Population dynamics, diversity and abundance of medicinal plants vis-à-vis anthropogenic interferences-A Review

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Abstract: This paper reviews important and outstanding work on population dynamics, diversity and abundance of economically important medicinal plants vis-à-vis selected ones. Perusal of the literature revealed that the climate and edaphic factors are responsible for the proper growth and development of select medicinal plant of the area.
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1. Introduction

Kashmir Himalaya hosts a remarkably rich wealth of medicinally important herbs. Ranging from cold desert of Ladakh through temperature Zone of Kashmir Valley to the sub-tropical areas of Jammu province, the area offers congenial habitats for luxuriance of the species with wide ranging ecological requirements. It is worthy to note that about 40% of medicinal herbs inhabiting the area are used in the local medical system and some are highly inhabiting the area are used in the local medical system and some are highly valued in the foreign market. Till about 20 years ago the country used to export 374,921Kgs Kutb (Saussurea Costus) to Hong Kong, Singapore, Thailand, Vietnam, Japan, Sri-Lanka and France.

The medicinal plants inhabiting this part of Himalaya include some endemic elements too which are predominantly represented in Ranunculaeeae, Apiaceae, Asteraceae and Lamiaceae etc. Many of these herbs are of a high pharmacological potential and commercially viable. Van Vangun (*Podophyllum hexandrum*). Patis (*AconitanHeterophyllun*) Kuth(*Sausserea Costus*); Koad (*Picrorhiza Kurrooa*); Pambt salan (Rheum emodi); Kahzaban (*Arnebia benthamii*); Krith (*Dioscorea deltoidea*), Dhoop (*Jurinea dolomacea*); and Kuroo (*Gentiana kurroo*) are few of such most important extensively used and highly threatened medicinal herbs of the region (Kaul *et al*., 1999).

Currently 11 of Indian medicinal plants are enlisted in the appendices of CITES which include the afore mentioned species, as well export of these herbs has been banned vide public notice number: 47 PN (92-97) dated March 30th 1994 and they have been enlisted in negative list of exports and imports policy 1997-2002 of the Government of India. It is apparent from this that the grim future of our medicinal plant wealth has been foreseen by various government and non-government organizations of the country hence the imposition of legislation including the Kuth Act of J&K government launched in the year 1974. Despite these protective measures at various levels from time to time to salvage this invaluable genetic resource and the country's national wealth nothing seems to happen at the grass root levels. Exploitation of these herbs continues unabated.

Miller (1924) reported that finer the particles the more surface is presented for the retention and solvent action of water and the greater is the absorbing area for plants. According to him the clay particles are so finely divided that they exhibited the properties of matter in colloidal state, one of which is an exceedingly great water retaining capacity. It was stated that clay is chemically reactive in presence of water and the soil without the clay would resemble a pile of sand (Russel, 1934). He also noted that fine sand and silts are intermediate in some of the properties described for coarse sand and clay. In the same year Wilde reported that soil texture not only exerts an important effect upon water relations but also upon aeration as well as the supply of nutrients. It profoundly affects the rapidity of organic matter and its retention against leaching. According to him, the nitrogen content of the soil is closely related its texture.

It was stated that both macronutrients as well as micronutrients are influenced by soil reaction (pH) and a normal pH range of 6.5-7.5 promotes the most ready available of plant nutrients (Seth, 1960). According to him it also aids in ion accumulation. In

the same year Jenny and Raychaudhuri studied organic carbon status in Indian soils and reported the effects of climate on carbon reserves in virgin and cultivated soils. According to workers the soil organic pool remains in a steady state of equilibrium under native vegetation cover, but is sensitive to anthropogenic activities.

In 1967, Buckman and Brady suggested that the chemical and physical properties of soils are controlled largely by clay and humus as it acts as the center of activity around which chemical reactions and nutrient exchange occurs.

Human activity is responsible for considerable deterioration of forests, Moehring and Rawal (1970).According to these workers trucks, tractors, and heavy equipments used in logging, results in substantial soil compactions. Hatchel et al, (1970) concluded that wet weather logging could cause soil compaction that may markedly reduce growth rates of established seedlings.

Bams (1971) reported that exhaustive management practices like clear felling or intensive logging or even shifting cultivation in North-West Himalaya result in declining organic matter levels. In the same year Odum described that in natural conditions contagious distribution is the most common type of distribution due to small but significant variation in the environmental conditions, while random distribution is found only in very uniform environment. A group of authors found significant decrease in concentrations of organic matters, total nitrogen, pH and exchangeable bases, where top soil has been removed by bull dosing (Uhl *et al*., 1982). Grazing is one of the selective forces acting on plants (Huntly, 1991). According to him, herbivore grazing has a significant effect on the relative abundance and composition of species in plant communities. In the same year Siddique *et al*., have reported that Kashmir Himalaya represent a rich repository of highly variable germplasm. Many of these species produce essential oils which are traditionally employed in various systems of medicine. Among these species *Artemisia maritime, cedrus deodara, Juniperous communis, Mentha sps., Rheum emodi etc.* have been assessed for the occurrence and availability, curative effects and the mode of administration of such as drugs or modern synthesized medicine has been made. The field surveys and analysis has revealed that non judicious exploitation of many such species had led to the decline in the number of populations as well as number of individuals per population in their natural habitats. During ethanobotanical surveys of the Garhwal hills in the lesser Himalayan range, Singh *et al.* (1991) reported nine important medicinal herbs at the verge of extinction. These are *Aconitum heterophyllum, Acorus calamus, Berberis aristata, B. lyceum, Ephedra gerardiana, Valeriana jatamansi, Orchis latiflora, Saussurea costus and Saxifraga ligulata.*

Shiddieq and Bayados (1992) observed a decrease in organic matter of soils following disturbance. According to them this can be attributed to increase in organic matter oxidation losses from erosion and decreased quantity of plant residues returned to the soil. Dale *et al*. (1993) reported that the relatively high organic matter under pasture is due to the fact that pastures are not tilled hence the loss of carbon is less compared to cropland soils. Moreover the periodic addition of organic material as animal waste could also have contributed to it. Goel (1993) has noted that some important medicinal plants northwest and central Himalayas (J&K, H.P and Nepal) are over exploited and therefore threatened to extinction. He suggested that different strategies should be practiced to achieve protection and conservation of medicinal plants. In the same year Raychaudhuri and Ahamd brings into light experimental demonstration cultivation practices of some important plants in India viz; Sandal wood *(Santalum album L.)* balangu-seed *(Lallemantia royleana Bench),* Isabgol *(Plantago Ovata Forsk.)* Sadabahar *(Catharanthus roseus Don.),* Senna *(Cassia auguostifola vahl.) and* Greater Ammi *(Ammi majus L.)*. A list of 144 medicinal herbs of choice for cultivation has been given. Further, the need to intensify research on cultivation aspect of important drug yielding plants commonly used in indigenous system of medicine was restressed.

Garhwal Himalaya region is considered to be an important source of a variety of medicinal plants since the Vedic periods Aswal (1994). These important ethno-medicinal plants face threat to their survival and therefore need proper utilization and conservation. In 1988 Adenan observed that the medicinal and aromatic plants used in pharmaceutical industry are traditionally harvested from the wild natural populations and this uncontrolled extraction of an important resource without replanting has inevitably led to the depletion of these materials. He recommended that domestication of these medicinal plants will assist in the conservation of plant genetic resources and facilitate avoiding further depilation.

It was concluded by Sen and Pradhan (1999) that medicinal plants in the hills of Bargarh District, in the western part of the Orissa are over exploited and if this situation continues several species will become rare or endangered. These workers further suggest that conservation of these ethno-medicines plants is a priority. Joshi *et al.* (2000) reported 224 species belonging to 129 genera and 75 families. These species have been analyzed for species

diversity, distribution utilization pattern, nativity, endemism and indigenous uses. They assessed that 145 species are native to Himalayan region, 4 species are endemic and 47 are near endemic. Maximum species (171 species) are distributed in the zone 2100-2800m asl. *Acer caesium, Picrorhiza kurrooa, Nardostachys grandiflora and Dioscorea deltoidea* (all vulnerable) along with others have been categorized as critically endangered (3 spp). Endangered (6 species), Vulnerable (7 species) and low risk near threatened (1 species). Population assessments, extraction trends of these resources, conservation and management of priority species have been envisaged. Dhar *et al*. (2000) collected information on various aspects of medicinal plants of the Indian Himalayan region. Among the identified gaps in knowledge, lack of objective assessment of threats was considered a major impediment in setting conservation priorities. An approach for prioritization of medicinal plants for conservation was developed. Prioritization based on three indices viz. use value index, sensitivity index and important value index was done to prevent biased approach. Also increased dependence on wild forms (64.6%), dominance of destructive harvest trend (69%) and restricted distribution range of most medicinal plants used by the industry is a pointer to the intensity of threat. In the same year Rai *et al.* (2000) reported about 4000 plants of therapeutic value in the Sikkim Himalaya. It was found that indiscriminate and non- systemic collection of medicinal plants led to serve pressure on the availability of plants which have become rare, threatened and endangered. Six species were taken as a case study viz. *Aconitum heterophyllum* Wall., *Podophyllum hexandrum* Royle, *Nardostachys jatamansi* DC., *Picrorhiza kurrooa* Benth etc. for framing successful conservation strategies for the large number of species that are claimed to have therauptic value and whose survival in wild is threatened.

Again in 2000, Kala analyzed the distribution pattern, population structure and conservation status of rare and endangered medicinal plants of the spiti sub-division of Himachal Pradesh. The study was stratified into six zones based on geo-morphological and phytogeographic variation. In each zone different habitat types for rare and endangered species were identified and sampled using quadrants. The highest mean density was reported for *Picrorhiza kurrooa* followed by *Saussurea gnaphaloides*. More species of rare and endangered medicinal plants were found close to the Great Himalayan range in the southern parts of the area.

Variation in community features in terms of diversity, species richness and distribution pattern in lower Dachigam National Park of Kashmir Himalaya was estimated by Shameem *et al.* (2002). The study was done on seasonal basis and the result revealed higher trend for diversity ($H^{/)}$ at both sites during summer season and they concluded that seasons have great influence on species diversity. Spring and summer season reported increase in species diversity which declines as autumn and winter approaches mainly due to dry environmental conditions, slow growth rate and other climatic factors. Also *Fragaria nubicola* (30.75 ind/m^2) and *V. odorata* (30.40 ind/m^2) have higher density values in protected areas (forest area of lower Dachigam). In the same year Kala and Mathur used point intercept method for vegetation analysis during their study on vegetation distribution of Trans Himalayan region of Ladakh. Plant communities were distinguished by cluster analysis. The highest species diversity was found in table land areas followed by undulating areas and river beds. Pandit (2002) opined that technological interventions in mountain ecosystems due to the urbanization and modernization have drastically changed the basic fabric of the natural forests by way of degradation of the ecosystem. Road communication through these systems is the main cause of deterioration of the forest environment. During the study on traditional medicinal practices of J&K State, India, a group of authors identified 25 plants and their use as veterinary medicine. These were documented on the basis of information obtained from knowledgeable persons belonging to different sects and ethic groups like shepherds, Chopans, Gujjars and Bakerwals in Drang, Tangmarg, Gulmarg, Khilanmarg, Sonamarg, Aharbal, Narbaran (upper Dachigam), Yusmarg, Sangrashi and Chaterhoma areas of Kashmir (Beig *et al*.,2002). Islam (2003) concluded that unplanned exploitation has resulted in loss of medicinally important species in Lawat District Muzaffarabad, POK. It was concluded that afforestation programmes followed by protection is need of time. Samant and Paul (2003) have reported that the maximum diversity of medicinal plants is seen in the zone of elevation of > 1800m which gradually decreases with increasing altitude during their study in Uttaranchal State India. Based on the distribution and potential values, medicinal plants were prioritized for cultivation in different altitudinal gradient. Further, appropriate action plan for conservation and management of medicinal plants was proposed with emphasis on prioritization. Shinwari and Gilani (2003) analyzed economic and aromatic plants including their occurrence, general distribution and abundance during their study on Bulashbar Nullah Astore (Northern Pakistan). They revealed 33 plants of the area were being used by the local communities for medicinal purposes. Two species, *Bunium*

persicum and *Ephedra gerardiana* were recommended for in-vitro cultivation to obtain quick benefits. And also *Hippophae rhamnoids* was recommended to be used as sustainably for socio-economic uplift of the local communities.

In 2004, Krishna monitored reproductive phenology of 60 under story species including 27 endemic and 33 non-endemic species was monitored at monthly intervals for 20 months in a mid-elevation wet forest in the southern Western Ghats. Narrow endemic species constituted 55% of the total endemic species studied. Peak flowering was observed during the dry and post monsoon seasons fir the endemic species. While non-endemic species flowered during the dry season. Fruiting peak was observed in the dry season for endemic species and during monsoon for non-endemic. The flowering and fruiting pattern in narrow and broad endemic species was uniform. Dhingra *et al.* (2004) on the basis of their studies have reported that plants growing naturally in Northern Rajasthan displayed wide variation in their phonological behavior. Almost all the medicinal plants exhibited vegetative stages in the rainy season. Flowering and fruiting in the post monsoon and senescence in the winter season. However, *Sisymbrium irio* bore flowers in early period of winter and fruits in the summer season.

Population status of threatened medicinal plants in 7 protected areas of Indian Himalaya was assessed by Kala (2005). In the ten major habitat types, he reported 60 threatened medicinal plants of 54 species occurred in the sampling plot 22% of threatened medicinal plants was critically endangered and 27% were vulnerable. He concluded that to ensure long term sustainability of threatened medicinal plants *in situ* and *ex situ* protocols should be developed on priority basis. In the same year Augustino and Gillah on the basis of their studieshave recommended validation of safety and efficacy, assessing the harvesting sustainability and wild status of medicinal plants. This will, in turn improve the health care system and strengthen conservation abilities in study area i.e. Tanzania. Masood and Shafi (2005) created a data base about medicinal plants of J&K wherein they documented the information depicting botanical name, common name, local name, botany, chemistry and medicinal uses. This information has been kept available on the university website for common use by researchers, students and teachers. Ghimire *et al.* (2005) analyzed the effects of different harvesting patterns on the population ecology of two highly threatened plants. *Nordostachys grandiflora* (Valerianaceae) and *Neo-picrorhiza scrophulariflora* (Seropphulariaceae) in Shey Phoksundo National Park and in its buffer zone in North Western Nepal. Two harvesting patterns done by amchis (traditional doctors trained in Tibetan medicine), who harvest plants in a selective manner and commercial collectors who harvest unselectively and at much higher intensity were applied in an experiment. They revealed a positive effect of low harvesting levels on plant density but recruitment and survival rates decreased with increasing harvesting levels.

On the basis of surveys Wani *et al.* (2006) reported 12 species belonging to 11 families for their importance and threat status in Kashmir Himalaya. It was observed that restricted population of these threatened species is squeezed further by various natural and anthropogenic factors, above and beyond being subjected to over exploitation. Lone and Pandit (2006) during their study on medicinal wealth of Langate forest division of Kashmir Himalaya enlisted some of the medicinally important plants growing at an altitudinal range of 1650-3700m amsl. The plant species are district based in alphabetical order with pertaining to specific and local names, author citation, family, site of collection and some medicinal properties. Ballabh and Chaurasia (2006) have reported 56 commercially important medicinal plants of cold desert Ladakh. This information was documented depicting botanical name, family, collection number, local name, part used and utilization by Amchis (herbal practitioners) in treatment of cold, cough and fever. Maron and Croee (2006) during their study have assessed larger effects of consumers on grassland than woodland forests. Stronger effects of herbivory in areas with high versus disturbance, but no systematic unambiguous differences in the impact of consumers based on plant life history on herbivory feeding mode in Montana Missoula USA. Smith *et al.* (2006) concluded that sustainable use of wild products of medicinal plants (as with other non-timber products) requires robust assessment of distribution and abundance of target species in the study area, Sri Lanka This study provides the only realistic means for assessing the population status ofMedicinal plants Uniyal *et al.* (2006) analyzed that the importance of area of research and in biodiversity conservation should be properly recognized during their study in Chotta Bhangal, western Himalaya. The effect of changing socio-economic conditions on the traditional knowledge were also dicussed, kala *et al*. (2006) have assessed that Northern India harbours a rich diversity of valuable medicinal plants. According to the authors attempts are being made at different levels for sustainable utilization of this resource, in order to develop the medicinal plant sector.

Ecological and cultural factors influence the selection of medicinal plants in Navarra region of Europe was reported by Akereta *et al*. (2007) Climate and substrate were most important ecological factors

that influence the distribution and abundance of plants, which are the biological factors that affect medicinal plant selection. Qureshi *et al.* (2007) analyzed about 33 medicinal plants belonging to 29 genera and 17 families for phonological studies. They reported that such type of studies will either assist a layman to identify the medicinal plants field in their specific months and also the forest and wild life managers in their effort for conservation medicinal plant wealth of Sudan Gali and Ganga Chotti hills (District Bagh, Azad Kashmir) In the same year Verma *et al.* (2007) attempted to investigate if traditional plants are maintained in urban environment. They presented information on the traditional uses of 72 plants species collected from their campus of Banaras Hindu University, Varanasi, Uttar Pradesh and highlights the uses of these plants by local inhabitants.

Ballabh *et al.* (2008) have carried out a documentation of new ethno-botanical information and traditional use of medicinal plants against kidney and urinary disorders. The study was aimed to conserve the rapidly disappearing traditional knowledge system of Amchis of Ladakh. Jerruto *et al*. (2008) on the basis of their studies emphasize that study of local knowledge about natural resources is increasingly becoming important in defining strategies and actions for conservation or recuperation of residual forest during their ethno-botanical survey among Nandi people in Kenya. Ignacimuthu *et al.* (2008) have reported 101 species of ethno-medicinal plants belonging to 90 species and 48 families using standardized questionnaire among 15 tribal information between the age group of 26-82 in Theni district of Tamil Nadu, India, A survey report by Sajem *et al.* (2008) in the district of North cachar hills, Assam, North East India revealed 34 species of plants to be threatened in several parts of the country and in the district itself. They documented the botanical name part used, local name and also compares the threat status relative to the other regions of the country as per IUCN Guidelines. Santos *et al.* (2008) evaluated the species richness and distribution of useful plants in the semi-arid caatinga vegetation of north eastern Brazil. A total of 42 families, 130 genera and 225 species were cataloged. The family Euphorbiaceae had the highest richness (34 species) with the genus croton comprising 11 species. In terms of the distribution of species, four species were found to be widely distributed, 33 demonstrated intermediate distribution and 188 were of restricted distribution. Of all the species recorded 122 were considered useful. They found the significant correlation between the precipitation and total richness of plants. Koche *et al.* (2008) documented the indigenous folk knowledge of the inhabitants of the Nagzira wild life sanctuary in eastern Maharashtra. They revealed a total of 70 different plant species having ethno-botanical and ethno-medicinal uses. Taxonomically the plants used by the villagers of this area were classified under 32 families of angiosperms. Rashid *et al.* (2008) have assessed that the execution of unplanned developmental activities and anthropogenic factors have resulted in serious ecological imbalance and degeneration of the biodiversity in the Rajouri district, J & K. They have also assessed the magnitude of various pressures, measures of mitigation future scope and prospects of wild edible plants of this region. A comprehensive data on the biodiversity and phonological pattern of plant species of Lawat Area, district Neelam Azad J & K was compiled by Dar and Malik 2009 who reported 180 species belonging to 144 genera and 66 families. The families Asteraceae, Balsaminaceae, Gentianaceae, Lamiaceae, Poaceae, Polygonaceae, Primulaceae, Ramunculaceae, Rasaceae, Scrophulariaceae and Umbellifereae were dominant families. Among these 51 species (29%) flowered from March to May, 83(45%) flowered from June and July, while 46 (26%) flowered from August to September, Eleven species in the investigated area were reported as evergreen. Singh and Singh (2009) documented the eroding plants and associated indigenous knowledge of Chandauli district in Uttar Prades to use it as a basis for developing management plants for conservation and sustainable use of medicinal plants. The principle threatening factors reported were deforestation (90%), agricultural expansion (5%) and overgrazing (5%). Khan *et al*. (2009) compiled the data on medicinal plant wealth of Sewa river catchment by interaction with local inhabitants and data assessment. The studies revealed 182 plant species distributed along diverse habitats as the important sources for medicinal usage. Kumar *et al* .(2009) during their study on Nubra valley gathered ethno-botanical information through several visits, group discussions and cross checked local medicine mean the study identified 65 plant species belonging to 3 families have been used to cure various diseases and ailments. Maximum number of species was recorded to be used in Kidney complaints (14spp) cold and cough (13 spp) and fever (1 spp). Leaves of 27 species, whole plant extract of 20 species and root/bulb of 19 species. Hassan *et al.* (2009) on the basis of data assessment reported that medicinal plants played a vital role for the development of new drugs (export and import diverse parts or bioactive compounds in the current market). It was recommended that the bioactive compounds should be standardized on the basis of active compounds. It was observed by Grabberr (2009) during his study on

biodiversity in the high ranges of the Alps that in a representative region in central Alps, traditional healers use 268 plant species of which 158 can be considered native to that area. Of the 25 predominantly Apline species three are restricted to the highest Alps where warming might lead to their extinction. Also the famous ornamentals of the area viz., Leontopodium, Rhododendron, Gentiana, Anemone species do not grows at critical high elevations but could disappear locally from mountains which are too low in elevation due to modern land use systems (industrial farming, tourism and urbanization).

Recently Rana and Samant (2010) have assessed two factors viz. over exploitation and habitat degradation as major threats to floristic diversity. Further the monitoring of population and habitat, development of conventional protocol, establishment of *in situ* conditions and akin habitats and replication of this approach in other parts of Himalayan region were suggested as the protective measures for biodiversity maintenance. Rokaya *et al.* (2010) assessed the ethno botanical use of botanical uses of medicinal plant for treatment of human and veterinary ailment among village development committees in the Humal district of Western Nepal. Homogenity of informant's knowledge and most important plant species used for different ailment categories was determined through Information Consensus Factor (ICF), Fidelity Level (FL) and use Value (UV). It was concluded that sustainable harvesting methods and domestication of the most preferred and highly traded medicinal plant species should be carried out as most these were threatened by over harvesting. Panghal *et al.* (2010) compiled detailed information on ethno-botanical usage and traditional medicines among snake charmers of Jhajar District, Haryana, India. The study has brought light that the main diseases treated by the community was snake bites in which different types of medicinal plants belonging to 13 families were used among which most belonged to family Fabaceae. Srivastava *et al.* (2010) while assessing flora of cold desert of Western Himalaya India, proposed a brief account of the physiography, vegetation types and adaptation in the plants for their survival, endemism, threatened taxa medicinal and economic plants along with the threats and conservation strategies were discusses. Shristha and Jha (2010) sampled Aconitum naviculare, an endemic Himalayan medicinal plant, so study its life history strategies and abundance across six sampling sites in Manang valley. Central Nepal. Seed germination, growth characters, reproductive output and population density were lowest at Khangsar, a site located at the highest elevation. Growth characters were largely governed by life forms of associated species. Plant height and petiole length were largely governed by life forms of associated species, plant height and petiole length were reported higher in individuals growing within Juniper scrub, whereas tuber mass, flower/ plant and seed/follicle were higher in open areas. Stem mass and above ground biomass declined with elevation. Whereas density increase with relative radiation index and associated shrubs reduced the pressure of human collection and destructive effect of animal grazing.

Very recently Wangchuk *et al.* (2011) identified 113 lower elevation medicinal plants (LEMPS) belonging to 104 genera and 68 families in Bhutan. The highest number of medicinal plants was part of family Leguminosae. Langtherl area was found to host the maximum number of LEMPS. Among the plant forms majority of the species belonged to the category of herbs and among the plant parts collected, seed were most prominent, Kamatenesi *et al*. (2010) documented medicinal plant species used in treating various health condition among the local people of Oyam district, Northern Uganda. The plant species belonged to 11 families with Asteraceae being the most represented one. In the same year during the study on the forests of North West Pakistan, Adnan and Holscher found that degradation of tree layer was associated with a decrease in the most valuable medicinal plants. Also the abundance of most valuable medicinal plants viz, *Bergenia ciliate, Valeriana jatamansi* and *Viola cancescens* increased with tree basal area and canopy cover. The mean coverage of medicinal plants of study area was found highest in old growth forest (7%) low in forest, degraded by logging, derived woodland and agro forest (0.33-2%) and intermediate in re-growth forest (4%). Rashid *et al.* (2011) during their study on phyto-ecology Malam jabba, Swat, Pakistan found 200 species belonging to 75 families. Asteraceae, Lamiaceae and Poaceae were important families in the study area. Therophytic and hemicroptophytic life forms and micromonophyllous leaf sizes were dominant in the area. It was found that the vegetation of the study area is the relics of moist temperature coniferous forests in the area. Sher *et al.* (2011) assessed the effect of local management practices on the population of three medicinal plants viz *Persicaria amplenicaule.* D. Don., *Valeriania jatamansi* Jonesand *Viola serpens* wall ex – Roxb in the coniferous forests of Northern parts of Pakistan. They found that the spices were extract so heavily in the past that they are found sparsely in some sites of the study area. Also the population of these plants is on the decline towards extinction due to loss of its habitat by deforestation and encroachment of land for cultivation.

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References

1. Adenan, M.I. 1998. Opportunities on the planting medicinal and herbal plants in Malaysia, planter-74(867):339-342.
2. Adnan, M. and Holscher, D. 2011. Medicinal plants in old-growth, degraded and re-growth forest of NW Pakistan. *Forest Ecology and Management* 261(11): 2105-2114.
3. Akerrata, S., Cavero, R.Y., Lopez, V. and Calvo, M.I. 2007. Analyzing factors that influence the folk use and phytonomy of 18 medicinal plants in Navarra in Europe. *Journal of Ethno-biology and Ethno-medicine,* 3: 16-24.
4. Anonymous, 2010. Metrological data. Department of Macrology, Rambagh Srinagar, J&K. Govt.
5. Ara, S. and Naqshi, A.R. 1992. Ethno-botanical studies in Gurais valley. *J. Econ. Bot.,*10: 185-191.
6. Aswal, B.S. 1994. Conservation of ethnomedicinal plant diversity of Garhwal Himalaya. *Ethnobiology in Human Welfare:* Abstracts of the 4th international congress of Ethno-biology, Lucknow, U.P. India 17-21.
7. Augustino, S., and Gillah, P.R. 2005. Medicinal plants in Urban districts of Tanzani plants, Gender roles and sustainable use.*International Forestry Review,*7(1):44-58.
8. Ballabh, B. and Chaurasia, O.P. 2006. Traditional medicinal plants of cold desertLadakh used in treatment of cold, cough and fever. *Journal of Ethno-pharmacology,*112(2): 341-349.
9. Ballabh, B., Chaurasia, O.P., Ahmad, Z., and Singh, S.B. 2008. Traditional medicinal plants of cold desert Ladakh used against Kidney and Urinary disorders. *Journal of Ethno-pharmacology,*118(2): 331-339.
10. Barnes, B.V., Zal, D.R., Denton, S.R. and Spurr, S.H. 1998. *ForestEcology,* 4th Ed. wiley, New York.
11. Beigh, S.Y., Nawchoo, I.A and Iqbal, M. 2002. Plants in Traditional Medicine of Kashmir Himalaya. *J. Econ. Tax. Bot*. 27(1): 99-104 Jodhpur.
12. Bhandari, B.S. and Tiwari, S.C. 1997. Dominance and diversity along an altitudinal gradient in a montane forest of Garhwal Himalaya *Proc. Indian* Nat Sci. Acad. 644(B): 437-446.
13. Bhat, D.M and Murali, K.S. 2001. Phenology of under storey species of tropical moist forest of western Ghats region of Uttara Kannada district in South India *Curr. Sci,*81: 799-805.
14. Bhattacharya, T., Pal, D.K., Mandal, C. and Velayutham, M. 2000. Organic carbon stock in Indian soils and their distribution. *Curr. Sci.,* 79(5): 655-660.
15. Billings, W. D. and Mooney, H.A. 1968. The ecology of Arctic and Alpine plant, *Biol. Rev,*43: 481-524.
16. Black, C.A. 1968. Soil Plant relations. *John Wiley and Sons, New York.*
17. Brames, E.A. 1971. Continuous cultivation of west African soils: Organic matter distribution and effects of applied lime and phosphorus. *Plant and soil*, 35:401-414.
18. Brisht, R.P., Verma, K.R. and Toky, O.P. 1986. Phenology of evergreen deciduous trees of central Himalaya *J. Tree. Sci.*5 (2): 126-130.
19. BSI-MoEF, 1993. *Conservation of medicinal plants of India.* Botanical survey of India, Kolkata, and ministry of environment and forests government of India, New Delhi.
20. Buckman, H.D. and Brady, N.C. 1967. *The Nature and properties ofsoils*. Eurasia publishing House (Pvt) ltd., New Delhi.
21. Chaudhary, T.N. and Sandhu, K.S. 1983. Soil physical Environment and root growth. *Adv. Soil sci.,*1: 1-43
22. Chhabra, A. and Dadhwal, V.K. 2005. Forest soil organic carbon pool: An estimate and review of Indian studies. Ind. For., 131(2):201-214.
23. Chopra, I.C., Sobti, S.N and Handa, K.L. 1956. *Cultivation ofmedicinal plants* in Jammu and Kashmir. ICAR, New Delhi.
24. Dale, V.H., Houghton, R.A. Grainger A., Lugo, A. And Brown, S.1993. Emissions of green house gases from tropical deforestation and subsequent uses of the land, In: *National Research Council, Sustainable Agriculture and the Environment inthe Humid Tropics.* National Academy Press, Washington D.C.
25. Dar,M.E.U.I. and Malik, Z.H. 2009. A floristic list and phenology of plant species of Lawat area District Neelum, Azad Jammu and Kashmir, Pakistan. *Int. J. Bot*, 13:194-199.
26. Daubenmire, R.F. and Colwell, W.E. 1942. Some edaphic changes due to over-grazing in the Agropyron-poa prairieof south eastern Washington Ecology, 23(1):32:40.
27. Deorge, T.1999. Soil electrical conductivity Mapping. *Crop Insights,*9: 19-23.

28. Dhar, G.H., bhagat, R.C. and Khan , M.A. 2001. Biodiversity of Kashmir Himalaya Valley Book House, J &K India.
29. Dhar, U., Rawal, R.S. and Upreti, J. 2000. Setting priorities for conservation of medicinal plants a case study in the Indian Himalaya. *J. Biol. Conser.,*95:57-65.
30. Falkengren-Grerup, U. 1987. Long term changes in pH of forest soils in southern Sweden. *Environ pollut*., 43:79-90
31. Ghimire, S.K., Mekey, D. and Thomas, Y.A. 2005. Conservation of Himalayan medicinal plants. Harvesting patterns and ecology of two threantened species Nardostachys grandiflora DC. and Neopicrorhiza Scrophulariflora (Pennell) Hong. *Biological Conservation*., 124:463-475.
32. Goel, C.L. 1993. Conservation of medicinal resources in Himalaya. Indian Forester, 119:12, 970-976.
33. Hassan, S.Z., Mishrra, V., Singh, S., Arora, G., Sharma, S. and Sharma. S. 2009. Current status of herbal drugs and their future perspective. *Journal Biological Forum*, 1: (1).
34. Hatchel, G.E., Ralston, C.W. and Foil, R.R 1970. Soil distribution in Logging. *Tree Planters Notes*, 68: 772-778.
35. Head, K.H. 1980. Manual of Soil Laboratory Testing Vol. I, Soil Classification and compaction test, Edition I: Pentech Press, Estover Road, Plymonth Devon.
36. Herrmann, L., Hebeal, A and Starr, K. 1994. Influence of microvariability in Sandy Saharian Soils on Millet growth. *Z. P. flanzenernahr. Bodenk*. 157:111-115.
37. Huntly, N. 1991. Herbivores and the dynamics of communities and ecosystems. *Ann. Rev. Ecol. Syst*., 22:477-503.
38. Ishtiaq, M., Hanief, W., Khan, M.A., Ashraf, M. and Butt, A.M. 2007. An ethnomedicianal survey and documentation of important medicine folkflore food phytonems of food of samahni calley, (Azad Kashmir) Pakistan. *Pakistan Journal of Biological Sciences PJBs*. 10(13):2241-2256.
39. Islam, Ejaz-ul-2003. Ethno-botanical uses of plants of Lawat District Muzaffarabad, Azad, Jammu and Kashmir. *Asian Journal of Plant Sciences*, 2(9): 680-682.
40. Kala, C.P. 2000. Status and Conservation of rare and endangered medicinal plant species in the Indian Trans. Himalaya. *Biological Conservation*. *93*(3): 371-379.
41. Kala, C.P. 2005. Ethno-medicinal botany of the Apatani in the Eastern Himalayan region of India. *Journal of Ethno-biol. and Ethno-medicine*, 1:11-15.
42. Kershaw, A.K.1973. *Quantitative and Dynamic plant Ecology. Edward Arnold It.,* London.
43. Khan, M., Kumar, S. and Hamal I.A. 2009. Medical plants of Sews river catchment area in the North West, Ethno-botanical leaflets, 3:1113-1139.
44. Khuroo, A. A., Dar, G.H.,Khan, Z.S. and Malik A .H. 2007. Exploring an inherent interface between taxonomy and biodiversity current problems and future challenges. *Journal for nature conservation,*15(4): 266-261.
45. Lone, H.A. and Pandit, A.K. 2006. *Anthropogenic impact on the plant diversity of forests of Kupwara in Kashmir*. M. Phil. Dissertation. The University of Kashmir, Srinagar, J&K -190006.
46. Lowton, J.R.S. and Akpan, E.E.T. 1968. Periodicity in plumaria. *Nature* 218: 384-386.
47. Masood, A. and Shafi, M. 2005. A data base for medical and aromatic plants of J&K (Jammu and Kashmir). *Bio- information*1(2):56-57.
48. National Medicinal Plant Board (NMPB) 2002. Cultivation Practices of some Commercially Important Medicinal Plant. New Delhi: Government of India.
49. Nilsson, S. I. and Bergkvist, B. 1983. Aluminium chemistry and acidification processes in a shallow podzol on the Swedish west coast. *Water, Air and Soil pollution*, 20:311-329.
50. Oberavuer, S. and Billings, W. D. 1981. Drought tolerance and water use by plants along an alpine topographic gradient. *Oecologia*, 50:325-321.
51. Odum, E.P. 1971. *Fudamentals of Ecology.* Saunders, Phildelphis, USA, pp:140-159.
52. Panday, S.K. and Shukla, R.P. 2005. Plant community and diversity pattern within the forested landscape of north eastern U.P. *Ind. For.*, 131(9):1217-1226.
53. Pandit, A.K. 2002. Technological intervention in mountain ecosystems, pp. 485-492. In: Ashok K.Pandit (ed) *Natural resources of Western Himalaya* Valley Book House, Srinagar, J&K, India.
54. Panghal, M., Arya, V.P., Yadav, S., Kumar, S. and Yadav, J. 2010. Indigenous knowledge of medicinal plants used by separate community of Khetawas, Jhajjar District, Haryana , India. *Journal of Ethno-medicine*, 6:4-13.
55. Qureshi, R. A., Gilani, S.A. and Ashraf, M. 2007. Ethno-botanical studies with special reference to plant phenology at sudan Gali and Ganga chotti hills(District Bagh, Azad

Kashmir). *Electronic Journal of Environmental, Agricultural and Food Chemistry*, 6(7):2207-2215.
56. Rashid, A., Anand, V.K. and Serwar, J. 2008. Less known wild Edible plants used by the Gujjar tribe of District Rajouri, Jammu and Kashmir State, *Int, J. Bot*., 4:219-294.
57. Rashid, A., Farooq., Swat, M.F., Sher, H. and AI-Yemeni, M.N. 2011. Phyto-ecological evaluation with detail floristic appraisal of the vegetation around Malam Jabba, Swat, Pakistan. *Asian pacific journal of tropical Bio-medicine*. 1(6):461-467.
58. Raunkiaer, S. 1934. *The life forms of plants and statistical plant geography*. Clarendon. Press. Oxford.
59. Raychaudhuri, S.P. and Ahmad, J. 1993. Cultivation of important Medicinal plants in India. *Glimpses in plant research* .10:265-274.
60. Saxena, A.K. and Singh, J.S.1982. A physiological analysis of forest communities of a part of Kumaun Himalaya. pp. 167-180 In : Singh, J.S. and Gopal, B.(eds) *Glimpses of Ecology* (prof. R. Mishar, commemoration volume) international Scientific Publications Jaipur.
61. Sen, S.K. and Pradhan, N.B. 1991.Conservation of ethno-medicinal plants of Bargarh district in Orissa. *Advances in Plant Sciences*, 12(1):207-213.
62. Seth, S.K. 1960. An analysis of Solid moisture regime in Sal (*Shorea robusta Gaerin*. f.) forests of Dehra Dun, with reference to natural regeneration *Ind. For*., 86:323-335.
63. Shameem, S.A., Soni, P.L. and Bhat, G.A. 2002. Comparative study of herbaceous vegetation in lower Dachigam national Park, Kashmir Himalaya, India . *Asian Journal Of Plant sciences*, 9:329-336.
64. Sharma, K.P. and Upadhyaya, B.P. 2002. Phytosociology, primary production and nutrient retention in herbaceous vegetation of the forestry arboretum on the Aravalli hills at Jaipur. *Trop. Ecol*., 43(2):325-335.
65. Sher, H., Elyemen, M., Khan, A.R. and Sabir, A. 2011. Assessment of local management practices on the population ecology of some medicinal plants in the coniferous forest of Northern parts of Pakistan. *Saudi journal of biological Sciences*. 18(2):141-149.
66. Shiddieq, D. and Badayos, R.B.1992. Effect of tropical range conversion to agricultural form on Ultisols in Subanjeriji, Sumatra, Indonesia. *The Phil. Agric*., 76:207-230.
67. Srivastava, S.K. 2010. Floristic diversity and conservation strategies in cold desert of western Himalaya, India. *Botanical oriental's: Journal of Plant Science*, 7:18-25.
68. Stewart, R. R. 1972. An annotated catalogue of the vascular plants of West Pakistan and Kashmir. Fakhri Press, Karachi, Pakistan.
69. Verma, A.K. Kumar, M. and Bussman, R.W. 2007. Medicinal plants is an Urban environment. The medicinal flora of Banaras Hindu University, Varanasi, Uttar Pradesh. *Ethno bio. Ethnomedi*.. 3:35-42.
70. Wangchuk, P., Pyne, S.G. and Keller, P.A 2010. Ethno-botanical authentication and identification of Khrogsman (lower Elevation Medicinal Plants) of Bhutan. *Journal of Ethno-pharmacology*, 134(3), 813-823.
71. Wani, P.A., Dar, A.R., Mohiud-din, G.G., Ganaie, K.A., Nawchoo, I.A. and Wafai, B.A. 2006. Treasure and tragedy of the Kashmir Himalaya. *International Journal of Botany*, 2:402-408.
72. Wilde, S.A. 1934. Soil reaction in relation to forestry and its determination by simple tests, *Jour. For*., 32:408-411.
73. Yadav, A.S. and Gupta, S.K. 2006. Effect of micro environment and human disturbance on the diversity of woody species in the Sariska. Tiger Project In India. *Forest ecology and Management* : 225(1-3)178-189.
74. Yadav, J.S.P. 1963. Studies on soil profile in chakrata division of UP. *Ind. For*., 89(1):18-38.

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