



## Study of Ethnomedicinal Plants used by Migratory Shepherds in Renuka Forest Division of District Sirmour (H.P.) Western Himalaya

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**ABSTRACT:** The present study was carried out during 2017 to 2018 to obtain the information on ethnomedicines used by migratory shepherds in Renuka Forest Division in district Sirmour of Himachal Pradesh in western Himalaya. Renuka Forest Division lied in between 30° 52 16 to 30° 31 11 N latitudes and 77° 17 34 to 77° 47 38 E longitudes. Shepherds migrate in the month of July from their originated villages to Sirmour ranges (low hills). The geographical area of the Renuka Forest Division is 1018 km<sup>2</sup>. The whole range of Renuka Forest Division is hilly and varies in elevations from 620 to 3647m msl. Most of the tribal population lives near to forest area and they use various plant species for their basic needs such as food, fodder, wood and medicines to treat several diseases. Importance of wild medicinal plants in traditional healthcare practices provides clues to new areas of research. The present survey is focused on the traditional uses of wild medicinal plants by migratory shepherd. Information on wild medicinal plants of the present survey has been gathered through personal field visits, interviews, discussion and through pretested questionnaire. A total of 21 medicinal plant species were reported viz., *Cannabis sativa*, *Rhododendron arboretum*, *Vitex negundo* and *Zanthoxylem armatum*, etc. are the commonly used species. It was recorded that herb species were markedly high (12) followed by tree (5), shrubs (3) and climber (1). This survey can help as baseline data on wild medicinal plant species and could be helpful in conservation of this significant resource as well as traditional knowledge of migratory shepherds in study area.

**Keywords:** Medicinal plants, Traditional knowledge, Survey, Migratory shepherds.

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### INTRODUCTION

The varied culture of India is a rich sources of traditional medicines, many of which are plant origin. Traditional folklore knowledge of India, plays an significant role in rural Inhabitants. Since time long ethnomedicines are used by our ancestors for their well-being and transferred orally from one generation to next generation. In social life it delivers systematic knowledge about tradition and culture. Western Himalaya is a store house of many natural flora and fauna, of which vegetation characteristic is predominant. Today around 65% of Indian inhabitants depend on the traditional medicine. They cure different diseases through their own traditional knowledge system (Sharma *et al.*, 2009; Sharma and Rana, 2016). In India forests have been reported the good source of traditional medicines for times about 17,000

species of higher plants described and 7500 species are recognized for their medicinal uses (Shiva, 1996; Dikshit *et al.*, 2017).

India is rich in its cultural assortment of various indigenous beliefs have retained traditional knowledge concerning the therapeutic value of the flora (Ragupathy and Mahadevan, 1996; Sharma and Mishra, 2009; Charjan, and Dabhadkar, 2014). It has been reported in India, about 90-95% collection of medicinal plant species is from the wild region (Adhikari *et al.*, 2010). For the sustained development of plants and plant resources, suitable supervision is the only way out. Due to lack of proper scientific attention and management practices, a huge number of grazing lands have been changed or are in the stage of conversion to degraded lands.

Very little conservation and management practices has been given to the vegetation (Verma and Kapoor, 2014; Verma, 2014; Kumar *et al.*, 2016). In particular the state of Himachal Pradesh is a home to sizeable tribal inhabitants like the Pangwals, Kinnauras, Gujjar's and Gaddis. Shepherds use green pastures for rearing their livestock. Shepherds of Himachal Pradesh with their livestock move from high altitude to low altitude and vice versa and travel all over the year, leaving for low hills with the commencement of winter season and returning to their villages (high hills) in summer time of year. Shepherds move from high hills in the month of July towards mid hills, and finally by September and October reach low hills or plains where they temporally settle up to the month of March. Their duration of stay both during migration and reverse migration often varies (Biswas and Rao, 2016).

The fast acceleration of market response for herbal medications, and recent disputes related to benefit sharing, access and biopiracy, the proper documentation of native knowledge is of vital priority. In low hills the knowledge about medicinal species is declining relative to higher elevations (Yadav *et al.*, 2014). The native peoples mainly depend on the endemic vegetation for their daily needs such as fuel, fodder, food and medicines for the different ailments. The documentation of traditional information has provided various significant medicines for the modern world. The continuation of traditional knowledge is risking as the transmission between the younger and older generations no longer exists (Kargioglou *et al.*, 2008; Kapoor, 2017). Therefore, proper documentation of the traditional information through ethnobotanical studies is significant for the utilization of biological resources and their conservation (Muthuet *et al.*, 2006; Sharma, 2016; Bagga, 2018). Moreover, Himachal Pradesh has led to tribal ways of life, adherence to the primitive customs and myths and traditions

representing an enormous and difficult terrain of scattered human settlement and sensitive ecosystem (Singh and Batish, 2015). Worldwide in recent years, attention in herbal remedies has increased considerably as they are believed to be comparatively less toxic than the synthetic drugs and easy to available from surroundings without any cost. But if efforts are not made with instant effect, the rich traditional knowledge possessed by migratory shepherds will diminish soon. This calls for an urgent need to document ethnomedicinal plant species. Renuka Forest Division is a less developed area that harbors higher number of medicinal plant species and is consequently one of the greatest study areas to document the traditional information on wild medicinal plants. Therefore, the present study is an attempt to document the ethnomedicines used by migratory shepherds during their seasonal migration from high altitude to low altitude in Renuka Forest Division of district Sirmour. There is no proper record available regarding the ethnomedicines used by migratory shepherds during their seasonal migration from high hills to low hills in Renuka Forest Division. The ethnobotanical information on medicinal plants of this area and is expected to provide new dimensions forever expanding pharmaceutical industry.

## MATERIALS AND METHODS

### A. Study area

Himachal Pradesh, a north Indian state, is situated in western Himalaya. Himachal Pradesh has a varied geographical grouping, mosaic socio-cultural diversity and huge wealth of natural resources (Chowhery, 1999). The present survey is carried out in Renuka Forest Division of district Sirmour in Himachal Pradesh. In Western Himalaya Renuka Forest Division lies in district Sirmour Himachal Pradesh (Fig.1).



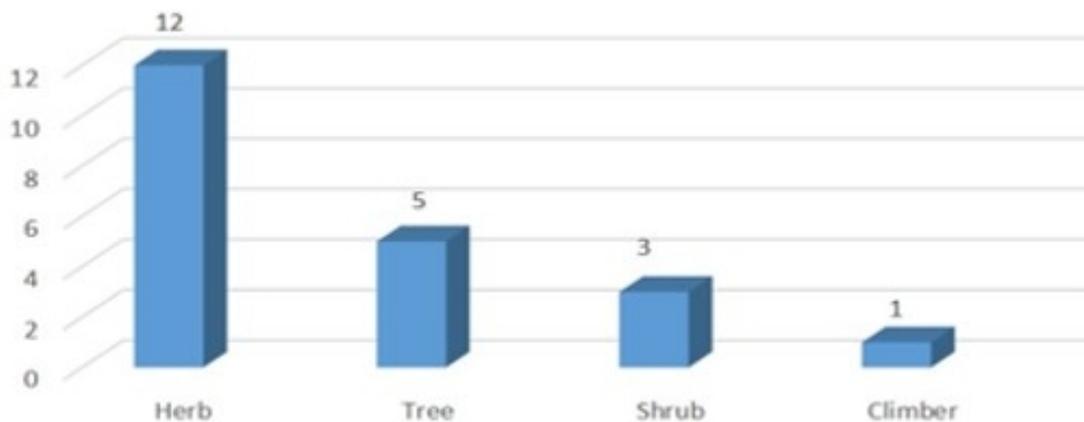
Fig. 1. Map of India showing Renuka forest division of District Sirmour in Himachal Pradesh.

Renuka Forest Division ranges between 30° 52 16 to 30° 31 11 N latitudes and 77° 17 34 to 77° 47 38 E longitudes (Anonymous, 1999).

**B. Data Collection**

For this survey, extensive field trips of the entire area of Renuka Forest Division were undertaken

between 2017 to 2018. The information on wild medicinal plants used by migratory shepherds in Renuka Forest Division (RFD) was collected by using interviews, pretested questionnaire, observation and through discussion method (Fig. 2).



**Fig. 2.** Wild Medicinal plants used by migratory shepherds in Renuka Forest Division of Sirmour in Himachal Pradesh.

Only those medicinal plants were collected, which were most frequently used by the migratory shepherds for the treatment of various ailments in Renuka Forest Division. The specimens of medicinal plant species being used by shepherds were collected, dried and mounted on herbarium sheets, with label information describing when and where they were collected. Vouchers of plant specimens were placed in the herbarium of the Shoolini University, Solan (H.P). Plants were identified either in the field itself through literature study (Thakur and Waske, 2018; Jain, 1991) or

with the help of experts from Forest Research Institute, Dehradun (Uttarakhand) and Botanical Survey of India, Dehradun (Uttarakhand).

**RESULTS**

The present study is carried out in Renuka Forest Division of district Sirmour in Himachal Pradesh (Fig. 3) concerning the ethnomedicines used by migratory shepherds in their own traditional health care system.



**Fig. 3.** Interaction with migratory shepherds in Renuka Forest Division of District Sirmour in Himachal Pradesh.

A total of 21 commonly used ethnomedicinal plants were documented in Renuka Forest Division. It was recorded that herb species were markedly high (12) followed by tree (5), shrubs (3) and climber (1). Among these plant species, the maximum plants were used for cough, cold, skin problems, and wound healing etc. Plants used by migratory shepherds were tabulated in alphabetical order of botanical name, family, Hindi name, flowering and fruiting months, habit, voucher no, parts used and ethnomedicinal uses

(Table 1). Unfavorable climatic conditions cause seasonal migration of shepherds from high hills to plains in different area of Himachal Pradesh. In the tribes of Himalayan region seasonal migration is a traditional process. It was perceived that migratory shepherds start their migration from high hills in the starting month of July and in October month there is no seasonal migration as the winters sets in. The tribal shepherds move in a group of their individual family members.

**Table 1: Ethnomedicines used by Migratory Shepherds in Renuka Forest Division of District Sirmour (Himachal Pradesh).**

| Sr. No. | Botanical Name                                       | Family         | Hindi name       | Flowering and Fruiting months | Habit   | Voucher number  | Parts used    | Ethnomedicinal uses  |
|---------|--|----------------|------------------|-------------------------------|---------|-----------------|---------------|--|
| 1.      | <i>Amaranthus viridis</i> L.                         | Amaranthaceae  | Jungalichaul ayi | July-October                  | Herb    | SUBMS/ BOT-401  | Leaves, Roots | The juice of Leaves and Roots are applied on skin infections.  |
| 2.      | <i>Abrus precatorius</i> L.                          | Fabaceae       | Ratti            | October-May                   | Climber | SUBMS/ BOT-428  | Leaves        | The juice of Leaves is used for wound healing.   |
| 3.      | <i>Argemone mexicana</i> L.                          | Papaveraceae   | Satyanashi       | Throughout the year           | Herb    | SUBMS/ BOT-586  | Whole plant   | An <i>Argemone mexicana</i> tea is used to treat malaria. The whole plant is used to make a tea and as much tea as possible is drunk until symptoms disappear. |
| 4.      | <i>Adhatoda vasica</i> Nees                          | Acanthaceae    | Arusa            | December-June                 | Herb    | SUBMS/ BOT-382  | Leaves        | The juice of Leaves is useful for curing coughs, asthma and colds.   |
| 5.      | <i>Bauhinia variegata</i> (L.) Benth.                | Fabaceae       | Kachnar          | April-November                | Tree    | SUBMS/ BOT-638  | Leaves, Bark  | The juice of dried Leaves and Bark is used for wound healing.  |
| 6.      | <i>Cannabis sativa</i> L.                            | Cannabaceae    | Bhang            | June-September                | Herb    | SUBMS/ BOT-584  | Leaves        | The Leaves of <i>Cannabis sativa</i> burn over flame and smoke is used for abdominal pain.   |
| 7.      | <i>Chenopodium album</i> L.                          | Chenopodiaceae | Bathua           | June - September              | Herb    | SUBMS/ BOT-1303 | Stem          | The juice of the stem is applied to sunburn.   |
| 8.      | <i>Euphorbia hirta</i>                               | Euphorbiaceae  | Duddhi           | November-April                | Herb    | SUBMS/ BOT-1311 | Leaves        | Juice of leaves is used for skin infection.  |
| 9.      | <i>Eupatorium adenophora</i> (Spreng.) King & H. Rob | Asteraceae     | Pamakani         | March-April                   | Shrub   | SUBMS/ BOT-398  | Leaves        | The Juice of Leaves is applied on skin cuts.   |

To be continued...

| Sr. No. | Botanical Name                        | Family         | Hindi name | Flowering and Fruiting months | Habit | Voucher number | Parts used             | Ethnomedicinal uses  |
|---------|---------------------------------------|----------------|------------|-------------------------------|-------|----------------|------------------------|--|
| 10.     | <i>Ficus religiosa</i> L.             | Moraceae       | Peepal     | November-February             | Tree  | SUBMS/BOT-1289 | Leaves                 | The powder of dried leaves is used for skin infection.                           |
| 11.     | <i>Hypericum perforatum</i> L.        | Hypericaceae   | Basant     | May-September                 | Herb  | SUBMS/BOT-408  | Leaves, Roots          | The juice of Leaves and Roots applied on skin allergy.                           |
| 12.     | <i>Hypericum oblongifolium</i> Choisy | Hypericaceae   | Basant     | May-September                 | Herb  | SUBMS/BOT-342  | Roots                  | The juice of Roots applied on skin allergy.                                      |
| 13.     | <i>Heracleum lanatum</i> Michx.       | Apiaceae       | Patrala    | June-July                     | Herb  | SUBMS/BOT-1403 | Root                   | Juice of roots is taken internally for cough.                                    |
| 14.     | <i>Juglans regia</i> L.               | Juglandaceae   | Akhrot     | April-October                 | Tree  | SUBMS/BOT-583  | Bark, Leaves, Fruits   | Bark, Leaves and Fruits used for diarrhea.                                       |
| 15.     | <i>Ocimum sanctum</i> L.              | Lamiaceae      | Tulsi      | June-September                | Herb  | SUBMS/BOT-369  | Flowers, Seeds, Leaves | The juice of dried Flowers, Seeds and Leaves are used for fever, cough and cold. |
| 16.     | <i>Oxalis corniculata</i> L.          | Oxalidaceae    | Amrul      | April-October                 | Herb  | SUBMS/BOT-1413 | Leaves                 | Juice of fresh leaves is used for skin infection.                                |
| 17.     | <i>Prunu scerasoides</i> D.Don        | Rosaceae       | Pajja      | December-March                | Tree  | SUBMS/BOT-341  | Fruits                 | Fruits are edible and highly nutritious for health.                              |
| 18.     | <i>Phytolacca acinosa</i> Roxb.       | Phytolaccaceae | Jalga      | July - September              | Herb  | SUBMS/BOT-1209 | Roots                  | The juice of Roots applied on skin allergy.                                      |
| 19.     | <i>Rhododendron arboretum</i> Sm.     | Ericaceae      | Burans     | March-September               | Tree  | SUBMS/BOT-1265 | Flowers                | Juice of fresh flowers is used for cough and cold.                               |
| 20.     | <i>Vitex negundo</i> L.               | Verbenaceae    | Nirgandi   | March-September               | Shrub | SUBMS/BOT-578  | Leaves                 | The juice of Leaves is applied to heal swollen joints pain.                      |
| 21.     | <i>Zanthoxylem armatum</i> DC.        | Rutaceae       | Tirmir     | April-June                    | Shrub | SUBMS/BOT-365  | Bark, Seeds, Fruits    | The juice of Bark and Seeds are used in fever. Fruits are used for tooth pain.   |

The migratory shepherds include both sheep and goats and size of the flock is varied. The migratory shepherds of Kinnaur district also take along with them few horses for carrying shelters and eatables. Often few dogs also accompany the migratory shepherds and in fact, these dogs are trained in protecting their livestock from wild animal attacks and these dogs also play significant role to keep the flock together.

The present survey revealed that the income of migratory shepherd's family is in need of either receiving food, medicines and wild fruits from the forests on the route they transect and selling the milk products and meat from their herds. During their seasonal migration the shepherds are much dependent on forest products for their daily requirements of food, fruits, vegetables and medicines etc.

## DISCUSSION

As the migratory shepherds move from their respective place of high reaches towards the lower hills or plains the plant species varies with different altitude. The migratory shepherds during their seasonal migration usually move along the roadside and rarely adopt shortcuts. For their own stay they use makeshift tents. There is at all times insufficiency of food, water and fodder for livestock and themselves. For this shepherds discover particularly degraded lands, adjoining areas, village and allow fields. It was remarkable to note that their migration patterns of shepherds closely mirrors the seasonal availability of natural fodder and food. Migratory shepherds during enroute migration face limitations like water deficit, fodder, It is also highlighted that satisfactory attention has not been put in promoting and conserving traditional wild medicinal plant species. There is an urgent need is to adopt large scale plantation of these medicinal plant species within the forests as well as along roadsides so that the tribal shepherds are profited.

## CONCLUSION

Plant species which have one or additional of its part containing ingredients that can be used for the healing purpose, are called medicinal plants (Arora, 2013, Rawat *et al.*, 2018). In developing countries, a majority of the world inhabitants still relies on herbal drugs to meets its health needs, in recent years even where modern medicines are available, the interest on herbal remedies and their use have been increasing speedily. Wild medicinal plant species were playing a significant role in curing health. The present study documented the traditional uses of wild medicinal plants by tribal migratory shepherds, their importance of wild medicinal plants in the Renuka Forest Division, district Sirmour. This study can serve as baseline information on wild medicinal plant species and could be helpful to further reinforce the conservation of this important resource. Wild plants have been used for medicinal purpose and for healthcare from several years ago. In older days' folklore based ethno botanical knowledge has been used widely to treat disease. Since long time knowledgeable persons have been keeping huge traditional as well as native knowledge about wild medicinal plants in perspective of their ethno-medicinal uses, identification and using processes. Hence, there is an urgent need to conserve traditional knowledge through documented literature and proper interaction with younger generation. Finally, the present survey, also recommends scientific validity and toxicity tests of the reported medicinal plants used for the treatment of different human diseases in traditional

food, wild animals, veterinary services, predators and sometimes few road coincidences of their livestock. Such problems have also been reported in many earlier survey (Rao *et al.*, 2011; Suresh *et al.*, 2011).

Unluckily, deforestation goes-on, over exploitation of wild medicinal plants and the changing environmental conditions have made accessibility of wild medicinal plants as a scarce resource to the migratory shepherds during their seasonal migration. Forest and forest products play an significant role in the lives of migratory shepherds during their routes from high hills to low hills. The results of this study suggest that wild medicinal plants are important for shepherds living in tribal areas of Himachal Pradesh.

medication. This survey can help as baseline data on wild medicinal plant species and could be helpful in conservation of this significant resource as well as traditional knowledge of migratory shepherds.

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## REFERENCES

- Adhikari, B.S. Babu, M.M. Saklani, P.L. Rawat, G.S. (2010). Medicinal Plants Diversity and their Conservation Status in Wildlife Institute of India (WII) Campus, Dehradun, *Ethnobotanical Leaflets*, **14**: 46-83.
- Anonymous, (1999). Management plan for Renuka Forest Division: 1999-2000 to 2013-2014. Working plan, Sirmour, (H.P.)
- Jain, SK (1991). Dictionary of Indian Folk Medicine and Ethnobotany. Deep Publication, New Delhi.
- Arora, A. (2013). Phytochemical Analysis of Methanolic Extracts of Leaves of Some Medicinal Plants. *Biological Forum—An International Journal*, **5**(2): 91-93.
- Bagga, J., Umakant, B., & Deshmukh. (2018). *Acmella radicans* (Jacquin) R.K. Jansen (Asteraceae)—A new distributional plant record for Jharkhand State (India). *Journal on New Biological Reports*, **7**(1): 24-27.
- Biswas, M.P. and Rao, M.R.M. (2016). Socioeconomic status of Gaddi tribes in Himachal Pradesh: a Study. *International Journal of Advance Research*. **4**(8): 159-167.
- Charjan, A.P. & Dabhadkar, D.K. (2014). Ethnomedicinal Documentation of Some Antidiabetic Plants used by Tribal's of Amravati District, Maharashtra. *Biological Forum – An International Journal*, **6**(2): 546-549.

- Chowhery, H.J. (1999). Himachal Pradesh, in Mudgal, V. and Hajra, P.K. (eds) Floristic diversity and conservation strategies in India vol II: in the context of state and union territories (BSI, Calcutta) 845-94.
- Dikshit, N. Chand, D., Gomashe, S. & Shingane, S. (2017). *Cajanus platycarpus*— an addition to the flora of Akola district, Maharashtra. *Journal on New Biological Report*, **6**(1): 58-62.
- Jain, S.K. (1991). Dictionary of Indian Folk Medicine and Ethnobotany. Deep Publication, New Delhi.
- Kaintura, S. Kumar, N. Kothiyal, P. (2007). Correlation of antihypertensive drugs and new onset diabetes: A review. *Int Res J Pharm*, **8**(5): 36-40.
- Kapoor, G. (2017). Conservation and Development in Great Himalayan National Park-Western Himalaya. *Journal on New Biological Reports*, **6**(3): 142-147.
- Kargioglu, M. Cenkci, S. Serteser, A. Evliyaoglu, N. Konuk, M. Kok, M.S. Bagci, Y. (2008). An Ethnobotanical Survey of Inner West Anatolia, Turkey. *Hum Ecol*, **36**: 763-777.
- Kumar, S., Mikawlawng, K., Lata, P., Singhal, S., Punia, P., Kumar, S., Sharma P., Sharma, S., Thakur, K., Kumari, S., Sehagal, S., & Dhoundiyal, A. (2016). Ethnobotanical survey of antimicrobial flora of Manipur: A biodiversity hotspot region of North East India. *Journal of New Biological Report*, **5**(3): 139-147.
- Muthu, C. Ayyanar, M. Raja, N. Ignacimuthu, S. (2006). Medicinal plants used by traditional healers in Kancheepuram district of Tamil Nadu, India. *J Ethnobiol Ethnoma*, **7**(2): 43.
- Ragupathy, S. and Mahadevan, A. (1996). Traditional medicine and ethno-botany among Dravidian tribal communities. In: Menon TM, editor. Encyclopaedia of Dravidian tribes. Thiruvananthapuram, India: International School of Dravidian Linguistic, 1–5.
- Rao, K.A. Rao, K.S. Rao, S.J. Ravi, A. Anitha, A. (2011). Studies on migration of sheep flocks in north coastal zone of Andhra Pradesh: identification of traditional migration tracts. *Indian J Small Ruminants*, **17**(2): 260-263.
- Rawat V., Sahabjada, Shivnath, Gupta, N.P., Rawat, S. & Arshad M. (2018). Screening of Phytochemicals in Ethanolic Extract of *Momordica charantia* leaves and *Semicarpus anacardium* nuts. *International Journal of Theoretical & Applied Sciences*, **10**(1): 185-189.
- Sharma, S. and Rana, M. (2016). Commonly used Medicinal Plants in Tehsil Pachhad District Sirmour, Himachal Pradesh; *Pharma Tutor.*, **4**(3): 34-38.
- Sharma, G., Joshi, P.C., Kumar, R., & Vasu, D. (2009). Floral diversity and limnological studies in and around Dholbaha dam (Punjab Shivalik, India). *Biological Forum—An International Journal*, **1**(1): 22-31.
- Sharma, P. & Mishra, N.K. (2009). Diversity, utilization pattern and indigenous uses of plants in and around a cement factory in Bilaspur district of Himachal Pradesh, North-Western Himalaya. *Biological Forum—An International Journal*, **1**(2): 78-80.
- Sharma, V. (2016). Traditional Use of Ethnomedicinal Plants of Asteraceae in the Alpine Zone of Tungnath Region. *International Journal of Theoretical & Applied Sciences*, **8**(2): 54-57.
- Shiva, M.P. (1996). Inventory of forestry resources for sustainable management and biodiversity conservation. New Delhi: Indus Publishing Company.
- Singh, K.N.H.P. and Batish, D.R. (2015). Most prominent ethno-medicinal plants used by the tribals of Chhitkul, Sangla valley. *Ann. of Plant Sci.*, **4**(01): 943-946.
- Suresh, A. Gupta, D.C. Mann, J.S. (2011). Trends, determinants and constraints of temporary sheep migration in Rajasthan—an economic analysis. *Agri Economics Res Rev.*, **24**: 255-265.
- Verma, R.K. and Kapoor, K.S. (2014). Status of Plant Diversity in Alpine Area of Rakchham- Chitkul Wildlife Sanctuary of District Kinnaur, Himachal Pradesh. *Biological Forum—An International Journal*, **6**(1): 5-12.
- Verma, R.K. (2014). Floristic Diversity along an Altitudinal Gradients in Hango Valley of Cold Desert in District Kinnaur, Himachal Pradesh. *Biological Forum—An International Journal*, **6**(2): 115-126.
- Yadav, V.K. Deoli, J. Rawat, L. Adhikari, B.S. (2014). Traditional Uses of Medicinal Tree Species in Renuka Forest Division, Western Himalaya. *Asian Pac J Health Sci.*, **1**(2): 72-77.
- Thakur, M.K. and Waske, Shubhangee (2018). Study of Medicinal Plants used by Local Herbal Healers in South Block of Seoni District (M.P.). *International Journal of Theoretical & Applied Sciences*, **10**(1): 95-99.