



## Ethnomedicinal study of herbaceous flora along the Kosi watershed, Kumaun Himalaya

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### Abstract

The present study was conducted in the Kosi watershed of Almora district. During the phyto-sociological investigation, the collected plant specimens along the riverside were examined by consulting important works on medicinal plants and ethnobotany. The documentation was made based on field observation, discussions with local and knowledgeable people, and scrutinizing the literature review. A total of 42 plant species, representing 26 families of medicinal plants, were documented. The Asteraceae and Poaceae families were the most prevalent, with six species each, followed by Polygonaceae and Rosaceae, with three species, and Plantaginaceae and Euphorbiaceae, with two species each. Of these species, 31 were identified as herbs and 11 as shrubs, utilized in various health care systems. The majority of the parts, i.e., the whole plant and leaves, are used in curing various ailments. Among the total of 42, there were 6 species of the Asteraceae family, which were highly used in reducing fever, cuts, and wounds and have healing properties. Unmanaged exploitation was the major problem in the area, leading to a decline in the diversity of medicinal flora and other associated species. Due to this, the use of ethnomedicine was also reduced to some extent. There is a need to document and preserve ethnomedicinal knowledge and raise awareness among peoples before it is lost forever.

**Keywords:** Koshi watershed, Himalaya, ethnomedicine, traditional knowledge

### Introduction

The Indian Himalayan Region (IHR) is a rich repository of biological diversity and comprises about 1748 species of medicinal plants, 675 species of wild edibles, 279 species of fodder, 118 species of essential oil-producing medicinal and aromatic plants, and 155 species of sacred plants (Samant & Pant, 2003; Samant *et al.*, 1998; Samant & Palni, 2000) <sup>[22, 19]</sup>. The Kumaun region of Uttarakhand, situated in the easternmost part of the western Himalayas (latitude 28°44' to 38°49'N, longitude 78°45' to 81°05'E), encompasses an extensive area spanning 31,033 square kilometers. This region is characterized by a diverse range of altitudes, rainfall patterns, climatic conditions, river systems, and topography, extending from subtropical to alpine zones and harboring rich biological diversity. The rich plant diversity in Uttarakhand has provided an advantage to the inhabitants in exploring various plant species for the purposes of food, medicine, fodder, fuel, timber, and spices. The ethnobotanical knowledge was documented by Nautiyal *et al.* (2001) and Maikhuri *et al.* (2000) <sup>[11]</sup>. While a comprehensive analysis has described the rich diversity and use of medicinal flora within Uttarakhand, it was done by Joshi (2002) <sup>[3]</sup>.

The Himalayan plant species have long been used for medical purposes, and about 1750 medicinal plants were reported from the Indian Himalaya by Samant *et al.* (1998) <sup>[22]</sup>. The unique diversity of medicinal plants in the region is manifested by the presence of a number of native (31%), endemic (15.5%), and threatened components (14%) of the total Red Data Book plant species of the Indian Himalaya Region (Samant *et al.*, 1998) <sup>[22]</sup>. The biodiversity of the region is declining rapidly due to habitat degradation, overexploitation, and changing environmental conditions (Samant *et al.*, 1998) <sup>[22]</sup>. Species extinction can result in a loss of biodiversity, habitat, and disruptions to natural ecosystem functions. The Kosi Watershed harbors rich biodiversity and diverse vegetation types. The area along the

river banks has been the most productive for a variety of products for centuries. People in this region rely on forest resources for medicine, food, and fuel for survival, and they have extensive traditional ethnobotanical knowledge. In the IHR, a number of studies have been carried out on the documentation of medicinal plant diversity (e.g., Samant *et al.*, 1998; Dhar *et al.*, 2002; Samant & Pant, 2006; Uniyal *et al.*, 2006) <sup>[22, 3, 20, 29]</sup>.

The rising demand for medicinal plants in the medicine and pharmaceutical sectors has led to the overexploitation of several species. The natural abundance of medicinal plants in hilly areas is gradually disappearing due to a variety of factors, including uncontrolled exploitation, small population size, restricted distribution area, habitat specificity, heavy livestock grazing, climate change, habitat loss, current development activities, and genetic drift (Kala 2000; 2005). Additionally, the use of ethnomedicine is slightly diminished by the scarcity of medicinal plants. However, local communities helped preserve traditional knowledge by passing it on through the generations. The ethnomedicinal knowledge is still present among the local knowledgeable people, which need to be documented before it is permanently lost. Several attempts have been made in the past to study ethnomedicinal plants from the Almora region. The present study focused on the ethnomedicinal use of herbaceous flora found along the Kosi watershed.

### Materials and methods

The present study is carried out in Almora district, Kumaun Himalaya, Uttarakhand, India. The district lies between 29°30' N to 30°20' N latitudes and 79°20' E to 80°20' E longitudes, at an average altitude of 1,651 meters. During its journey, the watershed passes through temperate and subtropical climatic zones. The watershed's mature hill topography is primarily composed of convex hill crests, with wide terraced valleys made of alluvium and concave slopes featuring pluvial cones and fans in the mid-crest. The

Kosi (spring-fed) river originates from the village of Budha Peenath in the Kausani region of district Almora, Uttarakhand. It is one of the main branches of the Ramganga River and one of the most prominent rivers in the northern region of Uttarakhand. The area is rich in traditional knowledge and vegetation. The present study is based on intensive field surveys made during 2022–23 regarding the phytosociological analysis within an altitudinal gradient of 900–1600 msl in the vicinity of the Kosi watershed. The villages were visited for the identification of medicinal plant species. Collected plant specimens were brought to the lab. The collected plant

specimens were examined by consulting important works on medicinal plants and ethnobotany, and identification of plant species was made with the help of available literature (Samant & Palni 2000; Samant *et al.* 2001) [19]. The documentation of the report was made based on field observation, discussions with local and knowledgeable people, and scrutinizing the literature review. The specimens were processed for the preparation of herbarium by standard methods. Moreover, all available information, including local names, habitat, parts used, etc., was recorded and tabulated.

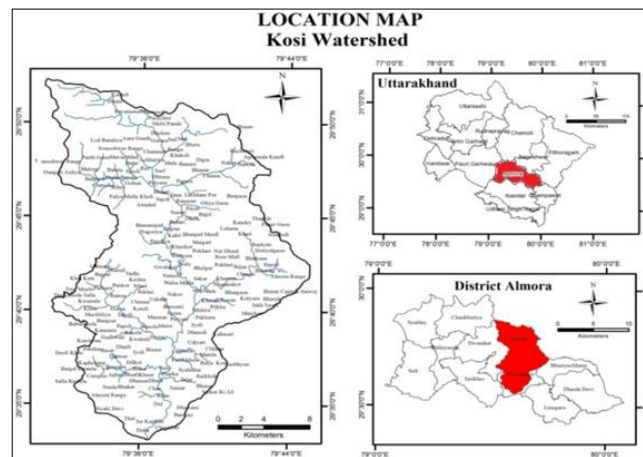


Fig 1: Study area map of Kosi watershed

## Results and Discussion

Utilization of plants for the treatment of diseases in humans is as old and put into practice as the human race itself. However, information about plant use has co-evolved with human society throughout the experiential use of plants, generation after generation. In this study, we documented the local uses of ethno-medically important plants. Most of the recorded species in this study have also been reported as medicinal species by other workers (Kumari *et al.*, 2012; Mehra *et al.*, 2014) [12]. The present findings regarding the similarity in the use of plants as medicines are in agreement with previous studies. On the basis of the present investigation, the scientific names of plants, their vernacular names, and their medicinal uses are presented in Table 1. Earlier, Kumari *et al.* (2012) explored the diversity and ethnomedical significance of the medicinal plant Almora. Tiwari *et al.* (2007) [4] reported 75 plant products used by

villagers in the Dwarahat region of the Almora district of Uttarakhand. A total of 42 plant species, representing 26 families of medicinal plants, were documented. The Asteraceae and Poaceae families were the most prevalent, with six species, followed by Polygonaceae and Rosaceae, with three species, and Plantaginaceae and Euphorbiaceae, with two species each. Of these species, 31 were identified as herbs and 11 as shrubs. The majority of the parts, i.e., the whole plant and leaves, are used in curing various ailments. The plants recorded from the study area were utilized in various health care systems, including treatments for mental fatigue, diarrhea, dysentery, fever, coughs, asthma, bronchitis, gastric disorders, diabetes, anti-allergic remedies, insecticidal properties, stomachaches, arthritis, wound healing, cholera, liver disorders, malarial fever, rheumatic problems, skin ailments, and inflammation

Table 1: List of ethno-medicinal plants used in the ailments of various diseases

S. No.	Botanical Name	Family	Local name	Habitat	Part used	Medicinal use	References
1.	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Amaranthaceae	Guderesag	Herb	Leaves	Dysentery, diarrhea, fever	Chopra <i>et al.</i> 2019 [11]; Swapna <i>et al.</i> 2011 [26]
2.	<i>Ageratum conyzoides</i> L.	Asteraceae	Jangali pudina	Herb	Whole plant	Cuts and wounds	Chopra <i>et al.</i> 2019 [11]; Tripathi <i>et al.</i> 2020 [27]; Saxena 2021 [23]
3.	<i>Centella asiatica</i> (L.) Urban.	Apiaceae	Brahmi	Herb	Whole plant	Improving memory and mental fatigue.	Kumari <i>et al.</i> 2018 [10]; Kapkoti <i>et al.</i> 2014 [8]
4.	<i>Cyperus iria</i> L.	Cyperaceae	Motha	Herb	Leaves	Stomachache	Usher, 1984 [30]
5.	<i>Artemisia scoparia</i> Waldst. & Kit.	Asteraceae	Jhau	Herb	Leaves	Hair tonic	Umair <i>et al.</i> 2019 [28]
6.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Dudhi	Herb	Whole plant	Cough, asthma and	Chopra <i>et al.</i> 2019

						bronchitis	[11]; Tripathi <i>et al.</i> 2020 [27]
7.	<i>Eupatorium adenophorum</i> Sprengl	Asteraceae	Kala basa	Herb	Leaves	Paste used for blood clotting and healing properties.	Kapkoti <i>et al.</i> 2014 [8]; Tripathi <i>et al.</i> 2020 [27]; Devi <i>et al.</i> 2019 [2]
8.	<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	Jharua	Herb	Whole plant	Reduce fever	Kumari <i>et al.</i> 2018 [10]; Devi <i>et al.</i> 2019 [2]
9.	<i>Hydrocotyle sibthoroides</i> Lam.	Araliaceae	Laghu Brahmi	Herb	Leaves	Diarrhea, dysentery	Dwivedi <i>et al.</i> 2019 [5]
10.	<i>Jaminum officinale</i> L.	Oleaceae	Juhi	Shrub	Flowers, leaves	Cure Ringworm	Vidyarthi <i>et al.</i> 2013 [31]
11.	<i>Lemna minor</i> L.	Araceae	Duckweed	Herb	Whole plant	Reduces fever, treats skin rashes	Umair <i>et al.</i> 2019 [28]
12.	<i>Nasturtium officinale</i> W.T.Aiton	Brassicaceae	Water cress	Herb	Leaves	Anti-allergic	Ikram <i>et al.</i> 2013
13.	<i>Mentha arvensis</i> L.	Lamiaceae	Pudina	Herb	Leaves	Gastrointestinal disorders	Pandey <i>et al.</i> 2016 [15]; Phondani <i>et al.</i> 2009 [18]
14.	<i>Persicaria barbata</i> (L.) H.Hara	Polygonaceae	Paniakhu	Shrub	Whole plant	Cuts and wounds, arthritis and muscle pain	Ikram <i>et al.</i> 2013; Usher, 1984 [30]
15.	<i>Persicaria glabrum</i> Willd.	Polygonaceae	Knotweed	Shrub	Flowers	Anti-inflammatory	Ikram <i>et al.</i> 2013
16.	<i>Prinsepia utilis</i> Royle	Rosaceae	Bhekal	Shrub	Seeds	Seed oil used in arthritis	Vidyarthi <i>et al.</i> 2013 [31]; Devi <i>et al.</i> 2019 [2]
17.	<i>Parthenium heterosporus</i> L.	Poaceae	Gajar ghas	Herb	Whole plant	Diarrhoea, dysentery, malaria	Devi <i>et al.</i> 2019 [2]
18.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Doob	Herb	Whole plant	Cure nasal bleeding	Mehra <i>et al.</i> 2014 [12]; Tripathi <i>et al.</i> 2020 [27]
19.	<i>Ricinus communis</i> L.	Euphorbiaceae	Arandi	Shrub	Leaves, seeds	Oil used for joint pain	Kumari <i>et al.</i> 2018 [10]; Dwivedi <i>et al.</i> 2019 [5]; Pandey <i>et al.</i> 2017 [14]
20.	<i>Solanum nigrum</i> L.	Solanaceae	Makoi	Herb	Whole plant	Diarrhea, liver disorder	Chopra <i>et al.</i> 2019 [11]; Tripathi <i>et al.</i> 2020 [27]
21.	<i>Saccharum spontaneum</i> L.	Poaceae	Kush	Herb	Leaves	Cure diarrhea	Kumari <i>et al.</i> 2018 [10]
22.	<i>Sorghum halepense</i> (L.) Pers.	Poaceae	Jangali-jowar	Herb	Stem, seeds, root	Stomachache, boils and cough	Umair <i>et al.</i> 2019 [28]
23.	<i>Verbascum thapsus</i> L.	Scrophulariaceae	Ekalvir	Herb	Leaves	Cold and fever	Mehra <i>et al.</i> 2014 [12]; Devi <i>et al.</i> 2019 [2]
24.	<i>Veronica angallis-aquatica</i> L.	Plantaginaceae	Jangali poundh	Herb	Leaves	Tonic, astringent	Singh <i>et al.</i> 2009 [25]; Ikram <i>et al.</i> 2013
25.	<i>Woodfordia fruticosa</i> (L.) Kurz.	Lythraceae	Dhoula	Shrub	Stem	Paste used in healing wounds	Kumari <i>et al.</i> 2018 [10]; Devi <i>et al.</i> 2019 [2]; Shah & Arya 2020 [24]
26.	<i>Xanthium strumarium</i> L.	Asteraceae	Chota dhatura	Shrub	Whole plant	Malarial fever	Pant 2015 [16]
27.	<i>Lantana camara</i> L.	Verbenaceae	Kuri	Shrub	Whole plant	Insecticidal properties	Kumari <i>et al.</i> 2018 [10]
28.	<i>Ranunculus sceleratus</i> L.	Ranunculaceae	Jaldhaniya	Herb	Leaves	Cure pain	Ikram <i>et al.</i> 2013
29.	<i>Cannabis sativa</i> L.	Cannabinaceae	Bhang	Herb	Whole plant	Control nausea and vomiting	Kumari <i>et al.</i> 2018 [10]; Shah & Arya 2020 [24]
30.	<i>Bidens pilosa</i> L.	Asteraceae	Kumri	Herb	Whole plant	Diarrhea, blood clotting	Parihar <i>et al.</i> 2014
31.	<i>Erigeron bonariensis</i> L.	Asteraceae	Gujju ghaas	Herb	Leaves	Paste used in skin, mouth and throat disease	Devi <i>et al.</i> 2019 [2]; Kumari <i>et al.</i> 2018 [10]
32.	<i>Oxalis latifolia</i> Hk.f.	Oxalidaceae	Khatti mitthi buti	Herb	Whole plant	Boils and pimples	Kumari <i>et al.</i> 2018 [10]
33.	<i>Persicaria capitata</i> (Buch.-Ham. ex D. Don)	Polygonaceae	Kalovar	Herb	Whole plant	Insect sting	Kumari <i>et al.</i> 2018 [10]; Devi <i>et al.</i>

	Gross						2019 [2]
34.	<i>Asparagus recemosus</i> Willd.	Asparagaceae	Shatavar	Shrub	Roots	Diabetes	Pant 2015 [16]
35.	<i>Rubus ellipticus</i> Smith.	Rosaceae	Hisalu	Shrub	Fruits	Cholera	Mehra <i>et al.</i> 2014 [12]; Devi <i>et al.</i> 2019 [2]; Pandey <i>et al.</i> 2017 [14]
36.	<i>Urtica dioica</i> L.	Utricaceae	Bicchu ghas	Shrub	Whole plant	Body cramp and external pain	Kapkoti <i>et al.</i> 2014 [8]; Tripathi <i>et al.</i> 2020 [27]
37.	<i>Cynoglossum lanceolatum</i> Forsk	Boraginaceae	Kuro	Herb	Whole plant	Muscle pain, cough and cold	Devi <i>et al.</i> 2019 [2]
38.	<i>Plantago ovata</i> Forssk.	Plantaginaceae	Isabgol	Herb	Leaves	Stomachache, Diarrhea and dysentery	Devi <i>et al.</i> 2019 [2]; Phondani <i>et al.</i> 2009 [18]
39.	<i>Potentilla indica</i> (Andrews) Th. Wolf	Rosaceae	Bhikafal	Herb	Leaves	Gastric disorder	Pandey <i>et al.</i> 2016 [15]; Pandey <i>et al.</i> 2017 [14]
40.	<i>Epilobium royleanum</i> Haussk.	Onagraceae	Bakury	Herb	Leaves	Astringent	Devi <i>et al.</i> 2019 [2]
41.	<i>Geranium nepalense</i> Sweet	Geraniaceae	Tirahni	Herb	Root	Treats rheumatic problems	Kumari <i>et al.</i> 2018 [10]
42.	<i>Echinochola crus-galli</i> (L.)	Poaceae	Jhangora	Herb	Seed	Diarrhea and dysentery	Kumar <i>et al.</i> 2021 [9]

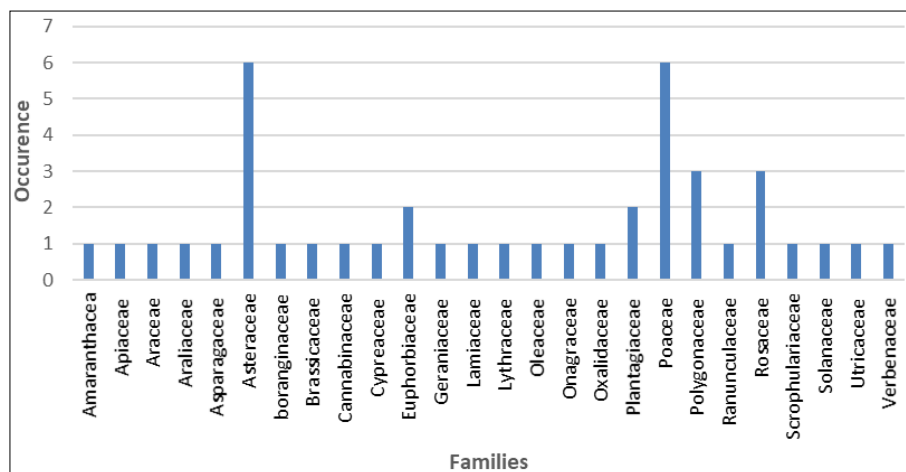


Fig 2: Graph showing the number of ethno-medicinal plants belonging to different families

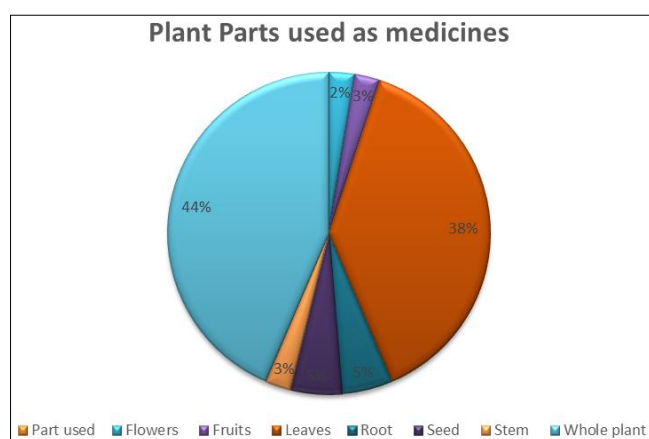


Fig 3: Pie chart showing part of plants used for ethno-medicinal purposes

**Conclusion**

The documentation of indigenous knowledge and evaluation of the use of plants for medicinal purposes plays a greater role in sustainable use and conservation of natural resources. The inhabitants are familiar with the use of medicinal herbs in traditional treatments. Global pressures, including

population growth, uncontrolled exploitation of medicinal plants, and development projects, have resulted in a surge in the demand for herbal remedies. It resulted in the loss of many important ethnomedicinal plants and will become a rare endangered species soon. There is a need to preserve its identity before it becomes extinct in the region. At present, the conservation and cultivation of natural resources, especially medicinal plants, are required. However, currently, respect and regard for traditional practices have been diminishing. It is necessary to raise awareness among the local indigenous population about floral biodiversity and conservation. As a result, the listing of medicinal plants and their current ethnobotanical knowledge will be useful for future understanding, research, and sustainable management of medicinal plants.

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**Conflict of interest**

No potential conflict of interest was reported by the authors.

## References

- Chopra N, Pandey N, Tewari LM, Tewari A. Floristic composition of ethnomedicinal plants used by indigenous people in Tarai region, Kumaun Himalaya. *Journal of Medicinal Plants Studies*,2019;7(4):139-143.
- Devi K, Samant SS, Puri S, Paul S, Dutt S. Diversity, distribution pattern and indigenous uses of medicinal plants in Kanawar Wildlife Sanctuary of Himachal Pradesh, North Western Himalaya, India. *Journal of Conservation Biology*,2019;117:172-219.
- Dhar U, Manjkhola S, Joshi M, Bhatt A, Bisht AK, Joshi M. Current status and future strategy for development of medicinal plants sector in Uttaranchal, India. *Current science*,2002;83(8):956-964.
- Dolly Tiwari DT, Pande PC, Lalit Tiwari LT. Ethno-veterinary herbal medicines of Dwarahat area of central Himalayas, 2007.
- Dwivedi T, Kanta C, Singh LR, Prakash IA list of some important medicinal plants with their medicinal uses from Himalayan State Uttarakhand, India. *Journal of Medicinal Plants Studies*,2019;7(2):106-116.
- Ikram S, Bhatti KH, Parvaiz M. Ethnobotanical studies of aquatic plants of district Sialkot, Punjab (Pakistan). *Journal of Medicinal Plants Studies*,2014;2(1):58-63.
- Joshi BD. A brief review on the flora of medicinal importance and prospects of developing a sustainable network of small scale pharmaceutical industries in Uttaranchal. *Himalayan Journal of Environment and Zoology*,2002;16(2):233.
- Kapkoti B, Lodhiyal N, Lodhiyal LS. Ethno-Medicinal plants and their uses by Van Panchayat people in Nainital of Kumaun Region, Uttarakhand. *Biolife Journal of biology and life science*,2014;2(2):526-32.
- Kumar M, Rawat S, Nagar B, Kumar A, Pala NA, Bhat JA, *et al.* Implementation of the use of ethnomedicinal plants for curing diseases in the Indian Himalayas and its role in sustainability of livelihoods and socioeconomic development. *International journal of environmental research and public health*,2021;18(4):1509.
- Kumari P, Samant SS, Puri S. Diversity, distribution, indigenous uses and conservation of medicinal plants in central Himachal Pradesh, North Western Himalaya. *J Med Plants Stud*,2018;6(5):45-68.
- Maikhuri RK, Nautiyal S, Rao KS, Semwal RL. Indigenous knowledge of medicinal plants and wild edibles among three tribal sub communities of the central Himalayas, India. *Indigenous Knowledge and Development Monitor*,2000;8(2):7-13.
- Mehra A, Bajpai O, Joshi H. Diversity, utilization and sacred values of Ethno-medicinal plants of Kumaun Himalaya. *Tropical Plant Research*,2014;1(3):80-86.
- Nautiyal S, Rao KS, Maikhuri RK, Semwal RL, Saxena KG. Traditional knowledge related to medicinal and aromatic plants in tribal societies in a part of Himalaya, 2000.
- Pandey NC, Bhatt D, Arya D, Chopra N, Upreti BM, Joshi GC, *et al.* Diversity of ethno-medicinal plant: a case study of Bageshwar district Uttarakhand. *J Med Plants Stud*,2017;5(2):11-24.
- Pandey NC, Joshi GC, Tewari LM. Ethnobotanical plant diversity of Betalghat region, Kumaun Himalaya. *Biolife*,2016;4(4):629-649.
- Pant GC. Indigenous medicinal practices of rural communities in respect use of the non-timber forest products in Indian central Himalaya, 2015.
- Parihaar RS, Bargali K, Bargali SS. Diversity and uses of Ethno-medicinal plants associated with traditional agroforestry systems in Kumaun Himalaya. *Indian Journal of Agricultural Sciences*,2014;84(12):1470-1476.
- Phondani PC, Maikhuri RK, Bisht NS. Medicinal plants used in the health care system practiced by traditional Vaidyas in Alaknanda catchment of Uttarakhand, India. *Ethnobotanical Leaflets*, 2009, (12)4.
- Samant SS, Palni LMS. Diversity, distribution and indigenous uses of essential oil-yielding medicinal plants of the Indian Himalayan region. *Journal of Medicinal and Aromatic Plant Sciences*,2000;22(1B):671-684.
- Samant SS, Pant S. Diversity, distribution pattern and conservation status of the plants used in liver diseases/ailments in Indian Himalayan region. *Journal of Mountain Science*,2006;3(1):28-47.
- Samant SS, Shreekar P. Diversity, distribution pattern and traditional knowledge of sacred plants in Indian Himalayan Region. *Indian Journal of Forestry*,2003;26(3):222-234.
- Samant SS, Dhar U, Palni LMS. Medicinal Plants of Indian Himalaya, 1998.
- Saxena S. Reviving the Ethnomedicinal Knowledge of Manila, District Almora (Uttarakhand), 2021.
- Shah Z, Arya D. Traditional knowledge of people on ethnomedicinal plants in a part of Garhwal Himalaya, India. *Int. J. Bot. Stud*,2020;5:207-212.
- Singh1, 3 P, Singh BK, Joshi GC, Tewari LM. Veterinary ethno-medicinal plants in Uttarakhand Himalayan Region, 2009.
- Swapna MM, Prakashkumar R, Anoop KP, Manju CN, Rajith NP. A review on the medicinal and edible aspects of aquatic and wetland plants of India. *Journal of medicinal plants research*,2011;5(33):7163-7176.
- Tripathi AN, Kumar P, Sati SC. Uses of invasive alien plants in Kumaun Himalayan folk medicinal system. *Int J Herb Med*,2020;8(1):27-31.
- Umair M, Altaf M, Bussmann RW, Abbasi AM. Ethnomedicinal uses of the local flora in Chenab riverine area, Punjab province Pakistan. *Journal of ethnobiology and ethnomedicine*,2019;15:1-31.
- Uniyal SK, Kumar A, Lal B, Singh RD. Quantitative assessment and traditional uses of high value medicinal plants in Chhota Bhangal area of Himachal Pradesh, western Himalaya. *Current Science*, 2006, 1238-1242.
- Usher G. *A Dictionary of Plants*. CBS Publishers and Distributors, New Delhi, 1984.
- Vidyarthi S, Samant SS, Sharma P. Traditional and indigenous uses of medicinal plants by local residents in Himachal Pradesh, North Western Himalaya, India. *International Journal of Biodiversity Science, Ecosystem Services & Management*,2013;9(3):185-200.