



ASSESSMENT OF WILD MEDICINAL PLANT USED BY MIGRATORY SHEPHERDS IN ALPINE AREA OF RAKCHHAM- CHITKUL WILD LIFE SANCTUARY OF DISTRICT KINNAUR IN HIMACHAL PRADESH

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Abstract

The present study was carried out during July 2017 to December 2018 to obtain the information on ethnomedicines used by migratory shepherds in Rakchham-Chitkul wildlife sanctuary situated in remote tribal district of Kinnaur in Himachal Pradesh. It was observed that in Rakchham-Chitkul wild life sanctuary a total of 68 wild medicinal plants were being used by shepherds and a few of these belonged to the same families. It was recorded that herbs species were markedly high (32) followed by tree (19), shrubs (10), grasses (5), climber (1) and fern (1). These wild species were not the only used by migratory shepherds for ethnomedicines but they also used for several purpose such as food, fodder, fuel and ethnoveterinary medicines etc. These days the awareness towards ethnomedicines and their products has been increasing in urban settlements as well as in rural areas. This development leads to greater demand for Himalayan medicinal plants, and one of the impacts is over-harvesting of these medicinal important species. Unfortunately, this knowledge of the people is vanishing fast and also there is a lack of proper documentation of medicinal plants of the area. There is urgent need to document this vast knowledge and experience of migratory shepherds concerning the use of ethnobotanical remedies for human health care. This survey was carried out with the aim of identification, exploration and documentation, of vast treasure of ethnobotanical information of wild medicinal plants used by migratory shepherds. The documentation of plant resources and the indigenous knowledge of shepherds highlighted in the present study is a step about raising awareness about the importance of these wild medicinal plants and their further conservation.

Key words: Ethno-medicines, Shepherds, Livestock, Tribal, Biodiversity.

Introduction

Indian Himalayan region (IHR) occupies about 18% of the total geographical area of India. It exhibits miscellaneous topography, climate, ecology and is well known for rich biodiversity in mountainous area and in the foot hills or plains of Himalayas throughout. The rich floral composition utilized in various forms including medicines, fodder, fuel, timber and food by the native people (Misri, 1995, Srama and Mishra, 2009; Hasan, 2009; Verma, 2014). The Indian Himalayan Region consist of more than 18,440 species of angiosperm plants – out of which 25% are endemic to the area (Singh and Hajra, 1996; Samant *et al.*, 1998). In India, it is assessed that about 800 important species are used as wild edible food, mainly by the tribal community (Singh and Arora, 1997). In India, the tribal community generally depend on forests for their day-to-day needs. The tribal people spend most of their time with nature and they have vast hereditary traditional knowledge of consuming wild plants such as fruits, shoots, tubers, roots, leaves etc. as a good source of food. Although, these edible plants play a vital role in food security, they are ignored (Khoshoo, 1991; Sharma *et al.*, 2009).

The Himalaya also comprises of different human groups, which differ in terms of culture, language, belief, tradition and pattern of resources use. Himachal Pradesh, situated in the centre of the Western Himalayas, having various agro-climatic conditions ranging from semi-tropical to alpine. Himachal Pradesh is rich in terms of flora and fauna, mainly due to varied climatic conditions fluctuating from tropical in the foothills to arctic environment in the trans-Himalayan area. Himachal Pradesh, average elevations above mean sea levels varies from 350 m to 7000 m and the climate is characteristically temperate. It has a forest cover of 26% (FSI, 2013). Himachal Pradesh is home to a sizeable tribal inhabitant like the Pangwals, Gaddis, Kinnauras, Gujjars, Lahulis and Bhots. Migratory shepherds use sub-alpine and alpine pastures for rearing their livestock. Due to ever-increasing demand of animals and animal products, the livestock population has increased multiple, thereby increasing pressure on these alpine and sub-alpine pastures. Nomadic tribes rearing goats and sheep move their livestock throughout the year in search of grazing pastures. Nomadic tribes move throughout the year from high hills to low hills and vice versa, leaving for low hills with the

commencement of winter season and returning to their villages in summer season. Shepherds move from high hills in the month of July towards mid hills, and finally by September-October reach low hills and plains where they temporally settle upto the month of March, and again start their return journey for high hills. Their period of stay both during migration and reverse migration often varies. The routes followed by migratory shepherds are century's old. Every year the movement of shepherds is in the early morning and there is no set pattern to the variation. The caravans commonly move along the roads for suitability and avoid traffic (Suri, 2014). Although, in the state of Himachal Pradesh, it is very challenging to make an exact approximation of the migratory sheep and goat population it has been reported that these constitute about 70% of the total goat and sheep (Misri, 1998). The recent trend of nomadic herders settling in hospitable climates has brought agriculture and other occupations to front and shepherding taken the secondary site (Biswas and Rao, 2010).

All over the world there are over 20,000 edible plant species, until now only 30 plant species are used to meet the 90% world's food necessity (Abbasi *et al.*, 2013). Identification of different phytochemical constituents present in different plant species is the most important tool to recognize the active moiety of plants (Rawat *et al.*, 2018).

Sanctuary may also be established for the reason of sustaining biodiversity or conserving nations unique natural environment. In many cases, sanctuaries are created to protect endangered species with a restricted territorial range. The Rakchham-Chitkul wildlife sanctuary is present in tribal district of Kinnaur in Himachal Pradesh situated in the Baspa valley (Sangla valley) and is characterized by lofty snow mountaintops lying on the right and left banks of Baspa river. The parts of Rakchham-Chitkul wildlife sanctuary gets the good precipitation in the form of snow. The forest category of Rakchham-Chitkul wildlife sanctuary includes Lower Western Himalayan Temperate Forest, Sub-Alpine Birch-Fir Forest, Upper Western Himalayan Temperate Forest. The Rakchham-Chitkul wildlife sanctuary has not received enough courtesy of the field biologists due to unreachable habitat, tough environmental conditions, and deficiency of local expertise (Negi, 1999).

The alpine areas generally fall in the great Himalayan ranges, these are about 2400 km in length and differ from 240 to 400 km in width with a number of peaks rising well above 7200 m, form the greatest outstanding feature in the topography of the World. In India alpine pastures occupy about 1.52% of the entire

land part in the country. In Himachal Pradesh alpine pastures cover around 17% of the total geographical area of the state. For the sustained expansion of these resources, appropriate supervision is the only way out. Floristic composition, population size and variety of species are significant biological essentials of an ecosystems. At the same time phytosociological studies are also useful for comparing varied communities. Due to deficiency of appropriate management practices, a huge number of pastures areas have been converted or are in the progression of conversion to degraded areas. Very few scientific attention has been implicit to the vegetation of the alpine areas (Chauhan, 1990; Verma and Kapoor, 2013).

Moreover, Himachal Pradesh has led to tribal ways of life, adherence to the myths and primitive customs and traditions signifying an enormous and tough terrain of scattered human settlement and sensitive environment. Ethnobotanical information is also existing for different districts of Himachal Pradesh as Chamba, Lahaul and Spiti, Kinnaur and Mandi (Sharma *et al.*, 2005; Singh and Kumar, 2008; Dutt and Nath, 2014; Singh, 2015; Kumar, 2016). In the recent past, prominence of wild plants in food and other nutraceutical uses has gained importance and, as a result there is extractive pressure on these plant resources. Extraction of these edible plants (like *Abies spectabilis*, *Asparagus filicinus*, *Berginia ciliata*, *Dioscorea deltoidea*, *Junniperus communis*, *Juniperus polycarpus*, *Lilium polyphyllum*, *Picrorhiza kurrooa* medicinal and aromatic plants, etc.) is already popular even amongst urban and rural people. This is now putting huge market pressure on these important species with the rural people realizing the nutritional potential of these plants and supplementary income generation. Literature study reveals that there are some researchers who have worked on wild plant species of Himalayas, however such studies are missing from this particular area (Jana and Chauhan, 1998).

In recent years, attention in herbal medicines has increased significantly as they are supposed to be relatively less toxic than the synthetics medicines and easy to accessible from environments without any cost. But if efforts are not made with immediate effect, the huge traditional information possessed by tribal people will diminish rapidly. This calls for an urgent need to document ethnomedicine plant species. Unfortunately, this significant traditional knowledge of medicinal plants based system ongoing to disappear with the way of time, due to absence of proper documentation, because of ignorance and illiteracy of the tribal groups thus, results in the destruction of significant information related with medicinal plants. Low earnings in these traditions forces the societies to give up these practices

and look for other profitable profession. However, the significance of this fast eroding traditional information is being understood and studies are being conducted to gather this beneficial information with a scientific method.

Therefore, the present study is an attempt to document the ethnomedicines used by migratory shepherds in tribal range of district Kinnaur in Rakchham and Chitkul wildlife sanctuary. There is no proper record available ethnomedicines used by shepherds in Rakchham and Chitkul wildlife sanctuary. This study was also carried out to know the multiple use of medicinal plant species of alpine area, which in turn could be helpful in planning strategies for better management. The ethnobotanical study on medicinal plants of this region and is expected to provide new dimensions forever expanding pharmaceutical industry.

Materials and Methods

(A) Study area

The present study documents the use of wild medicinal plants (plants and /or plant parts) by the migratory shepherds in Rakchham- Chitkul wildlife sanctuary present in remote tribal district of Kinnaur in Himachal Pradesh (Fig. 1). The Rakchham-Chitkul wildlife sanctuary located in the Baspa valley (Sangla valley) with geo-coordinates of latitude $31^{\circ}14'22''$ N - $31^{\circ}28'37''$ N and longitudes $78^{\circ}17'31''$ E - $78^{\circ}31'30''$ E covering an area of about 304 Km^2 , in the northeast corner of the Kinnaur district of Himachal Pradesh, India (Fig. 1). The altitude of Baspa valley ranges from 3,200masl to 5,486masl and temperature changing from -15°C to 18°C , mean rainfall is 463 mm and yearly snowfall 1130 mm (Chawla *et al.*, 2012). The Baspa valley has a remarkable topography of orchards, green vegetation, snow covering peaks and cold desert elevations (Balokhra, 2002).

(B) Data Collection

For this study, extensive field trips of the entire area of Rakchham-Chitkul wildlife sanctuary were undertaken between June 2017 to December 2018. The information on wild medicinal plants used by migratory shepherds in Rakchham-Chitkul wildlife sanctuary was collected by using a pretested questionnaire, interviews, participatory observation and through discussions method (Fig. 2). Only those medicinal plants were collected, which were most frequently used by the tribes for the treatment of various ailments. The specimens of wild medicinal plants being used by shepherds were collected, dried and mounted on herbarium sheets, with label information describing when and where they were collected. Vouchers of plants were placed in the herbarium of the Shoolini University, Solan. Plants were

identified either in the field itself through literature study or with the help of experts from Forest Research Institute, Dehradun (Uttarakhand) and Botanical Survey of India Dehradun (Uttarakhand) (Chauhan, 1989).

Results and Discussion

Rakchham-Chitkul wildlife sanctuary is rich in Bio-diversity but quite unexplored and little effort has been completed to inventorize, explore and evaluate the aromatic and medicinal plants that are used by the inhabitants of this region. It is a part of the Greater Himalayas varies from 1500 m to 4500 m. The length of the valley is about 65 km which shields an area of nearly 300 km^2 and accommodating approximately 9,500 populations. The valley consists of a number of small watersheds which find their way into the Baspa River. Moreover, hamlets are scattered all along the valley. North facing slope is relatively gentle and has adequate vegetation cover, soil cover, sporadic settlements and farm fields. Topmost part of the mountain peaks are usually covered with snow for few months of the year with the melting of snow unexpected diversity of beautiful colored flowers occupies these mountain creating a rich store of wild aromatic and medicinal plants (Chauhan, 2003).

Non-availability of feedstuff causes seasonal migration of tribal shepherds. It is a traditional old procedure in the tribes of higher Himalayan region. It was observed that most of the shepherds start migration from their villages in the month of July and August and in October there is no seasonal migration as the winters sets in. The tribe of migratory shepherds move in a group of their own family members (Table 1). Shepherds move in a group of their own family members and size of the flock (of goats and sheep) varied from 700-2000. The tribal shepherds also take along with them few horses for carrying provisions (Table 1). Often few dogs also accompany the shepherds and, in fact, these dogs are trained in protecting the sheep, goats and horses from wild animal's attacks. The present study also indicated that shepherds having high number of flock are comparatively well off compared to those with less number. In our study it was found that irrespective of flock size, the shepherds travel same distance. Irrespective of their origin of migration Rakchham-Chitkul wildlife sanctuary the shepherds move first to grazing sites in Chopal in Shimla district. In the second stage, the shepherds then move to Churdhar ranges and from here to Renukaji in Sirmour district. Finally, in the months of September-October they reach the low hills in Poanta-Sahib in Sirmour district and temporarily settle here upto the month of March, and the tribal shepherds again start their return journey to their

respective places by end of March month (spring season).

The present study revealed that the wild medicinal plants not only used as medicines but also for their livestock. It was observed that during their migration in Rakchham-Chitkul wild life sanctuary a total of 68 species were being used by migratory shepherds and a few of these belonged to the same families (Table 2). Out of 68 medicinal plant species recorded from the sanctuary, some species i.e., *Betula utilis*, *Picrorhiza kurrooa*, *Taxus wallichiana* and *Saussurea obvallata* etc. fall in the category of threatened plants. It was recorded that herbs species were markedly high (32) followed by Tree (19), shrubs (10), Grasses (5), Climber (1) and Fern (1) (Table 2). These wild species were not the only used by migratory shepherds for ethnomedicines but they also used for several purpose such as such as food, fodder, fuel and ethnoveterinary medicines (Fig. 3). It was found apart from used as ethnomedicinal plants 41 plant species used as fodder, 27 species for fuel, 41 species as ethnoveterinary and 15 species as wild edible plants (Table 3). Interestingly, the shepherds informed that their preference for medicines is *Picrorhiza kurrooa* (Herb) as it one of the important medicine used for blood purifier, cough, cold and Jaundice. Some of the medicinal plant species like *Betula utilis*, *Betula alnoides*, *Berberis lycium*, *Dioscorea deltoidea*, *Thymus serpyllum*, *Oxalis corniculata* and *Cannabis sativa* were commonly used for medicinal purposes especially for stomachic, skin infection, wounds healing, jaundice, headache and reduce mental stress as while they move (Table 2). The ethnobotanical use of some of these wild species has also been reported from various parts of India (Sood *et al.*, 2001; Singh and Rawat, 2011; Charjan and Dabhadkar, 2014; Kumar, 2016; Sharma, 2016; Bagga *et al.*, 2018).

There is always scarcity of food and fodder for themselves and livestock. For this they explore adjoining areas, particularly degraded lands, allow fields and village commons. It was interesting to note that their migration patterns closely mirrors the seasonal availability of natural food and fodder. It was observed in Khangchendzonga National Park that migration movements match with seasonal fodder resource availability. Shepherds during enroute migration face many problems like food, fodder, water deficit, veterinary facilities, wild animals, predators and sometimes road accidents of their livestock. Such problems have also been reported by many previous studies (Tambe *et al.*, 2009; Rao *et al.*, 2011; Suresh *et al.*, 2011; Thakur and Puri, 2016; Kaintura, 2017).

Description of the different species of plants, phenology, distribution of the species, habit, habitat, useful traits for abiotic and biotic stress reported by many workers from all over the world (Dikshit *et al.*, 2017). Biodiversity is respected because people cannot be familiar with what will be an asset in the upcoming future, because diversity is more attractive and our understanding of natural ecosystems is insufficient to be certain of the role and the effect of eliminating any component (Kapoor, 2017). The livelihood of shepherds and their family members is also met through selling of meat of sheep and goat. Wool is also sold but its contribution to livelihood is meagre. Unfortunately, deforestation activities and the changing climatic conditions have made availability of medicinal plants as a scarce resource to the migratory shepherds. The results of this study show that shepherds in tribal areas are highly dependent on ethnobotanical remedies, which evolved over generations of experience and practices, for the healthcare. This significant information is still mysterious to the outside world. In order to preserve their vast treasure of traditional knowledge, were inventoried and the ethno-botanical knowledge with respect to their use was collected. Plant and plant products play an important role in the lives of these shepherds. The critical review of the past work done and the result of this survey suggest that wild medicinal plants are very important for migratory shepherds living in tribal areas of Himachal Pradesh. It is also emphasized that sufficient interest has not been put in conserving and promoting traditional wild medicinal plants. The need is to adopt large scale plantation of these medicinal plants within the forests as well as along roadsides so that the migratory shepherds are benefited.

Conclusion

The migratory shepherds are very close to nature as they spend most of their time in forests with their livestock. They move with their livestock in search of quality grazing lands; and while on the move during migration they depend on local wild edible plants as their food and health purpose. Indian Himalayas has an astonishing variety of plant species due to its unique location, and has been regarded as a treasure which is confine to persons living here, but this treasure is diminishing very fast because migratory shepherds residing in this area hesitate to share their ethnobotanical information with others. Migratory shepherds are not ready to go ahead with this old traditional system of medicine, due to less profits generation and touching towards profitable profession, which results in gap of significant information between young and old generation. Identification of different phytochemical constituents present in different plant species is the most important tool to recognize the active

moyety of plants (Deepa and Rawat, 2011). There are number of endangered medicinal plants, status of these plants is not known to migratory shepherds due to high ignorance and illiteracy. They are using these important resources in unsustainable way causing vast harm to biodiversity. Unfortunately, deforestation activities, changing climatic conditions and over harvesting of medicinal plants have made availability of wild medicinal plants as a scarce resource to the migratory shepherds. The critical review of the past work done and the results of this survey suggest that wild plants and plant products play an important role in the lives of migratory shepherds living in tribal areas in Himachal Pradesh. It is also emphasized that sufficient interest has not been put in conserving and promoting traditional wild medicinal plants. The need is to adopt large scale plantation of these wild plants within the sanctuary, forests as well as along roadsides so that the migratory shepherds are benefited.

The present observations show that the migratory shepherds are particularly living in high altitude and remote areas mainly depend upon the natural plant resources to meet their day-to-day requirements from surroundings. But in the present day new generation is continuously forgetting the use of local natural recourses as food. It is also observed that due to over

exploitation of forests, these valuable plants and plants products are losing their existence, so it is necessary to improve the sustainable as well as socioeconomic use of these forest resources and also to develop agro-based and silvicultural practices in the forests so that these valued gift of nature do not disappear from the part of Himachal Pradesh. So it's a time that, state should made strict laws for sustainable development of environment.

Therefore, much importance should be given to: (i) collection, and exploration (ii) *ex situ* conservation (iii) product development and marketing (iv) *In situ* conservation (v) studying nutritional.

Conflict of Interest Statement

We declare that we have no conflict of interest.

Acknowledgement

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Table 1: Basic information of the shepherd's caravan in the study area

Sr. No.	Particulars	Study site Rakchham and Chitkul wildlife sanctuary of district Kinnaur				
1.	Group size (No.)	5	5	6	5	6
2.	Horses	3	2	4	2	2
3.	Dogs	3	2	4	2	2
4.	Average family income (all sources, Rs. Lakh/annum)	3	2	4	3	2

Table 2: A list of medicinal plants used by migratory shepherds in Rakchham and Chitkul wildlife sanctuary in district Kinnaur

Sr. No	Botanical Name	Local Name	Family	Habit	Flowering and Fruiting	Parts used	Ethno-medicinal Uses	Mode of application
1	<i>Asparagus adscendens</i> Roxb	Safed musali	Asparagaceae	Shrub	May-June	Roots	Dysentery, Diarrhea, Throat complaints, Antiseptic	Decoction
2	<i>Acer pictum</i> Thunb	Kandal	Aceraceae	Tree	March-November	Leaves, Fruits	Skin allergy, Sun burn	Paste
3	<i>Acer caesium</i> Wall.ex. Brandis	Kandal	Aceraceae	Tree	March-November	Leaves	Skin allergy, Sunburn	Paste
4	<i>Abies spectabilis</i> D.Don	Tosh	Pinaceae	Tree	March-November	Leaves, Needles	Fever, Chest infection, Cough, Cold	Powder
5	<i>Argimone mexicana</i> L.	Satyanashi	Papaveraceae	Herb	December-Feb.	Leaves, Roots	Skin allergy, Sun burn.	Paste
6	<i>Asparagus filicinus</i> D.Don	chiriya-kanda	Asparagaceae	Shrub	May-June	Roots	Dysentery, Diarrhea, Throat complaints, Antiseptic	Decoction
7	<i>Apluda mutica</i> L.	Pongta	Poaceae	Grass	October-November	Leaves	Skin infection	Paste

8	<i>Achillea millefolium</i> L.	Gandana	Asteraceae	Herb	July-September	Leaves, Flower heads, Entire plant	Tonic, Fever, Cold, Piles	Decoction
9	<i>Artemisia vestita</i> L.	Kubish	Asteraceae	Herb	October-November	Roots	Antiseptic, Wound healing	Powder
10	<i>Adiantum caudatum</i> L.	Morshikha	Pteridaceae	Fern	Throughout the year	Entire plant	Skin eruption, Headache, Joint pain.	Powder
11	<i>Berginia ciliata</i> (Haw.) Starnb	PashanBhed	Saxifragaceae	Herb	June-August	Roots, Flowers	Kidney stones, Liver disorders.	Decoction
12	<i>Betula utilis</i> D.Don	Bhojpatra	Betulaceae	Tree	June-October	Leaves	Wounds healing, Jaundice.	Tea made of dry leaves
13	<i>Berberis aristata</i> DC.	Kashmal	Berberidaceae	Shrub	March-June	Leaves, Stem, Roots,	Cough, Cold, Fever, Asthma, Respiratory problems, Joint pain, Headache	Decoction
14	<i>Bidens biternata</i> L.	Chirchitta	Compositae	Herb	April-October	Leaves, Roots	Headache, Skin allergy, Joint pain	Paste
15	<i>Buxus wallichiana</i> L.	Papri	Euphorbiaceae	Shrub	April-May	Roots	Cough, Cold, Wound healing	Powder
16	<i>Berberis lycium</i> Royle	Kashmal	Berberidaceae	Shrub	March-June	Seeds	Indigestion, Diarrhea, Cough, Cold, Fever, Constipation, Wound healing	Seeds are eaten raw
17	<i>Betulaalnoides</i> Buch.-Ham. ex D.Don	Bhojpatra	Betulaceaea	Tree	April-September	Leaves	Ear infection, Body pain, Wound healing	Leaves
18	<i>Carpinus viminea</i> Wall.ex. Lindl	Khari	Betulaceaea	Tree	March-April	Leaves	Wound healing	Paste
19	<i>Chenopodium album</i> L.	Bathua	Chenopodiaceae	Herb	July-September	Leaves, Flowers	Indigestion, Diarrhea, Cough, Cold, Fever, Wound healing	Powder
20	<i>Cynodon dactylon</i> L.	Dhruv	Poaceae	Grass	Throughout the year	Roots	Diarrhea, Fever, Cold, Skin infections	Powder
21	<i>Celtris tetrandra</i> Roxb	Khirk	Urticaceae	Tree	February-March	Fruits	Indigestion	Fruits are eaten raw
22	<i>Cannabis sativa</i> L.	Bhang	Cannabinaceae	Herb	June-October	Seeds	Headache, Reduce mental stress.	Powder
23	<i>Daphne papyraceae</i> Wall.ex Steud	Bhanchoi	Thymelaceae	Shrub	March-July	Roots	Headache	Paste
24	<i>Dioscorea deltoidea</i> Wall	Shingli-mingli	Dioscoreaceae	Climber	July-October	Tuber	Constipation, Asthma, Wound healing, Joint pain, Cough, Cold, Fever	Decoction
25	<i>Euphorbia hirta</i> L.	Bara dudhi	Euphobiaceae	Herb	Throughout the year.	Leaves	Wound healing, Skin allergy.	Paste
26	<i>Ephedra gerradiana</i> Wall	Somlata	Ephedraceae	Shrub	May-September	Leaves, Roots	Indigestion, Fever, Cough, Cold, Reduce blood pressure, Skin allergy	Powder
27	<i>Ficus religiosa</i> L.	Pipal	Moraceae	Tree	March-October	Seeds, Leaves	Reduce blood pressure, Indigestion.	Decoction
28	<i>Fraxinus floribunda</i> Wall	Sunnu	Oleaceae	Tree	June-July	Leaves	Wound healing	Paste
29	<i>Hippophae salicifolia</i> D.Don	Tarwa	Elaeagnaceae	Herb	June-July	Fruits	Sunburn, Skin allergy, Wound healing	Paste
30	<i>Heteropogon contortus</i> L.	Kumryaghas	Poaceae	Grass	March-November	Leaves	Joint pain	Paste
31	<i>Juglans regia</i> L.	Akhrot	Juglandaceae	Tree	February-April	Leaves, Fruits	Indigestion, Tooth pain, Constipation	Decoction
32	<i>Junniperus communis</i> L.	Hapusha	Coniferae	Tree	March-September	Fruits, Bark, Needles	Fever, Cough, Cold, Piles	Powder
33	<i>Juniperus polycarpus</i> L.	Shur	Cupressaceae	Tree	March-September	Leaves	Cardiac problems	Powder

34	<i>Jurinea dalomiaea</i> Boiss	JariDhoop	Asteraceae	Herb	July-September	Roots	Cough, Cold, Fever	Decoction
35	<i>Jurinea macrocephala</i> Benth	Dhoop	Asteraceae	Herb	March-September	Berries	Cough, Piles, Skin eruptions	Powder
36	<i>Lyonia ovalifolia</i> (Wall.) Drude	Angeri	Ericaceae	Shrub	April-June	Leaves	Skin infections	Paste
37	<i>Lilium polyphyllum</i> D.Don ex Royle	ksirakakoli	Liliaceae	Herb	July-August	Leaves	Constipation, Cough	Powder
38	<i>Oxalis corniculata</i> L.	Amrul	Oxalidaceae	Herb	April-October	Entire plant	Stomachic, Skin infection	Powder
39	<i>Oxalis acetosella</i> L.	Amloni	Oxalidaceae	Herb	April-October	Entire plant	Skin infection, Joint pain	Powder
40	<i>Phytolacca acinosa</i> Roxb	Jalga	Phytolacceae	Herb	April-June	Leaves	Joint pain, Skin allergy	Paste
41	<i>Parthenium hysterophorus</i> L.	Jari	Compositae	Herb	April-August	Roots	Wound healing	Paste
42	<i>Picrorhiza kurrooa</i> Royle ex Benth	Kour	Scrophulariaceae	Herb	June-August	Rhizomes, Stolens	Blood purifier, Blood pressure reducer, Cough, Cold, Jaundice	Rhizomes and Stolens are eaten raw
43	<i>Panicum silopodium</i> Trin	Bansi	Poaceae	Grass	August-September	Leaves	Skin allergy	Paste
44	<i>Polygonum verticillatum</i> L.	Mithadodhu	Polygonaceae	Herb	June-September	Leaves, Roots	Skin allergy, Ear pain	Paste
45	<i>Pinus wallichiana</i> A.B. Jacks	Kail	Pinaceae	Tree	April August	Roots	Headache, Joint pain	Paste
46	<i>Potentilla nepalensis</i> Hook	Laljarhi	Rosaceae	Herb	June-September	Leaves, Roots	Joint pain, Skin eruption	Paste
47	<i>Prunus armeniaca</i> L.	chaair	Rosaceae	Tree	April-July	Fruits	Indigestion, Piles	Fruits are eaten raw
48	<i>Quercus ilex</i> L.	Punj	Fagaceae	Shrub	August-September	Leaves	Skin allergy	Paste
49	<i>Quercus floribunda</i> Lindl	Maru	Fagaceae	Tree	August-September	Leaves, Roots	Skin allergy, Joint pain, Burns	Paste
50	<i>Quercus leucotrichophora</i> Hook	Banj	Fagaceae	Tree	August-September	Leaves	Skin allergy, Joint pain, Wound healing	Paste
51	<i>Rubia cordifolia</i> L.	Manjith	Rubiaceae	Herb	June-August	Leaves	Skin infection, Wound healing	Paste
52	<i>Ranunculus diffusus</i> DC.	Maardi	Ranunculaceae	Herb	March-May	Roots, Leaves	Skin allergy	Paste
53	<i>Rosa webbiana</i> Wall	Jangligulab	Rosaceae	Shrub	May-July	Flowers	Indigestion	Powder
54	<i>Rumex hastatus</i> D.Don	Khatimal	Polygonaceae	Herb	June-August	Roots, Shoots	Indigestion, Piles, Blood purifier, Reduce blood pressure, Skin infection, Body cuts	Roots and shoots are eaten raw
55	<i>Selinium vaginatum</i> C.B. Clarke	Bhutkeshi	Umbellifereae	Herb	July-September	Roots	Reduce blood pressure, Cough, Cold, Constipation, Diarrhea.	Powder
56	<i>Sassureacostus</i> (Falc.) Lipsch	Kuth	Asteracea	Herb	July-August	Leaves, Roots	Constipation, Cough, Cold, Asthma, Fever, Headache	Decoction
57	<i>Sassurea obvallata</i> (DC.) Edgew	Brahma Kamal	Asteraceae	Herb	July-September	Leaves, Roots	Joint pain, Wound healing	Paste
58	<i>Saccharum bengalensis</i> Retz	Munj	Poaceae	Grass	May-August	Roots	Body pain, Body cuts	Paste
59	<i>Solanum surattense</i> Burm. F.	Kateli	Solanaceae	Herb	October-November	Roots	Reduce blood pressure, Skin allergy, Cough, Cold.	Powder
60	<i>Thymus serpyllum</i> L.	Ban-ajwain	Lamiaceae	Herb	June-July	Roots, Leaves	Joint pain, Tooth pain, Skin allergy, Body pain, Indigestion,	Powder and paste
61	<i>Taxus wallichiana</i> Zucc	Brammi	Taxaceae	Tree	March-October	Young needles	Headache, Diarrhea, Fever	Powder

62	<i>Trillium govanianum</i> D.Don	Nagchhatri	Trilliaceae	Herb	May-June	Roots, Leaves	Fever, Cough, vomiting,	Powder
63	<i>Toona ciliata</i> Roem	Toon	Meliaceae	Tree	February-May	Roots, Leaves	Joint pain, Skin allergy	Paste
64	<i>Urtica palviflora</i> Roxb	Bichchhubuti	Urticaceae	Herb	May-August	Roots, Leaves	Indigestion, Piles, Skin allergy, Body cuts	Leaves are eaten raw
65	<i>Urtica dioica</i> L.	Bichchhubuti	Urticaceae	Herb	May-August	Leaves	Tonic	Leaves are eaten raw
66	<i>Vitex negundo</i> L.	Nirgundi	Lamiaceae	Tree	January-April	Leaves, flowers	Joint pain, Tooth pain, Skin allergy, Body pain	Powder and paste
67	<i>Valeriana jatamansi</i> D. Don	Mushkbala	Valerianaceae	Herb	June-September	Whole plant	Reduce blood pressure, Headache	Powder and paste
68	<i>Verbascum thapsus</i> L.	Ban tambaku	Scrophulariaceae	Herb	July-October	Flowers, Roots	Wound healing, Body cuts	Paste

Table 3: Ethnomedicinal plant species used by migratory shepherds in Rakchham and Chitkul wildlife sanctuary for multipurpose use

Sr. No	Botanical name	Ethnoveterinary use	Fodder use	Edible plants	Fuel use
1	<i>Asparagus adscendens</i> Roxb	✓	○	✓	○
2	<i>Acer pictum</i> Thunb	○	✓	○	✓
3	<i>Acer caecium</i> Wall.ex. Brandis	○	○	○	✓
4	<i>Abies spectabilis</i> D.Don	✓	✓	○	✓
5	<i>Argimone mexicana</i> L.	✓	✓	○	✓
6	<i>Asparagus filicinus</i> D.Don	✓	○	✓	○
7	<i>Apluda mutica</i> L.	○	✓	○	✓
8	<i>Achillea millefolium</i> L.	✓	○	○	✓
9	<i>Artemisia vestita</i> L.	✓	✓	○	✓
10	<i>Adiantum caudatum</i> L.	○	○	○	✓
11	<i>Berginia ciliata</i> (Haw.) Starnb	✓	✓	○	✓
12	<i>Betula utilis</i> D.Don	✓	✓	○	✓
13	<i>Berberis aristata</i> DC.	✓	✓	✓	✓
14	<i>Bidens biternata</i> L.	✓	✓	○	○
15	<i>Buxus wallichiana</i> L.	✓	○	○	○
16	<i>Berberis lycium</i> Royle	✓	✓	✓	✓
17	<i>Betulaalnoides</i> Buch.- Ham. ex D.Don	✓	✓	○	✓
18	<i>Carpinus viminea</i> Wall.ex. Lindl	○	○	○	✓
19	<i>Chenopodium album</i> L.	○	○	✓	○
20	<i>Cynodon dactylon</i> L.	✓	✓	○	✓
21	<i>Celtris tetrandra</i> Roxb	○	○	✓	✓
22	<i>Cannabis sativa</i> L.	✓	○	✓	✓
23	<i>Daphne papyraceae</i> Wall.ex Steud	○	○	○	✓
24	<i>Dioscorea deltoidea</i> Wall	✓	✓	○	✓
25	<i>Euphorbia hirta</i> L.	✓	✓	○	✓
26	<i>Ephedra gerradiana</i> Wall	✓	○	○	○
27	<i>Ficus religiosa</i> L.	✓	✓	○	✓
28	<i>Fraxinus floribunda</i> Wall	○	○	○	✓
29	<i>Hippophae salicifolia</i> D.Don	✓	○	○	○
30	<i>Heteropogon contortus</i> L.	○	○	○	○
31	<i>Juglans regia</i> L.	✓	○	✓	○
32	<i>Juniperus communis</i> L.	✓	✓	○	○
33	<i>Juniperus polycarpus</i> L.	✓	○	○	○
34	<i>Jurinea dalomiaea</i> Boiss	✓	○	○	○
35	<i>Jurinea macrocephala</i> Benth	✓	○	○	○

36	<i>Lyonia ovalifolia</i> (Wall.) Drude	○	○	○	○
37	<i>Lilium polyphyllum</i> D.Don ex Royle	○	○	○	✓
38	<i>Oxalis corniculata</i> L.	✓	✓	✓	✓
39	<i>Oxalis acetosella</i> L.	✓	✓	○	✓
40	<i>Phytolacca acinosa</i> Roxb	✓	✓	○	○
41	<i>Parthenium hysterophorus</i> L.	○	○	○	✓
42	<i>Picrorhiza kurrooa</i> Royle ex Benth	✓	○	○	○
43	<i>Panicum silopodium</i> Trin	○	✓	○	○
44	<i>Polygonum verticillatum</i> L.	○	✓	○	○
45	<i>Pinus wallichiana</i> A.B. Jacks	○	○	○	○
46	<i>Potentilla nepalensis</i> Hook	○	✓	○	○
47	<i>Prunus armeniaca</i> L.	○	✓	○	✓
48	<i>Quercus ilex</i> L.	○	✓	○	✓
49	<i>Quercus floribunda</i> Lindl	○	✓	○	✓
50	<i>Quercus leucotrichophora</i> Hook	○	✓	○	✓
51	<i>Rubia cordifolia</i> L.	✓	✓	○	✓
52	<i>Ranunculus diffusus</i> DC.	✓	✓	○	○
53	<i>Rosa webbiana</i> Wall	✓	✓	✓	○
54	<i>Rumex hastatus</i> D.Don	✓	✓	✓	✓
55	<i>Selinium vaginatum</i> C.B. Clarke	○	✓	○	✓
56	<i>Sassureacostus</i> (Falc.) Lipsch	○	✓	○	✓
57	<i>Sassurea obvallata</i> (DC.) Edgew	○	○	○	○
58	<i>Saccharum bengalensis</i> Retz	○	✓	○	✓
59	<i>Solanum surattense</i> Burm. F.	○	✓	○	✓
60	<i>Thymus serpyllum</i> L.	✓	○	✓	○
61	<i>Taxus wallichiana</i> Zucc	✓	✓	✓	○
62	<i>Trillium govanianum</i> D.Don	✓	○	○	○
63	<i>Toona ciliata</i> Roem	○	✓	○	✓
64	<i>Urtica parviflora</i> Roxb	✓	✓	✓	○
65	<i>Urtica dioica</i> L.	✓	✓	✓	○
66	<i>Vitex negundo</i> L.	✓	✓	○	✓
67	<i>Valeriana jatamansi</i> D. Don	✓	✓	○	○
68	<i>Verbascum thapsus</i> L.	✓	✓	○	✓

Used - ✓, No use- 0.

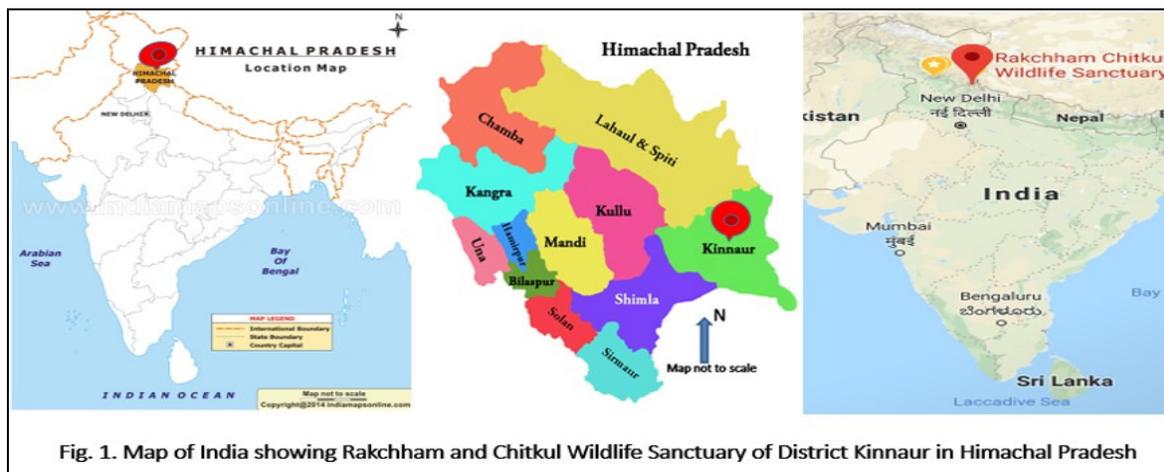


Fig. 1. Map of India showing Rakchham and Chitkul Wildlife Sanctuary of District Kinnaur in Himachal Pradesh



Fig. 2. Interaction with migratory shepherds in Rakchham and Chitkul wildlife sanctuary of District Kinnaur

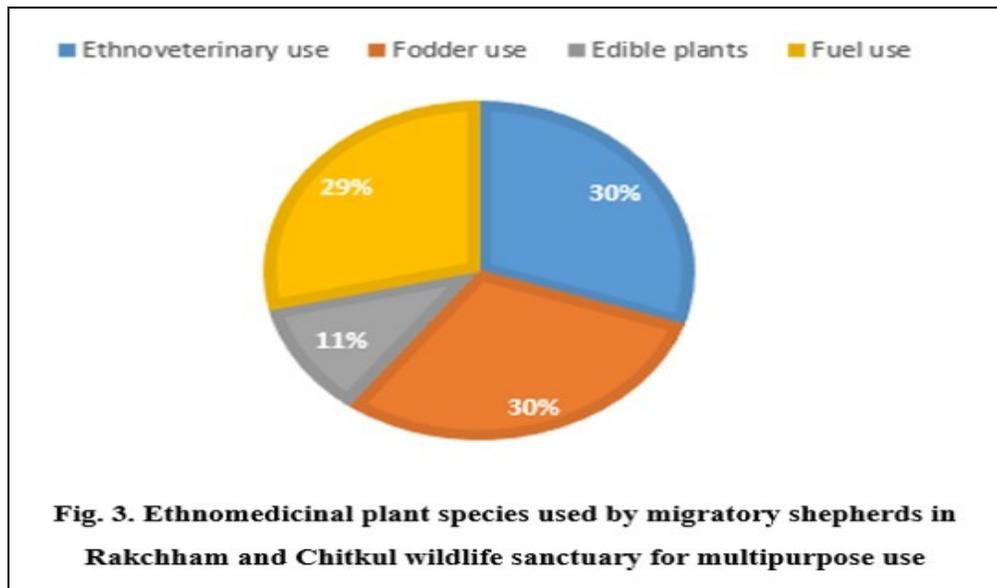


Fig. 3. Ethnomedicinal plant species used by migratory shepherds in Rakchham and Chitkul wildlife sanctuary for multipurpose use

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