



# Conservation Status, Diversity and Utilization Pattern of Threatened Ethno-Medicinal Plants of Betalghat Region, Kumaun Himalaya

Naveen Chandra Pandey, Geetanjali Upadhyay, Disha Upreti, Lalit M. Tewari, Anand Kumar and Vasundhra Lodhiyal

*Department of Botany, D.S.B. Campus, Kumaun University, Nainital-263 001, India  
E-mail: [pandeynaveen10@kunainital.ac.in](mailto:pandeynaveen10@kunainital.ac.in)*

**Abstract:** Himalaya is one of the repository of medicinal plants. The study was conducted for the documentation of threatened ethno-medicinal plants from Betalghat region, Kumaun Himalaya. Betalghat is a block of Nainital district located at the bank of river Kosi. The present study records 20 species of threatened plants belonging to 16 families and 18 genera. Out of which 3 species were trees, 4 shrubs, and 13 herbs. Caprifoliaceae, Lamiaceae and Orchidaceae were the dominant families. Out of 20 species, 9 species were near threatened, 6 species were least concern, 4 species were vulnerable and 1 species were endangered. Local Name, botanical Name, family, habit, altitudes (m), habitat and utilization pattern were provided for each species. Therefore, there is an urgent need for conservation steps to be taken up along with promotion of conservation of threatened medicinal plants.

**Keywords:** Threatened, Medicinal plants, Status, Betalghat region, Kumaun Himalaya

The erosion of biodiversity is an issue of global concern. In ecosystems building blocks are disappearing, one by one. The number of species, which are going threatened, is increasing gradually. The numbers of threatened plants are approximately 8457, out of which 247 plants are in various biodiversity hotspots of India (IUCN 2010). The use of plants by the local inhabitants of these regions for various purposes, i.e., as medicine, as edible, fodder, fuel, timber, in making agriculture tools, cultural and various others has occurred since time immemorial. The resurgence of public interest in plant-based medicine related to the rapid expansion of the pharmaceutical industry prompted overexploitation that threatened many useful medicinal plants (Kumari et al., 2012). Further, the level of threat to the natural population of medicinal plants has increased. More than 90% of India's raw plant products are sourced from natural environments for different herbal industries (Dhar et al., 2002). In the coming 20 to 30 years, 25 percent of all biodiversity could become extinct. The habitat fragmentation by an excessive clearing of native vegetation poses a significant threat to floral and faunal biodiversity (Ford et al., 2009).

The regular exploitation of various medicinal flora from the wild habitat and substantial loss of their habitats during the last 15 years have resulted in a population loss of various valuable medicinal plant species over the years. The main threats to medicinal plants influence any biodiversity that peoples utilize. The debility of traditional laws regulating natural wealth utilization is among the main reasons for threatening the wild medicinal plant species (Kala 2005, Kala and Ratajc 2012). Belt et al. (2003) observed that these

traditional laws have regularly proved to be simply damaged by modern socio-economic forces. Various possible reasons of a rarity in medicinal plant species, such as climatic changes, the explosion of the human population, fragmentation and degradation of population, habitat alteration and specificity, genetic drift, the introduction of non-natives, heavy grazing, narrow range of distribution and land-use disturbances (Kala 2005, Kala and Ratajc 2012).

However, the insufficient available data on the threatened species in nature has restricted their categorization to a few species based on herbarium collection and by consultation by a couple of specialists (Kala 2005, Kala and Ratajc 2012). The problems in assessing the plant species diversity are increased in the Himalayan region, in respect of high altitude areas because of inhospitable climatic conditions, rough and detachment of the terrain, and short life cycle of plants (Kala and Ratajc 2012). The indigenous communities and commercial herb gatherers also raid these same landscapes to collect valuable medicinal plants. Therefore, the predictable population density of categorized threatened medicinal plants is not exact. It varies the region that never and scarcely undergone any collection visits of such rare medicinal plant species (Kala 2005, Kala and Ratajc 2012).

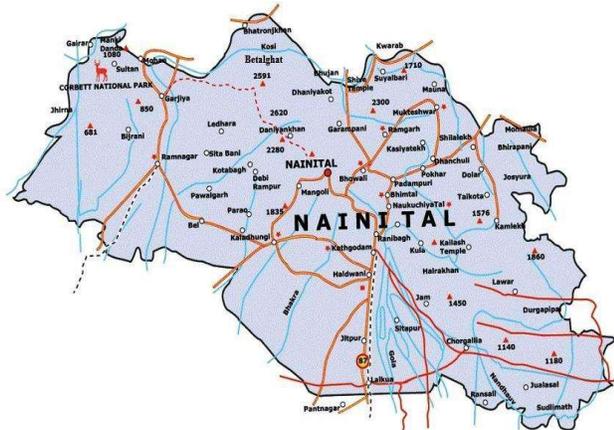
For short or long term management planning and area-specific threat categorization of medicinal plant species is important (Singh et al., 2009). The availability of critically endangered, endangered, and vulnerable medicinal plants indicates high anthropogenic pressure. If continuous overexploitation and habitat degradation of these species, they may disappear from the area shortly (Singh et al., 2009,

Kumari et al., 2012, Sharma et al., 2014). There is an urgent need of the establishment and conservation of medicinal plants nurseries and herbal gardens and ensuring the availability of quality planting material for large-scale cultivation, through educational and awareness programs (Singh et al., 2009, Kumari et al., 2012, Sharma et al., 2014). The present study represents such an effort in the study area, using the information on different attributes.

## MATERIAL AND METHODS

**Study area:** The Betalghat block lies between 29°32'45"-29°29'36"N latitudes and 79°14'43"-79°24'24"E longitudes. Betalghat is a block of Nainital district located at the bank of river Kosi (Fig. 1). It is situated in the northern part of the district Nainital, Kumaun Himalaya.

**Data collection and analysis:** The field surveys were carried out during the year 2022-2024. Specimens of all the plants were collected and identified with the help of relevant floras and herbaria (Gaur 1999, Joshi et al., 2018). The specimens collected from the field were deposited in the herbarium division of the Department of Botany, D.S.B. Campus, Kumaun University, Nainital. Using six attributes (i.e., habitat preference, distribution range, population size, use pattern, extraction trend, native and endemic species), the threat status was identified and also, categorization of these species is done as Least Concern, Near Threatened, Rare, Vulnerable, Endangered and Critically Endangered



(Source: <http://www.uttaranchal.org.uk>)

**Fig. 1.** Map of the study area

following (Samant et al., 1998, Dhar et al., 2002, Kala 2005, Singh et al., 2009, Kala and Ratajc 2012). Species with scores <46 were identified as least concern, 46-50 as near threatened, 51-55 as vulnerable, 56-60 as endangered, and >60 as critically endangered (Table 1).

## RESULTS AND DISCUSSION

**Diversity of threatened medicinal plants:** The present study recorded 20 species of threatened plants belonging to 16 families and 18 genera. Out of which 3 species were trees, 4 shrubs, and 13 herbs (Table 2, Plate 1). The families were Caprifoliaceae, Lamiaceae, and Orchidaceae, having two species and Apiaceae, Asparagaceae, Bignoniaceae, Celastraceae, Colchicaceae, Costaceae, Dioscoreaceae, Euphorbiaceae, Hypoxidaceae, Pittosporaceae, Ranunculaceae, Rutaceae, Saxifragaceae, and Ulmaceae having single species were identified. Along an altitudinal gradient, altitudinal zone 1001-1300m showed the maximum diversity (i.e., 12 spp.), followed by the zone 700-1000 m (11 spp.), 1601-1800 m (10 spp.), and 1301-1600 m (8 spp.) respectively. Overlapping within different altitudinal zones is noted in most of the cases.

**Status of threatened medicinal plants:** In the present study, 6 species (*Bergenia ciliata* (Haworth) Sternb., *Celastrus paniculatus* Will., *Curculigo orchoides* Gaertn., *Thalictrum foliolosum* DC., *Valeriana wallichii* DC. and *Zanthoxylum armatum* DC.) with scores 40-44 were considered as least concerned category, 9 species (*Baliospermum montanum* (Willd.) Muell.-Arg., *Clerodendrum serratum* L., *Coleus barbatus* (Andr.) Benth, *Costus speciosus* (Koenig ex Retz.) Sm., *Dioscorea deltoidea* Wall. ex Griseb., *Drimia indica* (Roxb.) Jessop., *Malaxis acuminata* D. Don, *Ulmus wallichiana* Planch, and *Valeriana hardwickii* Wall.) with score 48 were found under near threatened category, and 4 species (*Gloriosa superba* L., *Habenaria intermedia* D. Don, *Heracleum lanatum* Michaux and *Oroxylum indicum* L.) with score 52 were found under vulnerable category, and 1 species (*Pittosporum eriocarpum* Royle.) with score 56 were under endangered category (Table 3).

The Himalayan region has rich biological diversity that is now under threat from rapidly expanding human populations, habitat destruction, and concomitant environmental

**Table 1.** Different criteria for threat categorization of the species

Habitat	Distribution	Population (Individual/ location)	Use pattern	Extraction trend	Native and endemic	Score
One	<500	250 Individual/up to 2 location	4 and >4	Commercial	Native and endemic	10
2-3	500-1000	250-1000 Individual/3-5 location	2-3	Self-use	Native/Endemic	6
>3	>1000	1000 Individual/>5 location	One	No use	Non-native	2

**Table 2.** Diversity and utilization pattern of threatened ethno-medicinal plants of Betalghat Region, District Nainital (Kumaun Himalaya)

Local name	Botanical name	Family	Habit	Altitudes (m)	Habitat	Utilization pattern
Danti	<i>Baliospermum montanum</i> (Willd.) Muell.-Arg.	Euphorbiaceae	Sh	700-1100	Forest openings, edges, and wastelands	Arthritis, bronchitis diseases, constipation, jaundice, and skin disease.
Silphora	<i>Bergenia ciliata</i> (Haworth) Sternb.	Saxifragaceae	H	1400-1800	Shady and moist rocks	Asthma, boils, cough, diarrhea, fever, gall bladder, and kidney stones.
Mal-kangani	<i>Celastrus paniculatus</i> Willd.	Celastraceae	Sh	700-1100	Open places, rocky substrate	Arthritis, cough, diarrhea, dysentery, gout, headache, itching, piles, and wounds.
Bharangi	<i>Clerodendrum serratum</i> (L.) Monn.	Lamiaceae	Sh	700-1100	Roadside, open places	Asthma, bronchitis, cough, headache, fever, and skin diseases.
Hiwain	<i>Coleus barbatus</i> (Andr.) Benth	Lamiaceae	H	1100-1500	Rocky substrate	Constipation, low blood pressure, and intestinal worm infection.
Keva	<i>Costus speciosus</i> (J. Koenig) Sm.	Costaceae	H	700-1100	Shady forest slopes	Arthritis, cold, cough, and stomach-ache.
Kali Musli	<i>Curculigo orchioides</i> Gaertn.	Hypoxidaceae	H	700-1600	Open grassy localities, undergrowth in moist shady areas,	Asthma, cough, cuts and wounds, diarrhoea, jaundice, Insect or scorpion bite, itching piles, skin diseases, and urinary disorders.
Jangli Gethi	<i>Dioscorea deltoidea</i> Wall. ex Griseb.	Dioscoreaceae	H	1600-1800	Open places	Dysentery, fever, jaundice, and skin diseases.
Ban Pyaj	<i>Drimia indica</i> (Roxb.) Jessop.	Asparagaceae	H	700-1100	Open exposed, grassy slopes	Joints, pain, and arthritis.
Kalihari	<i>Gloriosa superba</i> L.	Colchicaceae	H	700-1100	Along forest margins	Fever, gonorrhoea, insect or scorpion stings, leprosy intermittent, piles, painful delivery, rheumatism, skin diseases, and tumors.
Vridhi	<i>Habenaria intermedia</i> D. Don	Orchidaceae	H	1600-1800	Open grassland, grassy slopes	Asthma, health tonic and skin diseases.
Kakriya	<i>Heracleum lanatum</i> Michaux	Apiaceae	H	1600-1800	Shady forests edges and open fields	Arthritis, leucoderma and toothaches.
Jivak	<i>Malaxis acuminata</i> D. Don	Orchidaceae	H	1500-1800	Moist shady places	Fever, bronchitis, general debility, and weakness.
Syonake	<i>Oroxylum indicum</i> (L.) Kurz	Bignoniaceae	T	700-1000	Open places	Diarrhea, dysentery, fever, indigestion, insect and scorpion stings, stomach-ache and urinary disorders.
Agni	<i>Pittosporum eriocarpum</i> Royle.	Pittosporaceae	T	900-1300	Banj-oak and miscellaneous forests	Bronchitis and rheumatic swellings.
Mamiri	<i>Thalictrum foliolosum</i> DC.	Ranunculaceae	H	900-1800	Open hill slopes	Conjunctivitis boils, and jaundice.
Chamar-Mua	<i>Ulmus wallichiana</i> Planch	Ulmaceae	T	1600-1800	Banj-oak forests	Bone fracture.
Sameo	<i>Valeriana hardwickii</i> Wall.	Caprifoliaceae	H	1100-1800	Moist shady slopes	Diarrhoea, fever, and urinary disorders.
Sameo	<i>Valeriana wallichii</i> DC.	Caprifoliaceae	H	1400-1800	Moist places, forest floors	Cholera and urinary disorders.
Timur	<i>Zanthoxylum armatum</i> DC.	Rutaceae	Sh	800-1800	Open scrub jungles and grazing places	Mouth wash, toothache, headache, and asthma.

**Abbreviations used-** H: Herb; Sh: Shrub; T: Tree

degradation occurring at a fast pace. At the regional, national and global levels various attempts have been made to identify threatened species, including medicinal plants, using different attributes such as biogeographical range, habitat preference, population size and utilization pattern (Kala and Ratajc 2012, Kumari et al., 2012, Chauhan et al., 2014, Lone et al., 2014, Manikandan and Srivastava 2015, Singh et al., 2017, Arya et al., 2018, Jeph and Khan 2019, Bhatt et al., 2020, Chandra et al., 2021, Rawal and Tewari 2022).

The total of 121 species of vascular plants, including 17 species of medicinal plants from IHR, have been recorded in the Red Data Book of Indian Plants (Nayar and Shastri, 1987, 1988, 1990). It is therefore evident from the present investigation that all the documented threatened plants of present study belong to different threat categories according to the Red Data Book of Indian Plants (Nayar and Sastry 1987, 1988, 1990), CAMP (Conservation Assessment and Management Plan 1998, 2003) Workshop, other existing literature (Kumari et al., 2012, Srivastava and Singh 2005, Bhatt et al., 2020). At regional and global levels, threat categorization has also been done in which *Baliospermum montanum* (Willd.) Muell.-Arg. and *Celastrus paniculatus* Will. are under the near-threatened category, *Bergenia ciliata*

(Haworth) Sternb., *Clerodendrum serratum* L., *Curculigo orchioides* Gaertn, and *Thalictrum foliolosum* DC. under a vulnerable category, *Gloriosa superba* L. and endangered categories and *Dioscorea deltoidea* Wall. ex Griseb., *Valeriana wallichii* DC. under critically rare categories (CAMP 1998). Srivastava and Singh (2005) reported 60 species of threatened medicinal plants from Uttarakhand, Joshi et al. (2010) reported 33 species of threatened medicinal plants from Alpine region of Uttarakhand, Kumari et al (2012) reported 21 species of threatened ethno-medicinal from district Almora, Kumaun Himalaya, Manikandan and Srivastava (2015) reported 30 species of threatened plants from Govind Pashu Vihar Wildlife Sanctuary, Western Himalaya, Rai et al (2017) reported 18 species of threatened plants Kedarnath Wildlife Sanctuary, Garhwal Himalaya, Uttarakhand, Singh et al. (2017) reported 29 species of threatened plants from Jakholi block of district Rudraprayag, Western Himalaya, Jeph and Khan (2019) reported 39 species of threatened plants from Jhunjhunu District, Rajasthan, Bhatt et al. (2020) reported 50 species of threatened plants from Kumaun Himalaya, Chandra et al. (2021) reported 14 species of threatened medicinal and aromatic plants from Western Himalaya and Rawal and

**Table 3.** Status and threats of threatened ethno-medicinal plants of Betalghat Region, Nainital District (Kumaun Himalaya)

Botanical name	Family	Observed status	CAMP status (1998, 2003)	Threats
<i>Baliospermum montanum</i> (Willd.) Muell.-Arg.	Euphorbiaceae	NT	NT	G, HD
<i>Bergenia ciliata</i> (Haworth) Sternb.	Saxifragaceae	LC	VU	OE, HD
<i>Celastrus paniculatus</i> Will.	Celastraceae	LC	VU	HD
<i>Clerodendrum serratum</i> L.	Lamiaceae	NT	VU	HD
<i>Coleus barbatus</i> (Andr.) Benth	Lamiaceae	NT	VU	HD
<i>Costus speciosus</i> (Koenig ex Retz.) Sm.	Costaceae	NT	NT	HD, G
<i>Curculigo orchioides</i> Gaertn.	Hypoxidaceae	LC	VU	OE, G
<i>Dioscorea deltoidea</i> Wall. ex Griseb.	Dioscoreaceae	NT	EN	HD
<i>Drimia indica</i> (Roxb.) Jessop.	Asparagaceae	NT	VU	HD, OE
<i>Gloriosa superba</i> L.	Colchicaceae	VU	VU	HD
<i>Habenaria intermedia</i> D. Don	Orchidaceae	VU	EN	HD
<i>Heracleum lanatum</i> Michaux	Apiaceae	VU	EN	HD, OE
<i>Malaxis acuminata</i> D. Don	Orchidaceae	NT	VU	HD, OE
<i>Oroxylum indicum</i> L.	Bignoniaceae	VU	VU	HD, OE
<i>Pittosporum eriocarpum</i> Royle.	Pittosporaceae	EN	EN	HD
<i>Thalictrum foliolosum</i> DC.	Ranunculaceae	LC	VU	OE
<i>Ulmus wallichiana</i> Planch	Ulmaceae	NT	VU	HD, OE
<i>Valeriana hardwickii</i> Wall.	Caprifoliaceae	NT	VU	G, HD
<i>Valeriana wallichii</i> DC.	Caprifoliaceae	LC	VU	OE
<i>Zanthoxylum armatum</i> DC.	Rutaceae	LC	VU	HD, OE

**Abbreviations Used-** EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; OE: Over Exploitation; HD: Habitat Degradation; G: Grazing; CAMP: Conservation Assessment and Management Plan



*Baliospermum montanum*



*Bergenia ciliata*



*Celastrus paniculatus*



*Clerodendrum serratum*



*Coleus barbatus*



*Costus speciosus*



*Curculigo orchioidea*



*Dioscorea deltoidea*



*Drimia indica*



*Gloriosa superba*



*Habenaria intermedia*



*Heracleum lanatum*



*Malaxis acuminata*



*Oroxylum indicum*



*Pittosporum eriocarpum*



*Thalictrum foliolosum*



*Valeriana wallichii*



*Zanthoxylum armatum*

**Plate 1.** Threatened plants of Betalghat Region, District Nainital(Kumaun Himalaya)

Tewari (2022) reported 16 species of threatened plants from Kedarnath Wildlife Sanctuary, Garhwal Himalaya, Uttarakhand. The present study reports 20 species of threatened plants belonging to 17 families and 19 genera. Out of which 3 species were trees, 4 shrubs, and 13 herbs. It is observed that out of 20 species, 9 species were near threatened, 6 species were least concern, 4 species were vulnerable and 1 species were endangered.

### CONCLUSION

The indicate that 20 species of threatened plants belonging to 17 families and 19 genera. The six species are considered as least concerned category, 9 species under near threatened category, 4 under vulnerable category, and 1 species under endangered category in the study area. Documentation of these threatened medicinal plants may provide basic information for conservation and sustainable development of the Himalayan region.

### AUTHOR CONTRIBUTIONS

Naveen Ch. Pandey, Geetanjali Upadhyay, Disha Upreti, Anand Kumar and Vasundhra Lodhiyal: formal analysis, investigation, methodology, writing-original draft. Lalit M. Tewari: supervision, visualization, conceptualization, review and editing.

### REFERENCES

- Arya JC, Joshi GC and Tewari LM 2018. *Medicinal Flora of Tari Region of Uttarakhand*, Shree Publishers and Distributors, New Delhi, p 140.
- Belt J, Lengkeek A and Zant JVD 2003. *Cultivating a Healthy Enterprise Developing a sustainable medicinal plant chain in Uttaranchal-India*. KIT Publication, Amsterdam, Netherlands, Bulletin, **350**: 1-56.
- Bhatt D, Joshi GC, Tewari LM and Pandey NC 2020. *Traditional Medicinal Systems and Threatened Medicinal Plants of Kumaun, Western Himalaya, India*, Indu Book Services Pvt, Ltd, (Publishers & Distributors) New Delhi, p. 140.
- Chandra N, Singh G, Lingwal S, Rai ID and Tewari LM 2021. Alpine medicinal and aromatic plants in the Western Himalaya, India: An ecological review. *Indian Journal of Ecology* **48**(2): 319-331.
- Chauhan PK, Singh S, Kour J and Singh M 2014. Need of conservation and management of endangered plant species of North Western Himalayas: A review. *World Journal of Pharmaceutical Research* **3**(9): 222-226.
- CAMP 1998, 2003. *Conservation Assessment and Management Plan Workshops Report*, www.camp.org.
- Dhar U, Manjkhola S, Joshi M, Bhatt A, Bisht AK and Joshi M 2002. Current status and future strategy for development of medicinal plant sector in Uttarakhand, India. *Current Science* **83**(8): 956-964.
- Ford HA, Walters JR, Cooper CB, Debus SJS and Doerr VAJ 2009. Extinction debt or habitat change? Ongoing losses of woodland birds in North-Eastern New South Wales, Australia. *Biological Conservation* **142**: 3182-3190.
- Gaur RD 1999. *Flora of the District Garhwal Northwest Himalayas (With Ethnobotanical Notes)*, Transmedia: Srinagar, Garhwal, p 811.
- IUCN 2010. *International Union for Conservation of Nature (IUCN), Red List of Threatened Species, Switzerland, Cambridge, UK: IUCN, Glands* www.iucnredlist.org.
- Jeph A and Khan JB 2019. Study on some threatened, rare and endangered plant's species in reserve forest area of Jhunjhunu District, Rajasthan. *Indian Journal of Ecology* **46**(4): 755-759.
- Joshi GC, Tewari LM Lohni N, Kumar S, Kumari, P and Bhatt D 2010. Studies on Status, Threats and Strategies of Endangered Medicinal Plants of the Alpine Regions of India, pp 256-264. In: Tewari LM, Pangtey YPS and Tewari G (eds). *Biodiversity potentials of the Himalaya*. Gyanodaya Prakashan, Nainital.
- Joshi GC, Tewari LM, Pandey NC and Upreti BM 2018. *Flora of Ranikhet West Himalaya*, Indu Book Services, New Delhi, p 375.
- Kala CP 2005. Indigenous uses, population density, and conservation of threatened medicinal plants in protected areas of the Indian Himalayas. *Conservation Biology* **19**(2): 368-378.
- Kala CP and Ratajc P 2012. High altitude biodiversity of the Alps and the Himalayas: ethnobotany, plant distribution and conservation perspective. *Biodiversity and Conservation* **21**: 1115-1126.
- Kumari P, Joshi GC and Tewari LM 2012. Biodiversity status, distribution and use pattern of some ethno-medicinal plants. *International Journal of Conservation Science* **3**(4): 309-318.
- Lone PA, Bhardwaj AK, Shah KW and Tabasum S 2014. Ethnobotanical survey of some threatened medicinal plants of Kashmir Himalaya, India. *Journal of Medicinal Plants Research* **8**: 1362-1373.
- Manikandan R and Srivastava SK 2015. Diversity, medicinal and threatened plants in Govind Pashu Vihar Wildlife Sanctuary, Western Himalaya. *Indian Forester* **141**(9): 966-973.
- Nayar MP and Sastry ARK 1987, 1988, 1990. *Red Data Book of Indian Plants*, eds. 1-3. Botanical Survey of India, Howrah (Calcutta), India, p 367.
- Rai ID, Singh G and Rawat GS 2017. *Plants of Kedarnath Wildlife Sanctuary, Western Himalaya: A Field Guide*, Bishen Singh Mahendra Pal Singh, Dehradun, p 824.
- Rao KC, Geetha BL and Geetha S 2003. *Red List of Threatened Vascular Plant Species in India*, Botanical Survey of India, Howrah, p 43.
- Rawal R and Tewari LM 2022. Floristic diversity, nativity and endemism of high altitude forested landscape of Kedarnath Wildlife Sanctuary. *Indian Journal of Ecology* **49**: 1240-1246.
- Samant SS, Dhar U and Palni LMS 1998. *Medicinal plants of Himalaya. Diversity distribution potential values*, Gyanodaya Prakashan, Nainital, p 163.
- Sharma P, Samant SS, Lal M and Sharma A 2014. Diversity, indigenous uses, threat categorization and conservation prioritization of medicinal plants: A case study from Himachal Pradesh, India. *Journal of Biodiversity and Endangered Species* **2**(4): 1-6.
- Singh A, Manohar L and Samant, SS 2009. Diversity, indigenous uses and conservation prioritization of medicinal plants in Lahaul valley, proposed Cold Desert Biosphere Reserve, India. *International Journal of Biodiversity Science & Management* **5**(3): 132-154.
- Singh A, Nautiyal MC, Kunwar RM and Bussmann RW 2017. Ethnomedicinal plants used by local inhabitants of Jakholi block, Rudraprayag district, Western Himalaya, India. *Journal of Ethnobiology and Ethnomedicine* **13**(49): 1-29.
- Srivastava SK and Singh DK 2005. *Glimpses of Plant Wealth of Uttarakhand*. Bishan Singh Mahendra Pal Singh, Dehradun, Uttarakhand, India, p 50.