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Assessment of Floristic Diversity Status of the Lalgarh Sacred Forest in Jhargram District, West Bengal, India

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Abstract

The Lalgarh sacred forest is biologically and culturally significant and a geographically important ecosystem. The current study was carried out between January and December 2024 and assessed the floristic diversity condition of the 7235 hectare forest, which is located at the altitude between 65 and 300 meters. Quadrats were used to collect data in the compartments of the sacred forest. Findings were characterized by a rich flora of 52 plant species by 34 families and 51 genera. The species were a source of biological and socio-cultural services. Simpson index D = 0.02, Shannon-Wiener index H = 3.7 demonstrated good species diversity and evenness respectively. The Lalgarh sacred forest is also a hot spot of floristic diversity and it has maintained ecological stability and traditional practices in the lodha tribe. On the other hand, human pressure causes a commotion to its endangered and rare species. The main policy interventions to focus on are community-based conservation, integration of traditional ecological knowledge into the management of forest and tightening the sacred forest governance systems. The use and protection of this distinct forest will guarantee its future in terms of protecting biodiversity and conservation of cultural heritage.With sociological, cultural and religious facts of human life, tribal communities or indigenous group of people remain attached to forest and lead sustainable livelihood by consuming forest products. Proper utilization and prudent use of bio resources would save our mother nature. As per the indigenous knowledge, various parts of plants have been presented to God during various ceremonies and festivals due to their religious faith. In other words, it is one of the most important biodiversity protection strategies, according to this spiritual belief of ethnic people. This communities will be developing the rural economy through employing young generation to produce the herbal products and marketing them. This current research is meant to present the various mode of man-plant relationship and use of phyto-resource that can be used in their conservation, environmental protection and sustainable livelihood.

Keywords: Floristic Diversity, Lalgarh, Jhargram District

Introduction

Biodiversity consisting of land, sea and other water bodies. It is the most suitable measure of the health and resilience of the ecosystem. Biodiversity in India is critical towards maintaining ecological stability and livelihood through supplying the food, medicine, fuel, and raw materials [1]. The SGs lies in the fertile territory of flora and fauna, the bigger part of which is unique and bound to the ethnic and mystic

beliefs of local people. Forests in a number of indigenous communities are not merely a natural space because they are sacred areas that form the core of indigenous religious practices and governance in the community. These sacred forests are often used as biodiversity hot spots, which cannot be abused with the help of customary norms that make them customary conservation models. In parts of West Bengal especially where aboriginal ascendency systems are well established, sacred forests have been used to protect the endangered and ecologically significant species [5]. These forests are not only the protectors of the ethnic heritage and biodiversity, but they work towards this goal as communicated through the community-approved regulations, which in most cases, ban deforestation, hunting, and non-ritual human activity [10]. Despite these systems are getting threatened by socio-political upheavals, high population growth, agricultural, and erosion of traditional power [13]. This is followed by a growing need of scientific research that will present the up-to-date biodiversity status and ecological evaluation of these sacred forest despite being aware of its socio-cultural status as well.

Native economies and traditional medicine Forest cover has vibrant functions and supports forest structure and function as well. Nevertheless, there are challenges of deforestation and soil erosion. Nevertheless, the area has high-anthropogenic pressure because of rising population density, agriculture, and unpredictability of climate. Within this trend, sacred forests in the area, have been quite preserved because of original restrictions of entree and utilization [4].

Since time immemorial, the forest has been a holy place in religious practices in all parts of the world. It is a sacred place to a great number of people, and the spirits of nature are supposed to live in it. Trees, with their tall bodies and howling leaves, tend to be regarded as a sign of power and intelligence [8]. They provide shelter, food and medicine to people that live within their precincts. The forest has been an important element of spiritual and cultural heritage of most of the Indigenous tribes. To these people, the forest is a source of life and spiritual food, giving them all of life such as food and shelter, as well as medicine and wisdom. The interrelationship between forest and religion is multiple and complex and covers the levels of spiritual, cultural, social, and economic. The forest has been of a significant role in religious and cultural beliefs of the tribal people of India. They consider the forest a divine home of their spirits and gods. The forest is also considered to be a source of different resources which are needed to sustain and support the existence of the community such as food, water, medicinal plants, and timber [7]. Tribal people have also established self-sustainable activities to secure the forest and its resources by conserving and preserving them. They strongly care about the forest and resources, which they consume in a way that makes them sustain over time. This admiration of the forest is evident in most cultural traditions and religious views of the tribal communities.

Materials and Methods

Description of the study area

This study conducted from January2023 to December 2023.The Lalgarh forest range is located in newly formed Jharagram district on 4 April 2017, after bifurcation from the PaschimMedinipur district. It is chiefly situated in some part of Binpur-I block of the district. The forest range is dispersed in patches within N-22053'-22068' longitude and E-87008'-87013' latitude. Its area is spread over an area of 7235.07 ha. The area is a fragment of Chhotonagpur plateau and covered with hard literate stone. Its altitude ranges from 65m to 300 m. The average temperature varies from 50°C in winter to 41^0C in summer.

Data Collection

Data were collected from various sacred forest compartments. Four 10 ×10 m quadrats established at 25 m intervals. Plant species notedcombined with their frequency of occurrence. The plant identification was done with the assistanceof app called as 'PlantNet' which had been pre-tested to make certain accuracy of results. Those which could not be identified in the field were pressed in newspapers and sent to the YBN University Herbaria for proper identification.

Data Analysis

The indices outlined below were computed from the data. All the analyses were done using in Microsoft Excel 2013.

i. Margalef species richness index (d)

$$d = \frac{s-1}{\ln N}$$

Where d =Margalef index (measure of species richness); S = total number of species; N = total number of individuals in the site; In = natural logarithm (Margalef, 1958).

ii. Shannon-Wiener diversity index (H)

$$H = -\sum Pi \ln Pi$$

Where; Pi = proportion of individuals found in the species i; In = natural logarithm (Shannon and Wiener, 1949). The method developed by Hussain et al. (2012) for rating biodiversity was adopted for inferring the values of H and d.

Table 1: Ranges for evaluating ecological indices

iii. Simpson's diversity index (D)

$$D = \sum_{i=1}^{s} \frac{Ni(Ni-1)}{N(N-1)}$$

D ranges from 0 to 1 where 0 indicates the absence of diversity and 1 absolute diversity. Values close to 1 show a community of many species with equally low abundances while those close to 0 express fewer species with one of them clearly dominant (Simpson, 1949).

Table 1: Flora of the Lalgarh Sacred Forest and Their Uses

Sl No	Scientific Name	Family	Local Name	Habit	Uses
1.	Abutilon indicum (L.)Sweet	Malvaceae	Pateri	Shrub	Cardiovascular disease
2.	Acacia nilotica (L.)Wild ex Delile	Fabaceae	Babul	Tree	Dysentery
3.	Acalyphaindica L.	Euphorbiaceae	Muktojhuri	Herb	Bleeding
4.	AdhatodazeylanicaMedico.	Acanthaceae	Vasak	Shrub	Ulcer
5.	Aegle marmelosCorr.exRoxb.	Rutaceae	Bel	Tree	Headache
6.	Albiziaprocera (Robx.)Benth	Fabaceae	Siris	Tree	Asthma
7.	Alstoniascholaris (L.)R.Br.	Apocynaceae	Chatim	Tree	Skin disease
8.	AlternantherasessilisLR.Br.ex DC	Amaranthaceae	Sanchi	Herb	Cholera
9.	Andrographispaniculata(Burm.f.)Wall.ex Nees	Amaranthaceae	Kalmegh	Herb	Eczema

10.	Annona squamosa L.	Annonaceae	Ata	Tree	Skin problem
11.	Argemonemexicana L.	Papaveraceae	Sial kata	Herb	Asthma
12.	Aristolochiaindica L.	Aristolochiaceae	Iswarmul	Herb	Snake bite
13.	Asparagus recemosus Wild	Asparagaceae	Satamul	Herb	Tumors
14.	Azadirachtaindica A. Juss.	Meliaceae	Neem	Tree	Skin disease
15.	Bauhinia acuminata L.	Fabaceae	Kanchan	Tree	Diarrhea
16.	Boerhaaviadiffusa L.	Nyctaginaceae	Punarnova	Herb	Toothache
17.	Bombaxceiba L.	Bombacaceae	Simul	Tree	Skin disease
18.	Butea monosperma (O.Kuntz) Taub.	Fabaceae	Palash	Tree	Sore
19.	Calotropisprocera (Ait)R.Br.	Asclepiadaceae	Akanda	Shrub	Headache
20.	Cassia fistula L.	Fabaceae	Bandarlathi	Tree	Fistula
21.	Catharanthusroseus(L.)G.Don.	Apocynaceae	Nayantara	Herb	Knee pain
22.	Cissusquadrangularis Linn.	Vitaceae	Harjora	Climber	Eye infection
23.	Cleistanthuscollinus (Roxb.) Benth.exHook.f.	Phyllanthaceae	Kargalli	Tree	Eczema
24.	Cocciniagrandis (Linn.) Voigt	Cucurbitaceae	Telakucha	Climber	Genital herpes
25.	Costusspeciosus Koen. Ex Retz. Smith	Zingiberaceae	Keo	Herb	Vomiting
26.	Croton bonplandianumBaill	Euphorbiaceae	Chuchuri	Shrub	Bleeding
27.	Curcuma amadaRoxb.	Zingiberaceae	Amada	Herb	Bleeding
28.	CuscutareflexaRoxb.	Cuscutaceae	Alok-jui	Herb	Skin rash
29.	DalbergiasissooRoxb.	Fabaceae	Sisoo	Tree	Headache
30.	Datura metel L.	Solanaceae	Dhutra	Shrub	Dyspepsia

31.	Ecliptaprostrata L.	Asteraceae	Keshut	Herb	Headache
32.	Ficusbenghalensis L.	Moraceae	Bat	Tree	Remove hair lice
33.	Helicteresisora Linn.	Steruculiaceae	Atmora	Shrub	Dysuria
34.	Heliotropiumindicum L.	Boraginaceae	Hatisur	Herb	Convulsion
35.	Hemigraphishirta (Vahl)T.Anders	Acanthaceae	Musakani	Herb	Skin disease
36.	Holarrhenapubescens(Buch-Ham)Wall.ex DC.	Apocynaceae	Kurchi	Tree	Sepsis
37.	Jatropha curcas L.	Euphorbiaceae	Verenda	Shrub	Dysentery
38.	Lanneacoromandelica (Houtt.) Merrill	Anacardiaceae	Doka	Tree	Vomiting
39.	Madhucalongifolia (Koenig)Macbride	Sapotaceae	Mahua	Tree	Beverage
40.	Ocimumtiniflorum L.	Lamiaceae	Kalo-Tulsi	Herb	Jaundice
41.	Oxalis corniculata L.	Oxalidaceae	Amrul	Herb	Toothache
42.	RauvolfiaserpentinaBenth.ex.Kurz	Apocynaceae	Sarpagandha	Shrub	Hypertension
43.	Semecarpusanacardium Linn. F.	Anacardiaceae	Soso	Tree	Bronchitis
44.	ShorearobustaGaertn.f.	Dipterocarpaceae	Sal	Tree	Dyspepsia
45.	Solanum nigrum L.	Solanaceae	Kakmachi	Herb	Snake bite
46.	Strychnosnuxvomica L.	Loganiaceae	Kuchila	Tree	Oliguria
47.	Tephrosiapurpurea (L.) Piers	Fabaceae	Ban neel	Shrub	Ringworm
48.	Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Bahera	Tree	Vomiting
49.	Terminalia chebula Retz.	Combretaceae	Haritaki	Tree	Jaundice
50.	Tinosporacordifolia (Willd)	Menispemiaceae	Gulancha	Shrub	Bone fracture
51.	Tylophoraindica (Burm.f.)Merrill.	Asclepiadaceae	Anantamul	Climber	Asthma

52.	Vitexnegundo L.	Verbaceae	Nishinda	Shrub	Hair growth

Table 2: Number of Individuals (S), Relative Abundance (Pi),Margalef (d), Shannon-Wienner (H) and Simpsons (D) Indices

Sl.no	Scientific Name	S	P_i	d	H	D
1.	Abutilon indicum (L.)Sweet emend.Hochr.	5	0.010570	0.649446	0.002323	0.00008958
2.	Acacia nilotica (L.)Wild ex Delile	12	0.025369	1.785976	0.093211	0.00059124
3.	Acalyphaindica L.	6	0.012684	0.811807	0.055396	0.00013437
4.	AdhatodazeylanicaMedico.	7	0.014799	0.974169	0.062351	0.00025083
5.	Aegle marmelosCorr.exRoxb.	8	0.016913	1.136530	0.068999	0.00025083
6.	Albiziaprocera (Robx.)Benth	6	0.012684	0.811807	0.055396	0.00013437
7.	Alstoniascholaris (L.)R.Br.	7	0.014799	0.974169	0.062351	0.00018812
8.	AlternantherasessilisLR.Br.ex DC	10	0.021141	1.461253	0.081531	0.00040312
9.	Andrographispaniculata(Burm.f.)Wall.exNees	20	0.042283	3.084868	0.133756	0.00170208
10.	Annona squamosa L.	5	0.010570	0.649446	0.048090	0.00008958
11.	Argemonemexicana L.	15	0.031712	2.273061	0.109440	0.00094062
12.	Aristolochiaindica L.	11	0.023255	1.623615	0.087467	0.00049270
13.	Asparagus recemosus Wild	9	0.019027	1.298892	0.075383	0.00032249
14.	Azadirachtaindica A. Juss.	6	0.012684	0.811807	0.055396	0.00013437
15.	Bauhinia acuminata L.	7	0.014799	0.974169	0.062351	0.00018812
16.	Boerhaaviadiffusa L.	16	0.033826	2.435422	0.114552	0.00107499
17.	Bombaxceiba L.	11	0.023255	1.623615	0.087467	0.00049270
18.	Butea monosperma (O.Kuntz) Taub.	18	0.03805	2.76014	0.12438	0.0013706

			4	5	8	2
19.	Calotropisprocera (Ait)R.Br.	16	0.033826	2.435422	0.114552	0.0010749
20.	Cassia fistula L.	10	0.021141	1.461253	0.081531	0.0004031 2
21.	Catharanthusroseus(L.)G.Don.	8	0.016913	1.136530	0.068999	0.0002508 3
22.	Cissusquadrangularis Linn.	4	0.008456	0.487084	0.040359	0.0000537 4
23.	Cleistanthuscollinus (Roxb.) Benth. exHook.f.	3	0.006342	0.324723	0.032094	0.0000268 7
24.	Cocciniagrandis (Linn.) Voigt	6	0.012684	0.811807	0.055396	0.0001343 7
25.	Costusspeciosus Koen. Ex Retz. Smith	11	0.023255	1.623615	0.087467	0.0004927 0
26.	Croton bonplandianumBaill	7	0.014799	1.136530	0.062351	0.0001881 2
27.	Curcuma amadaRoxb.	20	0.042283	3.084868	0.133756	0.0017020 8
28.	CuscutareflexaRoxb.	5	0.010570	0.649446	0.048090	0.0000895 8
29.	DalbergiasissooRoxb.	6	0.012684	0.811807	0.055396	0.0001343 7
30.	Datura metel L.	1	0.002114	0	0.013020	0
31.	Ecliptaprostrata L.	11	0.023255	1.623615	0.087467	0.0004927 0
32.	Ficusbenghalensis L.	4	0.008456	0.487084	0.040359	0.0000537 4
33.	Helicteresisora Linn.	5	0.010570	0.649446	0.048090	0.0000895 8
34.	Heliotropiumindicum L.	9	0.019027	1.298892	0.075383	0.0003224 9
35.	Hemigraphishirta (Vahl)T.Anders	11	0.023255	1.623615	0.087467	0.0004927 0
36.	Holarrhenapubescens (Buch-Ham)Wall.ex DC.	2	0.004228	0.162361	0.023110	0.0000044 7
37.	Jatropha curcas L.	15	0.031712	2.273061	0.109440	0.0009406 2
38.	Lanneacoromandelica (Houtt.) Merrill	3	0.006342	0.324723	0.032094	0.0000268 7
39.	Madhucalongifolia (Koenig)Macbride	12	0.02536	1.62361	0.09321	0.0005912

			9	5	1	4
40.	Ocimumtiniflorum L.	4	0.008456	0.487084	0.040359	0.0000537 4
41.	Oxalis corniculata L.	5	0.010570	0.649446	0.048090	0.0000895 8
42.	RauvolfiaserpentinaBenth.ex.Kurz	5	0.010570	0.649446	0.048090	0.0000895 8
43.	Semecarpusanacardium Linn. F.	15	0.031712	2.273061	0.109440	0.0009406 2
44.	ShorearobustaGaertn.f.	12	0.025369	1.785976	0.093211	0.0005912 4
45.	Solanum nigrum L.	21	0.044397	3.247230	0.138278	0.0018812 4
46.	Strychnosnuxvomica L.	13	0.027484	1.948338	0.098781	0.0006987 4
47.	Tephrosiapurpurea (L.) Piers	15	0.031712	2.273061	0.109440	0.0009406 2
48.	Terminalia bellirica (Gaertn.) Roxb.	10	0.021141	1.461253	0.081531	0.0004031 2
49.	Terminalia chebula Retz.	5	0.010570	0.649446	0.048090	0.0000895 8
50.	Tinosporacordifolia (Willd)	6	0.012684	0.811807	0.055396	0.0001343 7
51.	Tylophoraindica (Burm.f.)Merrill.	4	0.008456	0.487084	0.040359	0.0000537 4
52.	Vitexnegundo L.	10	0.021141	1.461253	0.081531	0.0004031 2
	Total	473	1.000000	68.35418	3.762076	0.0227852

Result

The results presented 52 plant species belonging to 34 families and 51 genera in the Lalgarh sacred forest. The value of Shannon-Wienner diversity index showed that the forest ecosystem was of good diversity (Table 1 and Table 2). Accordingly, the Simpson index that was close to 1 showed that though diverse, the the abundances of the individual species in the Lalgarh sacred forest were low, ranging from 0.001 to 0.094.

Conclusion

The information gathered from the ethnic people and accumulated in this paper may be of great use for advance research in the field of taxonomy, pharmacology ethno botany by researchers in near future. It is the most important to article this material for the future generation, otherwise, it will be lost forever with the death of local healers. For our unawareness, many herbal drugs need to be patented. It is crucial to conservation and sustainable utilization cultivation of these therapeutic plant species.

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