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Original Research Paper

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PHYTOSOCIOLOGICAL ANALYSIS OF THE FLORA OF MADHAV NATIONAL PARK, SHIVPURI [M.P.]

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ABSTRACT

The paper deal with the phytosociological analysis of unexplored Madhav national park. The phytosociology is one of the important aspect for analyzing the structure and composition of vegetation and its dynamics. The quantitative study of vegetation is called Phytosociology or the special field of study of plant communities with respect to their components structure and classification forms the basis of division of ecology called phytosociology. The present paper focuses on the tree species diversity observed in tropical forest area of MNP district, Shivpuri, M.P., via survey conducted during 2010 to 2012. As a result, in all 65 species of the plants were recorded from MNP. A total of 65 species, 59 genera, belonging 41 families were estimated from the study area in which 33 are tree and 18 are shrubs. Leguiminaceae was the dominant family recorded under present investigation. Author observed 16 type plant community . That indicates the vegetation of forest is dry deciduous and thorny scrub type. Hence, the proposed work, will add much new information about biodiversity. Phytoclimate of MNP is phanerochamaephytic . The phytosociological studies quantitatively analyzed for basal area , relative density,relative frequency and relative dominance (Phillip 1959). The importance value index (IVI) was determined as the sum of the relative frequency, relative density, and relative dominance.

KEYWORDS : Phytosociology, Basal area, ,RF,RD,RDo,IVI and Biodiversity .

Introduction:

Vegetation is complex in nature and its structure and composition differs from place to place because of varying climatic condition and topography (Singh, 2006; Raturi 2012).

Madhya Pradesh is the home of several National Parks, MNP is one of them. It is created in the year 1956. It is situated near the Shivpuri town in the central highlands of India and forms parts of upper vindhyan ranges . It is located in the zone -4 which is semi arid zone , out of two separate biotic province . This region the national park is situated in province-2 i.e- Gujarat and Rajwara province (4 B) (Rodger and Pawar 1988).

The vegetation of large area of the world(Earth) remains poorly under stood , according to Eckholm (1978) more than 50% species of tropical rain forest have not been documented . Leave aside the detail ecological information about and few studies are available.

A stress has been laid down on the preparation of the flora of M.P. by Hewetson (1951). Since than various parts of states national parks vegetation has been explored. But the available botanical literature indicate that the Phytosociology of MNP never been systematically investigated . Therefore the paper proper to make a detailed phytosociological survey was carried out to analyze the structure, composition, distribution and diversity of woody vegetation in MNP . The present work is based on botanical excursions undertaken by the author from (2009- 2013) .

Location of MNP :

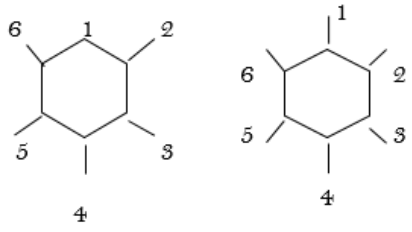
MNP of Shivpuri lies between 24˚14' to 25˚55' N latitude and 77˚ 15' to 78˚ 30' E longitude. It has an average altitude of about 464 msl and a national highway NH-3 passes through and devide it in to 2 separate parts .

Climate : The climate of MNP Shivpuri is semi arid . Average rainfall is 816mm & average monthly temperature fluctuates between 23˚c t0 40˚c , relative humidity in monsoon, post monsoon and winter season is 70,50 and 65% respectively, while it is 20% in after noon of summer season.

Materials and Methods :

Study Area : - The study was conducted during 2010 and 2012 to cover all spectrum of vegetation at Madhav National Park in Shivpuri District of State Madhya Pradesh .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. The total area of National Park is approx 354.61 sq km at a height of 464 m above the msl.

Data Collection :- The Survey of (Madhav National Park) was done every two month of the year and the site was divided into 10 sampling zones randomly on the basis of altitude, physiognomy, hill, slope, dry place, water body, road side. In each sample zone point centre quarter method was used at five places to study each zone. Thus a total of 50 sample points were laid down with sampling intensity based on random sampling method. All the plots were systematically surveyed for all the tree (basal area) and at breast height (130 cm above ground) and herbs measure at base level . Point centre quarter method was used for the survey . All plots sample were representative of the most common forest type of Madhav national park *i.e* . tropical dry deciduous and thorn forest . The plant materials were collected in a polythene bags and giving the sample site ,number and name.The collected plant material was identified with the help of flora ,journals , herbarium of Jiwaji university and herbarium of Forest Research Institute of Dehradun. Phenological observation were made and accordingly phenograms of both trees and herbs were prepared as follows.

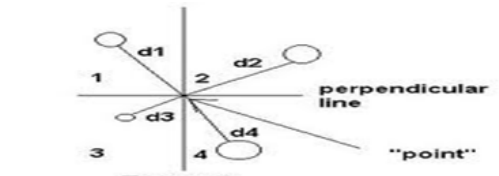


A) Phenogram of woody plants (Trees)

1. Incoming of new leaves
2. Vegetative phase
3. Flowering
4. Fruiting
5. Fruit fall
6. Leaf fall

B) Phenogram of Annual plants (Herbs)

1. Germination
2. Vegetative growth
3. Flowering
4. Fruiting
5. Fruit fall
6. Death



Point-centered Quarter Method

Result and Discussion :-

The term Phytosociology was coined by Josef Paczoski in 1869. It is also known as plant sociology, plant coenology or phytocoenology. Phytosociology is the study of plant communities with regard to their components structure and classification including species diversity, growth trends of succession etc. In the study area, a total of 33 trees ,18 shrub and remaining 14 herbs species were encountered which belonging to 41 families and 59 genera with *Anogeissus pendula* as the most dominant species .

Table . 1 TOTAL SPECIES FOUND IN M.N.P. TREE

S.NO.	LOCAL NAME	SPECIES NAME	FAMILY
1 .	KHAIR	*Acacia catechu*	Leguiminaceae
2 .	BABUL	*Acacia nilotica*	,,
3.	PALASH	*Butea monosperma*	,,
4.	SAINTHA	*Bauhenia racemosa*	,,
5.	KACHNAR	*Bauhenia variegate*	,,
6.	AMALTAS	*Casia fistula*	,,
7.	SIRIS	*Albezia lebbek*	,,
8.	PARAS PIPAL	*Thespesia populnea*	Moraceae
9.	GULAR	*Ficus glomerata*	,,
10.	SITAFAL	*Anona squamosa*	Anonaceae
11.	KARI	*Saccopetalum tomentosum*	,,
12.	AAM	*Mangifera indica*	Anacardiaceae
13.	GURJAN	*Lannea coromandelica*	,,
14.	ACHAR	*Buchanania lanzan*	"
15.	KARDHAI	*Anogeissus pendula*	Combretaceae
16.	BAHERA	*Terminalia bellarica*	,,
17.	KOHA(ARJUN)	*Terminalia arjuna*	,,
18.	AMLA	*Embelica officinalis*	Euphorbiaceae
19.	AKAJ	*Bridilia retusa*	,,
20.	KAIM	*Mitragyna parvifolia*	Rubiaceae
21.	KADAMB	*Cephalus cadamba*	,,
22.	JAMUN	*Eugenia jambolanum*	Myrtaceae
23.	HINGOTA	*Balanitis roxburghii*	zygophyllaceae
24.	DHAMAN	*Grewia tilifolia*	Tiliaceae
25.	TENDU	*Diospyros tomentosa*	Ebenaceae
26.	KAREH(KULU)	*Sterculia eurens*	Sterculiaceae
27.	GHONT	*Ziziphus xylopyra*	Rhamnaceae
28.	DATE PALM	*Phoenix sylvestris*	Palmae
29.	KHINNI	*Monilkara hexandra*	Sapotaceae
30.	MAHUA	*Madhuca indica*	,,
31.	JAMRASI	*Elaeodendron roxburghii*	Celasteraceae
32.	JANGALJALEBI	*Mimosa duteii*	Mimosaceae
33.	SALAI	*Boswellia serrata*	Burseraceae
SHRUBS			
1 .	KARONDA	*Carica indicus*	Apocynaceae
2 .	KANER	*Nerium indicum*	,,
3 .	LANTANA	*Lantana camara*	Verbanaceae
4 .	NIRGUDI	*Vitex negundi*	,,
5 .	MEHNDI	*Myrtus communis*	Myrtaceae
6 .	KAT JAMUN	*Syzygium heyneanum*	,,
7 .	MARORPHARI	*Helictorus isora*	Sterculiaceae
8 .	MAKOI	*Ziziphus oenoplia*	Bhamnaceae
9 .	ADUSA	*Athatoda vesica*	Acanthaceae
10.	MAKOY	*Solanum nigrum*	Solanaceae
11.	JHARBERRI	*Ziziphus nummularia*	Rhmnaceae
12.	ALOE	*Aloe vera*	Cactaceae
13.	BARLERIA	*Barleria prionitis*	Acanthaceae
14.	CHAPARA	*Myrsine africana*	Myrsinaceae
15.	BESARAM	*Ipomea cornea*	Convulvulaceae
16.	GUDMAR	*Gymnema sylvestris*	Asclepiadaceae
17.	GOMCHI	*Abrus precatorius*	Papilionaceae
18.	OPUNTIA	*Opuntia*	Cactaceae
HERBS			
1 .	ATAJHARA	*Achyranthus aspera*	Amaranthaceae
2 .	BANTULSI	*Oscimum basilicum*	Labiateae
3 .	SANKHPUSHPI	*Convolvulus pluricaulis*	Convolvulaceae
4 .	GHAMARA	*Eclipta alba*	Asteraceae
5 .	GORAKHMUNDI	*Spheranthus indicus*	,,
6 .	JANGLI MENTHI	*Trigonella*	Malvaceae
7 .	SIDA	*Sida cardifolia*	,,
8 .	DUDHI	*Euphorbia thymibloa*	Euphorbiaceae
9 .	GAJAR GHAS	*Parthenium*	Compositeae
10 .	MARSILEA	*Marsilea*	Marsiliaceae
11 .	DUB	*Cyanadon dactylon*	Graminae
12 .	MUNJ	*Saccharum munja*	,,
13 .	PUAR	*Casia tora*	Leguiminaceae
14 .	SADABAHAR	*Peristrophe bi caliculata*	Acanthaceae

Table -2. Plant species

S.no.		No.	Dicot	Monocot
1	Family	41	39	2
2	Genus	59	54	5
3	Species	65	60	5

Table - 3 . MNP Life Forms

PH = 41	**Ch = 12**	**H = 9**	**Th = 2**	**G = 1 .**

Family = 41, Genus = 59, Species = 65.
Dicot Genus = 54, Monocot Genus = 5.
Dicot Species = 60, Monocot Species = 5

Table No. 4. Phytosociological Characters at MNP .

S. No.	Name of Species	Points					Total no. of points in which species occur	Total no. of species present	RF	RD	Rdo	IVI
		1	2	3	4	5						
1	*Butea monosperma*	0	1	1	0	0	2	2	6.897	5.263	30.719	42.878
2	*Eugenia jambolanum*	0	0	2	0	1	2	3	5.882	4.412	60.003	70.298
3	*Cassia fistula*	1	0	0	1	1	3	3	10.714	9.677	18.618	39.010
4	*Mangifera indica*	0	0	1	1	0	2	2	4.762	3.571	25.903	34.236
5	*Lannea coromandelica*	1	2	2	2	1	5	8	12.195	16.327	8.757	37.279
6	*Anogeissus pendula*	2	0	1	1	1	4	5	11.429	11.111	11.684	34.224
7	*Anogeissus pendula*	1	2	1	1	0	4	5	10.811	10.000	21.107	41.918
8	*Ficus glomeratus*	1	0	0	0	0	1	1	3.448	2.000	85.678	91.126
9	*Grewia tilifolia*	1	0	1	0	1	3	3	10.714	8.571	32.346	51.632
10	*Mitragyna parviflora*	1	2	0	1	0	3	4	8.571	8.889	18.311	35.772

The phytosociological studies quantitatively analyzed for basal area , relative density,relative frequency and relative dominance . The importance value index (IVI) was determined as the sum of the relative frequency, relative density, and relative dominance etc can find by following formulas.

IVI = Relative Density + Relative Frequency+ Relative Dominance

Relative density = $\frac{\text{Density value of species}}{\text{Sum of density value of all species}} \times 100$

Relative frequency = $\frac{\text{Frequency value of species}}{\text{Sum of frequency value of all species}} \times 100$

Relative dominance = $\frac{\text{Total basal area of the species}}{\text{Total basal area of all species Biodiversity}} \times 100$

An observation on Phytosociological characteristics is one of the basic requirements to estimate the current status of forest resources or to effectively plan and conserve the existing forest covers out of 39 families recorded for the representative genera and species *Combretaceae* and *Anacardiaceae* families were observed to be dominant at all site .These families were represented by 59 genera and 65 Species with 5 genus and 7 Species of family Leguiminaceae is the dominant families , 14 were herbs/ prostrate herbs (2 grasses, 3 climber),18 shrubs /under shrubs and remaining 33 were trees. Detail of vegetational features are shown in figure .M o n o c o t represent by 2 families Gramineae .and Palmeae while remaining 39 families represented Dicot.

Life forms of the MNP is compared with the normal world spectrum . The percentage of Phanerophytes (63.07) is predominate in this area. Followed by chamaephytes (18.46) , hemicryptophytes (13.84) , cryptophytes (1.53) and therophytes (3.07) . The area presents both warm and dry climate and warm moist climate during various season. It is warm moist during rainy season and warm dry during summer months . This condition can explain the preponderance of phanerophytes in the present investigation.

According to phenological pattern 40 plant species (61.53%) flowered from the month of June and July while 23 plant species (35.38%) flowered from August to September and 5 plant species investigated area were reported as evergreen plants.

The structural aspect of the investigation is usually connected with the physical , biological characteristics of the vegetation during different period of its life history including vegetative phase, flowering, fruiting and leaf fall etc.

This study helpful in identification of community formation, vegetational development , phonological aspects, life forms, cycling of nutrient and growth forms the functional aspects of the ecosystem. The forest vegetation of Madhav National Park have tropical dry deciduous because low rain fall and high temperature. During March month mostly vegetation showing leaf fall and new leaf arising , after it phonological chronology started.The phytosociological attributes of the park , showing different zone in different vegetation.

Site no. 1 have maximum IVI was for *Butea monosperma* and minimum IVI was for *Saccharum munja* in one month , other month have *Peristrophe bicaliculata*, *convolvulus pluricaulis*, site no.2 have maximum IVI was for *Eugenia jambolanum* and minimum IVI was for *Euphorbia thymifolia* and *Marsilea*. For site no.3 *Casia fistula* have maximum IVI and minimum IVI was for *Aloe vera* , site no.4 have maximum IVI was for *Mangifera indica* and minimum IVI was for *Spheranthus indicus* and also *Cyanadon dactylon* in other month , site no.5 have maximum IVI was for Lannea coromandelica and minimum IVI was for *Achyranthus aspera* , site no.6 have maximum IVI was for *Anogeissus pendula* and minimum IVI was for *Abrus precatorius* , site no.7 have maximum IVI was for again *Anogeissus pendula* and minimum IVI was for *Lantana camara* , site no.8 have maximum IVI was for *ficus glomeratus* and minimum IVI was for *Carica indicus*, *Cyanadon dactylon* and *Achyranthus aspera etc,* at site no.9 *Grewia tilifolia* and *Carica indica* had maximum and minimum IVI respectively . And site no.10 have and minimum IVI was for *Mitragyna parviflora* and *Lantana camara* respectively .

The herb , shrub shows minimum IVI and Trees revealed maximum IVI through out the sampling period.

The climatic study of the area under investigation clearly reveals that there is is a monoxeric climate shows dry phases followed by a wet phase and dry phase extends for nearly eight months comparatively greater dry period than the wet one clearly indicate that the climate is of semi- arid type. This semi arid climate hold a vegetation which is adapted for such climatic conditions.

The long dry and hot period requires a very specific adaptation for the survival of the vegetation .The constant exposure of the vegetation to such cyclic changes leads to plant succession culminating into a stable community, the climatic climax. A climatic region may be determined not only by the amount of rainfall and temperature but also the length of dryness and the season of occurence of drought. In Madhav National park ,Shivpuri , there is a cool season drought and summer rains which corresponds to semi-arid climate. The climate is marked by south west monsoon with rains from June to September . Such a climate affords a dry deciduous forest as climax. This forest type is dominated by *Anogeissus pendula* (Kardhai) , *Boswellia serrata* (Salai) , *Butea monosperma* (Palas) , and *Lannea coromandelica* (Gurjan).

Plants have shown comparatively higher relative frequency and relative density, consequetly higher degree on dispersion and numerical strength of species in winter season on account of most sustainable climatic conditions. It seems, in such natural communities , that stability appears to depend on the balance between the stability and variability of the environment.

Three groups of vegetation were characterized trees, shrubs and herbs.The herbaceous flora is mainly seasonal and appears during rainy season. On the basis of deterioration, scrub forest, open forest and dense forest were categorized.

The study of the phytosociological characteristics of Madhav National Park, provide the complete status of species diversity and community association of the area, which is not known yet and *Madhuca longifolia, Diospyros tomentosa* knowledge of the potential economic plants of the area. It has been observed that although the area has been conserved as a Madhav National Park but it faces threat from tourist visiting various caves and waterfalls.Hence more concerted efforts should be made for the conservation of phytosociology of the MNP, in general further suggested that there must be sustainable utilization of plant resources in order to uplift the economy of the tribal efforts should be made to grow indigenous economic plants like *Diospyros melanoxylon*, *Madhuca longifolia*, *Buchanania lanzan*, *Terminalia arjuna*, *T. chebula* etc.

So I concluded that the irregularities of species distribution due to depends upon the environmental condition . The increasing or decreasing trend of result in relative frequency , relative density , RDo as well as IVI herb/ trees attributed to be due to variation in species composition inter and intra specific competition among the species micro and macroclimatic fluctuation , physiochemical characteristics of the soil as well as the photosynthetic efficiency of the species concerned. There are both natural and man made causes which have used a serious threat to the phytosociology . The natural causes include fluctuation , abiotic parameters of the environment such drought, flood meteors and biotic parameters such natural competetion between species biology species , natural regeneration, disease and spread alien(invasive) species.

Conclusion :- It is concluded that phytosociology of MNP 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 phytosociology. The present study also concludes that vegetation patterns is considerable at all scales and provides a clear picture of prevailing climate.

The phytosociological analysis of these forest communities reveals that there is a big gap between the values of various parameters like IVI, density, frequency, abundance etc. There are many tree species having very low values of IVI and other parameters and these species deserve more attention for conservation.

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