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Study on biological spectrum of Madhav National Park, Shivpuri Madhya Pradesh India

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Abstract

The present study was carried out to understand the Biological spectrum of the flora of Madhav National Park. A total of 65 species, 59 genera belonging 41 families were estimated from the study area. Leguminaceae was the dominant family (10.60%) recorded under present investigation. The major class of life form was found to be Phanerophytes (Ph = 63.07%), Chamaephytes (Ch = 18.46%), Hemicryptophyte (He = 13.84%), Cryptophytes (Cr = 1.53%) and Therophytes (Th = 3.07) were represented by 41, 12, 9, 1 and 2 species respectively. Most of the plant species had flowering and fruiting in rainy season, followed by summer season and very few species in winter season.

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Introduction

Life form of the plant is the sum of all life processes, evolved directly in response to the environment (Cain, 1950). Humboldt (1886) for the first time formulated the concept of the life forms for which he considered the location of perennating buds or organs. Raunkiaer (1934) used it as descriptive tool for classifying plant life forms based on the position and degree of protection of the renewing buds, which are responsible for the renewal of the plant's aerial body when the favorable season comes. The life forms are classified on the basis of adaptation of their perennating organs to tide over the unfavorable conditions. Madhav National Park have unique vegetation due to diverse geo-morphology which provides different microhabitats for specific plant growth. Vegetation of this part has many characteristic features because of microhabitat zone, edaphic factors seasonal succession and distributional pattern. On the basis of distribution the plants represent distinct habitats. (Semwal and Gaur, 1981). Raunkiaer grouped the plant species into five main classes: phanerophytes, chamaephytes, hemicryptophytes, cryptophytes and therophytes.The percentage of various life form classes put together reflects the biological spectrum. Raunkiaer (1934) constructed a "normal spectrum" by which different life form spectra could be compared. Raunkiaer's normal spectrum indicates a phanerophytic community for the World and deviation from it determines the phytoclimate of the habitats. The occurrence of similar biological spectra in different regions indicates similar climatic conditions. Differences in the life form distribution between the normal spectrum and a biological spectrum would point out which life form characterizes the phytoclimate or the vegetation under study. The biological spectra of different regions of India have been worked out by different researchers (MeherHomji, 1964; Pandey and Parmar, 1993, Sharma and Dhakre, 1993; Reddy *et al.,* 1999, 2002; Rana *et al.,* 2002; Pattanaik *et al.,* 2007). Thus the biological spectrum of different regions may be worked out and used to compare the widely separated plant communities in terms of their climatic adaptability. Due to distinct variation in climate the district is very rich in plant diversity, such as *Anogeissus pendula,Lannea coromandelica*, *Grewia tilifolia Boswellia serrata Sterculia eurens* and *Acacia catechu* etc.

Although some work is reported on the forests of shivpuri district but it is a floristic survey done by the forest department. No work has been reported on biological spectrum and various life forms of Madhav National Park. Present work has been taken to study the assemblage of different life forms and to prepare the biological spectrum to infer the existing phytoclimate of different sites along the climatic gradient in Madhya National Park, Shivpuri, India.

Materials and Methods

Site Study

The National Park is situated between the following longitude and latitude i.e., 77°15'to 78°30' East latitudes 24°50' to 25°55' North. and is considered to be one of the oldest National park of Madhya pradesh created in the year 1956. The total area of National Park is approx 354.61 sq km at a height of 464 m above the msl. It is situated close to Shivpuri town. Two national highways *viz,* (*Agra-Bombay* (NH-3) and *Jhansi-Shivpuri* (NH-25)) pass through the park. Physical and manmade features have divided the National Park Into 3 zones, viz., North, Central and South. The average temperature is 32°C-45°C in summer and 4°C-15°C in winter. The average rain fall is approximately 100 cm-125 cm/anum falling from July to October.

Collection of Data and Analysis

Phytosociological studies were carried out during 2010 to 2012 to cover over all spectrum of vegetation. The Survey area (Madhav National Park) was divided into 10 sampling zone randomly on the basis of altitude, physiognomy aspects, hill, slope, dry place, water body, road side etc. In each sample zone point centre quarter method was used at five places. Thus a total of 50 sample points were laid down by random sampling method. All the sites were systematically surveyed. The

trees basal area at breast height (130 cm above ground) while herbs were measured at base level.

Results and Discussion

Life form spectrum

Life forms spectrums of Madhav National Park was as such, Phanerophytes (Ph) 63.07%, Chamaephytes (Ch) 18.46%, Hemicryptophyte (He) 13.84%, Cryptophytes (Cr) 1.53% and Therophytes (Th) 3.07% and were represented by 41, 12, 9, 1 and 2 species respectively (**Table 1**) (**Fig.1**). The life form of a plant species is usually a constant characteristic. But the same species may assume different life forms when growing together in a community and competete directly for the same space or niche. Their similarity in structure and form indicates a similarity in adaptation to the utilization of the environmental resources offered in a given space. About 40 plant species (61.53%) flowered during the month of June and July while 23 plant species (35.38%) flowered during August to September and only 5 plant species were reported as evergreen plants. Life form pattern of Madhav National Park reveals that Phanerophytes are most dominant followed by Chamaephytes and Hemicryptophytes . Therophytes and Geophytes are very less amount .It means the climatic condition are favourable for phanerophytes . Biological spectrum has been drawn following the procedure suggested by Pandeya *et al* (1968). Biological spectrum of Madhav National Park was compared with World Normal Spectrum and found that Phanerophytes (63.07) and Chamaephytes (18.46) were greater than Normal spectrum (**Table 2**) (**Fig. 2**). The deviation from normal spectrum in case of Phanerophytes, Chamaephytes, Hemicryptophyte, Cryptophytes and Therophytes in Madhav National Park is obviously due to difference in seasonal aspectation leading to increase in Phanerophytes, Chamaephytes and Therophytes.This could be because of the difference in terrain of MNP. Some area has mountains, while some have large water bodies. Since it is a national park therefore anthropogenic influence is obvious in sampling points close to road or tourist spots.

Table 1. showing Life form number and Percentage.

S. No.	Life forms	Abbrev-iation	Number	Percen-tage
1	Phanerophyte	Ph	41	63.07
2	Chamaephyte	Ch	12	18.46
3	Hemicryptophyte	H	9	13.84
4	Cryptophyte	Cr	1	1.53
5	Therophyte	Th	2	3.07
6	**Total**		**65**	**100**

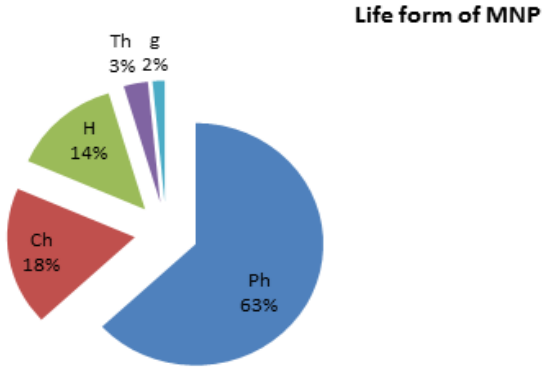

Fig. 1. Showing Percentage of life forms.

Table 2. Showing Comparative Biological Spectrum.

S. No.	Name	World Normal Spectrum	Madhav National Park
1	Phanerophytes	46	63.07
2	Chamaephytes	9	18.46
3	Hemicrytophytes	26	13.84
4	Geophytes	4	1.53
5	Hydrophyte	2	0
6	Therophytes	13	3.07

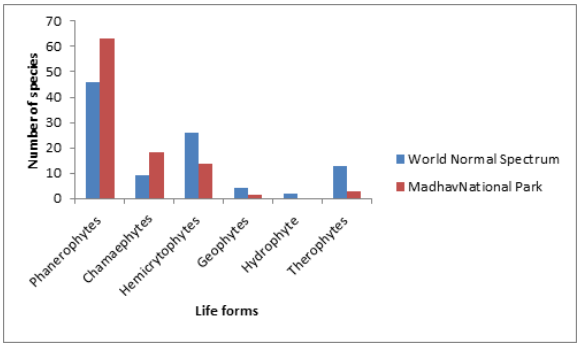

Fig. 2. Showing comparision between WNM and MNP.

Presently the vegetation is good, but the sustainability of this vegetation over a long period of time is questionable. The water availability depends on monsoon, which fortunately during the study period was good.

Life form Species

The following Life form species were present in Madhav National Park.

Phanerophytes – 41 species

Acacia catechu, 2) Acacia nilotica, 3) Butea monosperma, 4) Bauhenia racemosa, 5) Bauhenia variegate, 6) Cassia fistula, 7) Albezia lebbek, 8) Thespesia populnea, 9) Ficus glomerata, 10) Anona squamosa, 11) Saccopetalum tomentosum, 12) Mangifera indica, 13) Lannea coromandelica, 14) Buchanania lanzan, 15) Anogeissus pendula, 16) Terminalia bellarica, 17) Terminalia arjuna, 18) Embelica officinalis, 19) Bridilia retusa, 20) Mitragyna parvifolia, 21) Cephalus cadamba, 22) Eugenia jambolanum, 23) Balanitis roxburghii, 24) Grewia tilifolia, 25) Diospyros tomentosum, 26) Sterculia eurens, 27) Ziziphus xylopyra, 28) Phoenix sylvestris, 29) Manilkara hexandra, 30) Madhuca indica, 31) Elaeodendron roxburghii, 32) Mimosa duteii, 33) Boswellia serrata, 34) Ziziphus oenoplia, 35) Carica indicus, 36) Nerium indcum, 37) Myrsine africana, 38) Ipomea cornea, 39) Vitex negundi, 40) Myrtus communis, 41) Syzygium heyneanum.

Chamaephytes – 12 species

1) *Helicteres isora,* 2) *Lantana cmara, 3) Athatoda vesica, 4 Solanum nigrum, 5) Ziziphus nummularia, 6) Barleria prionitis, 7) Achyranthes aspera, 8) Oscimum basilicum, 9) Gymnema sylvestris, 10) Abrus precatorius, 11) Parthenium, 12) Cassia tora*

Hemicryptophytes– 9 species

1) *Aloe vera, 2) Opuntia Cactaceae, 3) Convolvulus pluricaulis, 4) Eclipta alba, 5) Spheranthus indicus, 6) Euphorbia thymifolia, 7) Peristrophe bicaliculata, 8) Marsilea, 9) Cyanodon dactylon,*

Geophytes – 1 species

1) Saccharum munja

Therophytes – 2 species

Trigonella, Sida cardifolia

Conclusion

It is concluded that vegetation biological spectrum more accurately describes the vegetation physiognomy, since individuals are counted by their life form. The differential pattern of rainfall and temperature appears as the most operative factor as compared to biotic factors for evaluation of biological spectrum. The present study also concludes that vegetation biological spectrum is considerable at all scales and provides a clear picture of prevailing climate.

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