



Diversity, distribution and Indigenous uses of some threatened medicinal plants in Kullu district of Himachal Pradesh, Northwestern Himalaya

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Abstract: In the remote areas of the Indian Himalayan Region, the inhabitants largely depend on medicinal plants for curing diseases and income generation. But, proper documentation of the medicinal plants has been poorly attempted. The value of medicinal plants in traditional healthcare practices provides clues to latest areas of research in biodiversity conservation. Keeping this in view, the present study has been conducted to study the diversity, distribution and indigenous uses of medicinal plants in Kullu district of the Himachal Pradesh. A total 528 economically important plant species (Angiosperms: 477; Gymnosperms: 09 and Pteridophytes: 42) belonging to 103 families and 294 genera were recorded and used by the inhabitants of the area. Amongst 528 economically important species, 223 species were used as medicine, 85 species were found to be as wild edible/food, 175 species having fodder value, 49 species providing fuel, 11 species of timber importance, 44 species of religious significance, 20 of them being used for making agricultural implements whereas, 11 are being used as insecticide and 10 of them used as condiments in the study area. Maximum species (477 spp.) were reported in the altitudinal zone of 2100m-2800m above msl and species diversity decreased with increasing altitude in the study area. The continued over-exploitation, habitat degradation and changing environmental conditions may lead to the extinction of these species within a few years. Therefore, regular monitoring of population and habitats using standard ecological methods, development of conventional and *in-vitro* propagation protocols, establishment of species in *in-situ* and *ex-situ* conditions have been suggested.

Keywords: Kullu District, Diversity, Distribution, Threatened plants, Therapeutic uses

Introduction

The practice of traditional medicines is as old as man himself. It is the sum total of the practices based on the theories, beliefs and experiences of different cultures and time. Traditional medicinal practices form an important part of the primary health care delivery system in most of the developing world (Akerlele, 1998; Bodeker, 1994; Sheldon *et al.*, 1997; Fabeku 2006). The plants have been the important source of medicines used by man from prehistoric times for relieving suffering and curing ailments. The need for the integration of local indigenous knowledge for a sustainable management and conservation of natural resources received more and more recognition (Posey, 1992). The quest for documentation of traditional knowledge has been concentrated especially around traditional health practices. In India, many indigenous plants are used in herbal medicine to cure diseases and heal injuries. If this information is to be collected systematically and comprehensively and maintained in databases in a manner they would help in protecting their knowledge. The objective of this study is to document the medicinal plants used by the local peoples, their status in the study area which will act as a data base for the formulation of the conservation strategy so that the plants can be saved from being extinct.

Material and Methods

The study was carried out in District Kullu of Himachal Pradesh. It lies between 31°58'00" north latitude and 77°06'04" east longitude. The total area of the district is 5503 sq. kms. River Sutlej serves as boundary between Kullu, Shimla and Kinnaur in the South-west. Lahaul-Spiti is in its North-east and the middle Himalayan ranges separate it from Kullu. The altitude varies from 1100 meters to over 6000 meters from the mean sea level (Thakur, 2005).

The paper is the outcome of the study done during 2008-2010. During the study a number of field exploration trails were

conducted in the interiors of the district covering all seasons. Extensive field surveys of the entire area were carried out, starting from the lower elevation to the higher elevation. Information pertaining to the traditional knowledge, local uses of the plants, information about the local name of the plants, plant parts and the purpose for which these are used, mode of administration and curative properties were recorded through intensive interviews and discussions with the elderly people, herbal healers, local *vaid*s and rural women of the area and the same have been documented and are depicted in the results. Local *Vaid*s and knowledgeable persons from each village were also hired while surveying and collecting the useful plant species from the natural habitats. Information on local names, altitudinal ranges, habit, habitat(s), part (s) used and use values including indigenous knowledge and practices were gathered. Fresh samples of the useful species were collected and identified with the help of local and regional floras (Chowdhery & Wadhawa, 1984; Aswal & Mehrotra, 1994; Dhaliwal & Sharma, 1999; Singh & Rawat, 2000 etc.). Information on the mode of utilization of medicinal plants was also collected. The information was compiled and analyzed for the utilization pattern following Samant *et al.* (2002a, 2006a). Plant specimens were collected, processed, identified and deposited in the herbarium of Himalayan Forest Research Institute, Shimla, as reference material.

Results and Discussion

Diversity and utilization pattern of economically important plants: Total 528 economically important plant species (Angiosperms: 477; Gymnosperms: 09 and Pteridophytes: 42) belonging to 103 families and 294 genera were recorded. Asteraceae (48 spp.); Poaceae (35 Spp.); Rosaceae (28 spp.); Ranunculaceae (22 spp.); Lamiaceae (21 spp.); Apiaceae (17 spp.) and Fabaceae (16 spp.) were the dominant families. Amongst genera, *Impatiens* (11 spp.); *Carex* and *Lonicera* (8 spp. each);

Anaphalis (6 spp.); *Viburnum* and *Anemone* (5 spp., each); *Berberis*, *Artemisia*, *Rhododendron* (4 spp., each) were the dominant. Alangiaceae, Aquifoliaceae, Asparagaceae, Blechnaceae, Campanulaceae, Cannabaceae, Coriariaceae, Corylaceae, Cryptogrammaceae, Cucurbitaceae, Dastiscaceae, Dioscoreaceae, Dipsacaceae, Equisetaceae, Haemodoraceae, Juglandaceae, Linaceae, Loganiaceae, Morinaceae, Myrsinaceae, Osmundaceae, Papaveraceae, Phytolaccaceae, Podophyllaceae, Sapindaceae, Schisandraceae, Taxaceae and Vitaceae were the monotypic families. Amongst 528 economically important species, 223 species were used as medicine, 85 species were found to be as wild edible/ food, 175 species having fodder value, 49 species providing fuel, 11 species of timber importance, 44 species of religious significance, 20 of them being used for making agricultural implements whereas, 11 are being used as insecticide and 10 of them used as condiments in the study area (Fig. 1).

Species distribution: (i) Altitudinal distribution: Maximum species (477 spp.) were reported in the altitudinal zone of 2100m-2800m above msl and species diversity decreased with increasing altitude (Fig. 2.). Some economically important species of the altitudinal

zone, 2100m-2800m were *Pinus wallichiana*, *Picea smithiana*, *Acer caesium*, *Abies pindrow*, *Cornus capitata*, *Ulmus villosa*, *Taxus baccata* subsp. *wallichiana*, *Quercus floribunda*, *Indigofera heterantha*, *Sorbariatomentosa*, *Berberis lycium*, *Podophyllum hexandrum*, *Polygonatum verticillatum*, *Angelica glauca*, *Dioscorea deltoidea*, *Viola canescens*, etc. and altitudinal zone, 2801m-3800m above msl were *Acer acuminatum*, *Aconitum violaceum*, *Betula utilis*, *Abies pindrow*, *Cortia depressa*, *Quercus semecarpifolia*, *Rhododendron campanulatum*, *R. anthopogon*, *Dactylorhiza hatagirea*, *Bergenia stracheyi*, *Juniperus recurva*, *J. indica*, *Jurinea dolomiaea*, *Rheum moorcroftianum*, *Rheum webbianum*, *Picrorhiza kurrooa*,

Table-1: Taxonomic Description of Economically Important Plants

Taxonomic Group	Family	Genera	Species	Herbs	Shrubs	Trees	Ferns
Angiosperms	89	273	477	351	88	38	-
Gymnosperms	4	6	9	-	3	6	-
Pteridophytes	10	15	42	-	-	-	42
Total	103	294	528	351	91	44	42

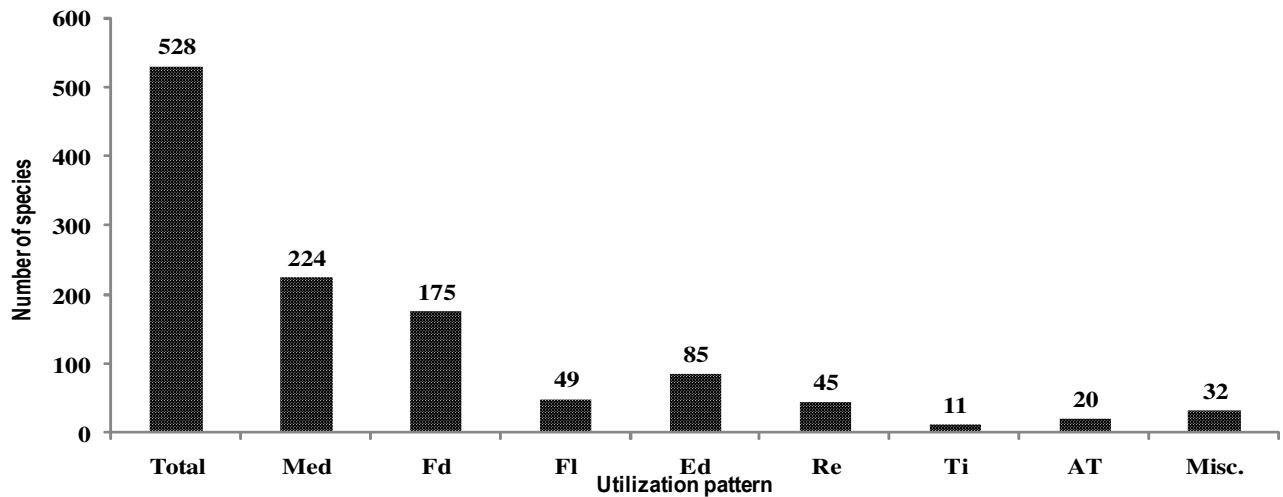


Fig. 1: Diversity and utilization pattern of economically important plants (Abbreviations used: T=Total; Med=Medicinal; Fd=Fodder; FI=Fuel; Ed=Edible; Re=Religious; Ti=Timber; AT=Agricultural Tools; Misc.=Miscellaneous)

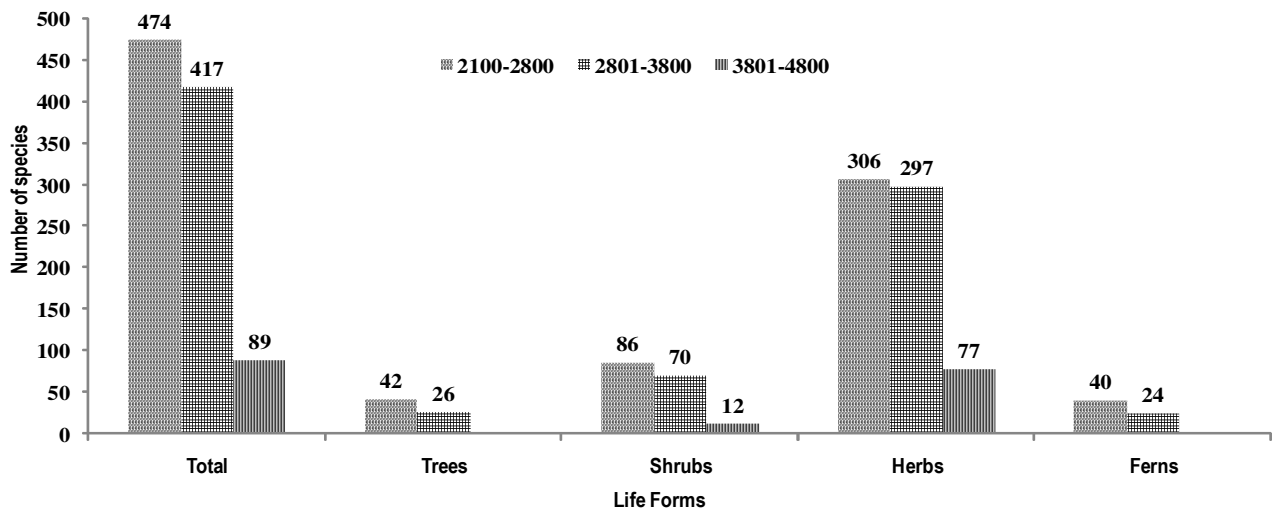


Fig. 2: Diversity and distribution of economically important plants in three important altitudinal zones of District Kullu

Table-2. Therapeutic uses of threatened plants of KulluDistrict Himachal Pradesh

Taxa	Family	Local Name	LF	Altitudinal Range	Therapeutic Uses
Critically Endangered					
<i>Aconitum heterophyllum</i>	Ranunculaceae	Patish	H	3200-4000	Dried powdered roots given to reduce fever; tonic to anaemic patients; helps in arresting bleeding from cuts and bruises; also given with luke warm water to cure stomach ailments like dysentery and diarrhoea.
<i>Aconitum violaceum</i>	Ranunculaceae	MeethaPatish	H	3500-4500	Root juice acts as antidote in snake and scorpion bites; cures intestinal inflammation.
<i>Alnusnitida</i>	Betulaceae	Kosh	T	2100-2800	Bark decoction applied externally to treat swellings and body pains; wood used for construction and furniture.
<i>Angelica glauca</i>	Apiaceae	Chora	H	2800-3500	Roots used in the treatment of constipation; aromatic, used as food flavouring agent.
<i>Betulautilis</i>	Betulaceae	Bhojpatra	T	3000-3600	Bark infusion used as eardrops to relieve earache; barkpaste used as a poultice on cuts, wounds and burns; outer bark used as a paper for writing amulets.
<i>Dactylorhizahatagirea</i>	Orchidaceae	Salampanja, Hathpanja	H	2500-3500	Tubers edible; paste used to treat bone fracture.
<i>Liliumoxypetalum</i>	Liliaceae	Sheerkakoli	H	3100-3500	Infusion of bulbs used as eye drops in the treatment of inflammation of eyes.
<i>Liliumpolyphyllum</i>	Liliaceae	Kakoli	H	2600-3000	Juice of bulbs mixed with little salt is taken orally in the treatment of fever.
<i>Meconopsisaculeata</i>	Papavaraceae	Mushtanda, Poppy	H	3000-4000	Entire plant expressed into juice and applied on back to treat backache.
<i>Nardostachys grandiflora</i>	Valerianaceae	Nihani	H	3700-4000	Fruit used in the treatment of worms. Rhizomes are dried, powdered and mixed with ghee to make dhoop.
<i>Picrorhizakurrooa</i>	Scrophulariaceae	Karoo	H	3200-4200	Rhizome has a very beneficial effect upon the liver and digestive system and is used in the treatment of a wide range of conditions including fevers, constipation and jaundice
<i>Polygonatumcirrhifolium</i>	Liliaceae	Salam mishri	H	2500-3200	Tubers edible; stem juice is taken orally to purify the blood.
<i>Rheum moorcroftianum</i>	Polygonaceae	Chuchi	H	3500-4700	Paste of root applied externally on cuts, wounds and to forehead in headache; watery extract is given orally in stomach pain, constipation and in dysentery; eardrops.
<i>Rheum webbianum</i>	Polygonaceae	Chunkhari	H	3300-4200	Decoction of root given to cure piles, improve appetite, eye diseases, wounds, cuts, asthma and bronchitis.
<i>Zanthoxylumarmatum</i>	Rutaceae	Timir	Sh	2100-2500	Twigs used as tooth cleaner. Abode of God.
Endangered					
<i>Aesculusindica</i>	Sapindaceae	Khnor	T	2100-2800	Oil expressed from the seeds and bark is applied externally in the treatment of skin disease and rheumatism; leaves as fodder; seeds as detergent; wood as fuel and to make palanquins of the local deity; fuel also.
<i>Allium wallichii</i>	Amaryllidaceae	Fam	H	3000-4000	Boiled bulbs fried in ghee, eaten to cure dysentery. Raw bulbs chewed to treat coughs and colds. Dried leaves used as condiment.
<i>Arenariafestucooides</i>	Caryophyllaceae	-	H	3200-4200	Crushed flowers applied to fractured bone area and tied with a cloth, practice repeated for few days.
<i>Artemisia brevifolia</i>	Asteraceae	Jaora, Jhao, Seski	H	2500-3500	Infusion considered extremely useful for those with weak and under-active digestion; leaves and flowering shoots as vermifuge; dried plant used to repel insects.
<i>Berberisjaeschkeana</i>	Berberidaceae	Kiyambal/ Kashmal	Sh	2800-3900	Infusion obtained from dried stem, root bark and wood used to relieve eye complaints and jaundice; fruit edible; wood used as a fuel; spiny branches used for making fencing around fields.
<i>Cotoneaster bacillaris</i>	Rosaceae	Riyunsh	Sh	2100-2800	The stolons are crushed and applied to cuts and wounds to arrest bleeding. Branches are used for making walking sticks, basket making and agricultural implements.
<i>Dioscoreadeltoidea</i>	Dioscoreaceae	Shingli-Mingli/ Kaanj	H	2200-2900	Root tuber juice taken in the treatment of roundworms; also used to alleviate constipation. Soap obtained from the tuber used as a body wash to kill lice. Flowers used in religious ceremonies.
<i>Fagopyrumdibotrys</i>	Polygonaceae	Ban fafra	H	2100-3000	Root decoction used in the treatment of insect bites and snakebite; leaves as vegetable.
<i>Juglansregia</i>	Juglandaceae	Akhrot	T	2100-2800	Bark of the tree and the fruit rind are dried and used as a tooth cleaner. Fruit is one of the most preferred wild fruit among the locals. Oil expressed from seed is used in cooking. A very valuable timber tree, it is used for furniture making. Fruits and leaves are used as religious offerings to deities in local fairs; fuel also.

<i>Neolitseapallens</i>	Lauraceae	Chhinchhri	T	2200-2700	Freshly pressed juice of the whole plant is considered effective hair tonic.
<i>Rhodiolaheterodonta</i>	Crassulaceae	Salai	H	3300-4500	Powdered seeds given to expel the worms from the stomach.
<i>Rhododendron anthopogon</i>	Ericaceae	Nachani	Sh	3000-4000	Leaves are boiled and the vapours inhaled to treat coughs and colds; flowers used as a tea substitute. Flowers are used in religious ceremonies; fuel
<i>Taxusbaccata</i> subsp. <i>wallichiana</i>	Taxaceae	Rakhal	T	2300-3300	Wood as fuel and also for making the handles of the agricultural implements; bark used to make tea as it is having medicinal properties. Wood is used to make palanquins for the local deity.
<i>Valerianajatomansi</i>	Valerianaceae	Mushkwala	H	2500-3200	Root juice applied to forehead to relieve headaches; eye drops; paste applied externally to boils. Rhizomes are dried, powdered and mixed with ghee to make <i>dhoop</i> .

Abbreviations used: LF-Life form, T-Tree, Sh-Shrub, H-Herb

Pleurospermumcandollei, *Aconitum heterophyllum*, *Meconopsisaculeata*, *Viola biflora*. Species occurring in the altitudinal zone varying between 3801m-4800m above msl included *Picrorhizakurrooa*, *Primulamegalocarpa Pleurospermumcandollei*, *Rhodiolatibetica*, *Nepetacoeruleascens*, *Rheum moorcroftianum*, *Aconitum violaceum*, *Rhodiolabupleuroideset*c. Details on diversity, distribution and therapeutic uses of 29 threatened plants belonging to 22 families and 26 genera have been described in Table-2

The Indian Himalayan Region is well known for its diversity of Medicinal plants (Jain, 1991; Pant et al. 2009; Rana and Samant, 2011; Samant et al. 2007; Samant et al. 1998; Sharma and Mishra, 2009; Singh et al. 2009). However, studies on medicinal plants at catchment, watershed and valley specific are not available. Therefore, the present study provides comprehensive baseline information on diversity, distribution pattern, indigenous uses and part/s used of medicinal plants in Kullu District of Himachal Pradesh. The occurrence of 223 species of medicinal plants in the area indicates the presence of diverse habitats and large altitudinal range and favourable environmental conditions. The altitudinal range, 2100-2800m identified the richest zone for the medicinal plants. This zone is inhabited by a large number of villages and villagers utilize them for curing various diseases/ailments. Habitat degradation and over exploitation of these species may lead to their early extinction in the area. The over exploitation of medicinal plants parts such as roots, rhizomes, tubers, inflorescences, fruits, oils, seeds, etc. may lead to poor regeneration and extinction of these species in near future. An area specific threat categorization of species is most important for short or long term management planning. Cultivation of threatened medicinal plants in the surrounding villages and other private lands may reduce the pressure on wild population. Identification of active ingredients would help identifying the potential species for marketing. Regular populations and habitats monitoring of native, endemic and threatened medicinal plants using ecological methods and notification of key areas as medicinal plants conservation areas (MPCAs) for *in situ* conservation, with the involvement of the State Forest Department and inhabitants of the area have been suggested. Besides these, mass reproduction using multiplication methods, establishment and maintenance of herbal gardens and medicinal plant nurseries for *ex situ* conservation and ensuring the availability of quality planting material for cultivation, together with education and awareness programmes for the conservation and sustainable utilization of medicinal plants are suggested.

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