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Ecological analysis of trees at Jaisinghnagar Tahsil (M.P.) India

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Abstract

Madhya Pradesh boasts a wealth of traditional knowledge connected to its biodiversity. This paper focuses on the ecological analysis of tree species in the Jaisinghnagar Tahsil region of Madhya Pradesh (M.P.). The study utilized the quadrat method for assessing vegetation. Through repeated quadrat sampling, the presence of 10 tree species was recorded along with their frequency, abundance, and density. The findings were analyzed using Raunkiaer's classification and the Importance Value Index (IVI).

Keywords: Biodiversity, ecological trees, quadrat sampling

Introduction

India, the seventh-largest country in the world, boasts extraordinary biological diversity. According to the World Conservation and Monitoring Center, India is among the 17 recognized mega-diverse nations globally. Understanding the ecological vegetation of plants in a specific area requires basic knowledge of factors like climate, rainfall, and temperature. Madhya Pradesh, with its diverse climatic conditions, provides an environment conducive to a wide variety of flora. Within the state, Jaisinghnagar has a relatively moderate climate characterized by high rainfall and low evaporation rates. These conditions make survival easier for plants, resulting in an abundance of vegetation that supports wildlife by providing ample food resources. However, this can lead to the problem of overgrazing, which may disturb the soil's natural balance and ultimately cause an imbalance in the region's plant ecology. Trees refers to the collective plant life or greenery found in a particular region or area. The flora of Madhya Pradesh encompasses a diverse array of plant species. Conducting a taxonomic study of this flora is crucial to grasp the full scope of biological diversity. Such research plays a vital role in assessing plant diversity, guiding conservation efforts, and promoting sustainable use of natural resources.

Study Area

Jaisinghnagar is a tahsil and a Nagar panchayat in Shahdol district in the Indian state of Madhya Pradesh. Latitude: 23° 37' 48.00" N Longitude: 78° 34' 12.00" E. Jaisinghnagar tehsil covering area approximately 1,673 km². Its climate is sub-tropical with hot summers, and its drainage pattern is primarily dendritic, characterized by a generally flat terrain on either side of the Lerar Nala with scanty vegetation. The area's economy relies on agriculture, with crops like paddy and maize, and oilseeds, and it is also a significant area for sand mining for construction purposes.

Materials and Methods

Phytosociological studies were conducted by using quadrat method. The density, frequency and abundance were estimated in the randomly placed quadrates. For vegetation sampling and analysis minimum 11 quadrates taken and each of size 100 mt. x 100 mt. for trees (Goldsmith *et al.* 1986) ^[1]. Each quadrat was subdivided in to 5 mt. x 5 mt. The quadrates were laid out randomly throughout the study area in each site. The size and the number of quadrates were determined by the species curve (Misra, 1968) ^[2]. All the species occurring in each quadrat was noted and their numerical count was carried out. Names of species and number of individual species in each unit are recorded and percentage frequency, density and abundance

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are calculated by the formula. The Importance value index (IVI) for each species was determined as sum of relative density, relative frequency and relative dominance (Phillips, 1959; and Curtis, 1959) [3-4]. The frequency of individual species is the number of times.

The species occur in the sampling unit. It is usually represented as a percentage calculated as follows.

$$\text{Frequency} = \frac{\text{Number of plots in which species occurs}}{\text{Total number of plots sampled}} \times 100$$

$$\text{Relative Frequency} = \frac{\text{Frequency of a particular species}}{\text{Total frequency of all species}} \times 100$$

Raunkiaer (1934) [5] made an elaborative study, divided species into 5 classes viz. A, B, C, D, E. Raunkiaer suggested law of frequency species poorly distributed in an area are to be presented more compared to those that have better dispersion in an area, like that A>B>C>D>E. Raunkiaer's normal frequency diagram was a histogram made on the bases of the average frequency data in which value shows by above chart. In disturbed ecosystems, the frequency distribution varies from that of normal as proposed by Raunkiaer.

Density

Density is the number of counting units per unit area and is measured in quadrates of varying sizes. Density can be calculated by species or for all species combined. The formula for calculation of species density is as follows.

$$\text{Density} = \frac{\text{Total number of individuals of the species in all the sampling units}}{\text{Total number of units studied}}$$

$$\text{Relative Density} = \frac{\text{Density for a species}}{\text{Total density for all species}} \times 100$$

Abundance

Abundance is also calculated like density but in this case, only those quadrates are considered for calculation where a species actually occurs. The formula for calculation of species abundance is as follows.

$$\text{Abundance} = \frac{\text{Total number of individuals of the species in all the sampling units}}{\text{Number of sampling units in which the species occurred}}$$

$$\text{Relative Abundance} = \frac{\text{Abundance of a species}}{\text{Total Abundance of all species}} \times 100$$

Importance Value Index

The sum of three relative values is considered an Important value Index:

IVI= Relative frequency + Relative Abundance + Relative density

Result and Discussion

Present study field covers approximately an area of 3250 m². In this area ecological study was made, table: 1 which shows *Acacia nilotica* has maximum 90.91, 2.73 frequency and density respectively, whereas, *Ficus benghalensis* has minimum 18.18, 0.18 frequency and density respectively. *Acacia nilotica* has maximum abundance 3.00 and *Ficus religiosa* L. have minimum abundance 0.83.

The distribution of species was calculated based on frequency class and vegetation. Present ecological study was made, table: 2 which shows the frequency values refers to Raunkier's formula A>B>C>D>E. Prepared frequency diagram (fig: 2), does not match with normal diagram (fig: 1) which disclose the heterogeneity of the vegetation.

Present investigation in Table 3 study of IVI value *Ficus benghalensis* L. has minimum 10.97 IVI, and *Acacia nilotica* 60.70 has maximum IVI (Fig. 3).

Table 1: Result of frequency, density and abundance analysis

S. No.	Name of the Species	Total No. of individual species	Total No. of Quadrat of occurrence	Total No. of Quadrat studied	Frequency (%)	Frequency class	Density	Abundance
1.	<i>Azadirachta Indica</i> A. Juss	20	8	11	72.73	D	1.82	2.50
2.	<i>Ficus benghalensis</i> L.	2	2	11	18.18	A	0.18	1.00
3.	<i>Ficus religiosa</i> L.	5	6	11	54.55	C	0.45	0.83
4.	<i>Holoptelea integrifolia</i> (Roxb) P.	15	8	11	72.73	D	1.36	1.88
5.	<i>Prosopis cineraria</i> (L.) Druce	12	5	11	45.45	C	1.09	2.40
6.	<i>Salvadora persica</i> L.	9	8	11	72.73	D	0.82	1.13
7.	<i>Syzygium cumini</i> (L.) Skeels	4	4	11	36.36	B	0.36	1.00
8.	<i>Acacia nilotica</i> L.	30	10	11	90.91	E	2.73	3.00
9.	<i>Polyalthia longifolia</i> Sonn.	6	4	11	36.36	C	0.55	1.50
10.	<i>Eucalyptus globulus</i> Labill.	10	6	11	54.55	C	0.91	1.67

Table 2: Raunkiaer's Frequency class distribution.

Raunkiaer's Frequency class	Class value	Raunkier's value	Frequency class of vegetation
A	0-20	53	10
B	21-40	14	10
C	41-60	9	40
D	61-80	8	30
E	81-100	16	10

Table 3: Result of phyto-sociological analysis.

S. No.	Name of the Species	Relative Frequency	Relative density	Relative abundance	IVI
1.	<i>Azadirachta indica</i> A. Juss	13.11	17.70	14.79	45.61
2.	<i>Ficus benghalensis</i> L.	3.28	1.77	5.92	10.97
3.	<i>Ficus religiosa</i> L.	9.84	4.43	4.93	19.19
4.	<i>Holoptelea integrifolia</i> (Roxb) P.	13.11	13.28	11.09	37.49
5.	<i>Prosopis cineraria</i> (L.) Druce	8.20	10.62	14.20	33.02
6.	<i>Salvadora persica</i> L.	13.11	7.97	6.66	27.74
7.	<i>Syzygium cumini</i> (L.) Skeels	6.56	3.54	5.92	16.02
8.	<i>Acacia nilotica</i> L.	16.39	26.56	17.75	60.70
9.	<i>Polyalthia longifolia</i> Sonn.	6.56	5.31	8.88	20.74
10.	<i>Eucalyptus globulus</i> Labill.	9.84	8.85	9.86	28.55

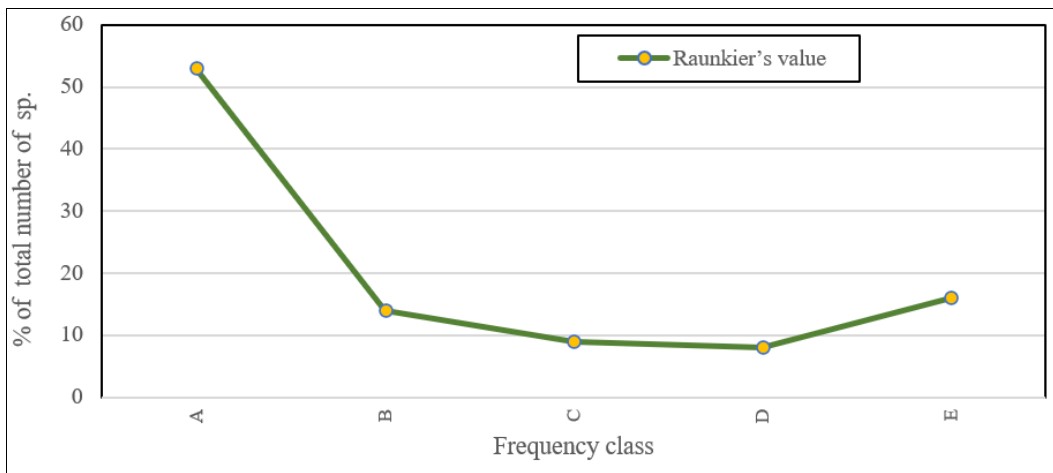


Fig 1: Graph analysis of Raunkiaer's Normal Frequency

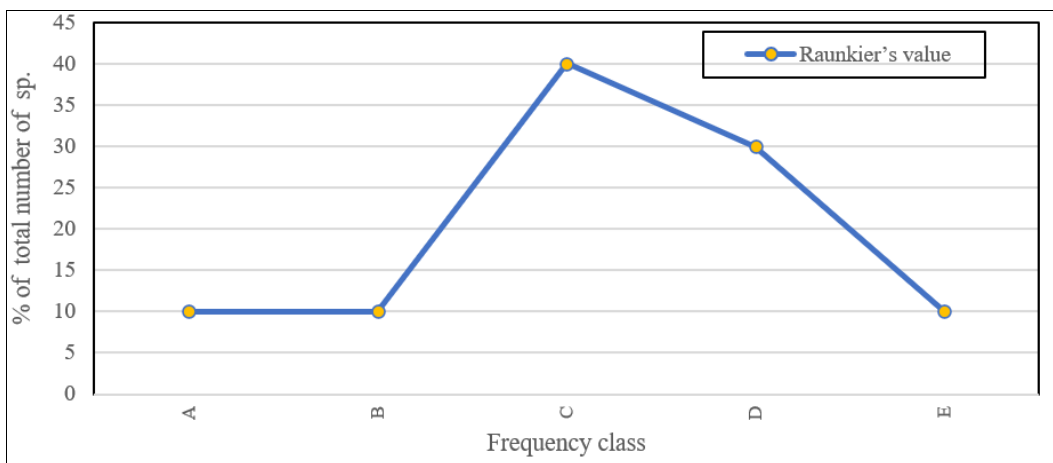


Fig 2: Graph analysis of Frequency.

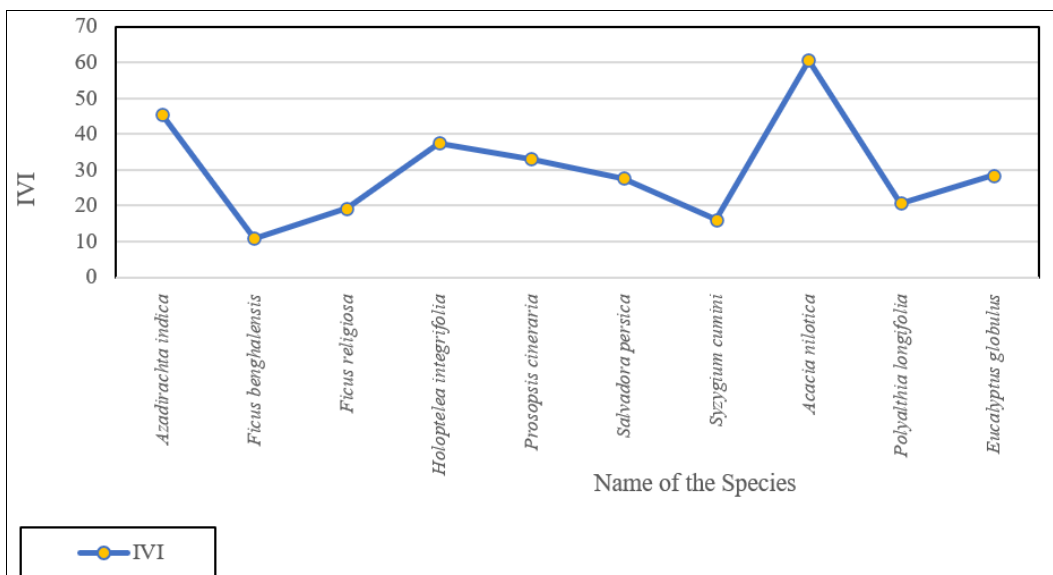


Fig 3: Graph analysis of IVI.

Conclusion

This study offers insights into an ecological investigation focusing on 10 tree species. Observations revealed that the area's dynamics are strongly influenced by natural plant resources in the surrounding environment, which significantly impact the daily lives of local communities. The frequency diagram created for this study did not align with Raunkiaer's normal frequency diagram, indicating that the vegetation found in the region is heterogeneous. Among the species

studied, *Azadirachta indica* A. Juss. emerged as the most abundant in the Jaisinghnagar tahsil.

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References

1. Goldsmith FB, Harrison CM, Morton AJ. Description

- and analysis of vegetation. In: Moore PD, Chapman SB, editors. *Methods in plant ecology*. Oxford: Blackwell Scientific; 1986. p. 442-82.
2. Misra R. *Ecology work book*. Calcutta: Oxford and IBH Publication Co.; 1968. 249 p.
 3. Philips EA. *Methods of vegetation study*. New York: Henry Holt Company; 1959. 107 p.
 4. Curtis JT. *The vegetation of Wisconsin: an ordination of plant communities*. Madison (WI): University of Wisconsin Press; 1959. 657 p.
 5. Raunkiaer C. *The life forms of plants and statistical plant geography*. Oxford: Oxford University Press; 1934.