

AN ETHNOBOTANICAL STUDY OF WILD MEDICINAL PLANTS USED BY MIGRATORY SHEPHERDS – A TRIBAL COMMUNITY OF WESTERN HIMALAYAS

RADHA^{1*}, PURI S¹, KUMAR S²

¹Department of Botany, School of Biological and Environmental Sciences, Shoolini University of Biotechnology and Management Sciences, Solan, Himachal Pradesh, India. ²Department of Botany, College of Horticulture and Forestry, Neri, Hamirpur, Himachal Pradesh, India.
Email: radhuchauhan7002@gmail.com

Received: 31 December 2018, Revised and Accepted: 21 February 2019

ABSTRACT

Objectives: Migratory shepherds of Kinnaur, Shimla, and Sirmaur districts in Himachal Pradesh of the western Himalayas have rich traditional knowledge of medicinal plants and its uses, in this respect; an ethnobotanical survey was carried out from 2017 to 2018.

Methods: The required information on ethnomedicines used by tribal migratory shepherds was collected through personal field visits, interview method and using a pretested questionnaire.

Results: It was observed that in all 78 species were used by shepherds en route from high hills to low hills. In high hills 35 species, in mid hills 20 species, and low hills 23 species were found to be used as ethnomedicine source.

Conclusion: This study shows that shepherds in tribal areas are highly dependent on ethnobotanical remedies, which evolved over generations of experience and practices, for health care. The common diseases were treated by ethnomedicinal plants such as cough, cold, body pain, Skin infection, wounds, diarrhea, respiratory problems, and sunburn. The collected detailed information on the list of plants and their therapeutic practices among tribal migratory shepherds may be helpful to improve the future pharmaceutical applications.

Keywords: Ethnomedicines, Shepherds, Livestock, Biodiversity.

© 2019 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2019.v12i4.31130>

INTRODUCTION

The Indian Himalayan region is characterized by its unique ecosystem with a wide range of climates and habitat types which supports different flora and fauna [1]. The Himalaya Hotspot is home to the world's highest mountains. The mountains of Himalaya rise abruptly, resulting in a variety of ecosystems [2]. Himachal Pradesh, a North Indian state, is located in the western part of the Himalaya. The state has a wide geographical area (55,673 km²) and altitudinal variation (350–7000 m amsl) with a rich assortment of biotic components [3]. Himachal Pradesh has a forest cover of 26% and rich in medicinal plant species. The plant medications of inhabitants, handed down by word of mouth from one generation to the next generation, gradually became part of the knowledge of ancient civilization [4-8]. Majority of the rural societies possess significant traditional knowledge of natural resources, which they have inherited from their forefather. They closely depend on this knowledge for a variety of reasons related to the social order, health care, economy, shelter, food, etc. However, if the efforts are not made with instant effect, the rich traditional knowledge possessed by tribal society will diminish soon. This calls for an urgent need to document ethnomedicinal plant species. Ethnobotanical information is already given by many workers in different districts of Himachal Pradesh such as Lahaul and Spiti, Chamba, Mandi, and Kinnaur [9-13]. Moreover, Himachal Pradesh has led to tribal ways of life, adherence to the primitive customs and myths and traditions representing on enormous and difficult terrain of scattered human settlement [14]. The present study is an effort to enhance such surveys and make an addition to utilization of some of the wild medicinal plant species by tribal migratory shepherds which are not recorded earlier from the studied sites. The ethnobotanical information on medicinal plant species of the studied area is expected to provide new dimension's forever expanding the pharmaceutical industry.

METHODS

Himachal Pradesh, a North Indian state, is situated in the heart of Western Himalaya and has a varied geographical grouping, mosaic sociocultural diversity and huge wealth of natural resources [15,16]. The present study is undertaken in Himachal Pradesh situated between 75°45'55"–79°04'20"E longitude and 30°22'40"–33°12'40"N latitude. Physiographically, the state consists of three distinct regions outer Himalaya, mid-Himalaya, and greater Himalaya. The outer Himalaya, also called Shivalik hills, ranges from 350 to 1500 amsl. The mid hills cover an area up to 3500 m. The greater Himalaya also called a high altitude alpine zone generally starts from an elevation of 3510m and above. It includes higher altitude areas of Kullu, Kinnaur, Lahul-Spiti, and Chamba districts. Due to diverse ecological conditions and altitudinal differences, the state is rich in plant species, which includes around 3400 species of flowering plants ranging from alpine to tropical zone [1].

Kinnaur district of Himachal Pradesh is well known for migratory shepherding, where the shepherds move from their places to low hills on a set route to enter sites in Shimla and Sirmaur districts. The present study documents the use of ethnomedicines used by migratory shepherds of district Kinnaur Himachal Pradesh. A total of five field surveys were carried out taking into account the migratory route of the shepherds from high hills to low hills. In the higher reaches of Kinnaur district, the Kinnaure (shepherds) started the movement from five different villages of Kinnaur and these were Kamru, Sangla, Batsari, Rakchham, and Chitkul. Besides, the place of origin of shepherds, surveys were done for four other places, namely – Chopal, (mid hills), Churdhar (mid hills), Renukaji (low hills), and Poanta-Sahib (low hills). These four places were their part of the migratory route. The migratory shepherd's groups were selected randomly for an interview during field visits.

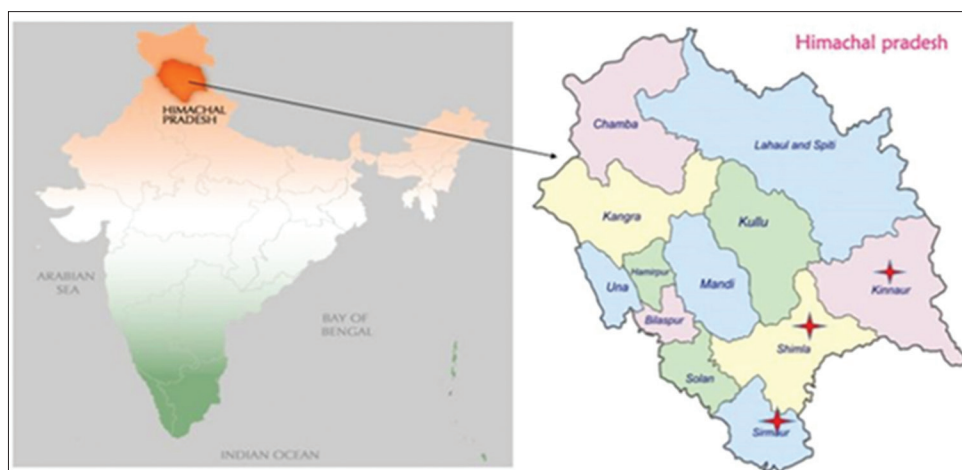


Fig. 1: Map of India showing the districts of Kinnaur, Shimla, and Sirmaur of Himachal Pradesh



Fig. 2: Satellite map showing routes of shepherds from their originated villages Chitkul, Rakchham, Batseri, Sangla and Kamru (High hills) to Chopal and Churdhar (Mid hills) to the final destination Renukaji and Poanta—Sahib Sirmaur (Low hills)

Table 1: Basic information of tribal migratory shepherds in study sites of district Kinnaur, Himachal Pradesh

S. No.	Particulars	Study villages				
		Kamru	Sangla	Batsери	Rakchham	Chitkul
1.	Altitude	2700 m	2600 m	2700 m	3100 m	3450 m
2.	Group size (No.)	5	6	6	5	5
3.	Average family income (Rs., Lakh/annum)	3	2	4	2	3
4.	Horses (No.)	2	2	4	2	3
5.	Dogs (No.)	2	3	4	2	3
6.	Flock size (sheep and goats)	654	712	990	640	780

Shepherds migration started from Kamru (2700 m), Sangla (2600 m), Batsери (2700 m), Rakchham (3100 m), and Chitkul (3450 m) in July. These originated sites of migratory shepherds located at high altitude remain cutoff from the rest of the world due to heavy snowfall during winters. The information on ethnobotanical medicines was collected using a pre-tested questionnaire, interview, through participatory discussion and observation from July 2017 to October 2018. The specimens of ethnobotanical medicines being used by migratory shepherds for their health care were collected, dried, and mounted on herbarium sheets, with label information describing when and where they were collected. Plants were identified either in the field itself or with the help of experts from Botanical Survey of India (BSI) Dehradun Uttarakhand and Forest

Research Institute (FRI) Dehradun, Uttarakhand. Vouchers of plants were placed in the herbarium of Shoolini University, Solan [17].

RESULTS

Harsh environmental conditions cause seasonal migration of shepherds from high hills to low hills in Himachal Pradesh (Fig. 1). Seasonal migration is a traditional process in the tribes of the Himalayan region. It was observed that the majority of shepherds start their migration from their villages (Fig. 2) in July. However, a few also migrate in August and September, but there is no migration as the winters sets in. The migratory shepherds move in a group of their family members. The

Table 2: Ethnomedicinal plants used by migratory shepherds in high hills of district Kinnaur, Himachal Pradesh

S. No.	Botanical name	Family	Common name	Flowering and Fruiting period	Parts used	Habit	Voucher specimen number	Ailments/diseases treated	Ethnobotanical Uses
1	<i>Abies spectabilis</i> (D. Don.) Spach.	Pinaceae	Kolroi, Tosh, Talispatra	April–May, Cones ripen during September–October	Leaves	Tree	SUBMS/BOT-431	Asthma, Fever, Bronchitis	Juice of leaves is used.
2	<i>Asparagus filicinus</i> D. Don.	Asparagaceae	Chiriyakhana, Sahasimuli, Sharanoi	May–July	Roots	Fern	SUBMS/BOT-370	Dysentery, Diarrhea, Throat complaints	Juice of roots is used
3	<i>Argemone mexicana</i> L.	Papaveraceae	Satyanashi, Bharband	Throughout the year	Whole part	Herb	SUBMS/BOT-388	Malaria	The whole plant is used to make a tea and as much tea as possible is drunk until symptoms disappear. Whole plant is used.
4	<i>Achillea millefolium</i> L.	Asteraceae	Bhutkesi	June–December	Whole part	Herb	SUBMS/BOT-455	High Blood Pressure, Body pain, Respiratory infection	Fruits are edible and highly nutritious. Roots decoction is given in jaundice.
5	<i>Berberis lycium</i> Royle.	Berberidaceae	Karmashal	March–July	Fruits, roots	Shrub	SUBMS/BOT-659	Nutritious for health, jaundice	Decoction of rhizome prescribed to cure cold and joint pains. Leaves and flowers used for fever.
6	<i>Bergenia ciliata</i> (Haw.) Sternb.	Saxifragaceae	Pashambhed	June–August	Rhizomes, leaves, flowers	Herb	SUBMS/BOT-352	Cold, Joint pains, Fever	Seeds mixed with <i>Cynodon dactylon</i> and paste prepared and used on the fractured part then covered with the bark of <i>Betula utilis</i> .
7	<i>Betula utilis</i> D. Don.	Betulaceae	Bhojpatra	May–October	Seeds	Tree	SUBMS/BOT-387	Bone fracture	The juice from the seeds is used.
8	<i>Celtis tetrandra</i> Roxb.	Ulmaceae	Khirk	February–April	Seeds	Tree	SUBMS/BOT-378	Indigestion	Leaves of <i>Cannabis sativa</i> burn over flame and smoke is used for abdominal pain.
9	<i>Cannabis sativa</i> L.	Cannabaceae	Bhang	June–September	Leaves	Herb	SUBMS/BOT-658	Abdominal pain	Juice of whole grass is used.
10	<i>Cynodon dactylon</i> L. Pers.	Poaceae	Doob, Durva	Throughout the year	Whole part	Grass	SUBMS/BOT-338	Headache, Skin allergy, Cough, Cold, High Blood Pressure	Seeds are used for the treatment of urinary infections.
11	<i>Chenopodium album</i> L.	Chenopodiaceae	Bathua	June–September	Seeds, roots, stem	Herb	SUBMS/BOT-660	Urinary infections, Dysentery, Sunburn	The juice of the roots is used in the treatment of dysentery. The juice of the stem is applied to sunburn.
12	<i>Dioscorea deltoidea</i> Wall. Ex Griseb.	Dioscoreaceae	Singli mingli	July–October	Tubers, leaves	Climber	SUBMS/BOT-661	Skin allergy, Constipation, wound healing, Burns	Juice of tubers and leaves is used.
13	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Duddhi	November–April.	Stem, leaves	Herb	SUBMS/BOT-662	Jaundice	Juice of stem and leaves is used.
14	<i>Ephedra Gerardiana</i> Wallich ex C. A. Meyer.	Ephedraceae	Rachi, Budagur, Chhe	May–September	Whole part	Shrub	SUBMS/BOT-422	Cold, Coughs, Asthma, Respiratory problems	Tea of leaves is used.

(Contd...)

Table 2: (Continued)

S. No.	Botanical name	Family	Common name	Flowering and Fruiting period	Parts used	Habit	Voucher specimen number	Ailments/diseases treated	Ethnobotanical Uses
15	<i>Ficus religiosa</i> L.	Moraceae	Peepal	November–February	Leaves, bark	Tree	SUBMS/BOT-361	Wounds, Skin allergy	Powder of dried bark and leaves is used.
16	<i>Juglans regia</i> L.	Juglandaceae	Akhrot	April–October	Bark, leaves, fruits	Tree	SUBMS/BOT-340	Diarrhea	Bark, leaves, and fruits are used.
17	<i>Juniperus communis</i> L.	Cupressaceae	Bethar, Pethri	March–September	Bark, needles	Shrub	SUBMS/BOT-366	Asthma	Juice of bark and needles is used.
18	<i>Heracleum lanatum</i> Michx.	Apiaceae	Patraia, Padara	June–July	Roots	Herb	SUBMS/BOT-399	Cough, Asthma, Allergy complaints	Juice of roots is taken internally.
19	<i>Hippophae salicifolia</i> D. Don.	Elaeagnaceae	Chuk, Chuma, Kalabis	June–July	Bark, fruits	Shrub	SUBMS/BOT-425	Sunburn	Juice of bark and fruits is applied.
20	<i>Jurinea dolomiada</i> Boiss.	Asteraceae	Jari-Dhoop	July–September	Roots	Herb	SUBMS/BOT-374	Fever, Cold, Cough	Juice of the roots is taken orally.
21	<i>Lilium polyphyllum</i> D. Don.	Liliaceae	Ksirakakoli	June–October	Roots	Herb	SUBMS/BOT-394	Tonic, Energy source	Dried roots are used.
22	<i>Oxalis corniculata</i> L.	Oxalidaceae	Amrul	April–October	Leaves	Herb	SUBMS/BOT-663	Stomach infection	Juice of fresh leaves is used.
23	<i>Picrorhiza kurroa</i> Royle ex Benth.	Scrophulariaceae	Karru, Kutki	June–August	Leaves, rhizomes	Herb	SUBMS/BOT-463	Asthma, Cold, Cough, jaundice	Juice of dried leaves and rhizomes is used.
24	<i>Phytolacca acinosa</i> Roxb.	Phytolaccaceae	Jharka, Jalga	July–September	Leaves, twigs	Herb	SUBMS/BOT-332	Nutritious for health	Tender leaves and twigs are cooked as a vegetable.
25	<i>Rumex hastatus</i> D. Don.	Polygonaceae	Churki, Churka	June–August	Roots, shoots	Herb	SUBMS/BOT-664	Indigestion	Juice of shoots and roots are used.
26	<i>Rubus ellipticus</i> Sm.	Rosaceae	Anehhu, Hinsalu, Aakhe	February and April	Fruits	Shrub	SUBMS/BOT-665	Fever, Cough	Juice of fruits is used.
27	<i>Solanum surattense</i> Burm. f.	Solanaceae	Kantkari	April–August	Fruits	Herb	SUBMS/BOT-666	Stone in Bladder	Juice of fruits is used.
28	<i>Selinum vaginatum</i> C.B. Clarke.	Apiaceae	Bhutkeshi, Mathosla	July–September	Leaves	Herb	SUBMS/BOT-439	Skin allergy	Juice of leaves is used.
29	<i>Saussurea obvallata</i> (DC.) Edgew.	Asteraceae	Brahma Kamal	July–September	Roots	Herb	SUBMS/BOT-452	Wounds, Cuts	Juice of roots is used.
30	<i>Trillium govanianum</i> (D. Don.) Kunth.	Trilliaceae	Nagchatri	May–June	Leaves, roots	Herb	SUBMS/BOT-392	Fever, Headache	Juice of leaves and roots is used.
31	<i>Thymus serpyllum</i> L.	Lamiaceae	Banjawain	April–September	Leaves, seeds	Shrub	SUBMS/BOT-461	Stomach problems, fever, cough, cold	Leaves and seeds are considered a popular remedy
32	<i>Urtica parviflora</i> Roxb.	Urticaceae	Kandali	June–October	Leaves, shoots	Herb	SUBMS/BOT-402	Sprain of foot	Juice of leaves and shoots is applied.
33	<i>Verbascum thapsus</i> L.	Scrophulariaceae	Tamaku	June–August	Roots	Herb	SUBMS/BOT-414	Vomiting	Juice of roots is taken orally.
34	<i>Valeriana jatamansi</i> Jones.	Caprifoliaceae	Muskbala	March–April	Leaves, roots	Herb	SUBMS/BOT-334	Headache, Wounds	Juice of dried leaves and roots mashed in water is applied on the forehead to relieve the pain. The juice of dried roots is applied to wounds for healing.
35	<i>Vitex negundo</i> L.	Verbenaceae	Nirgandi	March–September	Leaves	Shrub	SUBMS/BOT-397	Joint pains	Leaf paste applied to heal swollen joint pains.

Table 3: Ethnomedicinal plants used by migratory shepherds in mid hills, (Chopal in Shimla-district and Churdhar in Sirmaur-district) Himachal Pradesh

S.No.	Botanical name	Family	Hindi name	Flowering and fruiting	Parts used	Habit	Voucher no.	Ailments/diseases treated	Ethnobotanical use
1	<i>Bergenia ciliata</i> (Haw.) Sternb.	Saxifragaceae	Pashanbhed	June–August	Rhizomes, leaves, flowers	Herb	SUBMS/BOT-667	Cold, Joint pains, Fever	Juice of rhizomes, leaves, and flowers is used.
2	<i>Chenopodium album</i> L.	Chenopodiaceae	Bathua	June–September	Seeds, Roots, Stem	Herb	SUBMS/BOT-668	Urinary infections, dysentery, sunburn	Juice of seeds, stem, and roots is used.
3	<i>Commelina benghalensis</i> L.	Commelinaceae	Kana, Kankawa	Throughout the year	Leaves, Roots, Flowers	Herb	SUBMS/BOT-669	Diarrhea, Stomach disorder, Eye problems	Juice of Leaves, Roots, and Flowers is drunk.
4	<i>Cannabis sativa</i> L.	Cannabaceae	Bhang	June–September	Leaves	Herb	SUBMS/BOT-348	Abdominal pain	Leaves of <i>Cannabis sativa</i> burn over flame and smoke are used.
5	<i>Dioscorea deltoidea</i> Wall. ex Griseb.	Dioscoreaceae	Singli mingli	July–October	Tubers, Leaves	Climber	SUBMS/BOT-353	Skin allergy, Constipation, Wound healing, Burns	Juice of tubers and leaves is used.
6	<i>Gentiana kurroo</i> Royle.	Gentianaceae	Kaur, Kutki	August–October	Roots, leaves rhizomes	Herb	SUBMS/BOT-345	Urinary infections	Roots, Leaves, and Rhizomes are used.
7	<i>Hypericum oblongifolium</i> Choisy.	Hypericaceae	Basant	May–September	Roots	Herb	SUBMS/BOT-670	Skin allergy	The juice of roots is used.
8	<i>Hedychium spicatum</i> Sm.	Zingiberaceae	Kapurkachri	July–October	Rhizomes	Herb	SUBMS/BOT-384	Cough, Asthma, Headache, Skin infections, Purify Blood	Grounded rhizomes a used.
9	<i>Lyonia ovalifolia</i> (Wall.) Drude.	Ericaceae	Ayar, Airan Alhan	April–September	Leaves, Buds	Herb	SUBMS/BOT-371	Throat infections, insecticides	Tea of young leaves and buds is used.
10	<i>Leycesteria formosa</i> Wall.	Caprifoliaceae	Piralu	June–November	Roots	Shrub	SUBMS/BOT-381	Skin infections	The juice of roots is used.
11	<i>Morchella esculenta</i> Fr.	Morchellaceae	Guchhi	March–October	Whole part	Fungi	SUBMS/BOT-446	Indigestions	<i>Morchella esculenta</i> has been used as a vegetable.
12	<i>Punica granatum</i> L.	Punicaceae	Daru	February–December	Fruits	Shrub	SUBMS/BOT-577	Nutritious for health	Fruits are used.
13	<i>Prunus cerasoides</i> D.Don	Rosaceae	Pajja	December–March	Fruits	Tree	SUBMS/BOT-356	Nutritious for health	Fruits are used.
14	<i>Picrothiza kurroa</i> Royle ex Benth.	Scrophulariaceae	Karru, Kutki	June–August	Leaves, Rhizomes	Herb	SUBMS/BOT-576	Asthma, Cough, Cold, Jaundice	Juice of dried leaves and rhizomes is used.
15	<i>Rubus ellipticus</i> Sm.	Rosaceae	Anehhu, Hinsalu, Aakhe	February–April	Fruits	Shrub	SUBMS/BOT-575	Fever, Cough	Juice of the fruits is used.
16	<i>Solanum nigrum</i> L.	Solanaceae	Mokoi, Dhakh	April–July	Leaves, Roots	Herb	SUBMS/BOT-574	Foot infections	Juice of leaves and roots is used.
17	<i>Urtica dioica</i> L.	Urticaceae	Bichhu Booti	June–October	Leaves, roots, shoots	Herb	SUBMS/BOT-573	Wounds, Nutritious for health	Juice of leaves and roots is used. Tender leaves and shoots cooked as a vegetable.
18	<i>Urtica patvijfiora</i> Roxb.	Urticaceae	Kandali	June–October	Leaves, Shoots	Herb	SUBMS/BOT-672	Sprain of foot	Juice of leaves and shoots is applied.
19	<i>Vitex negundo</i> L.	Verbenaceae	Nirgandi	March–September	Leaves	Shrub	SUBMS/BOT-646	Swollen joints pain	Juice of leaves is applied.
20	<i>Zanthoxylum armatum</i> DC.	Rutaceae	Timir	April–June	Bark, Seeds, Fruits	Shrub	SUBMS/BOT-671	Fever, Tooth pain	Juice of bark and seeds and fruits is used.

Table 4: Ethnomedicinal plants used by migratory shepherds in low hills, Renukaji and Poanta-Sahib of district Sirmour

S. No.	Botanical name	Family	Hindi name	Flowering and fruiting	Parts used	Habit	Voucher no.	Ailments/diseases treated	Ethnobotanical uses
1	<i>Amaranthus viridis</i> L.	Amaranthaceae	Jungali chaulayi	July–October	Leaves, Roots	Herb	SUBMS/BOT-401	Skin infections	Juice of leaves and roots is applied.
2	<i>Abrus precatorius</i> L.	Fabaceae	Ratti, Gunchi	October–May	Leaves	Climber	SUBMS/BOT-428	Wound healing	The juice of leaves is used.
3	<i>Argemone Mexicana</i> L.	Papaveraceae	Satanashi, Bharband	Throughout the year	Whole part	Herb	SUBMS/BOT-586	Malaria	<i>Argemone Mexicana</i> tea is used.
4	<i>Adhatoda vasica</i> Nees.	Acanthaceae	Aruasa, Vasaka	December–June	Leaves	Herb	SUBMS/BOT-382	Cough, asthma, cold	Juice of leaves is used.
5	<i>Bauhinia variegata</i> (L.) Benth.	Fabaceae	Kachnar	April–November	Leaves, bark	Tree	SUBMS/BOT-638		Juice of dried leaves and Bark is used.
6	<i>Chenopodium album</i> L.	Chenopodiaceae	Bathua	June–September	Seed, roots, stem	Herb	SUBMS/BOT-585	Urinary infections, dysentery, Sunburn	Juice of seeds, roots, and stem is used.
7	<i>Cannabis sativa</i> L.	Cannabaceae	Bhang	June–September	Leaves	Herb	SUBMS/BOT-584	Abdominal pain	Leaves of <i>Cannabis sativa</i> burn over flame and smoke is used.
8	<i>Eupatorium adenophora</i> (Spreng.) King and H. Rob.	Asteraceae	Pamakani	March–April	Leaves	Shrub	SUBMS/BOT-398	Skin cuts	Juice of leaves is applied.
9	<i>Hypericum perforatum</i> L.	Hypericaceae	Basant, Balsana	May–September	Leaves, roots	Roots	SUBMS/BOT-408	Skin allergy	Juice of leaves and roots are applied.
10	<i>Hypericum oblongifolium</i> Choisy.	Hypericaceae	Basant	May–September	Roots	Herb	SUBMS/BOT-342	Skin allergy	Juice of roots applied.
12	<i>Juglans regia</i> L.	Juglandaceae	Akthrot	April–October	Bark, Leaves, Fruits	Tree	SUBMS/BOT-583	Diarrhea	Bark, leaves and fruits are used.
12	<i>Prunus cerasoides</i> D. Don	Rosaceae	Pajja	December–March	Fruits	Tree	SUBMS/BOT-341	Nutritious for health	Fruits are edible.
13	<i>Ocimum sanctum</i> L.	Lamiaceae	Tulsi	June–September	Flowers, seeds, leaves	Herb	SUBMS/BOT-369	Fever, Cough, Cold	Juice of dried flowers, seeds and leaves are used.
14	<i>Pyracantha crenulata</i> (D. Don.) M. Roem.	Rosaceae	Bedu, Chhota seb	March–June	Leaves, fruits, stem	Shrub	SUBMS/BOT-434	Tonic, fever	Leaves fruits and stem are used.
15	<i>Pinus roxburghii</i> Sarg.	Pinaceae	Chir	March–May	Leaves	Tree	SUBMS/BOT-393	Joint pains	Juice of leaves is used.
16	<i>Phytolacca acinosa</i> Roxb.	Phytolaccaceae	Jharka, Jalga	June–September	Leaves, Twigs	Herb	SUBMS/BOT-582	Nutritious for health	Tender leaves and twigs are cooked as a vegetable.
17	<i>Rhododendron arboretum</i> Sm.	Ericaceae	Burans	March–September	Flowers	Tree	SUBMS/BOT-364	Cough, Cold, Fever	Juice of dried flowers is used.
18	<i>Rhus parviflora</i> Roxb.	Anacardiaceae	Samakdana, Samakdan	July–August	Bark	Shrub	SUBMS/BOT-581	Headache	The paste prepared from the dried Bark is used.
19	<i>Solanum surratense</i> Burm. f.	Solanaceae	Kantkari	April–August	Fruits	Herb	SUBMS/BOT-458	Stone in Bladder	Juice of fruits is used.
20	<i>Solanum nigrum</i> L.	Solanaceae	Mokoi, Dhalkh	April–July	Leaves, roots	Herb	SUBMS/BOT-580	Foot infection	The Juice of leaves and roots is applied.
21	<i>Urtica dioica</i> L.	Urticaceae	Bichhu Booti	June–October	Leaves, roots, shoots	Herb	SUBMS/BOT-579	Wound, Nutritious for health	Juice of leaves and roots is used. Tender leaves and shoots cooked as a vegetable.
22	<i>Vitex negundo</i> L.	Verbenaceae	Nirgandi	March–September	Leaves	Herb	SUBMS/BOT-578	Joint pains	Juice of leaves is applied.
23	<i>Zanthoxylum armatum</i> DC.	Rutaceae	Tirmir	April–June	Bark, seeds, fruits	Shrub	SUBMS/BOT-365	Fever, tooth pain	Juice of bark, fruits and seeds is used.

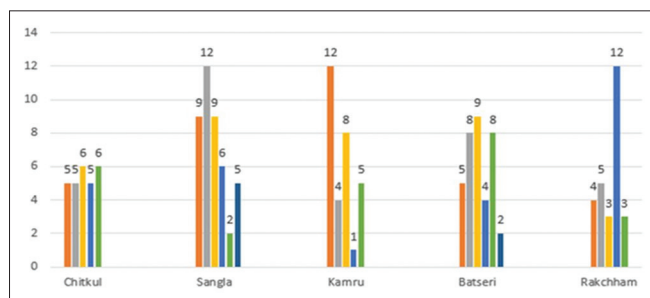


Fig. 3: Educational qualification of shepherds in five villages

migration flock includes both goats and sheep and size of the flock varies (Table 1). Shepherds move first to grazing pasture in Chopal (district Shimla) irrespective of their origin place of migration. The shepherds take along with them 2–4 horses for carrying tents and provisions. Often four to five dogs also accompany the shepherds, and in fact, these dogs are trained in protecting the goats and sheep from wild animals and also keep the flock together. The disparity of flock size generally is an indicator of the status of farmer's livestock holding capacity. The present study also indicated that shepherds having a high number of the flock are comparatively well off compared to those with less number. Many studies have reported that flock size is directly associated with migration distance, flock with larger size travel longer distance as compared to small size flocked [18,19]. In our study, it was found that irrespective of flock size, the shepherds travel the same distance. In the second stage, the shepherds then move to Churdhar ranges and from here to Renukaji in Sirmaur district. The routes of migration are generally fixed (Fig. 2) and proper permission is obtained from the authorities for the purpose. Finally, in the months of September–October, they reach the low hills in Poanta-Sahib in Sirmaur district and temporarily settle here up to March, and start their return journey to their respective places by end March (spring season). It was also observed that the shepherds are not highly qualified and it varied from 1st class to 12th class (Fig. 3).

The present studies revealed that the livelihood of shepherd's family is dependent either getting food and fruits from the forests/trees on the path they transect and selling the meat and milk products from their herds. The wild plants not only serve as their food but also for their livestock. It was observed that during their migration from upper hills to lower hills a total of 78 medicinal species were being used by the migratory shepherds, and a few of these belonged to the same families. All these medicinal plants are an integral part of shepherd's health-care during migration (Tables 2-4). The collection of various medicinal plants and plant parts varied from plant to plant, depending on their availability and usability. During their seasonal migration, the shepherds are much dependent on forest products for their requirements of fruits, vegetables, and medicines.

As the shepherds move from their respective place of origin (high hills), it was noted that 35 species (herbs, shrubs, and trees) were found to be used by the shepherds for their health care (Table 2). Interestingly, the shepherds informed that their preference for medicine is *Picrorhiza kurroa* (herb) as it is one of the important in medicines in their tribe. Similarly, in the mid-hills 20 plant species were found to be taken as medicine as the shepherds move toward Shimla hills (Table 3). Some of the medicinal plant species such as *Chenopodium album*, *Berginia ciliata*, *Cannabis sativa*, *Dioscorea deltoidea*, *Picrorhiza kurroa*, and *Urtica palviflora* found in mid hills were also present in higher hill regions (Table 3). Three species, namely *Cannabis sativa*, *Vitex negundo*, and *Zanthoxylum armatum* were frequently used for medicinal purposes. The use of many of these medicinal plants has also been reported by many workers from different parts of Himachal Pradesh [20,21].

Due to variation in climatic conditions from high hills to low hills (Table 4), shepherds were commonly affected by many common diseases such as cough, asthma, cold, skin allergy, and fever. Five species

from low hills, namely *Adhatoda vasica*, *Hypericum oblongifolium*, *Rhododendron arboretum*, and *Urtica dioica* were frequently used by shepherds to treat common diseases. The shepherds during migration generally move along the roadside and rarely adopt bridal pathways or shortcuts. For their own stay, they use makeshift tents and shift tents frequently within 5–6 days. There is always a scarcity of food and fodder for themselves and livestock. For this, they explore adjoining areas, particularly degraded lands, fallow fields, and village commons. It was interesting to note that their migration patterns closely mirrors the seasonal availability of natural food, fodder, and medicinal plants. In Khangchendzonga National Park, it was observed that migration movements match with seasonal fodder resource availability [22]. Shepherds during en route migration face constraints such as food, fodder, water deficit, veterinary facilities, wild animals, predators, and sometimes road accidents of their livestock. Such constraints have also been reported by many previous studies [23-26].

DISCUSSION

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 benefitted. Unfortunately, deforestation activities and the changing climatic conditions have made the availability of medicinal plants as a scarce resource to the migratory shepherds. Plants and plant products play an important role in the lives of these migratory shepherds. The critical review of the past work done and the results of this survey suggest that wild medicinal plants are very important for migratory shepherds living in tribal areas of Himachal Pradesh. The documentation of the ethnobotanical approach is an improvement for enhancing the understanding of native knowledge systems [27,28]. The present trends for surviving healthy long life entirely dependent on the traditional medicines and it possesses several natural constituents to eliminate the critical causes of the disease [29,30]. Plants are a rich source of free radical scavenging molecules such as terpenoids, vitamins, lignins, phenolic acids, flavonoids, tannins, quinones, alkaloids, coumarins, betalains, amines, and other metabolites which are rich in antioxidant property. The antioxidants property in plant products helps in the stimulation of biological system against oxidative damage [31-33]. In the modern day world traditional ethnomedicinal plants play a significant role in the health-care system, but due to lack of interest between the younger generation and their tendency to migrate to cities for lucrative jobs, a wealth of traditional knowledge is decreasing. The need of the hour is to harness this important traditional knowledge and preserve this traditional knowledge for the benefit of future generation. The information generated from the study regarding the ethnomedicinal plants used by tribal migratory shepherds needs a through phytochemical investigation including phytochemical extraction and isolation along with few clinical trials. This could help in creating mass awareness regarding their conservation within the region.

CONCLUSION

In the present investigation, the traditionally using plants as medicinal value by migratory shepherds a tribal community of Western Himalaya were identified. They are using the plants for cough, cold, fever, asthma, skin allergy, bone fracture, abdominal pain, jaundice, body pain, bone fracture, malaria, wound healing, etc., in various forms such as decoction, powder, paste, and juice. The foremost important thing is to give awareness and training to tribal migratory shepherds on a multidimensional basis about sustainable utilization of wild medicinal plant wealth in the hillside management for plant resources. This valuable survey may be useful to improve the pharmaceutical and application in the future.

ACKNOWLEDGMENT

We are grateful to the migratory shepherds and local peoples of the study area for their cooperation in providing valuable information about

ethno aspects. Thanks to experts from BSI Dehradun, Uttarakhand, and FRI Dehradun, Uttarakhand for the identification of ethnomedicinal plant specimens collected from study sites.

AUTHORS' CONTRIBUTIONS

The concept, design, and questionnaire of the study were done by Radha. Fieldwork and literature study was done by Radha. Interpretation of data was prepared by Radha, Dr. Sunil Puri and Dr. Sanjeev Kumar. Revision of the article was done by Radha and Dr. Sanjeev Kumar.

CONFLICTS OF INTEREST

We declare that we have no conflicts of interest.

REFERENCES

- Singh JP, Roy MM, Radotra S. Technical Bulletin. Jhansi: Grasslands of Himachal Pradesh. Director, Indian Grassland and Fodder Research Institute; 2009.
- Myres N, Mittermeier RA, Mittermeier CG, da Fonseca GA, Ken J. Biodiversity hotspots for conservation priorities. *Nature* 2000;403:853-8.
- Wildlife Institute of India. Protected Areas of Himachal Pradesh; 2014. Available from: <http://www.wii.gov.in>.
- Negi KS, Gaur RD, Tiwari JK. Ethnobotanical notes on the flora of Hariki Doon (district Uttarakashi), Gharwal Himalaya UP, India. *Ethnobotany* 1999;11:9-17.
- Khanna KK, Ramesh K. Ethno-medicinal plants used by Gujjar tribe of Sharanpur district, Uttar Pradesh. *Ethnobotany* 2000;12:17-22.
- Chauhan NS. Important medicinal and aromatic plants of Himachal Pradesh. *Indian Forester* 2003;129:979-98.
- Thakur R, Singh R, Saxena P, Mani A. Evaluation of antibacterial activity of *Prosopis juliflora* (SW.) DC. Leaves. *Afr J Tradit Complement Altern Med* 2014;11:182-8.
- Sharma PK, Lal B. Ethnobotanical notes on some medicinal and aromatic plants of Himachal Pradesh. *Indian J Tradit Knowl* 2005;4:424-8.
- Rawat DS, Kharwal AD. Ethnobotanical studies of weed flora in Shivalik Hills, Himachal Pradesh, India. *Int J Adv Res* 2014;2:218-26.
- Singh KN, Kumar A, Lal B, Todaria NP. Species diversity and population status of threatened plants in different landscape elements of the Rohtang Pass, Western Himalaya. *J Mountain Sci* 2008;5:73-83.
- Dutt B, Nath D, Chauhan NS, Sharma KR, Sharma SS. Ethnomedicinal plant resources of Tribal Pangi valley in district Chamba, Himachal Pradesh, India. *Int J Bioresour Stress Manag* 2014;5:416-21.
- Kumar N. Some plants used as cardiac stimulants, blood purifiers, purgative and antispasmodic in Unani system of medicine from Joginder Nagar (H.P.). *Indian J Fundam Appl Life Sci* 2014;4:427-32.
- Singh KN, Batish DR. Most prominent ethno-medicinal plants used by the tribals of Chhitkul, Sangla valley. *Ann Plant Sci* 2015;4:943-6.
- Sharma PK, Chauhan NS, Lal B. Studies on plant associated indigenous knowledge among the Malanis of Kullu district, Himachal Pradesh. *Indian J Tradit Knowl* 2005;4:403-8.
- Chowhery HJ. Himachal Pradesh. In: Mudgal V, Hajra PK, editors. Floristic Diversity and Conservation Strategies in India Vol II: In the Context of State and Union Territories. Calcutta: BSI; 1999. p. 845-94.
- Singh SK. Ethnobotanical study of useful plants of Kullu district in Northwestern Himalaya, India. *J Econ Tax Bot* 1999;23:185-98.
- Botanical Survey of India. Flora of India. Kolkatta, India: Botanical Survey of India; 1996.
- Kaur H, Sharma M. Flora of Sirmaur (Himachal Pradesh). Dehradun: Bisen Singh Mahendra Pal Singh; 2004. p. 770.
- Kumaravelu N, Muralidharanand R, Sivakumar T. A study on migratory sheep production system in southern agro climatic zone of Tamil Nadu. *Indian J Small Rumin* 2008;14:137-40.
- Balamurugan V, Krishnamoorthy P, Veeragowda BM, Sen A, Rajak KK, Bhanuprakash V, et al. Seroprevalence of peste des petits ruminants in cattle and buffaloes from Southern Peninsular India. *Trop Anim Health Prod* 2012;44:301-6.
- Sharma PK, Chauhan NS, Lal B. Commercially important medicinal and aromatic plants of Parvati Valley, Himachal Pradesh. *J Econ Taxonomic Bot* 2003;27:937-42.
- Thakur K, Puri S. Ethnobotanical plants of bandli wildlife sanctuary, Mandi, Himachal Pradesh. *Int J Adv Res* 2016;4:106-8.
- Tambe S, Rawat GS. Traditional livelihood based on sheep grazing in the Khangchendzonga national park, Sikkim. *Indian J Tradit Knowl* 2009;8:75-80.
- Rao KA, Rao KS, Rao SJ, Ravi A, Anitha A. Studies on migration of sheep flocks in north coastal zone of Andhra Pradesh: Identification of traditional migration tracts. *Indian J Small Rumin* 2011;17:260-3.
- Suresh A, Gupta DC, Mann JS. Trends, determinants and constraints of temporary sheep migration in Rajasthan-an economic analysis. *Agric Econ Res Rev* 2011;24:255-65.
- Kaintura S, Kumar N, Kothiyal P. Correlation of antihypertensive drugs and new onset diabetes: A review. *Int Res J Pharm* 2017;8:36-40.
- Kalaiselvan M, Gopalan R. Ethnobotanical studies on selected wild medicinal plants by irula tribes of Bolampatty valley, Nilgiri biosphere reserve (NBR), Southern Western Ghats, India. *Asian J Pharm Clin Res* 2014;7:22-6.
- Ranganathan R, Vijayalakshmi R, Parameswari P. Ethnomedicinal survey of Jawadhu hills in Tamil Nadu. *Asian J Pharm Clin Res* 2012; 5:45-9.
- Agarwal P, Mishra A. Pharmaceutical quality audits: A review. *Int J Appl Pharm* 2019;11:14-22.
- Maurya H, Kumar T. Formulation, standardization and evaluation of polyherbal dispersible tablet. *Int J Appl Pharm* 2019;11:158-67.
- Ansari N, Chandel D. Antioxidant studies on methanol and aqueous extracts of *Gymnosporia montana* plant. *Int J Pharm Pharm Sci* 2019;11: 65-70.
- Arirudrai B, Janani B, Rao US. Evaluation of antioxidant and chemopreventive potential of methanolic extracts of leaf of *Aegle marmelos* attributes towards ductal carcinoma studied in mcf 7 cells. *Int J Pharm Pharm Sci* 2019;11:21-5.
- Sharma M, Biswajit D. Medicinal plants of North-East region of India: A small review. *Int J Curr Pharm Res* 2019;10:11-2.