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Phyto-diversity of Mukundara hills national park of Kota district, Rajasthan, India

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ABSTRACT

A wide-spread field assessment was carried out observe the diversity of plants species including tree, shrub and herb species. To achieve this purpose intensive survey was conducted in Mukundara Hills National Park, Kota district of Rajasthan state during the session of 2009-2012. Herbaria were also prepared of collected plants. Floras of states, districts and protected areas have been thoroughly followed to identify the plants. A total of 712 species belonging to 125 families are recorded across the study sites, of which 110 are trees, 167 are shrubs, and 318 are herbs and 117 are grasses. Among these Poaceae (88), Fabaceae (77) Asteraceae (46), Acanthaceae (31), Cyperaceae (29) are the most abundant families. This research is also beneficial for list out the endemic or endangered plant species in the area. Present study concluded that the plant are used for planking, carriages, furniture, and carpentry of all kinds and traditional medicinal purpose which will promote forest conservation and plant diversity research through extensive survey, afforestation, reforestation and forest rehabilitation. Apart from this, in future, study will be utilized as a reference of plant species distribution and availability in this National Park.

Key words: Mukundara Hills National Park, Endemic, Endangered, Herbaria.

INTRODUCTION

Understanding the diversity of nature in various forms is a fundamental goal of ecological research (Lubchenco et.al., 1991). Apart from the immense economic, ethical and aesthetical benefits, biodiversity is essential for the ecosystem function and stability. (Ehrlich and Wilson, 1991; Holdgate, 1996; Tilman, 2000) Biodiversity has attracted world attention because of the growing awareness of its importance on the one hand and the anticipated massive depletion on the other. (Singh, 2000)

Species Diversity and variability of plant and animal species are the most striking feature of life, which reflects the complexity, uniqueness, and intactness of natural ecosystems. (Mohamed et.al., 2009) An appropriate biodiversity management strategy should take into account the distribution patterns of species. (Perring and Lovett, 1999) Conservation of ecosystem and maintenance of biodiversity is matter of both national and international concern.

Plants provide food and other life supporting commodities and very important for survival of human beings and other organisms, besides they protect our environment and maintain nature. Tropical forests are major reservoir of plant diversity. Those forests inhabit a large number of trees, shrubs, herbs, climbers, faunal, wealth and a wealth of non-timber forest products including medicinal and wild edible plants. The increased demand of medicinal plants in drug and pharmaceutical industries have caused the over exploitation of many species. Many of these are close to extinction due to over harvesting or un-skilled harvesting. Some important forestry species need an immediate attention for conservation in India for human being. (Kharkwal, 2009)

Study Area

India is one of the 12th mega-biodiversity centres in 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. (Reddy, 2008; Hajra and Mudgal, 1997) Rajasthan is the largest state of India and is located in the northwest part. It is situated between $23^0 3'$ to $30^0 12'$ North latitude and $69^0 3'$ to $78^0 17'$ East longitude.

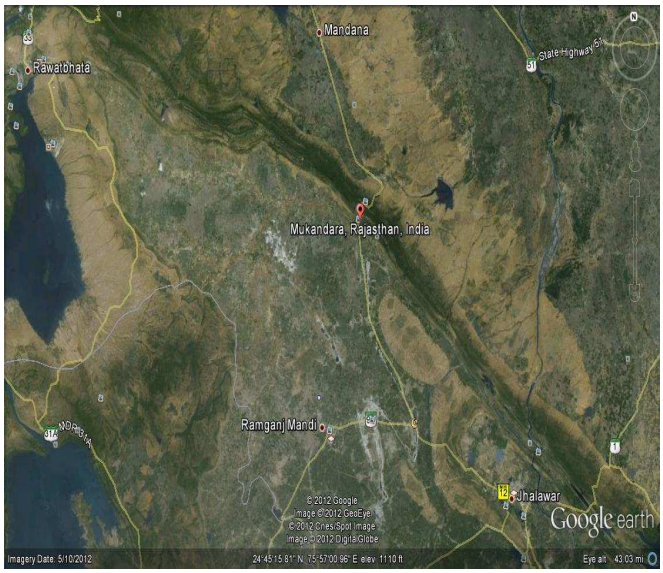

Figure 1- Satellite Map of Mukundara Hills National Park

The present study area includes Mukundara Hills National Park of Kota division (Hadauti plateau). It is situated at the edge of Malva plateau at $23^o 45'$ to $25^o 53'$ N latitudes and $75^o 9'$ to $77^o 26'$ E longitude of Rajasthan state. (Fig. 1) This region is quite unique not only because of its historical, cultural and geographical heritage but also to its perennial and seasonal rivers and water reservoirs. As well as the thick and dense forest that supports the growth and development of different species of various plant groups. The climate of this area is dry or semi humid. The black cotton growing soils are significantly recorded in the vast portion of the area. It is supposed to be suitable for oil yielding crops, as these have got a favourable character of moisture retention for oil yielding plants.

MATERIALS AND METHODS

The field exercise was carried out throughout the Forest of Mukundara Hills National Park of Kota district during the session of July 2009 to July 2012. The polythene bags, tags, field note book, pencil and blotting paper etc. were used to collect herbarium specimens during field survey. The survey was conducted in different forest sites of National Park, and the plant species including herbs, shrubs and trees were recorded. Throughout field visits, plant samples were collected from natural habitats, wastelands, road sides, and other relevant localities. Identification was done mostly with live specimens in the field itself but when it was not found possible then plant samples were identified in the lab. The collected plants species were identified using of Rajasthan Flora Vol. I, II and III. (Singh, Parmar and Pandey, 1987, 91, 93) Identification of plant specimens was followed by, the arrangement of plants according to Bentham and Hooker's system of classification. Additional information of plants about their habit was also recorded and incorporated in the study.

RESULTS AND DISCUSSION

An extensive survey of the National Park was made for the proposed study. A total of 712 species belonging to 125 families are recorded across the study sites, of which 110 are trees, 167 are shrubs, and 318 are herbs and 117 are grasses (Table 1).

Among all families *Poaceae* is leading with maximum number of species (88). Family *Fabaceae* (77) with sub family *Caesalpinaceae, Mimosaceae* and *Papilionaceae*; and family *Asteraceae* (46), *Acanthaceae* (31), *Cyperaceae* (29) are the next dominant families, followed by *Malvaceae* and *Euphorbiaceae* (with 26 species), *Convolvulaceae* (23 species), *Lamiaceae* (15), *Cucurbitaceae* (with 14 species), *Asclepiadaceae* (11), *Cucurbitaceae* (9), *Solanaceae* (9), *Sterculiaceae* (9), *Verbenaceae* (7) whereas the remaining 108 families were represented by one or species each (Table 1).

Most of the species were recorded as tree species viz. *Acacia nilotica* (L.) Willd. (*Mimosaceae*), *Anthocephalus sp.* (*Rubiaceae*), *Atrocarpus heterophyllus* Lam. (*Moraceae*), *Aegle marmelos* (L.) Corr. (*Rutaceae*), *Azadirachta indica* A. Juss. (*Meliaceae*), *Bombax ceiba* L. (*Malvaceae*), *Cassia fistula* L. (*Caesalpinaceae*), *Citrus aurantifolia* (Christ.) Swingle (*Rutaceae*), *Delonix regia* (L.) Gamble (*Caesalpinaceae*), *Dalbergia sissoo* Roxb.(*Papilionaceae*), *Phyllanthus emblica* L. (*Euphorbiaceae*), *Eucalyptus sp.* (*Myrtaceae*), *Ficus religiosa* L. (*Moraceae*), *Ficus glomerata* Roxb. (*Moraceae*), *Ficus benghalensis* L. (*Moraceae*). Plants together with trees, shrubs and herbs on the earth represent one of the vital elements of biodiversity; therefore the understanding of plant species occur in the different areas of the world is a pre-requirement to preserve and maintain the natural biodiversity. It helps us to appreciate the overall structure and function of an ecosystem. (Sumeet et.al., 2010) For this reason accurate information of the known plant species from a given area is essential. The information is significant as it allows us to prevent or avoid the potential chances of biodiversity loss and to plan future policy for the protection of our environment. For instance, invasive alien species which are second greatest threat to biodiversity; (Wilcove et.al., 1998) can be better managed only if proper and accurate information is available for them. The different forestry species provides forest genetic resources for human welfare and provide timber, drugs, fiber, food, and other value added products. Genetic diversity provides the fundamental basis for the evolution of forest tree species and for their adaptation to change. Conserving forest genetic resources is therefore vital, as they are a unique and irreplaceable resource for the future. Forest genetic resources management can be effective only if treated as an integral element of overall sustainable forest management. Conservation concerns should be integrated into broader national and local development programmes, such as national forest programmes, rural development plans and poverty reduction strategies, which promote cooperation among sectors. To maintain the ecosystem equilibrium, awareness of the sustainable utilization of these species is important and their conservation in sustainable environment is urgently needed, keeping in view the demand among the communities and their drugs in the global market.

The results of the present study open new prospect of plant materials used in traditional medicine which will promote forest conservation and ecological research through surveys, development and implementation of land use plans by proper planting, afforestation, reforestation and forest rehabilitation. Medicinal plants could also be incorporated into primary health care, as people generally feel safer with indigenous cures and also the costs of medicine would be much lesser than modern drugs. (Kharkwal, 2009)

Table. 1- Habit wise contribution of family to genera and species

S. No.	Family	Tree		Shrub		Herb		Grass	
		Genus	Species	Genus	Species	Genus	Species	Genus	Species
1.	*Ranunculaceae*	-	-	-	-	1	1	-	-
2.	*Annonaceae*	-	-	4	4	-	-	-	-
3.	*Menispermaceae*	-	-	3	3	-	-	-	-
4.	*Nympheaceae*	-	-	-	-	1	2	-	-
5.	*Nelumbonaceae*	-	-	-	-	1	1	-	-
6.	*Papaveraceae*	-	-	1	1	1	1	-	-
7.	*Fumariaceae*	-	-	-	-	1	1	-	-
8.	*Brassicaceae*	-	-	-	-	6	6	-	-
9.	*Cleomaceae*	-	-	-	-	1	2	-	-
10.	*Capparidaceae*	1	1	2	3	-	-	-	-
11.	*Violaceae*	-	-	-	-	1	1	-	-
12.	*Flacourtiaceae*	1	1	-	-	-	-	-	-
13.	*Polygalaceae*	-	-	-	-	1	2	-	-
14.	*Caryophyllaceae*	-	-	-	-	6	6	-	-
15.	*Portulacaceae*	-	-	-	-	1	2	-	-
16.	*Tamaricaceae*	-	-	1	2	-	-	-	-
17.	*Elatinaceae*	-	-	-	-	1	1	-	-
18.	*Malvaceae*	2	2	4	6	6	18	-	-
19.	*Bombacaceae*	2	2	-	-	-	-	-	-
20.	*Sterculiaceae*	7	7	2	2	-	-	-	-
21.	*Tiliaceae*	2	3	2	6	-	-	-	-
22.	*Linaceae*	-	-	-	-	1	1	-	-
23.	*Zygophyllaceae*	-	-	-	-	1	1	-	-
24.	*Oxalidaceae*	-	-	-	-	1	2	-	-
25.	*Balsaminaceae*	-	-	-	-	1	1	-	-
26.	*Rutaceae*	4	4	-	-	-	-	-	-
27.	*Simaroubaceae*	1	1	-	-	-	-	-	-
28.	*Balanitaceae*	-	-	1	1	-	-	-	-
29.	*Burseraceae*	1	1	-	-	-	-	-	-
30.	*Meliaceae*	2	2	-	-	-	-	-	-
31.	*Celastraceae*	1	1	2	2	-	-	-	-
32.	*Rhamnaceae*	-	-	1	3	-	-	-	-

33.	*Vitaceae*	-	-	3	3	-	-	-	-
34.	*Leeaceae*	-	-	1	1	-	-	-	-
35.	*Sapindaceae*	-	-	1	1	-	-	-	-
36.	*Anacardiaceae*	4	4	-	-	-	-	-	-
37.	*Moringaceae*	1	1	-	-	-	-	-	-
38.	*Fabaceae*	4	5	5	7	15	33	-	-
39.	*Caesalpiniaceae*	5	6	2	11	-	-	-	-
40.	*Mimosaceae*	7	13	1	1	1	1	-	-
41.	*Rosaceae*	-	-	-	-	1	1	-	-
42.	*Vahliaceae*	-	-	-	-	1	1	-	-
43.	*Combretaceae*	2	6	1	1	-	-	-	-
44.	*Myrtaceae*	4	5	1	1	-	-	-	-
45.	*Lythraceae*	2	2	3	4	-	-	-	-
46.	*Punicaceae*	1	1	-	-	-	-	-	-
47.	*Onagraceae*	-	-	-	-	1	2	-	-
48.	*Trapaceae*	-	-	-	-	1	1	-	-
49.	*Cucurbitaceae*	-	-	9	14	-	-	-	-
50.	*Passifloraceae*	-	-	1	1	-	-	-	-
51.	*Cactaceae*	-	-	1	2	-	-	-	-
52.	*Aizoaceae*	-	-	-	-	2	2	-	-
53.	*Molluginaceae*	-	-	-	-	2	2	-	-
54.	*Apiaceae*	-	-	-	-	1	1	-	-
55.	*Alangiaceae*	-	-	1	1	-	-	-	-
56.	*Rubiaceae*	-	-	2	2	8	9	-	-
57.	*Asteraceae*	-	-	-	-	37	46	-	-
58.	*Campanulaceae*	-	-	-	-	2	2	-	-
59.	*Plumbaginaceae*	-	-	1	1	-	-	-	-
60.	*Primulaceae*	-	-	-	-	1	1	-	-
61.	*Sapotaceae*	3	3	-	-	-	-	-	-
62.	*Ebenaceae*	1	2	-	-	-	-	-	-
63.	*Oleaceae*	-	-	1	1	-	-	-	-
64.	*Salvadoraceae*	1	2	-	-	-	-	-	-
65.	*Apocynaceae*	7	7	1	1	-	-	-	-
66.	*Asclepiadaceae*	-	-	10	11	-	-	-	-
67.	*Periplocaceae*	-	-	2	2	-	-	-	-
68.	*Gentianaceae*	-	-	-	-	4	4	-	-
69.	*Menyanthaceae*	-	-	-	-	1	2	-	-
70.	*Hydrophyllaceae*	-	-	-	-	1	1	-	-
71.	*Boraginaceae*	-	-	-	-	3	6	-	-
72.	*Ehretiaceae*	2	3	1	1	-	-	-	-
73.	*Convolvulaceae*	-	-	6	23	-	-	-	-
74.	*Cuscutaceae*	-	-	-	-	1	2	-	-
75.	*Solanaceae*	-	-	3	7	2	2	-	-
76.	*Scrophulariaceae*	-	-	-	-	15	20	-	-
77.	*Lentibulariaceae*	-	-	-	-	1	1	-	-
78.	*Orobanchaceae*	-	-	-	-	1	1	-	-
79.	*Bignoniaceae*	6	6	-	-	-	-	-	-
80.	*Pedaliaceae*	-	-	-	-	2	2	-	-
81.	*Martyniaceae*	-	-	-	-	1	1	-	-
82.	*Acanthaceae*	-	-	3	7	12	24	-	-
83.	*Verbenaceae*	2	2	2	3	2	2	-	-
84.	*Lamiaceae*	-	-	9	15	-	-	-	-
85.	*Nyctaginaceae*	-	-	-	-	4	4	-	-
86.	*Amaranthaceae*	-	-	-	-	9	17	-	-
87.	*Chenopodiaceae*	-	-	-	-	1	2	-	-
88.	*Basellaceae*	-	-	-	-	1	1	-	-
89.	*Phytolaccaceae*	-	-	-	-	1	1	-	-
90.	*Polygonaceae*	-	-	-	-	2	5	-	-
91.	*Aristolochiaceae*	-	-	-	-	2	2	-	-
92.	*Proteaceae*	1	1	-	-	-	-	-	-
93.	*Santalaceae*	1	1	-	-	-	-	-	-
94.	*Euphorbiaceae*	2	2	6	10	6	14	-	-
95.	*Ulmaceae*	2	2	-	-	-	-	-	-
96.	*Cannabinaceae*	-	-	-	-	1	1	-	-
97.	*Moraceae*	1	7	-	-	-	-	-	-
98.	*Casuarinaceae*	1	1	-	-	-	-	-	-
99.	*Ceratophyllaceae*	-	-	-	-	1	1	-	-
100.	*Hydrocharitaceae*	-	-	-	-	4	4	-	-
101.	*Lythraceae*	-	-	-	-	1	1	-	-
102.	*Orchidaceae*	-	-	-	-	1	1	-	-

103.	*Cannaceae*	-	-	-	-	1	1	-	-
104.	*Musaceae*	1	1	-	-	-	-	-	-
105.	*Amaryllidaceae*	-	-	-	-	1	1	-	-
106.	*Agavaceae*	-	-	1	2	-	-	-	-
107.	*Hypoxidaceae*	-	-	-	-	1	1	-	-
108.	*Dioscoreaceae*	-	-	-	-	1	2	-	-
109.	*Liliaceae*	-	-	-	-	8	8	-	-
110.	*Smilacaceae*	-	-	1	1	-	-	-	-
111.	*Pontenderiaceae*	-	-	-	-	2	3	-	-
112.	*Commelinaceae*	-	-	-	-	4	9	-	-
113.	*Juncaceae*	-	-	-	-	1	1	-	-
114.	*Arecaceae*	-	-	1	1	-	-	-	-
115.	*Pandanaceae*	-	-	1	1	-	-	-	-
116.	*Typhaceae*	-	-	-	-	1	1	-	-
117.	*Araceae*	-	-	-	-	2	2	-	-
118.	*Lemnaceae*	-	-	-	-	2	2	-	-
119.	*Alismataceae*	-	-	-	-	1	1	-	-
120.	*Potamogetonaceae*	-	-	-	-	1	4	-	-
121.	*Zannichelliaceae*	-	-	-	-	1	1	-	-
122.	*Najadaceae*	-	-	-	-	1	2	-	-
123.	*Eriocaulaceae*	-	-	-	-	1	1	-	-
124.	*Cyperaceae*	-	-	-	-	-	-	11	29
125.	*Poaceae*	-	-	-	-	-	-	55	88
	Total	**85**	**110**	**105**	**167**	**214**	**318**	**66**	**117**

CONCLUSION

The taxonomic understanding is critical to convene the challenges of biodiversity conservation in the 21st century. (Bhaskaran and Rajan, 2010) It is of fundamental importance for understanding biodiversity and ecosystem functioning, as it provides us with the data to explore and describe biodiversity through scientific analysis. The study provides the basic information about the woody and non woody plant species, which are currently found in the study area. Such a list could play an important role for the local and regional authorities interested in future to conserve and sustainable use the phyto-diversity for the sustainable development of the area. Forest managers can also use such information on important forestry plant species and common tree species alike to help manage habitat as well as provide cultural resource values of these trees. It will also provide a hand list on plant species distribution and diversity in Kota District. In future, it can be used by Ayurvedic Medicine practitioners to preventing disease and also useful for ethno botanist as well as researcher from plant science.

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