

Floristic diversity assessment of dry temperate and alpine region of Kinnaur district of Himachal Pradesh

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ABSTRACT

Assessment of floristic diversity provides basis for devising suitable strategies for conservation of the plant resources. Accordingly a study was conducted to understand the floristic diversity of dry temperate and alpine region of Kinnaur under different forest groups/types/sub-types. Out of 140 species 4 families belonging to trees, 11 shrubs, 25 herbs, 11 grasses and 2 ferns were encountered during the sampling of vegetation. Among trees species Pinaceae; among shrubs Berberidaceae, Cupressaceae, Fabaceae and Rosaceae; among herbs Asteraceae, Lamiaceae, Fabaceae, Ranunculaceae and Rosaceae and among grasses Poaceae were the dominant families. Among the total plant species recorded from the area 8 species viz *Betula utilis*, *Juniperus communis*, *J. indica*, *J. macropoda*, *Rhododendron campanulatum*, *Picrorhiza kurroa*, *Bergenia stracheyi* and *Ephedra Gerardiana* fell in the category of threatened species.

Keywords: Floristic diversity; threatened plants; dominant species; conservation

INTRODUCTION

Indian Himalayas are spread approximately 2500 km from northwest to southeast along with their extensions in northeastern parts of India with a breadth ranging from 250 to 450 km. The impact of terrain, diversity and altitudinal variation with concurrent changes in temperature and precipitation has created a unique ecosystem of diverse habitats and species associations one of the richest in world. A greater variation in aspect, slope and altitudinal zonation results in abrupt changes in plant communities and as such small areas may comprise a variety of habitat types (Verma 2000). The Himalayas are one of the largest and youngest mountain chains in the world and cover roughly 10 per cent of total land surface of India. Variations in terms of their size, climate and altitudinal ranges have created environments those are unique and characteristic to this region only. The diverse climate and the varied environmental conditions prevailing in Himalayas support diverse habitat and ecosystems with equally diverse life forms. The Himalayan region is

blessed with a wide variety of natural resources including medicinal plants. It provides an important habitat to the flora and fauna including 9000 species of angiosperms and hence is considered as the hot spot of biodiversity. There are about 3470 species considered exclusively endemic to the Himalayas (Verma and Kapoor 2010).

In Indian Himalayas dry temperate region is found in Jammu and Kashmir, Uttarakhand and Himachal Pradesh. In this forest region conifers predominate; broadleaved trees being of poorer height growth occur either scattered among the conifers or forming more or less pure patches. Shrubs occur freely and many form a continuous cover but more often leave a good deal of the soil exposed. Snowfall is important in this type of forest as it helps to maintain moisture supplies during the summer months when there is little rainfall. Fire is relatively uncommon but serious damage is liable to occur in dry summer months in the better stocked areas. Grazing is very prevalent and has a marked effect on the vegetation (Champion and Seth 1968).

Kinnaur is one of the twelve administrative districts of Himachal Pradesh. The district is divided into three administrative blocks viz Pooh, Kalpa and Nichar. A mountainous area ranging in altitude from 2320 to 6816 metres (7612 to 22362 ft) Kinnaur is one of the smallest districts in India by population. Most of Kinnaur enjoys a temperate climate due to its high elevation with long winters from October to May and summers from June to September. The lower parts of the Sutlej valley and the Baspa valley receive monsoon rains. The upper areas of the valleys fall mainly in the rain-shadow area. The proposed study was carried out to assess the status of floral diversity in dry temperate and alpine forest area of Kinnaur.

METHODOLOGY

The study was carried out in dry temperate and alpine forests of Kinnaur district of Himachal Pradesh situated at 77°45'00" and 79°00'35" E longitude and between 31°55'50" and 32°05'15" N latitude. The whole area was divided into different forest type ranges from Group 9 to Group 16 according to Champion and Seth (1968) forest

classification. In each forest type/sub-type 9 quadrates of size 20 x 20 m for trees were laid out randomly across the slope distributed along the elevation gradient (lower, medium and high). Within each quadrate (20 x 20 m) three sub-quadrates of the size of 5 x 5 m for shrubs and 1 x 1 m for herbs were measured. Plant samples collected were identified at Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh and Forest Research Institute, Dehradun, Uttarakhand.

RESULTS and DISCUSSION

Out of 140 species 4 families belonging to trees, 11 shrubs, 25 plants, 11 grasses and 2 ferns were encountered during the sampling of vegetation. Among trees species Pinaceae; among shrubs Berberidaceae, Cupressaceae, Fabaceae and Rosaceae; among herbs Asteraceae, Lamiaceae, Fabaceae, Ranunculaceae and Rosaceae and among grasses Poaceae were the dominant families. Similar dominance of the plant families in forests of Himalayan region has been reported by Verma and Kapoor (2010) and Sharma et al (2014).

Table 1. Floristic composition assessment of different forest types in dry temperate and alpine region of Kinnaur, Himachal Pradesh

Species	Family	Species	Family
Trees			
<i>Betula utilis</i>	Betulaceae	<i>Pinus gerardiana</i>	Pinaceae
<i>Cedrus deodara</i>	Pinaceae	<i>Pinus wallichiana</i>	Pinaceae
<i>Abies pindrow</i>	Pinaceae	<i>Quercus ilex</i>	Fagaceae
<i>Juniper macropoda</i>	Cupressaceae	-	-
Shrubs			
<i>Abelia triflora</i>	Fabaceae	<i>Juniperus communis</i>	Cupressaceae
<i>Berberis erythroclada</i>	Berberidaceae	<i>Juniperus indica</i>	Cupressaceae
<i>Berberis aristata</i>	Berberidaceae	<i>Juniperus recurva</i>	Cupressaceae
<i>Berberis lycium</i>	Berberidaceae	<i>Lonicera hypoleuca</i>	Caprifoliaceae
<i>Berberis vulgaris</i>	Berberidaceae	<i>Lonicera quinquelocularis</i>	Caprifoliaceae
<i>Cotoneaster baccillaris</i>	Rosaceae	<i>Placanthus rugosus</i>	Lamiaceae
<i>Daphne oleoides</i>	Thymelaeaceae	<i>Rhamnus variegata</i>	Rhamnaceae
<i>Desmodium confertum</i>	Leguminosae	<i>Rhododendron anthropogon</i>	Ericaceae
<i>Desmodium elegans</i>	Leguminosae	<i>Ribes orientale</i>	Grossulariaceae
<i>Desmodium tilaefolium</i>	Leguminosae	<i>Rosa microphylla</i>	Rosaceae
<i>Ephedra gerardiana</i>	Ephedraceae	<i>Rosa webbiana</i>	Rosaceae
<i>Indigofera heterantha</i>	Fabaceae	<i>Sorbus foliolosa</i>	Rosaceae
<i>Indigofera gerardiana</i>	Fabaceae	<i>Rhododendron campanulatum</i>	Ericaceae
Herbs			
<i>Aconitum heterophyllum</i>	Ranunculaceae	<i>Heracleum candicans</i>	Apiaceae
<i>Aconogonon alpinum</i>	Polygonaceae	<i>Impatiens brachycentra</i>	Balsaminaceae
<i>Aconitum molli</i>	Lamiaceae	<i>Impatiens sulcata</i>	Balsaminaceae
<i>Ainsliaea aptera</i>	Asteraceae	<i>Iris hookeriana</i>	Iridoideae
<i>Anaphalis busua</i>	Asteraceae	<i>Jurinea dolomiaea</i>	Asteraceae
<i>Anemone polyanthes</i>	Ranunculaceae	<i>Lactuca benthamii</i>	Asteraceae
<i>Anemone tetrasepala</i>	Ranunculaceae	<i>Laminas album</i>	Asteraceae

<i>Aquilegia fragrans</i>	Ranunculaceae	<i>Lespedeza gerardiana</i>	Fabaceae
<i>Artemisia brevifolia</i>	Asteraceae	<i>Ligularia fischeri</i>	Fabaceae
<i>Artemisia maritime</i>	Asteraceae	<i>Medicago falcate</i>	Fabaceae
<i>Artemisia parviflora</i>	Asteraceae	<i>Mentha longifolia</i>	Lamiaceae
<i>Artemisia scoparia</i>	Asteraceae	<i>Nepeta ruderalis</i>	Lamiaceae
<i>Artemisia roxburghii</i>	Asteraceae	<i>Origanum vulgare</i>	Lamiaceae
<i>Asparagus filicinus</i>	Asparagaceae	<i>Picrorhiza kurroa</i>	Plantaginaceae
<i>Aster albescens</i>	Asteraceae	<i>Pimpinella diversifolia</i>	Apiaceae
<i>Aster amellus</i>	Asteraceae	<i>Polygonum polygaloides</i>	Polygonaceae
<i>Astragalus candoleanus</i>	Fabaceae	<i>Potentilla atosanguinea</i>	Rosaceae
<i>Astragalus chlorostachys</i>	Fabaceae	<i>Senecio chrysanthemoides</i>	Compositae
<i>Astragalus frigidus</i>	Fabaceae	<i>Primula macrophylla</i>	Primulaceae
<i>Bergenia stracheyi</i>	Saxifragaceae	<i>Rumex nepalensis</i>	Polygonaceae
<i>Bistorta affinis</i>	Polygonaceae	<i>Salvia glutinosa</i>	Lamiaceae
<i>Bunium persicum</i>	Apiaceae	<i>Salvia nubicola</i>	Lamiaceae
<i>Carum carvi</i>	Apiaceae	<i>Saussurea albescens</i>	Asteraceae
<i>Cassiope fastigiata</i>	Ericaceae	<i>Saussurea lappa</i>	Asteraceae
<i>Chenopodium botrys</i>	Amaranthaceae	<i>Sedum ewersii</i>	Crassulaceae
<i>Chenopodium album</i>	Amaranthaceae	<i>Selinum tenuifolium</i>	Apiaceae
<i>Chenopodium opulifolium</i>	Amaranthaceae	<i>Senecio cappa</i>	Asteraceae
<i>Cirsium falconeri</i>	Asteraceae	<i>Silens edgeworthii</i>	Balsaminaceae
<i>Cirsium verutum</i>	Asteraceae	<i>Smilacina purpurea</i>	Asparagaceae
<i>Cynoglossum glochidiatum</i>	Boraginaceae	<i>Arisaema flavum</i>	Araceae
<i>Cynoglossum micranthum</i>	Boraginaceae	<i>Sopubia trifida</i>	Scrophulariaceae
<i>Datura stramonium</i>	Solanaceae	<i>Stachys sylvatica</i>	Lamiaceae
<i>Dianthus angulatus</i>	Caryophyllaceae	<i>Thalictrum alpinum</i>	Ranunculaceae
<i>Echinops cornigerus</i>	Asteraceae	<i>Thalictrum javanicum</i>	Ranunculaceae
<i>Equisetum arvense</i>	Equisetaceae	<i>Thymus serpyllum</i>	Lamiaceae
<i>Erigeron annuus</i>	Asteraceae	<i>Stachys melissaefolia</i>	Lamiaceae
<i>Fragaria nubicola</i>	Rosaceae	<i>Trifolium repens</i>	Fabaceae
<i>Fragaria vesca</i>	Rosaceae	<i>Urtica dioica</i>	Urticaceae
<i>Galium aparine</i>	Rubiaceae	<i>Verbascum Thapsus</i>	Scrophulariaceae
<i>Geranium wallichianum</i>	Geraniaceae	<i>Viola canasense</i>	Solanaceae
<i>Geum elatum</i>	Rosaceae	<i>Viola serpens</i>	Solanaceae
<i>Geum sikkimense</i>	Rosaceae	-	-
Grasses			
<i>Alopecurus arundinaceus</i>	Poaceae	<i>Chrysopogon gryllus</i>	Poaceae
<i>Dactylis glomerata</i>	Poaceae	<i>Dactylis glomerata</i>	Poaceae
<i>Piptatherum spp</i>	Poaceae	<i>Danthonia cachemiriana</i>	Poaceae
<i>Setaria viridis</i>	Poaceae	<i>Danthonia jacquemontii</i>	Poaceae
<i>Stipa sibirica</i>	Poaceae	<i>Danthonia schneideri</i>	Poaceae
<i>Agropyron longearistatum</i>	Poaceae	<i>Deyaurcia pulchella</i>	Poaceae
<i>Agropyron semicostatum</i>	Poaceae	<i>Elymus dasystachyum</i>	Poaceae
<i>Agrostis alba</i>	Poaceae	<i>Oryzopsis aequiglumis</i>	Poaceae
<i>Agrostis canina</i>	Poaceae	<i>Pennisetum orientale</i>	Poaceae
<i>Arthraxon lancifolius</i>	Poaceae	<i>Hemarthria altissima</i>	Poaceae
<i>Brachypodium distachyon</i>	Poaceae	<i>Stipa sibirica</i>	Poaceae
Ferns			
<i>Pteridium aquilinum</i>	Dennstaedtiaceae	<i>Dryopteris barbigera</i>	Dryopteridaceae

Threatened plant species

Out of total plant species recorded from the area, 8 species viz *Betula utilis*, *Juniperus communis*, *J indica*, *J macropoda*, *Rhododendron campanulatum*, *Picrorhiza kurroa*, *Bergenia stracheyi* and *Ephedra gerardiana* fell in the category of threatened species (Ved et al 2003). The habitat of most of the plant species has shrunk due to expansion of human population and environmental degradation

primarily due to heavy livestock grazing, uncontrolled and unscientific harvest of species, unregulated tourism and construction of roads etc. The better conservation of natural resources can be done by inclusion of a section on the plant conservation especially of rare and endangered medicinal plants in the wildlife protection act, promotion of community-based conservation, in situ conservation through the establishment of nature reserves, ex situ conservation through tissue culture,

developing cultivation technologies and nurseries of medicinal plants and conducting of regular training on the procedure of medicinal plants collection and processing among the local people, traders and real stakeholders.

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