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ECOLOGICAL AND FLORISTIC STUDIES OF THE VINDHYA REGION: A COMPREHENSIVE ASSESSMENT

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ABSTRACT

The Vindhya region of central India is known for its rich biodiversity and diverse ecological habitats, ranging from dry deciduous forests to scrublands. The survey was conducted during different seasons of the year 2023-24 after rainy seasons, in winter & in Basant seasons. Flora of trees, herbs, shrubs and grasses were collected in flowering and fruiting stage & herbarium sheets were prepared. Soil samples from forest, agricultural and barren lands were collected and analyzed for different parameters. In a floristic survey 135 plants species belonging to different families were recorded. This research paper presents a comprehensive ecological and floristic study conducted across various parts of the Vindhya Range, emphasizing species composition, community structure, and the impact of human disturbances. The study aims to provide critical data for conservation and management of this ecologically significant region.

Keywords: Floristic, Vindhya region, Ecological, Anthropogenic.

INTRODUCTION: -

The Vindhya Mountain range stretches across central India and plays a crucial role in separating the northern plains from the southern plateau. Ecologically, the region forms a transitional zone with a unique amalgamation of flora from both northern

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and peninsular India. The area supports a wide variety of plant species adapted to diverse microhabitats. However, due to increasing anthropogenic pressures like deforestation, mining, and overgrazing, the ecological balance is under threat. Uttar Pradesh is situated in the northern part of India. Sharing international border with Nepal. The Himalayas are located in the north part of the state and the plains cover most of the state. UP can be separated into three different hypsographical regions. The first one is the Himalayas region in the north. It has an extremely rugged and varied terrain. The topography varies to elevation ranging from 300 m to 500 m. the second is the Gangetic plain in the center. It has highly fertile alluvial soils and a flat landscape which is dotted by numerous lakes rivers etc. the third are the Vindhya hills and plateau in the south. It has a hard rock stratum and a diverse topography of plains, hills, valleys and plateau, water is limited in this region.

The weather of the state has primarily subtropical features. It experiences four seasons and has a humid temperate climate. The Himalayan region is cold while the weather in the plains varies in different seasons. The state has three distinct seasons. The winter season is from October to February, the summer season is from March to mid-June the rainy season is from June to September average temperature of 45°C accompanied by dust laden winds. Annuals rainfall of 990 mm.

The Vindhya region refers to the area surrounding the Vindhya Mountain range one of the major mountain systems in central India. These hills stretch across M.P., U.P., Chhattisgarh, and parts of Rajasthan and Bihar. Geographically they form a natural divide between North India and South India.

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The western part of Vindhya region is floristically richest part. The forest of *Madhuca indica*(Mahua), *Zizyphus mummularia* (Char beri), *Albizzia lebbek*, *Butea mososperma* are found in abundance. The forests are situated along the Uttar Pradesh – Jharkhand border. The central part having forest of Billi Bari with dominating species *Melia azadirachta* L., *Butea monosperma* ,*Tectona grandis* L. etc.

The soil in the valley is rich alluvial of the medium to heavy clay loam type on the top of the hills it tends to become gravel and shallow and of poor nutritive value. The soil is well drained on the hill slopes but along the foot of the hills sometimes it is water logged. Average annual rainfall is 750.7mm in the month of July, August and September; temperature ranges from 28°C to 45°C in summer and 4°C and 18°C in winter. As there is no published flora of Vindhya region Mirzapur and Sonbhadra district. In view of these present studies on the natural flora of this district has been taken. No doubt some work has been done on the study of vegetation of south east U.P. but still there is a pressing need for the survey of some more areas.

Study Area: The study was conducted in selected locations within the Vindhya range, including parts of Uttar Pradesh (Mirzapur, Sonbhadra) and Madhya Pradesh (Rewa, Satna). The region experiences a tropical monsoon climate with average rainfall of 800-1,200 mm annually and temperatures ranging between 10°C and 45°C.

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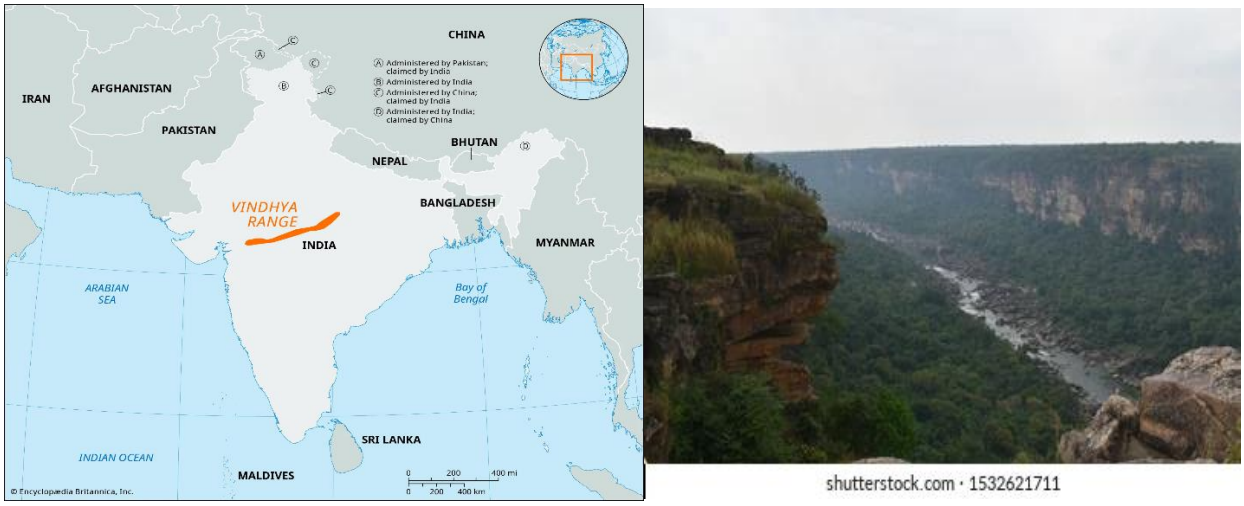

Fig-1 Map and Flora of Vindhya Region

Methodology-

Field Surveys: Conducted between October 2023 and February 2024 using quadrat sampling (10m × 10m for trees, 5m × 5m for shrubs, 1m × 1m for herbs).

Species Identification: Based on standard floras including "Flora of Upper Gangetic Plain" and "Flora of Madhya Pradesh".

Ecological Indices:

Species Richness (S)

Shannon-Wiener Diversity Index (H')

Importance Value Index (IVI)

Simpson's Dominance Index (D)

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Table No.1

An Enumeration of the plants inhabiting the Vindhya region including (herb, Shrubs, Trees)

Sr. No	Scientific Name	Common/ Local Name	Family	Uses
1	*Abrus precatorius* L.	Chirmi	Papilionaceae	Medicine seeds used for weighing gold
2	*Abutilon indicum* (L.) Sweet	Talakuchi	Malvaceae	Fuel, fodder fibre, medicine
3	*Acacia catechu* (L.f) Willed	Khair	Mimosaceae	Bark for tanning, katha, fuel, extracts
4	*A. eucopholea* (Roxb.) Willd	Safed Khair	Mimosaceae	Timber, fuel, fodder, food
5	*A. ilotica* (L.) Willd ex. Del.	Babul	Mimosaceae	Timber, fuel, fiber medicine soil conservation
6	*Achyranthes aspera* L.	Lat Jira	Amaranthaceae	Famine food medicine
7	*Adhatoda vasica* Nees.	Adusa	Acanthaceae	Medicine extracts
8	*Adina cordifolia* (Willd. Ex. Roxb.)	Haldu, Adru	Rubiaceae	Timber, fodder food, tannin
9	*Aegle marmelos* (L.) Corr.	Bael Bilipatta	Rutaceae	Timber, fodder food, medicine
10	*Ageratum conyzoides*	Bhakumber	Asteraceae	Medicine, extracts
11	*Albizzia lebbek* (L) Benth.	Kalasiris	Mimosaceae	Timber, fuel, fodder, extract
12	*A. rocera* (Roxb.) benth	Safed siris	Mimosaceae	Timber, fuel, medicine
13	*Aloe barbadens* Mill.	Gaur Pata	Liliaceae	Medicine used for healing wounds, cosmetics
14	*Amaranthus spinosus* L.	Kantewali Chaulai	Amaranthaceae	Fodder, food, leaves as vegetable
15	*A virdis*. L.	Jangli Chaulai	Amaranthaceae	Fodder
16	*Anagallis arvensis* L.	Jonkmri, Neel	Primulaceae	Medicine
17	*Annona squamosa* L.	Sitaphal	Annonaceae	Food, fuel
18	*Anogeissus latifolia* (Roxb. Ex. DC)	Safed Dhawra	Combretaceae	Fuel, timber fodder, extract

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19	*A. pendula*	Dhao, Kaldhai	Combretaceae	Fuel, timber, extract
20	*Argemone mexicana* L.	Satyanashi	Papaveraceae	Fuel, extract medicine oil, used in medicine.
21	*Argyreia nervosa* (Burm. f.) Boj.	Tamar Beal	Convolvulaceae	Medicine
22	*Asparagus racemosus(* L.) willd	Shatavari	Liliaceae	Food, veterinary & human medicine
23	*Azadirachta indica* A. Juss.	Neem	Meliaceae	Timber, fuel, medicine fruit, famine food.
24	*Bacopa Mannieri* (L.) wettest	'Jul Buti'	Scrophulariaceae	Medicine
25	*Balanites aegyptiaca* (L.) Delile	Hingota	Balanitaceae	Fruit as soap, fodder, fuel
26	*Barleria prionitis* L.	Brijdanti	Acanthaceae	Fuel medicine
27	*Bauhinia variegata* L.	Kachanr	Caesalpiniaceae	Timber, fuel, food, medicine "Bidi" Making
28	*Boerhaavia diffusa* (L.) hook. f.	Lal Sata	Nyctaginaceae	Food, root as laxative, in asthma, jaundice
29	*Bombox ceiba* L.	Semal	Bombacaceae	Pod fibers used as cotton, roots famine food timber, fuel
30	*Boswellia serrata* (Roxb.ex.colebr)	Salar	Burseraceae	Medicine, extract, timber, fuel
31	*Butea monosperma*	Dhak, Khakhra	Paplionaceae	Dye Root, Famine food, fuel, timber
32	*Caesalpinia bonduc* L. Roxb.	Kant – Karanj	Caesalpiniaceae	Soil conservation
33	*Calotropis gigantea* R. Br.	Aakra	Asclepidaceae	Fuel, fuel
34	*C . procera* (Ait.) R. Br.	Arkhja, Madar	Asclepidaceae	Fibre, medicine fuel
35	*Cannabinus sativa* L.	Bhang	Cannabinaceae	Medicine intoxicant
36	*Capparis decidua* (Forsk.) Edgew.	Ker	Capparidaceae	Panch Kutta component medicine timber, fuel
37	*Carissa spinarum* L.	Karaunda	Apocyanaceae	Food, fuel
38	*Cassia auriculata* L.	Tarwar	Carsalpiniaceae	Fuel, medicine, bark for tanning
39	*C fistula* L	Amaltas	Caesalpiniaceae	Tanning, timber,extract, medicine
40	*C siamea* Lem.		Caesalpiniaceae	Soil conservation, timber, fuel
41	*Celastrus paniculatus*	Malkangani	Celastraceae	Food
42	*Celosia cristata* L.	Morsikha	Amarnathaceae	Food, fuel, medicine
43	*Chenopodium album* L.	Bathua	Chenopodiaceae	Food
44	*Chlorophytum borivilianum* Sant.	Safed Musali	Liliaceae	Medicine

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45	*Coleus aromaticus* Benth.	Patherchur	Lamiaceae	Medicine
46	*Commiphora wightii* (Arnott.)	Gugal	Burseraceae	Fibre, medicine, timber, fuel
47	*Cordia dichotma* (Forst.f.prodr.)	Goonda Lisora	Ehretiaceae	Edible fruit, timber, fuel
48	*C gharaf* (Forsk.) Ehrenb.	Chotti Goondi	Ehretiaceae	Medicine food, fuel, timber
49	*Cryptostegia grandiflora* (Roxb.)	Chamchari	Asclepidaceae	Extract yields rubber
50	*Cuscuta reflexa* Roxb.	Amarbel	Cuscutaceae	Medicine
51	*Dalbergia sissoo* roxb.	Shisham	Papilionaceae	Timber, fuel, fodder
52	*Datura stramonium*	Dhatura	Solanaceae	Medicine
53	*Delonix regia* (Boj.ex.hook.) Ref.	Gul Mohar	Caesalpiniaceae	Timber, fuel
54	*Dendrocalamus strictus* (Roxb)nees	Bans	Gramineae	Timber, food, medicine veterinary medicine
55	*Digera muricata* L.	Lehsua	Amarnathaceae	Fodder
56	*Diospyros melanoxylon* Roxb.	Timmru	Ebenaceae	Timber, fuel, food, leaves for
57	*Echinops echinatus* Roxb.	Oonti kateli	Asteraceae	Medicine
58	*Emblica officinalis* Gartn.	Aamla	Euphorbiaceae	Medicine food
59	*Euphorbia hirta* L.	Dudhi	Euphorbiaceae	Fuel, medicine
60	*E. neriifolia* L.	Sehund	Euphorbiaceae	Fuel, medicine
61	*E. royleana* Boiss		Euphorbiaceae	Fuel
62	*Ficus Bengalensis* L.	Vad	Moraceae	Fruit famine food, timber, medicine
63	*F. carica* L.	Anjir	Moraceae	Medicine
64	*F .glomerata* Roxb.	Gular, Umri	Moraceae	Fruit famine food, timber fuel, fodder medicine.
65	*F .religiosa* L.	Pipal	Moraceae	Lac collected, fruit famine, medicine, religious
66	*Fumaria indica* (Haussk) Pugsley	Pit Papra	Fumariaceae	Medicine, weed plant
67	*Gomphrena celosioides* Mart.		Amaranthaceae	Weed
68	*Grewia tiliefolia* Vahl.	Dhaman	Tiliaceae	Fuel, fibre medicine, food, fodder
69	*Holoptelea interifolia* (Roxb.) Planch.	Churel	Ulmaceae	Timber, fuel, food, seeds, contain fatty oil,

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70	*Hydrilla verticillata*		Hydrocharitaceae	Food for aquatic animals
71	*Indigofera linifolia* (L.f.) Retz.	Sankh Buti	Papilionaceae	Medicine
72	*Ipomoea aquatica* (Forsk. Fl.)	Nali	Convolvulaceae	Food
73	*I. fistulosa* (Mart. Ex.choisy) Austin	Nagar Pan	Convolvulaceae	Hedge, fuel fodder
74	*I. palmata* Forsk.		Convolvulaceae	Fodder decorative bael
75	*Jasminum officinale* L.	Chameli	Oleaceae	Jasmine oil
76	*Jatropha curcas* L.	Ratanjot	Euphorbiaceae	Fuel, medicine bio- diesel extract
77	*J. gossypifolia* L.	Mavla or Ratanjoti	Euphorbiaceae	Fuel
78	*Lantana camara* L.	Latina	Verbenaceae	Fuel
79	*L indica* Roxb.	Safed galphusia	Verbenaceae	Fuel
80	*Launea asplenifolia* (roxb)Hook. f.		Asteraceae	Fodder ,weed
81	*Lawsonia inermis* L	Mehndi	Lytharaceae	Fuel,medicine,for colouring hand , hair ,feet fodder
82	*Leucus aspera* (Willd.) Link	Chtia	Lamiaceae	Fodder
83	*Madhuca indiaca* Gmel.	Mahua	Sapotaceae	Flower & fruit used for liquor , timber, fuel
84	*Malvastrum coromandelianum* L.	“buryara”	Malvaceae	Weed
85	*Mangifera indica* L.	Aam	Anacardiaceae	Timber, fuel, medicine extract
86	*Medicago sativa* L.	Rizka	Papilionaceae	Fodder
87	*Melia azadirachta* L.	Bakain	Meliaceae	Timber, fuel, medicine extract
88	*Melilotus indica* L. All	Methi	Papilionaceae	Food, medicine, soil conservation
89	*Mitragyna parviflora* L.	Kadam	Rubiaceae	Timber ,fuel fodder
90	*Moringa oleifera* Lamk.	Sohajan	Mori ngaceae	Food ,medicine ,soil conservation
91	*Morus alba* L	Mulberry shahtoot	Urticaceae	Silkwolm ,cultivation ,food ,timber for sport goods
92	*Mucuna pruriens* L. dc.	Kaunch	Papilionceae	Medicine
93	*Nelumbo nucifera* Geatrn.	Kamal	Nymphaceae	Food ,medicine
94	*Nerium oleander* Blanco.	Kaner	Apocyanaceae	Soil conservation ,decorative plant
95	*Nyctanthus arbortristis* L.	Har-shingav	Oleaceae	Fuel ,medicine

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96	*Nymphaea nouchali Burm* F.	Bambher	Nymphaceae	Scarcity food medicine
97	*Ocimum americanum* L.	Bapchi or jungali tulsi	Lamiaceae	Medicine
98	*Opunitia dillenii* (Ker-Gawler) Haw.	Nagphani	Cactaceae	Food ,planted as hedge
99	*Oxalis corniculata* L.	Khatto	Oxalidaceae	Fodder
100	*Peristrophe bicalyculata* (Retz)Nees.	Atrilal	Acanthaceae	Fibre ,soil conservation
101	*Phoenix sylvestis* L. Roxb	Khajur	Palmae	Fruits eaten ,fuel
102	*Pithecellobium dulce* (Roxb.)	Jangli jalebi	Mimosaceae	Fuel ,fodder ,food
103	*Ployalthia longifolia* (Sonnerat) Thw.	Ashok	Annonaceae	Timber
104	*Pongamia pinnata* L. Pierre	Karanj	Papilionaceae	Timber ,fuel ,fodder ,soil conservation
105	*Prosopis cineraria* L. Druce	Khrjri	Mimosaceae	Famine food ,sacred tree for bishnois
106	*Rauvolfia serpentina* L.benth.ex.Kurz	Serpgandha	Apocynaceae	Medicine plant
107	*Ricinus communis* L.	Arandi	Euphorbiaceae	Medicine ,fodder
108	*Rumex dentatus* L.	Jangli palak	Polygonaceae	Yields dye ,fodder ,food
109	*Santalum album* L.	Chandan	Santalaceae	Timber ,fuel ,medicine extract
110	*Sapindus detergens* L.	Areetha	Sapindaceae	In making soap
111	*Sida cordifolia* L.	Bhiunli	Malvaceae	Fodder
112	*Solanum nigrum* L.	Mako	Solanaceae	Fodder
113	*S. surratense* burm. F.	Kateri	Solanaceae	Medicine
114	*Sonchus arvensis* L.		Asteraceae	Fodder
115	*Sphaeranthus indicus* L.	Gorukh-mundi	Asteraceae	Medicine
116	*Strerculia urens* Roxb.	Kadaya	Streculiaceae	Fibre from bark extract timber ,fuel
117	*Syzygium cumini* (L.) skeels	Jamun	Myrtaceae	Medicine ,food ,timber ,fuel
118	*Tamarindus indicus* L.	Imli	Caesalpiniceae	Food
119	*Tecoma stans* (L.) H.B.K.	bignoniaceae	Bignoniaceae	Fodder ,hedge plant
120	*Tectona grandis* L.	Sagwan	Verbenaceae	Dye from leaves ,timber ,fuel ,medicine extract
121	*Terminalia arjuna* (Roxb. Ex. Dc.)	Arjun	Combretaceae	Timber ,fuel
122	*T. bellirica* (Roxb.)	Bahera	Combretaceae	Medicine extract

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123	*Thevetia peruviana* (Pers.) Merr.	Pili kaner	Apocyanaceae	Soil conservation ,hedge
124	*Tinospora cordifolia* (Willd.) Miers.	Neem giloi	Menispermaceae	Fuel ,medicine
125	*Trapa natans* L.	Singhara	Trapaceae	Seed edible ,food
126	*Tridax procumbens* L.	Kumru	Asteraceae	Veterinary medicine
127	*Trigonella foenum-graceum* (L.)	Methi	Papillonaceae	Medicine ,food
128	*Tylophora asthmatica* Wt.& Am.	Asthma bael	Asclepiadaceae	Medicine
129	*Typha angustata boryet* chaub.	Era patar	typhaceae	Food fibre ,green leave for mat weaving
130	*Vernonia cinerea* (L.) Less.	Sandri	Asteraceae	Fodder ,medicine
131	*Vitex negundo* L.	Nirgundi	Verbenaceae	Medicine ,fuel ,insect repellent
132	*Withania somnifera* (L.) Dunal.	Aswagandha	Solanaceae	Medicine
133	*Xanthinum strumarium* (L.)	Adhasisi or chirchita	Asteraceae	Medicine
134	*Zizyphus jujuba* Lamk.	Bada,ber	Rhamnaceae	Food ,soil-conservation fodder ,extract
135	*Zizyphus mummularia* (Burm.f.) W.& A.	Jharberi	Rhamnaceae	Fuel fodder, food medicine soil-conservation

Results and Discussion:

Floristic Composition:

Table-2 A total of 135 plant species were recorded, belonging to 69 families.

Life Form	Number of Species
Trees	55
Shrubs	20
Herbs	50
Climbers	10

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Dominant Families:

Fabaceae

Poaceae

Euphorbiaceae

Asteraceae

Diversity Indices (Sample Site: Sonbhadra)

Species Richness: 78

Shannon-Wiener Index (H'): 3.29

Simpson's Index (D): 0.8

The floristic survey highlights the richness and ecological variability of the Vindhya landscape. The dominance of Fabaceae and Poaceae indicates a mixed deciduous composition typical of dry forests. The relatively high Shannon index suggests moderate to high biodiversity.

However, signs of degradation such as invasion by *Lantana camara* and *Parthenium hysterophorus*, as well as human pressures like firewood collection and grazing, threaten native species composition and forest regeneration.

The comparison of disturbed and undisturbed plots showed a significant decline in species richness and diversity in disturbed areas. This indicates the need for immediate ecological interventions.

A concise list of wild plants (including herbs shrub & trees) of Vindhya region and their uses will provide basic data for further studies e.g., for soils conservation, timber & fuel, medicines, resources for economics welfare of tribal people. Besides this the nude hills of the district & barren area can be enriched with floristic diversity for the benefit of tribal people because tribal people of rural areas subsist on the resources of natural world.

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Conclusion

The Vindhya region represents a vital ecological corridor rich in native flora and biodiversity. The study provides baseline data essential for conservation planning and ecosystem management. Protection of remaining forest patches, control of invasive species, and sustainable land-use practices are crucial for preserving this ecological heritage.

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