Diversity and indigenous uses of plants in Naina Devi Sacred Shrine Rewalsar, Himachal Pradesh, North Western Himalaya, India

Sunil Marpa, SS Samant, Ashish Tewari and Shiv Paul

DOI: https://doi.org/10.22271/chemi.2020.v8.i2s.8939

Abstract
The analysis of the diversity, distribution and indigenous uses of plants in and around a Naina Devi Sacred Shrine Rewalsar of Mandi district in Himachal Pradesh were carried out from 2009-2014. A total of 169 species of plants belonging to 71 families and 136 genera were recorded. Among these ecologically and economically important species, tree (20 spp.), shrub (41 spp.), herb (91 spp.) were present. The species were used as medicine (117 spp.), wild edible/food (49 spp.), fuel (27 spp.), fodder (54 spp.), and religious (11 spp.) by the inhabitants of the area. The paper gives scientific name of wild plants along with authority, local names, family, life form, indigenous uses and plant part used by the local people of the region. Different parts of these species, such as whole plants, roots, leaves, flowers, fruits, seeds and stems are used by the inhabitants for remedial various diseases.

Keywords: Diversity, indigenous uses, utilization pattern, sacred shrine

Introduction
The Indian Himalayan Region (IHR) shows an abundant biodiversity and the natives living the rural areas are largely dependent upon this wealth. The relationship among native communities and plant wealth is strongly revealed by well developed traditional health care practices and a variety of plant uses in ceremonies, routine household uses and trading for economic gain (Singh, 1999) [15]. The rural poor depend upon biological resources for meeting 90% of their day-to-day needs (Totey and Verma, 1996) [39]. Of which, fuel wood and fodder are two important and critical components of village economy especially in the hills. In the Himalaya, 76% of total natural resource needs are derived from forests and agroforestry systems, mainly because they are free, easy to access and simple to use (Chhetri and Sharma, 2006) [4]. The growing commercial trade of natural products, in particular plant medicines and crafts, has resulted in the harvest of increasing volumes from wild plant populations (Lange, 1998) [14] and has therefore generated concern about overexploitation (Tiwari, 2000) [38]. For centuries tropical, sub-tropical and temperate forests have experienced intensive human activity across the globe (Heywood and Watson, 1995) [7]. Like other parts of India, in the Indian Himalaya, most of the people live in villages and use plants as medicine, edible/food, fodder, fuel, timber, agricultural tools and various other purposes (Samant and Dhar, 1997) [21]. From the IHR, 1748 medicinal plants (Samant et al., 1998) [20, 25], 675 wild edibles (Samant and Dhar, 1997) [21], 279 fodder (Samant, 1998) [20, 25], 118 essential oil yielding medicinal and aromatic plants (Samant and Palni, 2000) [22] and 155 sacred plants (Samant and Pant, 2003) [23] have been recorded. Himachal Pradesh, one of the Himalayan States, is blessed with rich biodiversity. It has a multitude of floral species to suit the local needs and site conditions. This treasure of useful raw materials has been exploited by the local people in a variety of ways. The local people mostly depend on biological resources for medicine, food/edible, fodder, fuel, timber, agricultural tools, fiber, dyes, aesthetic values and various other purposes. (Samant et al., 2007a) [24]. The review of available literature showed that in general, in Himachal Pradesh, a large number of studies have been carried out on ethnobotany including medicinal plants (Chauhan, 1996 and 1999; Sharma and Lal, 2005; Samant et al., 2007b; Rawat et al., 2009; Singh et al., 2009; Rana and Samant, 2011; Samant et al., 2010 and 2011; Kaur et al., 2011; Sharma et al., 2011; Thaplyal et al., 2012; Kumar and Chander, 2018a and b; Rana et al.,
In spite of the efforts of the above workers many biodiversity rich areas are still unexplored or underexplored including Sacred Shrines. Comprehensive studies on the status and distribution pattern of economically important species are essentially required so that pressure on the economically important species could be investigated and adequate management plan for their conservation could be developed. In view of this, an attempt has been made to; (i) assess the diversity, distribution, utilization pattern and indigenous uses of economically important species; (ii) identify species preference; and (iii) generate data and suggest strategies contributing to the management for conservation and sustainable use of economically important resources.

Materials and methods
Study Area: The Naina Devi Sacred Shrine Rewalsar - Mandi (NDSSM) (31º37’38” N latitude and 76º48’20” E longitude) is located in District Mandi (Fig. 1). It is 12 km away from Rewalsar. The area is unique and beautiful and known for its seven lakes “Saatsar” and colour of water in each laker is different. The vegetation is sub-tropical and temperate type. The area is mostly hilly. The soil is generally alluvial and Sandy-loamy and with exceptions of clay patches. The climate is sub-tropical and temperate type. Broadly four distinct seasons can be delineated, namely, winter (middle of December to February), summer (March to June), rainy (early July to the middle of September) and autumn (October to November). Winter is mild in low-lying area, whereas it snow on high mountain ranges. Springs are warm and sunny. Rainy season is the wettest part of the year and characterized by high humidity. Summers are prickly hot during monsoon month. The vegetation includes sub-tropical, temperate and sub-alpine broad leaved and coniferous forests and supports a large number of sensitive biodiversity elements including medicinal and aromatic plants, wild edibles, native, near endemic and wild relatives of crop plants. The forests are characterized by; (i) evergreen coniferous forests mainly of Pinus roxburghii and Cedrus deodara; and (ii) evergreen broad leaved forests of Myrica esculenta, Quercus oblongata and Rhododendron arboreum. The forest types support a large number of biodiversity elements. Besides, the notable faunal components are Leopard (Panthera pardus L.), Himalayan Black Bear (Selenarctos thibetanus Cuvier), Jungle cat (Felis chaus Guld.), Indian Fox (Vulpes bengalensis Shaw), Himalayan Pine Martin (Martes flavigula Bodd.) and Indian Porcupine (Hystrix indica Kerr.), Blue Rock Pigeon (Columba intermedia Srickl.), Dove (Streptopelia decaocto Lath.), Jungle Myne (Acridotheres fuscus Wangl.), Kaleej Pheasant (Lophura leucomelanos Lath.), Cheer Pheasant (Catreus wallichii Hardw.), etc. In spite of the religious importance of NDSSM, the surrounding areas of the shrine are facing tremendous pressure as the inhabitants are dependent of floristic diversity for medicine, wild edibles, fuel, fodder, timber, making agricultural tools, religious and various other purposes.

Fig 1: Map of the study area showing Naina Devi Sacred Shrine Rewalsar Mandi

Assessment of Resource Utilization Pattern: The representative villages namely Sarkidhar, Dhar, Garloni and Laheda in NDSSRM were selected to generate information on resource utilization pattern of the inhabitants. Local Vaidhyas and knowledgeable persons from each village were interviewed, irrespective of their age or gender. The interviews were mostly individual, except in some cases, where several people participated at the same time. Interviews did not follow a previously-defined strict questionnaire; it consisted of open and semi-structured questions, which encouraged the interviewee’s spontaneous participation. The language used with the informants was the local dialect of the
study area viz, Mandyali and Hindi. As part of the interviews, among the village experts, one person was hired to survey and collect the samples of the economically important plants from the natural habitats for further identification. Information on local name of the plant, plant part used to cure the ailment and the ailment for which it is used, altitudinal range, habit, habitat/s, and use values was gathered. The plants with ≥ 03 uses are considered as multipurpose plants. Fresh samples of the useful species were collected and identified with the help of local and regional florals (Chowdhery and Wadhawa, 1984; Aswal and Mehrotra, 1994; Dhaliali and Sharma, 1999; Singh and Rawat, 2000; Khullar, 1994&2000, etc.) [5, 1, 6, 36, 10]. Information on mode of utilization of medicinal plants was collected. Regarding the external use of the plant, the most common is as poultice and as ointment, prepared by macerating the useful part to cure diseases and heal the wounds. For the internal use, as per the requirement, decoction of the part with hot water, milk or honey is prepared and given to the patients 2 or 3 times in a day (Samant et al., 1998) [20, 25]. Infusion is another popular method of preparation for oral administration in the present investigated area. The indigenous uses are based on the surveys, however in the case of medicinal plants information on indigenous uses has also been updated with the help of existing secondary information (Jain, 1991; Samant and Palni, 2000; Samant et al., 2001, 2007a&b) [8, 22, 24]. Some of the species of medicinal plants are not used by the inhabitants, but their uses as medicine are known from other parts of the State and IHR. Such species have also been included under medicinal plants. The wild edibles are either eaten fresh, boiled, cooked or in the form of dried or liquid products (Samant and Dhar, 1997) [21]. Fodder is either fed fresh or stored after drying to use during the lean period. For nomenclature, The Plant List, and International Plant Name Index (IPNI) were followed. The information was compiled and analyzed for the utilization pattern following Samant et al. (2007a) [24].

Table 1: Taxonomic description of economically important plants in the NDSSRM

| Taxonomic Group | Family | Genera | Species | Herbs | Shrubs | Trees | Ferns |
|-----------------|--------|--------|---------|-------|--------|-------|-------|
| Angiosperms     | 64     | 128    | 155     | 91    | 41     | 18    | -     |
| Gymnosperms     | 1      | 2      | 2       | -     | -      | -     | 2     |
| Pteridophytes   | 6      | 6      | 6       | -     | -      | -     | 6     |
| Total           | 71     | 136    | 163     | 91    | 41     | 20    | 6     |

Utilization Pattern: Amongst 163 economically important species, 117 were used as medicine, 54 fodder, 49 wild edible/food, 27 fuel, 11 religious, 04 fibres, 04 timber, 03 for making agricultural tools, 03 dye and 04 for other purposes (Fig. 3). Among the parts of the plants used, leaf was used in majority of cases (59 spp.), followed by whole plant (47 spp.), root (34 spp.) and fruit (26 spp.) (Fig. 4 and Table 2).

Fig 2: Diversity of Native (N), Non-Native (NN), Native with Extension (NWE), Endemic (E) and Near-Endemic (NE) species of NDSSRM

Fig 3: Diversity and utilization pattern of economically important species in the Naina Devi Rewalsar. Abbreviations Used: T=Total; M=Medicinal; Fd=Fodder; Fl=Fuel; Ed=Edible; Re=Religious; Fb=Fibre; Ti=Timber; AT=Agricultural Tools; and Misc. = Miscellaneous

Abbreviations Used: T=Total; M=Medicinal; Fd=Fodder; Fl=Fuel; Ed=Edible; Re=Religious; Fb=Fibre; Ti=Timber; AT=Agricultural Tools; and Misc. = Miscellaneous
Threat Status: As per CAMP (Conservation Assessment and Management Prioritisation) Dioscorea deltoidea was Endangered and Zanthoxylum armatum was Vulnerable (Ved et al., 2003) [40]. Dioscorea deltoidea was Vulnerable as per Red Data Book (Nayar and Sastry, 1987, 1988 and 1990) [13]. Four species (i.e., Arisaeam jacquemontii, Sauromatum venosum, Cedrus deodara and Pinus roxburghii) were under Least Concern category of IUCN (International Union for Conservation of Nature).

Species preference: Among the medicinal plants, Ajuga integrifolia, Asparagus racemosus, Berberis lyceum, Capparis zeylanica, Cuscuta reflexa, Hedychium spicatum, Origanum vulgare, Pistacia chinensis ssp. integerrima, Rhododendron arboreum, Selinum tenuifolium, Viola canescens, Zanthoxylum armatum were highly preferred; fuel, Quercus oblongata, Cedrus deodara, Prunus cerasoides, Loniceria quinquelocularis, Myrica esculenta and Pinus roxburghii; fodder, Sarcococca pruiniforus, Albizia lebbeck, Trifolium pretense, Quercus oblongata, Loniceria quinquelocularis and Indigofera atropurpurea; wild edibles, Myrica esculenta, Elaeagnus conferta, Diplazium esculentum, Phyllanthus emblica, Berberis lyceum, Rubus biflorus, Rubus ellipticus and Dioscorea deltoidea; agricultural tools, Rhamnus purpurea, Symlocos paniculata, and Pinus roxburghii; religious Selinium tenuifolium, Artemisia nilagirica, Phyllanthus emblica, Origanum vulgare and Saccharum ruifilum; and timber, Quercus oblongata, Cedrus deodara, and Pinus roxburghii were the highly preferred species. Quercus oblongata (Ban oak) was found to be a dominant multipurpose tree species. It was heavily lopped as fodder, fuel wood and to prepare agricultural implements throughout the study area starting from low altitude to the higher altitude villages. Among the preferred medicinal plants, flowers of Rhododendron arboreum, rhizome of Hedychium spicatum, roots of Berberis lyceum and fruits of Myrica esculenta were traded by the inhabitants.

Discussion
In the Himalaya the Communities have developed an age old tradition of using a wide variety of forest resources for firewood, fodder, timber. (Rai et al., 2002) [16]. These communities have varying levels of dependency i.e., medicine, wild edible, fodder, fuel, timber, making agricultural tools, fibres etc. on the forests based on their socio-economic structure (Samant and Dhar, 1997; Samant et al., 1998, 2000, 2006, 2007a&b) [21, 20, 24, 25, 28]. Overall, occurrence of 163 species (Angiosperms: 155; Gymnosperms: 02 and Pteridophytes: 06) of the economically important plants belonging to 71 families and 136 genera indicates richness and high socio-economic value of these sacred shrines. Use of these species as medicinal (117 spp.), fodder (54 spp.), wild edible/food (49 spp.), fuel (27 spp.), religious (11 spp.), timber (04 spp.), making agricultural tools (03 spp.), dyes (03) and various other purposes (04 spp.) shows that these species are very important for the sustenance of the inhabitants. The predominating families in the sacred shrine were Compositae (19 spp.), Poaceae and Rosaceae (11 spp., each), Lamiaceae (10 spp.), and Leguminosae (9 spp.), showing their rich gene pool. The over exploitation of multipurpose utility plants and certain highly preferred species are facing high pressure. Such plants include Quercus oblongata, Cedrus deodara, Hedychium spicatum, Dioscorea deltoidea, Myrica esculenta, Elaeagnus conferta, Diplazium esculentum, Phyllanthus emblica and Berberis lyceum. The continuous extraction of these species from the wild for trade has caused increased pressure. Such continued practices will cause the loss of these species and also, loss of moisture, humus content which will lead soil erosion and finally, habitat degradation (Samant et al., 2000, 2006) [29]. In addition to it, spread of weeds and abnoxious exotic species has also led to threat to the natural vegetation of the area. Promotion of planned collections may help for the sustainable utilization of such high value species. The Forests have been subjected to lopping, and felling of trees, and grazing by cattle’s. It has been observed that due to unplanned collection of the resources, ecology of the forests has been seriously affected (Samant, et al., 2000) [27]. Therefore, conservation measures have to be taken to maintain the current status of these habitats, species and communities. Awareness among the villagers need to be created for the resource utilization techniques, so that

Abbreviations Used: Lf=Leaf; WP=Whole plant; Rt=Root; Fr=Fruit; Wd=Wood; Fl=Flower; Sd=Seed; AP=Aerial part; St=Stem; Bk=Bark; Bb=Bulb; Rh=Rhizome; Br=Bract; and Frd=Frond

Fig 4: Statistics of plant parts used.
sustainable utilization of the species could be done by the villagers and mass multiplication through conventional and in-vitro methods of economically important species facing high anthropogenic pressures and their establishment and maintenance in in-situ and ex-situ conditions may help in their conservation and management. In addition, the degraded forests may be re-established through plantations of the seedlings of the preferred medicinal, wild edibles, fuel fodder and timber species with the participation of local inhabitants.

**Conclusion**

The present study recorded 163 species economically important plants from Naina Devi Sacred Shrine Rewalsar of Mandi district in Himachal Pradesh for the first time. The study revealed that the inhabitants/native communities of surrounding villages are largely dependent upon the surrounding plant resources to meet their day to day requirements. The inhabitants are the store house of traditional knowledge particularly about the use of economically important species. The over exploitation of propagating parts such as roots, rhizomes, tubers, bulbs and seeds by the inhabitants in the area may lead rapid population depletion of the species. Similarly, high preference and multiple utility of the species, continuous utilization and over exploitation may lead not only decline in their number and availability but, also may lead their extinction in near future. Therefore, frequent monitoring of populations of these species in relation to climate change, and education and awareness among the local inhabitants and Forest Department Officials are suggested for the conservation management of this rich wealth for posterity.

**Table 2.** Taxa with family, local names, life form, part used of economically important plants in NDSSRM

| Families/Taxa | Local Name | LF | Parts used | Uses                                      | Nativity        |
|---------------|------------|----|------------|-------------------------------------------|-----------------|
| **Angiosperms** |            |    |            |                                           |                 |
| **Acanthaceae** |            |    |            |                                           |                 |
| Barleria cristata L. | -       | H  | WP         | Medicinal (Anaemia, body pain, headache, swelling in legs, toothache); Edible | Ind Or Burma    |
| Dicliptera chinensis (L.) Juss | -       | H  | WP         | Medicinal (Tonic)                          | As Trop         |
| Goldfussia dalhousiana Nees. | -       | H  | WP         | Fodder                                    | Reg Himal       |
| **Anacardiaceae** |            |    |            |                                           |                 |
| Pistacia chinensis ssp. integerrima (J. L. Stewart ex Brandis) Rech. f. | Kakarsinghi | T  | Fr         | Medicinal (Tonic, expectorant, cough, asthma, fever, appetite, irritability of the stomach, chronic pulmonary affection, dyspeptic, vomiting and diarrhoea); Edible; Fodder; Timber; Dye | Reg Himal Aegypt Persia China |
| **Apiaceae** |            |    |            |                                           |                 |
| Cyclospermum leptophyllum (Pers.) Sprague | -       | H  | Fr         | Medicinal (Germicide, finds wide application as a disinfectant and antiseptic of rather pleasant odor. flavoring of all kinds of food products, meats, sauces and canned food) | Austr           |
| Bupleurum hamiltonii N. P. Balakr. | -       | H  | WP         | Fodder                                    | Nepal (Indian Subcontinent As Trop) |
| Chaerophyllum villosum Wall. ex DC. | -       | H  | Rt         | Edible                                   | Reg Himal       |
| Pimpinella diversifolia DC. | -       | H  | Rt         | Medicinal (Cold, cough, digestive disorder) | Reg Himal       |
| Selinum tenuifolium Wall.* | Matoshal | H  | WP         | Medicinal (Incense, insecticidal, nerve tonic, sedative); Religious | Reg Himal       |
| Trachydrum rosiei L. | -       | H  | AP         | Fodder                                    | Reg Himal Ind Or |
| **Araceae** |            |    |            |                                           |                 |
| Arisaema flavum (Forsk.) Schott | Kira aloo | H  | Bb         | Medicinal (Skin disease)                   | Arabia          |
| A. intermedium Bl.* | Kira aloo | H  | Bb         | Medicinal (Ringworm, skin diseases)        | Reg Himal       |
| A. jacquemontii Bl.* | Kira aloo | H  | Bb         | Medicinal (Ringworm and other skin diseases) | Reg Himal       |
| A. tortuosum (Wall.) Schott | Kira aloo | H  | WP         | Medicinal (Veterinary diseases)            | Reg Himal       |
| Sauromatum venosum (Dryand. ex Aiton) Kunth. | -       | H  | Tu         | Medicinal (Skin disease, tumors, veterinary sores); Edible | Ind Bor Occ     |
| **Araliaceae** |            |    |            |                                           |                 |
| Hedera nepalensis Koch. | Katari   | Sh  | Fr, Lf     | Medicinal (Cold, cough, stimulant, diaphoretic, cathartic, rheumatism); Edible | Reg Himal Europe Afr Bor As Temp |
| Hydrocotyle javanica Thumb. | -       | H  | Lf         | Medicinal (Dysentery, indigestion, fever)  | Java            |
| **Apocynaceae** |            |    |            |                                           |                 |
| Ceropogia longifolia wall. | -       | H  | Tu         | Edible                                   | Reg Himal       |
| Cryptolepis dubia (Burm.f.) M.R.Almeida | -       | Sh  | WP         | Medicinal (Rickets); Fibre                | Ind Or          |
| **Asparagusaceae** |            |    |            |                                           |                 |
| Asparagus racemosus Wild. | Sansarpali | Sh  | Tu         | Medicinal (Antihelmintic, aphrodisiac, rheumatism, bleeding from nose, cough, dysentery, febrifuge, gastric complaints, gonorrhoea, headache, menstral complaints, snake bite, stomachache, tonic, urine complaints); Edible | Ind Or Afr Trop Austr |

~ 1269 ~
| Family               | Genus                          | Species                        | Habit  | Part(s) | Use(s)                                      | Region                  |
|---------------------|--------------------------------|--------------------------------|--------|---------|---------------------------------------------|-------------------------|
| Berberidaceae       | Berberis lycium                | Royle*                         | Kshambal | Sh, Rt, Fr | Medicinal (Jaundice, eye diseases); Edible; Fuel | Reg Himal               |
| Betulaceae          | Carpinus viminea               | Lindl.                          | Cham-Khadik | T, Wd | Fuel                                        | Reg Himal               |
| Brassicaceae        | Cardamine impatiens            | L.                               | -       | H, St | Medicinal (Tonic); Edible                  | Europe As               |
| Buxaceae            | Sarcococca prunifloriformis   | Lindl.                          | Rawal   | Sh, Lf, Fl | Fodder; Fibre; Religious                    | Ind Or Malaya           |
| Capparaceae         | Capparis zeylanica             | L.                               | -       | Sh, Wp | Medicinal (Antihelmintes, blisters, boils, cholera, colic, pneumonia, piles, rheumatism, snake bite, swell testicle, ulcer); Edible | Ind Or                  |
| Caprifoliaceae      | Lonicera quinquelocularis      | Hardw.                          | -       | Sh, Lf, Wd | Fodder; Fuel                                | Reg Himal               |
| Caryophyllaceae     | Stellaria media                | (L.) Villars                    | -       | H, WP | Medicinal (Bone fracture); Edible           | Reg Himal Louisiana (SE USA N Amer) |
| Celastraceae        | Euonymus lucidus               | D. Don                          | -       | T, Rt, Bk, Lf | Medicinal (Dysentery, eye diseases, headache) | Reg Himal               |
| Commelinaceae       | Commelia paludosa              | Bl.                             | -       | H, WP | Medicinal (On insect stings)                | Ind Or Malaya           |
| Cyanotis cristata   | C. vaga                        | (L.) Don                        | -       | H, Lf | Medicinal (Applied to sores); Fodder; Edible | Ind Or Malaya           |
| Compositae          | Ainsliaea aptera               | DC.*                            | Sath jalari | H, Rt | Medicinal (Stomachache)                    | Reg Himal               |
| Ageratum conyzoides | -                              | L.                              | Karu-buti | Lf, Rt, Sd, Fr, Fl | Medicinal (Antilithic for kidney stone, antiseptic, boils, burns, cancer, cuts, diarrhoea, headache, leprosy, muscular pain, piles, ringworm, scabies, snake bite, sores, swellings, tumor, uterine disorders, hair problems, wounds); Edible | Reg Trop Amer           |
| Anaphalis royleana  | -                              | DC.                             | -       | H, Fl | Used as an incense                          | Reg Himal               |
| Artemisia japonica  | -                              | Pamp.                           | -       | H, Lf | Medicinal (decoction, treatment of vaginitis, skin diseases) | Japon Ind Or Burma      |
| A. nilagirica      | A. pilifera                     | (Cl.) Pamp.                     | -       | Sh, Wp | Medicinal (Antialergic, headache, menstrual problem, insect replent); Religious | Reg Temp Bor            |
| A. parviflora      | A. pilifera                     | Roxb. ex D. Don                 | Jhau    | H, Lf, Rt, Sd | Medicinal (Carminative, wormifuge, throat problems); Fodder | Ind Or Burma            |
| Bidens binternata  | B. pilifera                     | (Lour.) Merr. and Sherff.        | -       | H, Fr, Lf, Fl, Rt | Medicinal (Apetizer, cough, cuts, inflammation, snake bite, sores, toothache, ulcers); Edible | Reg Trop                |
| B. pilosa L        | -                              | DC.                             | -       | H, WP | Medicinal (Cough, cuts, ear and eye complaints, headache, inflammation, leprosy, skin diseases, snake bite, sores, ulcers); Edible | Reg Trop                |
| Blumea lacinata    | Blumea lacinata (Roxb.) DC.     | -                              | H, Lf | Medicinal (Eczema, skin disease)            | Ind Or Malaya           |
| Cirsium vulichii   | Cirsium vulichii (Decne.) DC.   | *                               | -       | H, WP | Medicinal (Swelling, headache, pneumonia)   | Reg Himal               |
| E. bonariensis     | E. canadensis                   | L.                              | -       | H, Lf | Medicinal (Rheumatism, mouth, throat and skin diseases) | Amer Austr              |
| E. canadensis      | E. canadensis                   | L.                              | -       | H, WP | Fodder                                       | Amer Austr              |
| Gerbera gossypina  | Gerbera gossypina (Royle)       | Beavu.                         | Bach    | H, Rt | Medicinal (Blood pressure, gastric disorders) | Reg Himal               |
| Pseudognaphalium   | Pseudognaphalium hypoleucum    | (DC.) Hilliard and B. L. Burtt  | -       | H, WP | Medicinal (Cuts, wounds)                    | As Trop                 |
| Inula capa         | Inula capa (Buch.-Ham. ex D. Don) DC. | -                              | H, Lf | Medicinal (Headache, urinary complaints); Fodder | Reg Himal Java China    |
| I. cappalata       | Senecio nadiisculus            | Buch.-Ham.                     | -       | H, Rt | Medicinal (Cough, cold)                      | Reg Himal               |
| Sigesbeckia orientalis | Sigesbeckia orientalis         | L.                              | -       | H, Wp | Medicinal (Boils, sores, ulcer, cardiac ailment, skin disease) | Cosmop Trop             |
| **Convolvulus arvensis L.** | - | H | Wp | Medicinal (Purgative, burns, bruises); Detergent | Geront Temp |
| **Evolvulus alsinoides (L.) L.** | - | H | Wp | Medicinal (Asthma, fever, scorpion sting, stomachache); Religious | Amphig Trop |
| **Cuscuta reflexa Roxb.** | Amar bel | H | Wp | Medicinal (Bodyache, burns, cuts, nervien weakness, swell of legs, body part, Veterinery, kills lice) | Ind Or |
| **Cornus macrophylla Wall.** | Kirchhan | T | Fr, Wd, Lf | Fodder; Fuel; Edible | Reg Himal China Japon |
| **Kalanchoe intergra (Medik.) Kuntze** | H | Lf | Medicinal (healing for scar) | As Temp |
| **Rosularia rosulata (Edgew.) H. Ohba** | Moshu gha | H | Lf | Medicinal (Skin disease) | Reg Himal |
| **Carex cruciata Wahlenb.** | Dastana ghas | H | Wp | Fodder | Ind Or China |
| **Dioscorea deltoidea Wall. ex Kunth** | Shinglingli | H | Tu | Medicinal (Dysentery, piles); Edible | Ind Or |
| **Phyllanthus emblica L.** | T | Wp | Medicinal (Constipation, skin problem, hair tonic); Edible, Religious | As Temp |
| **Euphorbia hirta L.** | Dhudhi | H | Wp | Medicinal (Antidote in snake bite, asthma, boils of mouth, kidney disease, pain in joints, veterinary, bone fracture); Edible | Amphig Trop |
| **E. prolifera Buch.-Ham. ex D.Don** | H | WP | Fodder | Reg Himal |
| **Glochidion velutinum Juss.** | T | Lf, St | Fuel; Dye | Ind Or Malaya |
| **Quercus oblongata D. Don** | Ban | T | Wd, Lf | Fodder; Fuel; Timber | Reg Himal |
| **Swertia angustifolia Ham. ex D. Don** | Chirayata | H | WP | Medicinal (Malarial fever) | Reg Himal |
| **Geranium nepalense Sw.** | Tirahni | H | Rt | Medicinal (Cuts, jaundice, toothache, ulcer, wounds, stomach complaints); Dye | Ind Or China |
| **Deutzia staminea R. Br. ex Wall.** | Dendhru | Sh | Lf, Wd | Fodder; Fuel | Reg Himal |
| **Hypericum japonicum Thunb.** | Basanti | H | WP | Medicinal (Skin diseases) | As Temp Or Austr |
| **Nepeta ciliaris Benth.** | - | H | AP | Fodder | Amphig |
| **Ajuga integrifolia Buch.-Ham.** | Neelkanthi | H | Lf | Medicinal (Ascariasis) | Afr Trop Ind Or As Or |
| **Pseudocaryopteris foetida (D.Don) P.D.Cantino** | - | H | Lf | Medicinal (Wounds); Fodder | Reg Himal |
| **Micromeria biflora (Buch.-Ham.) Benth.** | - | H | Lf | Medicinal (Cold, gastroenteritis) | Ind Or Arab Afr Trop |
| **Oreganum vulgare L.** | Ban tulsi | H | WP | Medicinal (Cold, fever, hysteria, influenza, menstrual complaints, stimulant, tonic); Edible; Religious | Europe As et Afr |
| **Isodon lophanthoides var. graciliflorus (Benth.) H. Hara** | - | H | Lf | Medicinal (Cuts,wounds) | Reg Himal |
| **Salvia mukerjeei Bennet and Raizada** | Gawandru | H | Rt, Lf, Fl | Medicinal (Astringent, colic, cold, cough) | Reg Himal |
| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *S. nubicola* Wall. ex Sw. | - | H | Lf, Rt | Medicinal (Wounds, cold, cough) | Europe Austr Oriens Reg Himal |
| *Vitex negundo* L. | - | Sh | Wp | Medicinal (Blister, bone fracture, bodyache, cold, colic, diarrhoea, epilepsy, fever, gout, gum trouble, headache, itch, mental disturbance, piles, reduce sex desire, skin problem, tonic, ulcer) Insect repellent; Religious; Household | As Trop et Subtrop |

**Leguminosae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Desmodium gangeticum* (L.) DC. | - | Sh | Wp | Medicinal (Antidote to snake venom, cough, dysentery, eye infection, fever, tonic, vomiting); Fodder | As Trop Austr |
| *Indigofera atropurpurea* Horn. | Kathi | Sh | Lf, Wd | Fuel; Fodder | Reg Himal China |
| *L. cassinoides* Rottl. ex DC | - | Sh | Rt | Medicinal (Cough, pains in chest) | Reg Himal |
| *I. heterantha* Brandis | Kali Kathi | Sh | Rt, Fl | Medicinal (Veterinary, Medicinal urine problem); Edible | Reg Himal |

**Lespezea gerardiana Grah. ex Maxim.***

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Trifolium pratense* L. | Malori | H | WP | Fodder | Europe As Temp |
| *T. repens* L. | Malori | H | WP | Medicinal (Astringent); Fodder | Geront Bor Temp |
| *Vicia rigida* Royle | - | H | WP | Fodder | Reg Himal |
| *Vigna vexillata* (L.) A. Rich. | - | H | Rt, Sd | Medicinal (Cholera, ulcers); Edible | Geront Trop |

**Lythraceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Woodfordia fruticosa* (L.) Kurz | - | Sh | St, Fl, Rt | Medicinal (Bone fracture, burns, cholera, cough, dropsy, dysentery, fever, haemorrhage, injuries, menorrhoea, muscle pain, nausea, night blindness, fever, rheumatism, skin disease, small pox, sores, spleen complaints, sprain, ulcer wounds, veterinary sores); Edible | As et Afr Trop |

**Melastomataceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Osbeckia stellata* Buch.-Ham. ex D. Don | - | Sh | Rt, Lf | Medicinal (Cough, digestion, dysentery, nose bleeding, snake bite, wounds, stomachache, toothache) | Reg Himal |

**Menispermeae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Stephania glabra* (Roxb.) Miers. | Galaukadi | H | Tu | Medicinal (Asthma, dysentery, fever) | As Trop |

**Moraceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Ficus hederacea* Roxb. | - | Sh | Wd, Lf | Fodder; Fuel | Reg Himal Burma |
| *F. nerifolia* Sm. | - | T | Fr, Lf, Wd | Edible; Fodder; Fuel | As |
| *F. roxburghii* Wall. | - | T | Lf, Rt, Wd | Edible; Fodder, Fuel | As Trop |

**Myricaceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Myrica esculenta* Buch.-Ham. ex Don | Kaphal | T | Bk, Fr, Wd | Medicinal (Asthma, cholera, cough, fever, indigestion, malaria, rheumatism); Edible; Fuel | As Trop et Subtrop |

**Myrtaceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Syzygium cumini* (L.) Skeels | - | T | Br, Lf, Sd, Fr | Medicinal (Astringent, blister in mouth, cancer, piles, pimples, fermentation for rice beer); Edible; Fuel; Household (Various construction purposes, Dying, Tanning); Religious | As et Austr Trop As Trop |

**Oleaceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Jasminum discolor* Wall. ex Roxb. | - | Sh | Lf | Medicinal (Cuts, wounds); Fodder | Reg Himal |
| *J. humile* L. | Juhi | Sh | Fl, Rt, Lf | Medicinal (Sinus, skin, blood, heart disease, ringworm) | As Trop |

**Orobanchaceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Pedicularis pectinata* Wall. ex Benth | - | H | WP | Medicinal (Bodyache, sedative) | Reg Himal Persia |

**Plantaginaceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Plantago lanceolata* L. | Ishabogol | H | Lf | Medicinal (Blood purifier) | Europe As Bor |
| *P. ovata* Forssk. | Jangali isabogol | H | Sd, Husk | Medicinal (Diarrhea, constipation) | Reg Mediterr Orients |

**Plumbaginaceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Plumbago zeylanica* L. | - | H | St, Rt, Fl, La | Medicinal (Abortifacient, headache, rheumatism,) | Geront Trop |

**Poaceae**

| Species | Habitat | Use | Notes |
|---------|---------|-----|-------|
| *Apluda mutica* L. | - | H | WP | Medicinal (Mouth sores); Fodder | As Trop Polynesia Austr |
| *Arundinella nepalensis* Trin. | - | H | WP | Medicinal (Ointment) | Ind Or |
| Plant Name | Genus | Species | Family | Common Name | Uses |
|------------|-------|---------|--------|-------------|------|
| Bothriochloa bladhii | S.T. Blake | Retz. | Poaceae | Fodder | Orien Afr et As Trop Austr |
| B. pertusa | L. | A. Camus | Poaceae | Fodder | Sicil As et Afr Trop Austr |
| Diginaria cruciata | (Nees) A. Camus | - | Poaceae | Fodder | Reg Bor Temp et Trop Ind Or Cosmop |
| Eragrostis unioloides | (Retz.) Nees. | - | Poaceae | Fodder | Ins Banca |
| Opismenus compositus | (L.) P. Beauv. | P. | Poaceae | Fodder | Cosmop Trop |
| O. hirtellus | (L.) P. Beauv. | - | Poaceae | Fodder | Cosmop Trop |
| Saccharum rufipilum | Steud. | - | Poaceae | Fodder, Religious | Reg Calid Cult |
| S. spontaneum | L. | - | Poaceae | Medicinal (Asthma, cholera); Fodder | Geront Trop |
| Pennisetum glaucum | (L.) R. Br. | - | Poaceae | Edible | Europe As Temp |
| Polygonaceae | | | | | |
| Rumex hastatus | D. Don | Aambi | Polygonaceae | Edible | Reg Himal |
| R. nepalensis | Spreng. | Albar | Polygonaceae | Medicinal (Boils, colic, cooling, diuretic, purgative, scurvy, swelling of muscles); Fodder | As Occ Ind Or Malaya Afr |
| Primulaceae | | | | | |
| Myrsine africana | L. | Sh | Primulaceae | Medicinal (Pain, Gum tone, Vermifuge) | Reg Himal Afr Austr et Trop Ins Azor |
| Ranunculaceae | | | | | |
| Clematis buchananiana | DC. | Chabru | Ranunculaceae | Medicinal (Skin diseases, sores, tumors) | Reg Himal |
| C. grata | Wall. | Cl | Ranunculaceae | Fodder | Reg Himal China Afr Trop |
| Ranunculus diffusus | DC. | - | Ranunculaceae | Medicinal (Boils) | Ind Or Malaya |
| Rhamnaceae | | | | | |
| Rhamnus purpurea | Edgew. | Chaunsha | Rhamnaceae | Medicinal (Purgative); Agricultural tools; Fodder | Reg Himal |
| Rosaceae | | | | | |
| Agrimonia pilosa | Ledeb. | Kuri | Rosaceae | Medicinal (Cough, urinary problems) | Reg Bor Temp |
| Cotoneaster microphyllus | Wall. ex Lindl. | Sh | Rosaceae | Medicinal (Astringent); Fodder; Edible | Reg Himal |
| Fragaria vesca | L. | H | Rosaceae | Edible | Reg Temp |
| Potentilla fulgens | Wall. | - | Rosaceae | Medicinal (Astringent, tooth complaints, tonic) | Reg Himal |
| Pinsepa utilis | Royle | Bhekhal | Rosaceae | Medicinal (Burns, cuts, rheumatism, wounds); Edible | Reg Himal |
| Prunus cerasoides | Buch. - Ham. ex Don | Pajja | Rosaceae | Fodder; Edible; Fuel; Religious | Reg Himal |
| Pyrus pashia | Buch.-Ham. ex D. Don | Shegal | Rosaceae | Edible; Fodder; Fuel | Reg Himal |
| Rosa moschata | Herrm. | Kunjaphool | Rosaceae | Medicinal (Pain); Fuel; Fodder | Orients |
| Rubus biflorus | Buch.-Ham. ex Sm. | Aachhe | Rosaceae | Medicinal (Diarrhoea); Edible | Reg Himal Ind Or |
| R. ellipticus | Sm. | Aachhe | Rosaceae | Medicinal (Dysentery, malaria, stomachache, worms); Edible | Ind Or |
| R. niveus | Thunb. | Anchha | Rosaceae | Medicinal (Stomachache); Edible | Reg Himal |
| Rubiaceae | | | | | |
| Galium aparine | L. | - | Rubiaceae | Medicinal (Astringent, skin diseases) | Reg Bor Temp et Magell |
| G. rotundifolium | L. | - | Rubiaceae | Medicinal (Bronchitis, tonsil); Fodder | Europe As Temp |
| Himalrandia tetrasperma | (Wall. ex Roxb.) T. Yamaz. | - | Rubiaceae | Edible | Reg Himal Nepal |
| Rubia cordifolia | L. | - | Rubiaceae | Medicinal (Tonic, astringent, antidote, dysentery) | As Trop et Temp Afr Trop |
| Rutaceae | | | | | |
| Zanthoxylum armatum | DC. | Tirmir | Rutaceae | Medicinal (Cough, cholera, fever, eczema, itching, leucoderma, piles, rheumatism, tonic, tooth complaints); Edible; Fuel | Reg Himal China |
| Salicaceae | | | | | |
| Xylosma longifolium | Clos. | - | Salicaceae | Medicinal (Stomachache,) Edible; Fuel | Reg Himal |
| Santalaceae | | | | | |
| Oxyris lanceolata | Hochst. and Steud. | - | Santalaceae | Fodder | Ind Or |
| Scrophulariaceae | | | | | |
| Verbascum thapsus | L. | Jangli | Scrophulariaceae | Medicinal (Asthma, cough, inflammation, | Europe Oriens Reg |
### Acknowledgements

The authors are thankful to the Director, G. B. Pant National Institute of Himalayan Environment (GBPNIHE), Kosi-Katarmal, Almora for facilities and encouragement. Help received from all the Research Scholars of the GBPNIHE, Himachal Regional Centre, Mohal - Kullu are also acknowledged. Financial Assistance received from HPPCL, Shrabhai Kullu (Letter no: HPPCL/GMSHEP/DB/-Z/12-5650-53, Dated. 27.01.2012) is highly acknowledged.

### References

1. Aswal BS, Mehrotra BN. Flora of Lahaul-Spiti (A Cold Desert in North-West Himalaya). Bishen Singh Mahendra Pal Singh, Dehradun, 1994.
2. Chauhan NS. Plant resources of economic use in Himachal Pradesh. Directorate of Extension Education, UHF, Solan report, 1996, 14.
3. Chauhan NS. Medicinal and Aromatic Plants of Himachal Pradesh. Indus Publishing Company, New Delhi, India, 1999.

### Table: Plants and Their Uses

| Common Name | Scientific Name | Use(s) | Region |
|-------------|-----------------|--------|--------|
| Tambakhu    | Buddleja crispa Benth. | Fodder; Fuel | Himal |
| Leucoderma | Simaroumbaceae | Medicinal (Abdomin disease, earache, fever, gastric disease, stomachache); Edible | Reg Himal Burma |
| Veterinary Diseases | Brucia javanica (L.) Merr. | Medicinal (Gastric problem, skin diseases); Edible; Fuel | Reg Himal China Ins Sandvic |
| Himal | Smilacaceae | Medicinal (Skin eruptions, sores, wounds); Fuel | Europe Oriens Ind Or |
| Pork | Solanaceae | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal China |
| Fodder; Fuel | Buddleja crispa Benth. | - | - |
| SMA | Smilax aspera L. | Medicinal (Skin eruptions, sores, wounds); Fuel | Reg Himal China |
| Reg Himal Burma | Physalis minima L. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal China |
| Fodder; Fuel | Symplcos paniculata (Thunb.) Miq. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal Burma China |
| Thymelaeaceae | Wikstroemia canescens Meissn. | Medicinal (Piscicidal); Fiber; Paper making | Reg Himal Zeylan China |
| Daphne papyracea Wall. ex Steud. | Debresia longifolia (Burm. f.) Wedd. | Medicinal (Dandruff, hair problems) | Reg Trop et Subtrop |
| Urticaceae | Parietaria dehis Fleest. | - | - |
| Violaceae | Fossila scripta (Buch.-Ham. ex D. Don) Wedd. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
| Vitaceae | Parthenocissus semicordata (Wall.) Planch. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
| Zingiberaceae | Hedychium spicatum Sm.* | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
| Gymnosperms | Cedrus deodara (Roxb. ex D. Don) G. Don* | Medicinal (Antihelminthic, rheumatism, ulcers); Fuel; Timber | Reg Himal |
| Pteridophytes | Asplenium dalhousiae Hk. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
| Cryptogamaceae | Asplenium dalhousiae Hk. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
| Athyraceae | Diplozium esculentum (Retz.) Sw. | Medicinal (Constipation); Edible | Reg Himal |
| Cryptogrammaceae | Oxyrhyncum contignum Wall. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
| Equisetaceae | Equisetum arvense L. | Medicinal (Dandruff, hair problems) | Reg Trop et Subtrop |
| Equisetum arvense L. | Fossila scripta (Buch.-Ham. ex D. Don) Wedd. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
| Pteridophytes | Asplenium dalhousiae Hk. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
| Cryptogamaceae | Asplenium dalhousiae Hk. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
| Athyraceae | Diplozium esculentum (Retz.) Sw. | Medicinal (Constipation); Edible | Reg Himal |
| Cryptogrammaceae | Oxyrhyncum contignum Wall. | Medicinal (Astringent); Fuel; Agricultural tools | Reg Himal |
4. Chettri N, Sharma E. Assessment of natural resources uses patterns: a case study along a trekking corridor of Sikkim Himalaya, India. Resources Energy Dev. 2006; 3(1):21-34.

5. Chowdhery HJ, Wadhwa BM. Flora of Himachal Pradesh, Botanical Survey of India, Calcutta, 1984, 1-3.

6. Dhaliwal DS, Sharma M. Flora of Kullu District (Himachal Pradesh). Bishen Singh Mahendra Pal Singh, Dehradun, 1999.

7. Heywood VH, Watson RT. Global Biodiversity Assessment. Cambridge University Press, USA, 1995.

8. Jain SK. Dictionary of Indian Folk Medicine and Ethnobotany. Deep Publications, New Delhi, 1991.

9. Kaur I, Sharma S, Lal S. Ethnobotanical survey of medicinal plants used for different diseases in Mandi district, Himachal Pradesh. International Journal of Research in Pharmacy and Chemistry. 2011; 1:1167-71.

10. Khullar SP. An illustrated fern flora of the West Himalaya International Book Distributors, Dehradun. 1994, I.

11. Khullar SP. An illustrated fern flora of the West Himalaya International Book Distributors, Dehradun. 2000, II.

12. Kumar G, Chander H. Ethno-Veterinary and Fodder Plants of Awah-Devi Region of Hamirpur District, Himachal Pradesh. Journal of Biological and Chemical Chronicles. 2018a; 4(1):08-15.

13. Kumar G, Chander H. Indigenous Ethno-Medicinal and Ethno-Veterinary Practices in Shivalik Hills Zone of Himachal Pradesh, India. Asian Journal of Advanced Basic Sciences. 2018b; 6(2):01-14.

14. Lange D. Europe’s medicinal and aromatic plants. Their use, trade and conservation. TRAFFIC International, Cambridge, UK, 1998.

15. Nayar MP, Sastry ARK. Red Data Book of Indian Plants, Botanical Survey of India, Calcutta. 1987, 1988, 1990, I-III.

16. Rai YK, Chettri N, Sharma E. Fuelwood value index of woody tree species from forests of Manlay watershed, South Sikkim, India. Forests, Trees and Livelihoods, 2002: 12:209-219.

17. Rana D, Bhatt A, Lal B. Ethnobotanical knowledge among the semi-pastoral Gujar tribe in the high altitude (Adhvari’s) of Churah subdivision, district Chamba, Western Himalaya. Journal of Ethnobiology and Ethnomedicine, 2019; 15(1):10.

18. Rana MS, Samant SS. Diversity, indigenous uses and conservation status of medicinal plants in Manali wildlife sanctuary, North western Himalaya. Indian Journal of Traditional Knowledge. 2011; 10(3):439-459.

19. Rawat RS, Jishhu V, Kapoor KS. Medicinal and aromatic plant diversity of Himalayan Cold Desert with reference to Spiti valley of North-West Himalayas. Indian Forester 2009; 135(7):891-904.

20. Samant SS. Diversity, distribution and conservation of fodder resource of west Himalaya, India. In: Misri, B. (ed.) Proceedings of the Third Temperate Pasture and Fodder Network (TAPAFON), Pokhara, Nepal, 9-13 March, 1998, sponsored by F.A.O. Rome. 1998, 109-128.

21. Samant SS, Dhar U. Diversity, endemism and economic potential of wild edible plants of Indian Himalaya. The International Journal of Sustainable Development & World Ecology. 1997; 4:179-191.

22. Samant SS, Palni LMS. Diversity, distribution and indigenous uses of essential oil yielding plants of Indian Himalayan Region. Journal of Medicinal and Aromatic Plant Sciences. 2000; 22:671-684.

23. Samant SS, Pant S. Diversity, distribution pattern and traditional Knowledge of sacred plants of Indian Himalayan Region. Indian Journal of Forestry. 2003; 26(3):201-213.

24. Samant SS, Butola JS, Sharma A. Assessment of diversity, distribution, conservation status and preparation of management plan for medicinal plants in the catchment area of Pabbari Hydroelectric Project Stage – III in Northwestern Himalaya. Journal of Mountain Science, 2007a; 4(1):34-56.

25. Samant SS, Dhar U, Palni LMS. Medicinal plants of Indian Himalaya: Diversity distribution potential values. Gyanodaya Prakashan, Nainital, 1998.

26. Samant SS, Dhar U, Palni LMS. Himalayan Medicinal Plants: Potential and Prospects. Gyanodaya Prakashan, Nainital, 2001.

27. Samant SS, Dhar U, Rawal RS. Assessment of Fuel resource diversity and utilization patterns in Askot Wildlife Sanctuary in Kumaon Himalaya, India, for conservation and management. Environmental Conservation, 2000; 27(1):5-13.

28. Samant SS, Pant S, Singh M, Lal M, Singh A, Sharma A, et al. Medicinal plants in Himachal Pradesh, Northwestern Himalaya. International Journal of Biodiversity Science and Management, 2007b; 3:234-251.

29. Samant SS, Rawal RS, Dhar U. Diversity, extraction and status of fodder species in Askot Wildlife Sanctuary, West Himalaya, India. The International Journal of Biodiversity Science and Management. 2006; 2:29-42.

30. Samant SS, Singh A, Sharma P, Lal M. Studies on diversity and conservation status of plants in a proposed Cold Desert Biosphere Reserve of Trans and North West Himalaya. Final Technical Report submitted to Ministry of Environment and Forest, Government of India, New Delhi, 2010.

31. Samant SS, Vidyarthi S, Pant S, Sharma P, Marpa S, Sharma P. Diversity, Distribution, Indigenous Uses and Conservation of the Medicinal Plants of Indian Himalayan Region Used in Cancer. Journal of Biodiversity. 2011; 2(2):117-125.

32. Sharma J, Gaur RD, Painuli RM. Conservation Status and Diversity of some important plants in Shivalik Himalaya of Uttarakhand, India. International Journal of Medicinal and Aromatic Plants, 2011; 1(2):75-82.

33. Sharma PK, Lal B. Ethnobotanical notes on some medicinal and aromatic plants of Himachal Pradesh, Indian Journal of Traditional Knowledge, 2005; 4(4):424-428.

34. Singh A, Lal M, Samant SS. Diversity, indigenous uses and conservation prioritization of medicinal plants in Lahaul valley, proposed cold desert biosphere reserve, India. International Journal of Biodiversity Science & Management, 2009; 5(3):132-154.

35. Singh GS. Utility of non-timber forest products in a small watershed in the Indian Himalayas: the threat of its degradation. Natural Resources Forum, 1999; 23:65-77.

36. Singh SK, Rawat GS. Flora of Great Himalayan National Park, Himachal Pradesh. Bishen Singh Mahendra Pal Singh, Dehradun, 2000.

37. Thaplyal V, Sharma S, Bhatt AB. Sacred groves as ethnobotanical gene pools in tribal areas of the Western Himalaya. Indian Forester, 2012; 138(1):70-78.
38. Tiwari BK. Non-timber forest produce of north east India. Journal of Human Ecology. 2000; 11:445-455.
39. Totey NG, Verma RK. Biodiversity conservation. Indian Forester, 1996; 4:7-10.
40. Ved DK, Kinhal GA, Ravikumar K, Prabhakaran V, Ghate U, Sankar RV et al. Conservation assessment and management prioritisation for the medicinal plants of Jammu and Kashmir. Himachal Pradesh: Foundation for Revitalisation of Local Health Traditions, Bangalore, India, 2003.