Comparative Phyto-Sociological Estimation of Tree Plants in Kuldiha and Hadagarh Wildlife Sanctuary under Similipal Biosphere Reserve, Odisha, India

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Full Length Research Article

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A B S T R A C T

This paper reflects the comparative analysis of Phyto-sociological data of kuldiha and Hadagarh Wildlife Sanctuary, Odisha, India. The main objectives of our study are to identify and classify the vegetation of both the sanctuaries under the Similipal Biosphere Reserve. The study was done following the standard methods which are widely adopted for the phytosociological study like quadrate method. The present study concluded with the fact that despite sharing the common vegetation which is the tropical moist deciduous forest, the dominant species of the sanctuaries differ. The dominant tree species of Kuldiha was found *Terminalia tomentosa* (IVI- 290.75) and at Hadagarh it was *Shorea robusta* (IVI-285.12). The potential anthropogenic factors influence of cattle and herbivores and the demon fire are rapidly engulfing the density of the vegetation and its aesthetic beauty. Prompt and effective actions are needed to be implemented to preserve both the sanctuaries from biodiversity loss.

Key words: Kuldiha, Hadagarh, Biodiversity, Phytosociological study, Wildlife sanctuary

The diversity of plant species is complex in nature and because of the varying topographic and climatic conditions the vegetation structure also changes from place to place. Compared to the other ecosystems, tropical forests are being harshly exploited ecosystem of the biosphere [1]. Biodiversity has become the issue of global attention because of growing awareness of its importance on the one hand as ecosystem energy and on the other hand it allows building complex tropical networks and functions as insurance for ecosystem stability and resilience. In the present study, an attempt has been made to document the comparison of the tree species and their ethno-medicinal importance of Kuldiha and Hadagarh wildlife sanctuary under Similipal biosphere reserve, which will help in the understanding the vegetation status of the two areas, their management and thereby conservation of the forest vegetations of the studied areas in the near future [2]. Similipal was designated as tiger reserve in 1956 [3]. Then it became the part of the Project Tiger in 1973. The Government of Odisha declared Similipal as a wildlife sanctuary in 1979. Then it was declared as a Biosphere Reserve in 1994.UNESCO also added this national park to its list of Biosphere Reserves in 2009. Today finally Similipal Biosphere Reserve includes three protected areas — Similipal Tiger Reserve (2750.00 km^2), Hadagarh Wildlife Sanctuary (191.06 km^2), Kuldiha Wildlife Sanctuary (272.75 km^2) [4].

MATERIALS AND METHODS

Phytosociological studies were carried during the time period of June 2020 to December 2021 for the purpose to cover all spectrum of vegetation. The surveys of area have been done by sampling method. Vegetation surveys were carried out by quadrate methods. For this purpose, the entire area of 100 ha was divided in to 10 segments. In each segment a sampling area of 400 sq. m with length and breadth 20m each were measured. All plants above 3m tall were recorded by measuring girth at breast height (GBH) species wise. The girth was measured using a 2m tape. The height was estimated visually.

Formulas used

Frequency (F%) = (Number of quadrates in which the species occurred/ Total number of quadrates studied) × 100

Density (D) = Total number of individuals of a species in all quadrates / Total number of quadrates studied

Abundance (A) = Total number of individuals of a species in all quadrates / Total number of quadrates in which the species occurred

Relative Frequency (RF) = (Frequency of a species/sum of frequency value) × 100

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Relative Density (RD) = (Total no of individuals of a species / Total no. of all individuals) × 100

Relative Abundance (RA) = Relative frequency + Relative density

Relative Dominance or Relative Basal Area (RBA) = (Total basal area of a species/ Total basal area for all species) × 100

IVI = Relative density + Relative frequency + Relative dominance

RESULTS AND DISCUSSION

A total of 191 individuals of tree belonging to 14 species of 12 genera is found in Hadagarh wildlife sanctuary (Table 1). Out of the total 14 species found, the family with highest species is Fabaceae (3) followed by Combretaceae (2) and Ebenaceae (2), and rest 7 families have one species each [3].

In the Kuldiha wildlife sanctuary, the total individuals of tree species under study were 266 (Table 2). Out of the 29 species studied, the family with the highest number of species is Fabaceae (7) followed by Combretaceae (4), Euphorbiaceae (2), Rubiaceae (2), Myrtaceae (2), Ebenaceae (2), Phyllanthaceae (2) and rest 8 families have one species each [4].

Table 1 Phyto-sociological estimation of tree species in Hadagarh wildlife Sanctuary, Odisha

Botanical name	NoI	F (%)	RF	D	RD	C (cm)	BA (cm^2)	RBA	IVI
Shorea robusta	105	100	14.08	10.5	54.97	54.5	236.48	89.57	158.62
Schleichera oleosa	10	50	7.04	1	5.24	7.4	4.36	1.65	16.09
Tamarindus indica	5	60	8.45	0.5	2.62	6.4	3.26	1.23	12.3
Acacia nilotica	6	50	7.04	0.6	3.14	5.7	2.59	0.98	11.16
Azadirachta indica	14	70	9.86	1.4	7.33	9.7	7.5	2.84	20.03
Cassia fistula	9	70	9.86	0.9	4,71	3.5	0.97	0.37	14.94
Diospyros malabarica	4	30	4.23	0.4	2.09	2.7	0.58	0.22	6.55
Diospyros melanoxylon	6	40	5.63	0.6	3.14	4.8	1.83	0.69	9.46
Lannea corromandelica	11	70	9.86	1.1	5.76	7.2	4.13	1.56	17.18
Eucalyptus tereticornis	4	30	4.23	0.4	2.09	2.5	0.5	0.19	6.51
Strychnos nux-vomica	5	40	5.63	0.5	2.62	2.1	0.35	0.13	8.38
Terminalia bellerica	7	50	7.04	0.7	3.66	3.2	0.82	0.31	11.01
Terminalia arjuna	4	40	5.63	0.4	2.09	2.8	0.62	0.23	7.95
Oroxylum indica	1	10	1.41	0.1	0.52	0.6	0.03	0.01	1.94
Total	191								

NOI= No of Individual, F%= Frequency%, RF= Relative Frequency, D= Dominance, RD= Relative dominance, C= Circumferences, BA= Basal Area, RBA= Relative Basal Area, IVI= Importance Value Index

Table 2 Phytosociological estimation of tree species in kuldiha wildlife sanctuary

| Botanical name	NoI	F (%)	RF	D	RD	C (cm)	BA (cm^2)	RBA	IVI
Anogeissus latifolia	19	60	5.21	1.9	7.14	11.4	10.35	9.12	21.47
Terminalia tomentosa	52	100	8.69	5.2	19.55	15.6	19.38	17.08	45.32
Shorea robusta	58	100	8.69	5.8	21.8	29	66.96	59.01	89.5
Terminalia chebula	3	20	1.73	0.3	1.13	0.9	0.06	0.05	2.91
Terminalia bellirica	7	70	6.08	0.7	2.63	2.8	0.62	0.55	9.26
Emblica officinalis	8	60	5.21	0.8	3.0	1.6	0.2	0.18	8.39
Oroxylum indica	1	10	0.86	0.1	0.38	0.2	0.003	0.003	1.243
Syzygium cumini	3	20	1.73	0.3	1.13	1.5	0.17	0.15	3.01
Dalbergia sisso	4	20	1.73	0.4	1.5	1.6	0.2	0.18	3.41
Dalbergia latifolia	3	30	2.6	0.3	1.13	0.9	0.06	0.05	3.78
Peltophorum pterocarpum	5	20	1.73	0.5	1.89	1.5	0.18	0.16	3.78
Haldina cordifolia	7	60	5.21	0.7	2.63	4.2	1.41	1.24	9.08
Hollarhena antydysenterica	5	20	1.73	0.5	1.89	1	0.08	0.07	3.69
Diospyros melanoxylon	10	50	4.34	1	3.76	4	1.27	1.12	9.22
Cassis fistula	3	30	2.6	0.3	1.13	0.9	0.06	0.05	3.78
Albizia lebbeck	2	20	1.73	0.2	0.75	1.6	0.2	0.18	2.66
Millusa velutina	10	60	5.21	1	0.38	5	2	1.76	7.35
Aegel marmelos	2	20	1.73	0.2	0.75	2	0.32	0.28	2.76
Eucalyptus tereticornis	6	20	1.73	0.6	2.26	3.6	1.03	0.91	4.9
Diospyros malabarica	3	20	1.73	0.3	1.13	0.6	0.03	0.03	2.89
Bridelia retusa	15	60	5.21	1.5	5.64	6	2.87	2.52	13.37
Xylia xylocarpa	3	30	2.6	0.3	1.13	0.6	0.03	0.03	3.76
Croton roxburghii	2	20	1.73	0.2	0.75	0.8	0.05	0.04	2.52
Pterocarpus mersupium	2	20	1.73	0.2	0.75	1.2	0.12	0.11	2.59
Antidesma ghaesembilla	14	50	4.34	1.4	5.27	2.8	0.62	0.55	10.16
Madhuca longifolia	8	60	5.21	0.8	3	5.6	2.5	2.2	10.41
Buchanania arborescens	3	30	2.6	0.3	1.13	0.9	0.06	0.05	3.78
Schleichera oleosa	5	40	3.47	0.5	1.89	4.5	1.61	1.42	6.78
Mitragyna parvifolia	3	30	2.6	0.3	1.13	3.6	1.03	0.91	4.64
Total	226								

NOI= No of Individual, F%= Frequency%, RF= Relative Frequency, D= Dominance, RD= Relative dominance, C= Circumferences, BA= Basal Area, RBA= Relative Basal Area, IVI= Importance Value Index

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The IVI of the tree species studied at Hadagarh wildlife sanctuary revealed the highest value of *Shorea robusta which* is 158.62, followed by *Azadirachta indica*: 20.03; *Lannea corromandelica*: 17.18 and so on. *Oroxylum indica* is the species with the lowest IVI value which is 1.94 [5].

In Kuldiha wildlife sanctuary also we find *Shorea robusta* showing highest IVI: 89.50 followed by *Terminalia tomentosa* showing IVI: 45.32 and so on. *Oroxylum indica* is the species with the lowest IVI value which is 1.24.

The comparative account of Hadagarh and Kuldiha sanctuaries highlights the species richness in Kuldiha wildlife sanctuary than in Hadagarh wildlife sanctuary. In both the sanctuaries we find *Oroxylum indica* depicting the lowest IVI value. The lowest IVI value of that said species is a matter of concern to protect the species in future. The said species is also an ethno medicinal plant and proper measure should be taken for the propagation and conservation of the species [6].
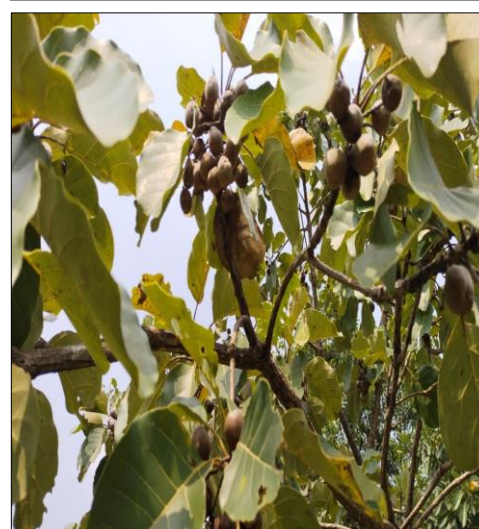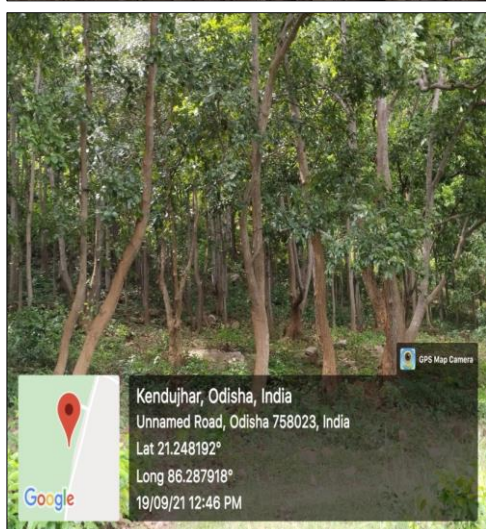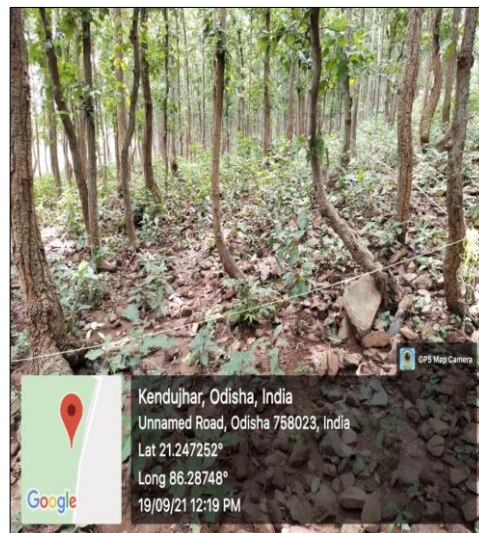
CONCLUSION

The present study revealed the wide gap between the values of the various parameters like density, abundance frequency and IVI of the study sites. More attention should be paid to the tree species showing very low values of IVI and other parameters. Kuldiha and Hadagarh sanctuaries are protected, still the forest vegetation is experiencing destruction due to the intervention of the local people for their dependence on the forest for the timber as well as non- wood forest products. Over-grazing by the livestock population has added to the parameter of devastation. This preliminary study will add to the knowledge about the present status of vegetation in Kuldiha and Hadagarh biosphere and also their comparative status. The comparison of the two study sites will lighten the population status of different species and will be helpful in the protection and plantation of the species and thereby restoration of the forest vegetation of the study sites.

LITERATURE CITED

1. Odum EP. 1994. *Basic Ecology*. Saunders College Publishing.
2. Dash AK, Upadhyay VP, Patra HK. 2020. Floristic assessment of semi evergreen forests of a peripheral site in Hadagarh sanctuary, Odisha, India. *International Journal of Biodiversity and Conservation* 12(2): 104-112.
3. Haines HH. 1925. *The Botany of Bihar and Orissa*. 6 parts, Adlard and Sons, London.
4. Rout SD, Panda SK, Panda T. 2018. Phytosociological and floristic evaluation of Kuldiha Wildlife Sanctuary, Odisha, India. *Tropical Plant Research* 5(3): 419-430.
5. Saxena HO, Brahman M. 1989. The Flora of Similipahar (Similpal), Orissa with particular reference to the potential economic plants. Regional research Laboratory (CSIR), Bhubaneswar.
6. Nayak AK, Kar T, Mandal KK. 2014. *Trees of Similipal Biosphere Reserve*. Published by Similipal Tiger Reserve.