

Floral Species Diversity of Colonel Sher Jung National Park, Himachal Pradesh

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ABSTRACT

An intensive floristic investigation provides the first systematic and comprehensive account of the floral diversity of Col. Sher Jung National Park of Himachal Pradesh. Knowledge of floristic diversity is essential for understanding ecosystem and its functioning. Total 184 species were found which includes 63 species of trees, 42 species of shrubs, 42 species of herbs, 22 species of grasses, 5 species of sedges, 3 species of ferns, 6 species of climbers and 1 species of creeper in the park. Fabaceae is the dominant family represented by 31 species, followed

by Poaceae (22 species), Malvaceae (14 species), Asteraceae (14 species) and Lamiaceae (7 species).

Keywords: Flora, Trees, Shrubs, Herbs, Col. Sher Jung National Park.

INTRODUCTION

India is one of the 12 mega biodiversity countries of the world and consists of 17,000 flowering plant species. It accounts for 8% of the global biodiversity with only 2.4% of the total land area in the world (Hajra and Mudgal 1997, Reddy 2008). Tropical forests are often referred to as one of the most species diverse terrestrial ecosystems (Kumar *et al.* 2006).

Plants form the major structural and functional basis of tropical forest ecosystems and can serve as robust indicators of changes and stresses at the landscape scale. Many tropical forests are under great anthropogenic pressure and require management intervention to maintain the overall biodiversity, productivity and sustainability. These forests are rich in medicinal and economically important plants. Over-exploitation has resulted in a rapid loss of tropical forests which is considered as one of the most serious environmental

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and economic problems all over the world (Hare *et al.* 1997).

There is a growing interest in quantifying habitat characteristics like forest structure, floristic composition and species richness in Indian forests (Kumar *et al.* 2006, Yadav and Yadav 2005). A study on tree species diversity of tropical forests is ecologically significant besides its usefulness in forest management.

To understand and assess richness of the floral diversity, a taxonomic study of the flora and forests is very much essential. Floristic surveys are the only means by which we can achieve this goal. The floristic studies are considered as the backbone of the assessment of phytodiversity, conservation management and sustainable utilization (Jayanthi and Rajendran 2013).

The flora are helpful in providing clues of changing floristic patterns, new invasions, current status, rare, endemic and threatened taxa in a phytogeographical area. They also form a vital component of any resource management and planning activities at the local regional and global levels.

The landscape of Col. Sher Jung National Park is characterized by hills, valleys, gullies and numer-

ous water streams and covered mainly by secondary degraded forests and plantations. Floristically Col. Sher Jung National Park is rich and diverse. Hence, it is very important to take proper steps to conserve this natural forest and to explore, document and analyze the species diversity occurring in the Col. Sher Jung National Park before disappearing from nature.

Understanding species diversity and distribution patterns is important for helping managers to evaluate the complexity and resources of these forests. This study investigates species diversity of Col. Sher Jung National Park of Sirmour district of Himachal Pradesh.

MATERIALS AND METHODS

Study site

The present study was carried out in the Col. Sher Jung National Park (Fig. 1) which encompasses an area of 27.88 sq km in the Sirmour district of Himachal Pradesh. It is exactly located between latitudes $30^{\circ}28'13''N$ to $30^{\circ}23'31''N$ and longitude $77^{\circ}28'43''E$ to $77^{\circ}27'40''E$. It lies in Paonta valley of Himachal Pradesh which shares boundary with Kalesar National Park and Rajaji National Park.

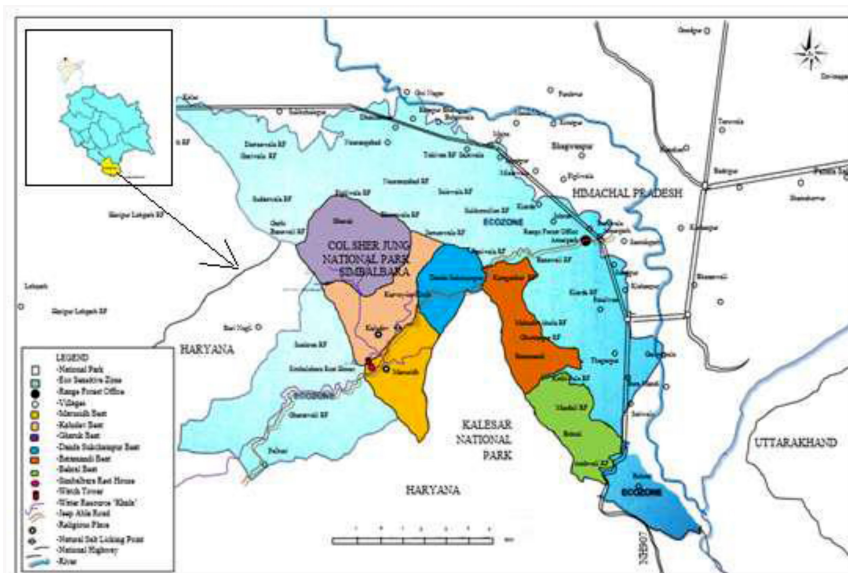


Fig. 1. Detail map of Col. Sher Jung National Park, Simbalbara, Sirmour, HP, India (Inset : Location map of Sirmour in HP).

National Park shows a wide geoenvironmental variation. In location; annual minimum and maximum temperature ranges from 3°C - 40°C, mean annual rainfall about 1200 mm and relative humidity varies from 26 % in summer to 90 % during monsoon. Studied area is having an elevational range of 350 amsl to 700 amsl. Which is composed of unconsolidated siltstone, sandstone and conglomerate.

Sampling protocol

The survey of the flora has been made through repeated field visits during rainy season (2018- 2019) when majority of the plants were at the peak of their growth and intensive observation for the collection of samples. 3 quadrats of 31.62 m × 31.62 m (0.1 ha) size were randomly laid to study tree species. The tree species includes all the saplings, poles and trees present in the study area (Nirmal Kumar *et al.* 2002). The shrub and herbaceous species were studied by laying 3 quadrats randomly. In each quadrat, a sub-quadrat of 5 m × 5 m (25 sq m) size for shrubs and a sub-quadrat of 1m 983 × 1m (1sq m) for herbaceous vegetation were selected.

Table 1. Plant diversity of study area.

Sl. No.	Family	Scientific name	Plant
1	Fabaceae	<i>Acacia catechu</i>	Tree
2	Fabaceae	<i>Acacia nilotica</i>	Tree
3	Fabaceae	<i>Albizia procera</i>	Tree
4	Fabaceae	<i>Albizia lebbbeck</i>	Tree
5	Fabaceae	<i>Bauhinia malabarica</i>	Tree
6	Fabaceae	<i>Bauhinia variegata</i>	Tree
7	Fabaceae	<i>Butea monosperma</i>	Tree
8	Fabaceae	<i>Cassia fistula</i>	Tree
9	Fabaceae	<i>Dalbergia sisoo</i>	Tree
10	Fabaceae	<i>Leucena leucophala</i>	Tree
11	Fabaceae	<i>Melilotus indicus</i>	Tree
12	Fabaceae	<i>Pongamia pinnata</i>	Tree
13	Fabaceae	<i>Prosopis juliflora</i>	Tree
14	Fabaceae	<i>Ougeinia oojeinensis</i>	Tree
15	Fabaceae	<i>Tamarindus indica</i>	Tree
16	Fabaceae	<i>Cassia occidentalis</i>	Shrub
17	Fabaceae	<i>Dendrolobium triangulare</i>	Shrub
18	Fabaceae	<i>Desmodium ngeticum</i>	Shrub
19	Fabaceae	<i>Desmodium pulchellum</i>	Shrub
20	Fabaceae	<i>Flemingia bracteata</i>	Shrub
21	Fabaceae	<i>Flemingia chappar</i>	Shrub
22	Fabaceae	<i>Indigofera gerardiana</i>	Shrub
23	Fabaceae	<i>Phyllodium pulchellum</i>	Shrub
24	Fabaceae	<i>Desmodium heterocarpan</i>	Herb
25	Fabaceae	<i>Desmodium triliflorum</i>	Herb
26	Fabaceae	<i>Mimosa pudica</i>	Herb
27	Fabaceae	<i>Trifolium alexandrinum</i>	Herb
28	Fabaceae	<i>Milletia auriculata</i>	Climber
29	Fabaceae	<i>Pueraria tuberosa</i>	Climber
30	Fabaceae	<i>Milletia aextensa</i>	Climber
31	Fabaceae	<i>Bauhinia vahlii</i>	Creeper
32	Moraceae	<i>Ficus benghalensis</i>	Tree
33	Moraceae	<i>Ficus glomerata</i>	Tree
34	Moraceae	<i>Ficus hispida</i>	Tree
35	Moraceae	<i>Ficus lacor</i>	Tree
36	Moraceae	<i>Ficus racemosa</i>	Tree
37	Moraceae	<i>Ficus religiosa</i>	Tree
38	Moraceae	<i>Ficus roxburghii</i>	Tree
39	Moraceae	<i>Ficus semicordata</i>	Tree
40	Moraceae	<i>Artocarpus lacucha</i>	Tree
41	Moraceae	<i>Morus alba</i>	Tree
42	Moraceae	<i>Morus nigra</i>	Tree
43	Combretaceae	<i>Anogeissus latifolia</i>	Tree
44	Combretaceae	<i>Terminalia alata</i>	Tree
45	Combretaceae	<i>Terminalia arjuna</i>	Tree
46	Combretaceae	<i>Terminalia chebula</i>	Tree
47	Combretaceae	<i>Terminalia bellirica</i>	Tree
48	Combretaceae	<i>Terminalia tomentosa</i>	Tree
49	Malvaceae	<i>Bombax cieba</i>	Tree
50	Malvaceae	<i>Grewia optiva</i>	Tree
51	Malvaceae	<i>Grewia oppositifolia</i>	Tree
52	Malvaceae	<i>Grewia elastic</i>	Tree
53	Malvaceae	<i>Kydia calycina</i>	Tree
54	Malvaceae	<i>Gossypium arboretum</i>	Shrub
55	Malvaceae	<i>Urena labata</i>	Shrub
56	Malvaceae	<i>Corchorus aestuans</i>	Herb
57	Malvaceae	<i>Malvastrum coromandelianum</i>	Herb
58	Malvaceae	<i>Sida acuta</i>	Herb
59	Malvaceae	<i>Sida cordata</i>	Herb
60	Malvaceae	<i>Sida cordifolia</i>	Herb
61	Malvaceae	<i>Sida rhomboidea</i>	Herb
62	Malvaceae	<i>Triumfetta rhomboidea</i>	Herb
63	Rubiaceae	<i>Adina cardifolia</i>	Tree
64	Rubiaceae	<i>Haldina cordifolia</i>	Tree
65	Rubiaceae	<i>Mitragyna parvifolia</i>	Tree
66	Rubiaceae	<i>Coffea benghalensis</i>	Shrub
67	Rubiaceae	<i>Randia uliginosa</i>	Shrub
68	Rubiaceae	<i>Borreria articularis</i>	Herb
69	Salicaceae	<i>Casearia tomentosa</i>	Tree
70	Salicaceae	<i>Flacourtia indica</i>	Tree
71	Salicaceae	<i>Populus deltoids</i>	Tree
72	Phyllanthaceae	<i>Bridelia retusa</i>	Tree
73	Phyllanthaceae	<i>Phyllanthu semblica</i>	Tree
74	Boraginaceae	<i>Cordia dichotoma</i>	Tree
75	Boraginaceae	<i>Ehretia laevis</i>	Tree
76	Boraginaceae	<i>Cynaglossum lanceolatum</i>	Herb
77	Myrtaceae	<i>Eucalyptus tereticornis</i>	Tree
78	Myrtaceae	<i>Syzygium cumini</i>	Tree

Sl. No.	Family	Scientific name	Plant	Sl. No.	Family	Scientific name	Plant
79	Anacardiaceae	<i>Lannea coromandelica</i>	Tree	122	Asteraceae	<i>Spilanthes paniculata</i>	Herb
80	Anacardiaceae	<i>Mangifera indica</i>	Tree	123	Asteraceae	<i>Syndrella vialis</i>	Herb
81	Meliaceae	<i>Melia azedarach</i>	Tree	124	Asteraceae	<i>Tridax procumbens</i>	Herb
82	Meliaceae	<i>Toona ciliata</i>	Tree	125	Asteraceae	<i>Vernonia cinerea</i>	Herb
83	Lamiaceae	<i>Gmelina arborea</i>	Tree	126	Asteraceae	<i>Xanthium indicum</i>	Herb
84	Lamiaceae	<i>Callicarpamacrophylla</i>	Shrub	127	Asparagaceae	<i>Agave cantula</i>	Shrub
85	Lamiaceae	<i>Clerodendrum-viscosum</i>	Shrub	128	Asparagaceae	<i>Asparagus adscendens</i>	Shrub
86	Lamiaceae	<i>Colebrookia oppositifolia</i>	Shrub	129	Asparagaceae	<i>Asparagus racemosus wild</i>	Herb
87	Lamiaceae	<i>Vitex negundo</i>	Shrub	130	Solanaceae	<i>Solanum hispidum</i>	Shrub
88	Lamiaceae	<i>Acrocephalus capitatus</i>	Herb	131	Solanaceae	<i>Solanum torvum</i>	Shrub
89	Lamiaceae	<i>Nepeta hindostana</i>	Herb	132	Convolvulaceae	<i>Ipomea atropurpurea</i>	Shrub
90	Lauraceae	<i>Litsea glutinosa</i>	Tree	133	Convolvulaceae	<i>Ipomea carnea</i>	Shrub
91	Euphorbiaceae	<i>Mallotus philippensis</i>	Tree	134	Rutaceae	<i>Murraya koenigii</i>	Shrub
92	Euphorbiaceae	<i>Baliospermum montanum</i>	Shrub	135	Rutaceae	<i>Toddalia asiatica</i>	Shrub
93	Euphorbiaceae	<i>Euphorbia hirta</i>	Herb	136	Primulaceae	<i>Ardisia solanacea</i>	Shrub
94	Euphorbiaceae	<i>Euphorbia prostrata</i>	Herb	137	Urticaceae	<i>Boehmeria frutescens</i>	Shrub
95	Annonaceae	<i>Miliusa velutina</i>	Tree	138	Verbenaceae	<i>Lantana camara</i>	Shrub
96	Arecaceae	<i>Phoenix humilis</i>	Tree	139	Rosaceae	<i>Rubus ellipticus</i>	Shrub
97	Arecaceae	<i>Calamus tenuis</i>	Shrub	140	Lythraceae	<i>Woodfordia floribunda</i>	Shrub
98	Rhamnaceae	<i>Ziziphus jujuba</i>	Tree	141	Amaranthac	<i>Achyranthes aspera</i>	Herb
99	Rhamnaceae	<i>Ziziphus nummularia</i>	Shrub	142	Amaranthaceae	<i>Alternanthera sessilis</i>	Herb
100	Dipterocarpaceae	<i>Shorea robusta</i>	Tree	143	Phyllanthaceae	<i>Phyllanthus virgatus</i>	Herb
101	Sapotaceae	<i>Madhuca longifolia</i>	Tree	144	Phyllanthaceae	<i>Phyllanthus urinaria</i>	Herb
102	Simaroubaceae	<i>Ailanthus excels</i>	Tree	145	Urticaceae	<i>Boehmeria macrophylla</i>	Herb
103	Ebenaceae	<i>Diospyros melanoxylon</i>	Tree	146	Commelinaceae	<i>Commelina benghalensis</i>	Herb
104	Apocynaceae	<i>Calotropis procera</i>	Shrub	147	Hypoxidaceae	<i>Curculigo orchroides</i>	Herb
105	Apocynaceae	<i>Carissa opaca</i>	Shrub	148	Oxalidaceae	<i>Oxalis corniculata</i>	Herb
106	Apocynaceae	<i>Carissa spinarum</i>	Shrub	149	Piperaceae	<i>Peperomia pellucid</i>	Herb
107	Apocynaceae	<i>Holarrhena antidysentrica</i>	Shrub	150	Papaveraceae	<i>Fumaria parviflora</i>	Herb
108	Apocynaceae	<i>Holarrhena pubescens</i>	Shrub	151	Mazaceae	<i>Mazus ramosus</i>	Herb
109	Apocynaceae	<i>Cryptolepis buchananii</i>	Climber	152	Portulacaceae	<i>Portulaca pilosa</i>	Herb
110	Acanthaceae	<i>Adhatodavastica</i>	Shrub	153	Loranthaceae	<i>Helixanthera ligustrina</i>	Climber
111	Acanthaceae	<i>Barleriastrigosa</i>	Shrub	154	Capparaceae	<i>Capparis zeylanica</i>	Climber
112	Acanthaceae	<i>Phlogacanthusth-yrsiflorus</i>	Shrub	155	Poaceae	<i>Coix lacryma</i>	Grass
113	Asteraceae	<i>Eupatorium adenophorum</i>	Shrub	156	Poaceae	<i>Cymbogon citrates</i>	Grass
114	Asteraceae	<i>Xanthium strumarium</i>	Shrub	157	Poaceae	<i>Cymbogon-schoenanthus</i>	Grass
115	Asteraceae	<i>Ageratum conyzoides</i>	Herb	158	Poaceae	<i>Cynodon dactylon</i>	Grass
116	Asteraceae	<i>Bidnes biternata</i>	Herb	159	Poaceae	<i>Dendrocalamus-hamiltonii</i>	Grass
117	Asteraceae	<i>Blumea laciniata</i>	Herb	160	Poaceae	<i>Dendrocalamus-strictus</i>	Grass
118	Asteraceae	<i>Eclipta prostratata</i>	Herb	161	Poaceae	<i>Digitaria ciliaris</i>	Grass
119	Asteraceae	<i>Emilia sanchifolia</i>	Herb	162	Poaceae	<i>Echinochloa colona</i>	Grass
120	Asteraceae	<i>Sigesbeckia orientalis</i>	Herb	163	Poaceae	<i>Eragrostis tremula</i>	Grass
121	Asteraceae	<i>Sonchus wightianus</i>	Herb	164	Poaceae	<i>Eragrostis minor</i>	Grass
				165	Poaceae	<i>Eulaliopsis binata</i>	Grass
				166	Poaceae	<i>Eleusine indica</i>	Grass
				167	Poaceae	<i>Hordeum vulgare</i>	Grass
				168	Poaceae	<i>Oplismenus compositus</i>	Grass
				169	Poaceae	<i>Oryza sativa</i>	Grass

Sl. No.	Family	Scientific name	Plant
170	Poaceae	<i>Paspalidium flavidum</i>	Grass
171	Poaceae	<i>Phalaris minor</i>	Grass
172	Poaceae	<i>Saccharum officinarum</i>	Grass
173	Poaceae	<i>Saccharum spontaneum</i>	Grass
174	Poaceae	<i>Setaria italica</i>	Grass
175	Poaceae	<i>Triticum aestivum</i>	Grass
176	Poaceae	<i>Zea mays</i>	Grass
177	Cyperaceae	<i>Cyperus distans</i>	Sedge
178	Cyperaceae	<i>Cyperus kyllingia</i>	Sedge
179	Cyperaceae	<i>Cyperus nireus</i>	Sedge
180	Cyperaceae	<i>Cyperus rotundus</i>	Sedge
181	Cyperaceae	<i>Kyllinga nemoralis</i>	Sedge
182	Pteridaceae	<i>Adiantum incisum</i>	Fern
183	Pteridaceae	<i>Adiantum venustum</i>	Fern
184	Pteridaceae	<i>Chelilanthus farinose</i>	Fern

RESULTS

During the study of floristic diversity total 184 species were found which includes 63 species of trees, 42 species of shrubs, 42 species of herbs, 22 species of grasses, 5 species of sedges, 3 species of ferns, 6 species of climbers and 1 species of creeper (Table 1).

Total 49 families were recorded out of which the main dominating families were Poaceae, Fabaceae, Malvaceae, Moraceae, Asteraceae and some of the recessive families were Annonaceae, Capparaceae, Commelinaceae, Hypoxidaceae, Lauraceae, Loranthaceae, Mazaceae, Piperaceae, Papaveraceae, Portulacaceae, Rosaceae, Oxalidaceae, Sapotaceae, Simaroubaceae, Primulaceae. Table 2 shows the dominating top ten families with highest number of species.

Percentage wise 34% were trees which was maximum (Fig. 2) and least was found for creeper (0%). From the above observation, it can be concluded that among trees Fabaceae is the dominant and leading family species wise (15), followed by Moraceae and Combretaceae. For shrubs Fabaceae is the dominant and leading family species wise (8), followed by Apocynaceae and Lamiaceae. For herbs Asteraceae is the dominant and leading family species wise (12),

Table 2. Top ten dominating families with maximum number of species.

Sl. No.	Families	No. of species
1	Fabaceae	31
2	Poaceae	22
3	Malvaceae	14
4	Asteraceae	14
6	Lamiaceae	7
7	Combretaceae	6
8	Rubiaceae	6
9	Apocynaceae	6
10	Cyperaceae	5

followed by Malvaceae and Fabaceae. Among grasses Poaceae (species 22) were found during the study.

DISCUSSION

In the present study forests areas of Col. Sher Jung National Park were visited for exploration. Its represents relic and unique vegetation of tropical and sub-tropical deciduous forest. The dominant trees are *Shorea robusta*, *Syzygium cumini*, *Eucalyptus tereticornis*, *Terminalia tomentosa*, *Ehretia laevis*, *Diospyros melanoxylon*. Fabaceae is the most dominant family comprises of trees, shrubs, herbs, climbers and creepers. It is one of the most diverse communities in the angiosperms. The second most dominant family is Poaceae comprises of grasses.

Present studied area is a diverse area with great species diversity and it is the prime requirement of the government and local people to protect them. The floristic elements of this National Park are the depend-

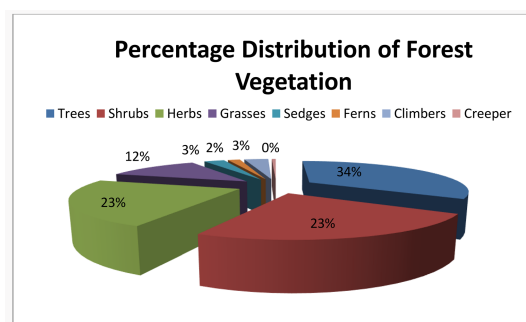


Fig. 2. Percentage distribution of forest vegetation.

able source of food, medicine, water, timber and fuel wood of the local inhabitants. The floral biodiversity of the National Park exists under different degraded ecosystems and its protection management is still inadequate. Sustainable Management Plan of the Protected Area in the light of National Conservation Strategy is to be made and proper implementation through action plan is urgently required with collaboration and cooperation of stakeholders and local administrations. Although it is widely believed that tropical regions are experiencing losses of biodiversity at unprecedented rates, we lack information about the rate of habitat loss. So it is the prime requirement to have data of the present species diversity of tropical forests.

REFERENCES

- Hajra PK, Mudgal V (1997) Plant diversity hotspots in India – An Overview, BSI India.
- Hare MA, Lantagne DO, Murphy PG, Chero H (1997) Structure and tree species composition in a sub-tropical dry forest in the Dominican Republic : Comparision with a dry forest in Puerto Rico. *Trop. Ecol* 38 : 1—17.
- Jayanthi P, Rajendran A (2013) Life- Forms of Madukkarai Hills of Southern Western Ghats, Tamil Nadu, India. *Life Sci. Leaflets* 9 : 57—61.
- Nirmal Kumar JI, Kumar RN, Joseph S (2002) Tree species diversity of Waghai forest of the Northern part of Western Ghats. *Int. J. Ecol. Environ. Conserv* 8 : 235—248.
- Kumar A, Gupta AK, Marcot BG, Saxena A, Singh SP, Marak TTC (2006) Management of forests in India for biological diversity and forest productivity, a new perspective. Volume IV : Garo Hills Conservation Area (GCA). Wildlife Institute of India.
- Reddy CS (2008) Catalogue of invasive alien flora of India. *Life Sci. J* 5 (2) : 84—89.
- Yadav AS, Yadav RK (2005) Plant community structure of Bala-fort forest in Alwar, Rajasthan. *Int. J. Ecol. Environm. Sci* 31 : 109—117.