

A Contribution to the Ethnomedicinal Flora of Chakrata Forests in Dehradun District, Uttarakhand[#]

*Zaheer Anwar Ali,
Sarfraz Ahmad,
Parwez Ahmad
and
Shariq Ali Khan

Survey of Medicinal Plants Unit,
Regional Research Institute of
Unani Medicine (CCRUM),
Post Box 70,
Aligarh – 202001 (U.P.)

Abstract

An ethnobotanical survey of the Chakrata forests in Dehradun district of Uttarakhand has yielded useful information on folk medicinal claims prevalent among the tribal communities, dominated by Jaunsar-Bawar. Based on this field study carried out during November 2014 and March 2017, the present paper deals with 55 species belonging to 51 genera and 34 families that are commonly used as folk drugs for treatment of various humans and cattle diseases and conditions. For each plant species the current botanical and prevalent local names, the part used, claimed medicinal use(s) and manner of using the crude drugs are provided. This report lists many new phytotherapeutic applications and preparations from the area surveyed.

Key Words: Ethnobotanical survey, Folk medicine, Chakrata forests, Dehradun, Uttarakhand.

Introduction

The Chakrata forest division (30° 26'–31° 02' N latitudes and 77° 38'–78° 04' E longitudes) forms a part of Dehradun district in Garhwal Himalayas. The entire division is a highly mountainous region located between the upper courses of river Yamuna and Tons. In major part of the year, many areas at higher elevations remain under snow cover. The area has mainly a temperate type of vegetation. Forests of this division are very rich in floristic diversity. It is a homeland of some primitive communities dominated by Jaunsar-Bawar. This particular region was selected for an extensive ethnobotanical survey of the medicinal plants because it is remote from the industrial centres and possesses interesting climate, landscape and varied flora (Agarwal, 1959; Chand and Yadav, 1970; Chandra *et al.*, 2010; Cheema *et al.*, 2014; Kanjilal, 1911; Singhal *et al.*, 1986). Moreover, available ethnobotanical publish reports were encouraging (Bartwal and Chandra, 2010; Bartwal *et al.*, 2011; Bhatt and Negi, 2006; Bist and Pundir, 2008; Chandra and Meenakshi, 2010; Chantia, 2003; Dobhal *et al.*, 2007; Jain and Puri, 1984; Joshi and Joshi, 2011; Kumar and Pandey, 2015; Neelam *et al.*, 2009, 2010; Rana and Datt, 1997; Rawat *et al.*, 2009; Singh and Pundir, 2004; Singh, 1997; Singh *et al.*, 1984). In this communication, an enumeration of the plants of ethnomedicinal utility is presented. The study represents a contribution on our existing knowledge on ethnomedicinal flora of this part of Garhwal Himalayas, Uttarakhand.

Methodology

The study area was surveyed in November 2014 and March 2017. During the course of fieldwork, a number of tribal settlements located in different forest ranges viz. Kanasar, Devghar, Rickhanar, Babar and Molta were visited and

[#] Feature Article

* Author for correspondence

data were obtained by interviewing local healers and other knowledgeable village elders. The information collected includes local name, claimed medicinal use(s), part used, other ingredients added (if any), method of preparing the medicine and mode of administration. Plant specimens were collected and identified by the senior author with the help of pertinent floras (Babu, 1977; Gupta, 1928; Naithani, 1984-1985) and nomenclature was updated according to a recent work on flowering plants of Uttarakhand (Uniyal *et al.*, 2007). All voucher specimens were prepared and deposited in the herbarium of the Survey of Medicinal Plants Unit, Regional Research Institute of Unani Medicine, Aligarh (UP), India.

Enumeration

In the following listing, plants are arranged in alphabetical order by their botanical name together with respective family between parentheses, local name, locality and voucher specimen number, followed by claimed medicinal use(s) and mode of administration. As far as possible, doses and duration of these crude drugs are also given.

Aconitum heterophyllum Wall. ex Royle (Ranunculaceae), 'Atis', Deoban (ZAA 10454). A small piece of fresh root is chewed for stomach-ache. Higher dose of the drug may be poisonous.

Acorus calamus L. (Araceae), 'Bach', Deoban (ZAA 10455). Dried rhizome is tied as an amulet around neck of the child suffering from worm infestation.

Ageratina adenophora (Spreng.) R.M. King & H. Rob. (Asteraceae), 'Kalabansa'/'Bushiyani', Gouraghati (ZAA 10415). Fresh leaves are washed and squeezed to obtain the juice. It is applied on cut to stop the bleeding.

Ainsliaea aptera DC. (Asteraceae), 'Kadu', Deoban (ZAA 10405). Leaf decoction is given orally to allay fever in pneumonia while fresh root is chewed for instant relief in abdominal pain due to flatulence.

Ajuga parviflora Benth. (Lamiaceae), 'Neelkanthi', Chakrata (ZAA 9795). A freshly made paste of the leaves, obtained by crushing, is applied externally on the body for general swelling.

Allium consanguineum Kunth (Liliaceae), 'Van Lehsan', Deoban (ZAA 10456). A paste, obtained by crushing the bulbs, is applied on knee for treating pain.

Artemisia roxburghiana Wall. ex Besser (Asteraceae), 'Chhamru', Chakrata (ZAA 9756). Aqueous decoction of dried leaves is given to treat stomach-ache.

Artemisia vulgaris L. (Asteraceae), 'Paati', Chakrata (ZAA 9852). Root decoction is administered orally against flatulence.

Berberis asiatica Roxb. ex DC. (Berberidaceae), 'Kashmoi', Deoban (ZAA 10345). Dried root piece is soaked overnight in water; the infusion thus obtained is given once daily in the morning to control diabetes. Prolong use of this drug damages kidney.

Berberis chitria Buch.-Ham. ex Lindl. (Berberidaceae), 'Kingor', Deoban (ZAA 10018). Sap of fresh root is instilled in the eyes for redness.

Bergenia ciliata (Haw.) Sternb. (Saxifragaceae), 'Pattharchoor'/'Silphora', Deoban (ZAA 10399). For treatment of piles, leaves are cooked and taken daily as pot herb. Simultaneously, root paste is given orally. Equal quantities of the root of 'pattharchoor', 'gokhru' (fruits of *Tribulus terrestris* L., Zygophyllaceae), 'kulthi' (seeds of *Macrotyloma uniflorum* (Lam.) Verdc., Fabaceae) and 'sonf' (*Foeniculum vulgare* Mill., Apiaceae) are crushed together and two spoon of this preparation are given twice a day for one to two month to dissolve and expel small kidney stones.

Boenninghausenia albiflora (Hook.) Rchb. ex Meisn. (Rutaceae), 'Pissu', Chakrata (ZAA 9778). Leaf decoction is poured over the body of cattle to keep away ectoparasites.

Cedrus deodara (Roxb. ex D. Don) G. Don (Pinaceae), 'Deodar', Guswapul (ZAA 10368). Wood-oil is applied on scabies. It is also applied on the body of sheep to kill lice.

Crotalaria linifolia L. f. (Fabaceae), 'Pengiyara', Chakrata (ZAA 9863). Leaf paste is applied on cut and wounds for healing.

Daphne papyracea Wall. ex G. Don (Thymelaceae), 'Satpura', Deoban (ZAA 10392). Stem bark paste is applied on burns.

Debregeasia saeneb (Forssk.) Hepper & J.R.I. Wood (Urticaceae), 'Siar', Lakhamandal (ZAA 10430). Stem twigs are used as splints in bone fracture.

Digitalis purpurea L. (Scrophulariaceae), 'Tilpushpi', Deoban (ZAA 10447). Equal quantities of the leaves and roots are boiled in water and liquid strained. It is given for chest pain in cardiac problem.

Elaeagnus rhamnoides (L.) A. Nelson (Elaeagnaceae), 'Ameesh Chook', Deoban (ZAA 10459). Fruit juice is given orally to reduce the risk of heart attack.

Ephedra gerardinia Wall. ex Stapf (Ephedraceae), 'Tootganth', Deoban (ZAA 10394). Leaf decoction is given to treat leucorrhoea.

Ficus neriifolia Sm. (Moraceae), 'Dudhla', Gouraghati (ZAA 10417). Fresh leaves are fed to cows for deficient lactation.

Gentiana kurroo Royle (Gentianaceae), 'Karwi'/'Tirayaman', Deoban (ZAA 10457). For treating urinary tract infection, the decoction of the chopped plant is administered orally two times a day for 7-10 days.

Gentiana tianschanica Rupr. ex Kusn. (Gentianaceae), 'Narbosa', Badrikhan (ZAA 9833). Root decoction is given for fever due to cold.

Geranium wallichianum D. Don ex Sweet (Geraniaceae), 'Raat Ninnai', Deoban (ZAA 9794). Leaf paste is applied externally on neck to treat tonsillitis.

Girardinia diversifolia (Link) Friis (Urticaceae), 'Karwakushka', Murthat (ZAA 9810). The root decoction is given orally to the women who is giving birth, the belief that it will facilitate delivery.

Grewia optiva J.R. Drumm. ex Burret (Tiliaceae), 'Bihu', Puna Pokhri (ZAA 10423). Fresh leaves are fed to cattle to treat the loss of appetite. These are also given to cow as galactagogue.

Hedychium spicatum Sm. (Zigiberaceae), 'Kapoor Kachri', Guswapul (ZAA 10458). Rhizome paste is applied on knee as poultice for joint pain and inflammation.

Juglans regia L. (Juglandaceae), 'Akhrot', Gouraghati (ZAA 10443). Fresh stem bark chewed to treat toothache.

Mahonia napaulensis DC. (Berberidaceae), 'Khoru', Gouraghati (ZAA 10357). Root sap is applied in the eye suffering from conjunctivitis.

Neolitsea umbrosa (Nees) Gamble (Lauraceae), 'Shrood', Deoban (ZAA 10451). The oil, extracted by crushing the dried seeds, is applied in the scalp with a light massage once daily to kill lice. This oil is often kept as households remedy and used as and when needed.

Picrorhiza kurrooa Royle (Scrophulariaceae), 'Kutki', Deoban (ZAA 9804). Root is crushed and boiled in water; the liquid is strained and given orally twice a day for one month for leucorrhoea.

Pinus wallichiana A.B. Jacks. (Pinaceae), 'Kail', Deoban (ZAA 10387). Paste of the stem bark mixed with little powdered alum is plastered around the fractured limb. Moreover, long pieces of the stem bark as splints and cotton bandages are used to hold the bones and plaster in position.

Platyclus orientalis (L.) Franco (Cupressaceae), 'Surai', Deoban (ZAA 10389). Cone is rubbed on stone with little water and the paste thus obtained is applied on burns.

Pouzolzia viminea Wedd. (Urticaceae), 'Panguri', Tuina (ZAA 9862). Leaf infusion is used as gargle for treating gingivitis.

Prunus cerasoides Buch.-Ham. ex D. Don (Rosaceae), 'Padam', Kanasar (ZAA 10461). Powder of the stem bark is boiled in water till it become semisolid and cooled. This is applied locally for muscular pain.

Punica granatum L. (Punicaceae), 'Darimb'/'Darmu', Lotakhand (ZAA 9855). Chopped stem bark is boiled in water and cooled. It is given two times a day for two week in jaundice. Long piece of the stem bark is rubbed with water on stone and given to children for cough. Inner portion of shell of the mature fruit is dried and ground to make a fine powder. One spoon of this is given with water once daily in the morning to control diabetes.

Pyrus pashia Buch.-Ham. ex D. Don (Rosaceae), 'Kaenth', Guswapul (ZAA 10354). Juice of the unripe fruit is instilled in injured eye of cattle for redness and healing.

Reinwardtia indica Dumort. (Linaceae), 'Pingli', Guswapul (ZAA 10366). Leaf paste is applied on cut for healing.

Rhododendron arboreum Sm. (Ericaceae), 'Burans', Deoban (ZAA 10336). Powder of the flower is snuffed in blood dysentery.

Rubia cordifolia L. (Rubiaceae), 'Charchara', Guswapul (ZAA 10371). Leaf paste is applied locally on scorpion sting to reduce stinging pain. It is also applied on bite point of other poisonous insects.

Rumex hastatus D. Don (Polygonaceae), 'Almoru', Chakrata (ZAA 10334). Leaf paste is applied on boil to speed up suppuration and healing.

Sapindus mukorossi Gaertn. (Sapindaceae), 'Reetha', Tuini (ZAA 10462). Paste of the fruit pulp is applied on alopecia.

Sarcococca pruniformis Lindl. (Buxaceae), 'Tiliari', Deoban (ZAA 10393). Root bark is ground with water and applied on abscesses of male genitalia.

Saussurea costus (Falc.) Lipsch. (Asteraceae), 'Kuth', Deoban (ZAA 10463). Crushed leaves are boiled and beverage drunk to relieve asthma. This preparation also claimed effective in the treatment of anuria.

Senecio nudicaulis Buch.-Ham. ex D. Don (Asteraceae), 'Neelkanth', Deoban (ZAA 10448). Leaf paste is applied on old wound for healing.

Sinopodophyllum hexandrum (Royle) T.S. Ying (Berberidaceae), 'Ban Kakri', Deoban (ZAA 10460). Root paste is given orally for uneasiness and stomach-ache.

Swertia chirayita (Roxb.) H. Karst. (Gentiaceae), 'Chirata', Murthat (ZAA 10416). Decoction of the whole plant is given to allay fever of pneumonia, typhoid and malaria.

Swertia ciliata (D. Don ex G. Don) B.L. Burt (Gentianaceae), 'Chirata', Vyas Shikhar (ZAA 9763). Leaf powder is boiled in water and liquid is strained. It is given to treat common fever.

Taxus baccata L. (Taxaceae), 'Thuner', Deoban (ZAA 10397). Paste of the stem bark is applied externally on cyst of breast.

Thalictrum foliolosum DC. (Ranunculaceae), 'Sopau', Deoban (ZAA 10411). Roots are ground and made into pills of pea size each with 'gur' (solidified sugarcane juice); about five pills are given with water twice daily for two week to activate liver after jaundice.

Thymus linearis Benth. (Lamiaceae), 'Banajwain', Deoban (ZAA 10408). Paste of the whole plant is given orally to treat chest pain due to excessive gases.

Tinospora glabra (Burm. f.) Merr. (Menispermaceae), 'Gilo', Deoban ZAA 10460). Paste of the stem-bits is mixed with traditional buttermilk and applied locally on mammary glands of cows in skin allergy.

Urtica doica L. (Urticaceae), 'Kandali', Puna Pokhri (ZAA 10422). Leaf paste is applied on wound for healing in cases of children.

Urtica parviflora Roxb, (Urticaceae), 'Karwakushka', Deoban (ZAA 9809). Wilted plants are fed to cows for deficient lactation.

Viola pilosa Blume (Violaceae), 'Benaksha', Guswapul (ZAA 10332). Two spoonful decoctions of aerial parts are given to infants to treat catarrh and cold.

Zanthoxylum armatum DC. (Rutaceae), 'Timur', Kuansi (ZAA 10428). Fruit paste is put on aching tooth.

Some Folk Medicinal Plants of the Study Area



Fig. 1. *Bergenia ciliata* (Haw.) Sternb.



Fig. 2. *Daphne papyracea* Wall. ex G. Don



Fig. 3. *Debregeasia saeneb* (Forssk.)
Hepper & J.R.I. Wood



Fig.4 *Gentiana kurroo* Royle



Fig. 5. *Mahonia napaulensis* DC.



Fig. 6. *Reinwardtia indica* Dumort.



Fig. 7. *Rhododendron arboreum* Sm.



Fig. 8. *Rubia cordifolia* L.



Fig. 9. *Sarcococca pruniformis* Lindl.



Fig. 10. *Zanthoxylum armatum* DC.

Results and Discussion

This report documents some traditional and contemporary knowledge of the medicinal use of plants employed by the indigenous communities of Chakrata forests. A total of 55 plant species belonging to 51 genera and 34 families were recorded for curing or alleviating various diseases and conditions viz. abscess and boils, alopecia, anuria, asthma, blood dysentery, bone fracture, burns, cold, diabetes, fevers, flatulence, jaundice, joint pain, kidney stones, leucorrhoea, muscular pain, piles, scabies, scorpion-sting, stomach-ache, tonsillitis, worm infestation, and many complaints of domestic animals. The data are authentic and based on direct field interviews of reliable informants who have sound knowledge of herbal remedies. These ethnomedicinal uses were compared with the pertinent literature (Agarwal, 1986; Ambasta, 1986; Anonymous, 2001; Chopra *et al.*, 1956; Jain, 1991; Kirtikar and Basu, 1935; Nadkarni, 1954) and it was found that uses of many plant species were similar and reported in the literature. Furthermore, many phytotherapeutic applications coincide with those of other parts of Dehradun (Ali *et al.*, 2015, 2016a, 2016b; Bisht and Bhatt, 2012; Deoli *et al.*, 2014; Gairola *et al.*, 2013; Gaur *et al.*, 2010; Maheshwari and Singh, 1992; Negi *et al.*, 1992; Pant and Sharma, 2010; Rawat and Bhatt, 2002; Sharma *et al.*, 1979, 2017; Sharma and Painuli, 2011; Singh *et al.*, 1989, 2008, 2014; Upadhyay, 2014, etc.). Uses of other plants seem to be new or imperfectly known. All such medicinal uses suggested by these elderly people seem to be reliable and deserve further scientific investigations for their toxicity, effectiveness and safe medicinal usage.

It was emphatically noted during the current survey that some important wild medicinal plants have become scarce in the area due to illegal and continued over exploitation as well as habitat destruction. Similarly, local traditional medicine men now represent a disappearing tradition because the younger generation is not interested to learn their traditional phytotherapy. Moreover, Primary Health Care Centres are now accessible to the rural populace. So, gradually this art of folk medicine is disappearing with every passing day. It is, therefore, desirable to conduct survey of other ethnobotanically important areas of the state before this traditional knowledge is lost permanently with the ever dwindling number of folk medicine men, the rapid devastation of natural plant habitats and cultural changes among the tribal communities due to the effect of modernization. Through such observations, based on properly designed field studies, many more reliable folk medicinal uses of plants may be revealed which may yield useful leads needed in the search of newer and potent pharmaceuticals of plant origin for wide application.

Acknowledgements

We are highly grateful to the Director General, Central Council for Research in Unani Medicine, New Delhi for providing necessary facilities for conducting the present field study. We should like to thank to Mr. Deep Chandra Arya, Divisional Forest Officer, Chakrata Forest Division, Dehradun for giving us permission to work in this Division. We would also record gratitude to all the informants and Shri Katku Ram, In charge of High-tech Medicinal Plants Nursery Deoban of the division who have willingly shared their knowledge on medicinal uses of local plants with the authors.

References

- Agarwal, S.C., 1959, Grasslands of Chakrata Forest Division, District Dehradun. *The Indian Forester* 85 (11).
- Agarwal, V.S., 1986. Economic Plants of India. Kailash Prakashan, Calcutta.
- Ali, Z.A., Ahmad, S. and Khan, S.A., 2015. Ethnomedicines of Mussoori Forest Division, Dehradun (Uttarakhand). *Hippocratic Journal of Unani Medicine* 10(4): 135-142.
- Ali, Z.A., Ahmad, S. and Khan, S.A., 2016a. Ethnomedicines in Kalsi forests of Dehradun district, Uttarakhand. *Hippocratic Journal of Unani Medicine* 11(2): 95-106.
- Ali, Z.A., Ahmad, S., Ahmad, P. and Khan, S.A., 2016b. A contribution to the ethnomedicinal floras of Doon Valley in Garhwal region, Uttarakhand. *Hippocratic Journal of Unani Medicine* 11(3): 151-160.
- Ambasta, S.P. (Ed.), 1986. The Useful Plants of India. PID, CSIR, New Delhi.
- Anonymous, 2001. Medicinal plants in folklores of Northern India. Central Council for Research in Unani Medicine, New Delhi.
- Babu, C.R., 1977. Herbaceous flora of Dehradun. CSIR, New Delhi.
- Bartwal, M. and Chandra, V., 2010. Ethnomedicinal plants used by the Jaunsari tribe in Tons Valley, Dehradun. In: Int. Conf. on Mountain Biodiversity Conservation and Sustainable Utilization. Doon University (Uttarakhand). Abs. P. 91.
- Bartwal, M., Chandra, V. and Rajwar, G.S., 2011. Ethnomedicinal plant diversity among the Jaunsaries in Tons Valley, Uttarakhand. In: Nat. Conf. on Forest Biodiversity: Earth Living Treasure. 22 May 2011. Pp 109-114. Uttar Pradesh State Biodiversity Board.
- Bhatt, V.P. and Negi, G.C.S., 2006. Ethnomedicinal plant resources of Jaunsari tribe of Garhwal Himalaya, Uttaranchal, India. *Indian Journal of Traditional Knowledge* 5 (3):331-335.

- Bisht, A.S. and Bhatt, A.B., 2012. A contribution to the medicinal plants of Sahastradhara, district Dehradun, Uttarakhand (with ethnobotanical notes). *Journal of Drug Delivery & Therapeutics* 2(5):114-120.
- Bist, D.S. and Pundir, Y.P.S., 2008. Wild medicinal plants of Jaunsar-Bawar (Western Himalayas), Uttarakhand-II. *Indian Forester* 134(5):674-686.
- Chand, G. and Yadav, J.S.P., 1970. A note on geology in relation to mortality of Fir and Spruce in Chakrata Forest Division. *Indian Forester* 96:766-768.
- Chandra J., Rawat, V.S., Rawat, Y.S., Ram, J., 2010. Vegetational diversity along an altitudinal range in Garhwal Himalaya. *International Journal of Biodiversity and Conservation* 2(1):14-18.
- Chandra, V. and Meenakshi, 2010. Wild medicinal plants resources of Jaunsar-Bawar (Uttarakhand). In: Nat. Sem. on Cultural & Ecological Aspects of Plant Diversity of Coastal India with thrust on conservation. Sept. 22-24, P. 41.
- Chantia, A., 2003. Traditional knowledge of ethnomedicine in Jaunsar-bawar, Dehradun district. *Indian Journal of Traditional Knowledge* 2 (4):397-399.
- Cheema, J., Bhattacharya, A. and Aggarwal, A., 2014. 'Chakrata': A floristically less explored pocket of Garhwal Himalaya. *Researcher* 6(8):45-50.
- Chopra, R.N., Nayar, S.L. and Chopra, I.C., 1956. Glossary of Indian Medicinal Plants. CSIR, New Delhi.
- Deoli, J., Yadav, V.K. and Negi, M., 2014. Ethno-medicinal plants used by people of Raipur in Dehradun District, Uttarakhand. *Journal of Applied Forest Ecology* 2(1):16-22.
- Dobhal, P., Sawan, S. and Sharma, N., 2007. Studies on medicinal plants of two villages of Chakrata forest division (Uttarakhand). *Annals of Forestry* 15(2):351-357.
- Gairola, S., Sharma, J., Gaur, R.D., Siddiqui, T.O. and Painuli, R.M., 2013. Plants used for treatment of dysentery and diarrhoea by the Bhoxa community of district Dehradun, Uttarakhand, India. *Journal of Ethnopharmacology* 150:989-1006.
- Gaur, R.D., Sharma, J. and Painuli, R.M., 2010. Plants used in traditional healthcare of livestock by Gujjar community of Sub- Himalayan Tracts, Uttarakhand, India. *Indian Journal of Natural Products and Resources* 1(2): 243-248.
- Gupta, B.L., 1928. Forest flora of the Ckakrata, Dehradun and Saharanpur forest divisions, Uttar Pradesh. International Book Distributors, Dehradun.
- Jain, S.K., 1991. Dictionary of Indian folk medicine and ethnobotany. Deep Publications, New Delhi.

- Jain, S.P. and Puri, H.S., 1984. Ethnomedicinal plants of Jaunsar-Bawar hills, Uttar Pradesh, India. *Journal of Ethnopharmacology* 12:213-222.
- Joshi, V. and Joshi, S.P., 2011. Wild vegetable species commonly consumed by tribes of Chakrata. *The Indian Forester* 137.
- Kanjilal, U.N., 1911. Forest Flora of the Siwalik and Jaunsar Forest Divisions of United Provinces of Agra and Oudh. Government Printing Press, Calcutta, India.
- Kirtikar, K.R. and Basu, B.D., 1935. Indian Medicinal Plants, Vol. I-IV. Periodical Experts, Delhi, India.
- Kumar, S. and Pandey, S., 2015. An ethnobotanical study of local plants and their medicinal importance in Tons river area, Dehradun, Uttarakhand. *Indian J. of Trop. Biodiv.* 23 (2): 227-321.
- Maheshwari, J.K. and Singh, H., 1992. Plants used by Bhojas P.G.T. of Dehradun. *Vanyajati* 40:1-8.
- Nadkarni, A.K., 1954. Indian Materia Medica. Vol. I & II, 3rd Edition, Popular Book Depot, Bombay.
- Naithani, B.D., 1984-1985. The Flora of Chamoli, Vols. I & II BSI, Howrah.
- Negi, K.S., Tiwari, J.K., Gaur, R.D. and Pant, K.K., 1992. Notes on ethnobotany of five districts of Garhwal Himalaya, Uttar Pradesh, India. *Ethnobotany* 5:73-81.
- Neelam, R. and Tamta, B.P., 2009. Medicinal plant resources used in primary healthcare in Chakrata Region. *International J. of Forest Usufruct Management* 10(1): 15-23.
- Neelam, R., Singson, M.Z. and Singh, A., 2010. Important non-timber forest product of Chakrata, Dehradun-its conservation and management. *International J. of Forest Usufructs Management* 11(2): 71-77.
- Pant, H.M. and Sharma, N., 2010. Inventory of some exotic cultivated tree species of Doon Valley and their ethnobotanical use. *Journal of Medicinal Plants Research* 4(20): 2144-2147.
- Rana, T.S. and Datt, B., 1997. Ethnobotanical observation among Jaunsar-Bawar, Dehradun (U.P.) India. *Int. J. of Pharmacognosy* 35:371-374.
- Rawat, N., Tamta, B.P., Singson, M.Z. and Singh, A., 2009. Medicinal plant resources used in primary healthcare in Chakrata region. *International J. of Forest Usufructs Management* 10: 15-23.
- Rawat, R.S. and Bhatt, V.K., 2002. Nature's Pharmacopoea, medicinal plants diversity in Doon Valley. *Navdanya* 148.

- Sharma, A., Singh, H. and Kumar, N., 2017. Studies on traditional knowledge of medicinal flora and its contribution to livelihood enhancement in the Doon Valley, Uttarakhand (India). *Int. J. of Life Sci. Scientific Res.* 3(2): 951-960.
- Sharma, J. and Painuli, R.M., 2011. Plants used for the treatment of rheumatism by the Bhoxa tribe of district Dehradun, Uttarakhand. *Int. J. of Medicinal and Aromatic Plants* 1(1): 28-32.
- Sharma, P.K., Dhyani, S.K. and Shanker, V., 1979. Some useful and medicinal plants of the district Dehradun and Siwalik. *J. Sci. Res. Plant. Med.* 1(1):17-43.
- Singh, K.K., 1997. Studies on native medicine of Jaunsari tribe of Dehradun district, Uttar Pradesh, India. *Int. J. Pharmacognosy* 35:105-110.
- Singh, D. and Pundeer, Y.P.S., 2004. Wild medicinal plants of Jaunsar-Bawar (Western Uttaranchal-I). *Indian Forester* 130:1259-1271.
- Singh, R.K., Semwal, P. and Kapoor, T., 2014. Medicinal potential of six different plant species of Dehradun district, Uttarakhand. *Asian Journal of Research in Pharmaceutical Sciences* 4(3): 135-140.
- Singh, L., Sharma, N., Joshi, S.P., Manhas, R.K. and Joshi, V., 2008. Ethnomedicinal uses of some weeds in some agroecosystem of Doon Valley. *J. Econ. Tax. Bot.* 32(Suppl.):97-103.
- Singh, N., Swami, A., Gupta, B.K. and Grover, S.P., 1989. Some noteworthy medicinal plants of commercial potential of Doon Valley. *Indian Journal of Physical and Natural Sciences* 9(Sec. A.): 24-33.
- Singh, V.K., Anis, M. and Khan, A.M., 1984. Folk medicinal claims of Chakrata forests, Uttar Pradesh, India. *J. Pl. Nature* 1:16-21.
- Singhal, R.M., Rawat, V.R.S., Kumar, P., Sharma, S.D. and Singh, H.B., 1986. Vegetation analysis of woody species of some forests of Chakrata Himalayas, India. *The Indian Forester* 112 (9).
- Uniyal, B.P., Sharma, J.R., Choudhery, U. and Singh, D.K., 2007. Flowering Plants of Uttarakhand (Checklist). Bishen Singh Mahendra Pal Singh. Dehradun.
- Upadhyaya, D., 2014. An ethnobotanical study of plants found in Timli forest range, district Dehradun, Uttarakhand, India. *Int. J. of Advanced Herbal Science and Technology* 1(1):13-19.

