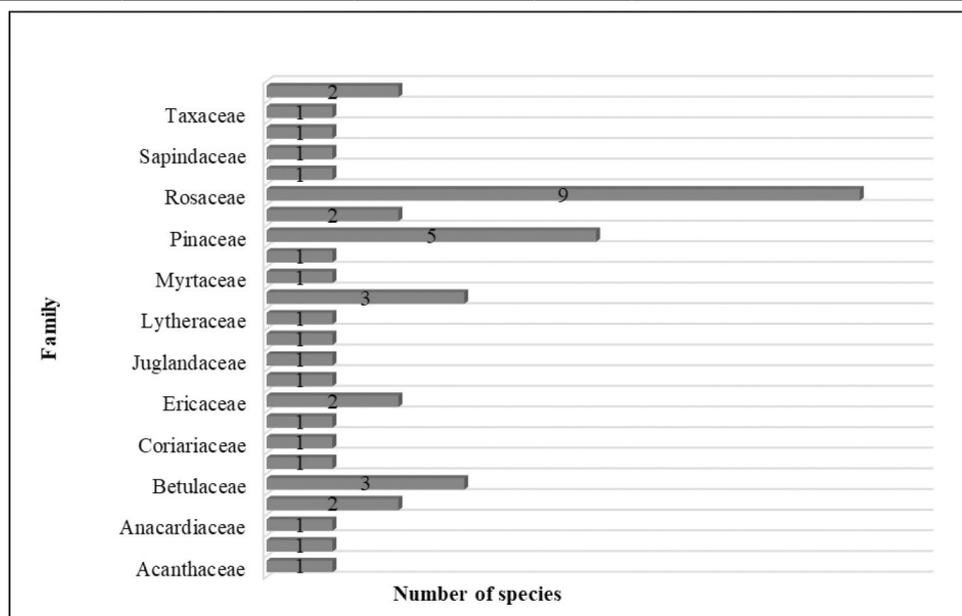


Figure 2: Family wise distribution of ethnomedicinal plants

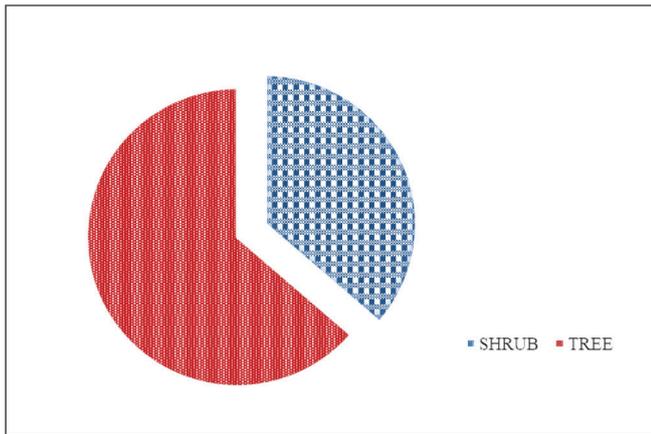


Figure 3: Habit wise distribution of ethnomedicinal plants

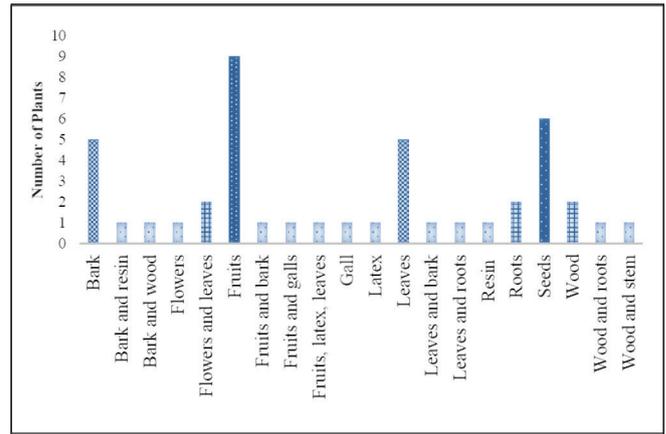


Figure 4: Plant part used to treat various ailments



Figure 5: From top left to bottom right, A. *Rosa sericea* Lindl., B. *Elaeagnus umbellata* Thunb., C. *Cotoneaster microphyllus* Wall ex. Lindl., D. *Aesculus indica* (Wall. ex Cambess.) Hok., E. *Berberis aristata* DC., F. *Neolitsea pallens* (D.Don) Momiy. & H.Rara, G. *Prinsepia utilis* Royale, H. *Cedrus deodara* (Roxb. ex D.Don) G.Don, I. *Rosa macrophylla* Lindl.

Conclusion

This knowledge is of prime importance to the healthcare system of the rural mountainous areas where there is a huge scarcity of registered medical practitioners. Ethnobotany gives an idea of the richness of traditional knowledge and provides a clue to potential new drugs. An effective way to find new drugs is to follow the indigenous knowledge of traditional medicine (Spjut & Perdue, 1976). Therefore, documentation of indigenous knowledge through ethnobotanical studies plays a key role for the conservation and utilization of biological resources (Muthu et al., 2006). Recording indigenous knowledge is essential in ethnobotany as research since traditional information is declining and cultural knowledge is being forgotten.

Ethnobotanical research could save traditional practices, cultures, ecosystems, and languages whose loss is causing the forgetting. More often today, the threatening loss of knowledge is the result of deliberate or purposive modern education, urbanization, media and commercial arts. Furthermore, to protect and develop the valuable knowledge of ethnobotanically important plants, their use should be encouraged, especially among the younger generation that will indeed save wealth and health of the tribal community. Baseline information, such as that provided in this study, on the useful species is essential to understand the population status of wild species to identify their economic and conservation value and thus develop strategies for conservation and management of economically important species that are under high anthropogenic pressure. Therefore, documentation of information on indigenous knowledge and practices will help in conserving the knowledge. Such information for the other parts of the IHR should also be documented; so that a comprehensive database of the plants used in various purposes could be made and information could be disseminated to the new generation for awareness and sustainable utilization of plants.

Author Contributions

Astha Chauhan has carried out all the field surveys, analyzed the data and wrote the research paper. Dr.

Vaneet Jishtu has edited the paper and identified the plant species of the study area. Mr. Shailender assisted in carrying out the field surveys.

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