Biological Forum – An International Journal **14(1): 371-378(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Floristic Diversity Assessment of Forest areas of Jamui District of Bihar

A. Chandra*, H.B. Naithani, P.K. Verma, J. Saxena and S. Kishwan
Forest Botany Division, Forest Research Institute, New Forest, Dehradun, (Uttarakhand), India.

(Corresponding author: A. Chandra)*
(Received 15 October 2021, Accepted 16 December, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The goal of the study was to determine the plant diversity of Jamui district of Bihar. Five forest sites were selected at random for the study. The study reveals that there are 129 species belonging to 109 genera and 52 families (46 dicotyledons, 5 monocotyledons, and 1 pteridophyte). Fabaceae (11 species) was the biggest family in the area, followed by Poaceae (7 species), Caesalpiniaceae (6 species), etc. In terms of habitat, in all five locations had 59 tree, 21 shrub, 23 herb, 18 climber, 7 grass and 1 pteridophyte species. For tree, shrubby, and herbaceous layers different diversity indices such as Important Value Index (IVI), Species richness, Shannon Wiener index, Concentration of dominance and Evenness were estimated. Study reveals that Lachcuar site is the most diverse in the area followed by Bamdah, Dahiyari, Mircha and Narganjo. Findings will be extremely useful to forest department officials, researchers, students, and others in carrying out conservation and management work. Similar kind of studies should be conducted in various forest sites across the country to capture present status of plant diversity for conservation and long-term use.

Keywords: Plant Diversity, Important Value Index, Species richness, Conservation.

INTRODUCTION

The variety and variability of all living organisms in a forested area is referred as forest biodiversity. It includes species diversity as well as environmental diversity. Forest biodiversity provides intangible benefits like timber, medicine, gums and resin, etc. However, in addition to this forest also gives much important intangible benefits such as regulation of climate, soil and water conservation, nutrient cycling, shelter for birds etc. which are equally important but are difficult to evaluate. In an ecosystem, vegetation is influenced by its surrounding environment (Billings, 1952). The structure and function of vegetation can be adequately explained using phyto-sociological attributes. It accurately anticipates the pattern of vegetation (Gautam and Joshi, 2014). Plant diversity in the wild is more important because species are present in their natural state. Hence, assessing and conserving the plant diversity in forest regions is utmost important. Plant diversity is under severe threat as a result of different anthropological pressures. Regular inventories and monitoring are essential for thorough understanding of vegetation pattern and subsequent management measures. The Convention on Biological Diversity has also stressed the need of this for long-term use (Leadley *et al.*, 2014).

Various researchers have studied the floral diversity of Bihar and the neighbouring state of Jharkhand in the past (Haines, 1921-1924; Mooney, 1950; Paul, 1973; Biswas and Maheshshwari, 1980; Bhatacharya and Sarkar, 1998; Singh *et al.*, 2001). Because qualitative status alone cannot provide comprehensive information about the vegetation of an area, quantitative status must be determined. Several researchers have reported diversity indices for various forests (Whittakar, 1965; Risser and Rice, 1971; Ralhan *et al.*, 1982; Knight, 1963; Peng *et al*., 2018; Dad, 2019).

The district of Jamui is one of Bihar's thirty-eight districts. The district has a total size of 3098 km^2. It is located between the latitudes of 24°23'15" and 25°08'30"N and the longitudes of 85°49'30" and 86°38'00"E. The state of Bihar has a forest area of 6,877 km^2, or 7.3 percent of the total land area. The Reserve, Protected, and Unclassified Forests cover 693 km^2, 6183 km^2, and 1 km^2 respectively. The state's forest and tree cover covers 7,306 km^2, or 7.76 percent of the state's entire geographical area. Out of which, 333.13 km^2 is covered by very dense forest, 3280.32 km^2 by moderately dense woods, and 3,692.54 km^2 by open forest (FSI, 2019). The forest occupies 674.95 km^2 which accounts 20.91 percent of the district's total geographical area. The density classes divide the land into 28.97 km^2 of very dense forest, 351.69 km^2 of moderately dense forest, and 267.95 km^2 of open forest. Jamui district has yet to provide a complete assessment of plant diversity. As a result, attempts were made in the current study to examine the plant diversity of

selected forest sites of the Jamui district of Bihar, India.

MATERIALS AND METHODS

A. Survey and Vegetation Data

A study was carried out in the Jamui district of Bihar (Fig.1). The region receives an average annual rainfall of 1107.3 mm. The south-west monsoon receives around 80% of the rainfall from June through September. The diurnal temperature can reach upto 42°C in the summer and 2°C in the winter. For the vegetation analysis, five random forest locations in Jamui district were chosen. GIS cell of the Forest Research Institute, Dehradun provided random coordinating points for collection of data. The study was conducted during 2015-16. The quadrat number and size were determined by the running mean method (Kershaw, 1973) and the species area curve method (Misra, 1968) respectively. Ten quadrats were randomly laid at each site. For tree, shrub and herb layers, quadrat size of 10 × 10m, 3 × 3m and 1 × 1m was used respectively. Analysis for frequency, density and dominance was estimated following Misra (1968).

Fig. 1. Location Map of Study Area.

In each quadrat, g.b.h. (girth at breast height at 1.37m above ground level) of each tree was measured. In the case of herbs and shrubs, diameter was recorded at 2.5 cm above ground level. Species were identified with the help of concerned floras and matched with DD Herbarium specimens. Plant nomenclature was updated as per the Plant List (Anon., 2013). Values of relative frequency, density and dominance were summed up to get the Importance Value Index (IVI). Species richness was calculated by counting total number of species. The species diversity (H'), concentration of dominance (Cd) and Evenness (E) were estimated using the Shannon and Wiener equation (Shannon & Wiener, 1963), Simpson's index (Simpson, 1949) and Pielou evenness index (Pielou, 1966) respectively.

RESULTS AND DISCUSSION

A total of 129 species belonging to 109 genera and 52 families (46 dicotyledons, 5 monocotyledons and 1 pteridophyte) were reported from all five study sites (Tables 2-6). The largest family in the area was Fabaceae (11 spp.), followed by Poaceae (7 spp.), Caesalpiniaceae (6 spp.), Asteraceae, Convolvulaceae, Malvaceae, Rhamnaceae, Rubiaceae and Verbenaceae (5 spp. each) etc. Habit-wise, there were 59 tree, 21 shrub, 23 herb, 18 climber, 7 grass and 1 pteridophyte species in the all five sites. A total of 57 species were reported from the dry deciduous forests of the Eastern Ghats by Sahu *et al.* (2012). Thakur (2015) recorded 36 trees, 8 shrubs, and 34 herbs from the tropical dry deciduous forest in Sagar district. A total of 29 tree species belonging to 17 families were recorded from six sites of tropical dry deciduous forests of Central India (Joshi and Dhyani, 2019) and 14 tree species under 10 families were reported from Amarkutir, tropical dry deciduous forest of West Bengal (Kumar *et al.*, 2020). Himanshi and Jakhar (2020) reported 76 plant species belonging to 37 families from south-west Haryana. Recently, Chandra *et al.* (2021) reported 126 and 174 species from the Aurangabad and Gaya districts of Bihar, respectively. The variation in the number of species in the present work may be because of the climatic and edaphic conditions and extent of the area covered under the study.

Table 1: Diversity indices of different growth forms of selected sites of Jamui District of Bihar.

Sr. No.	Sites	Tree Layer				Shrubby Layer				Herbaceous Layer			
		SR	H	cd	E	SR	H	cd	E	SR	H	cd	E
1.	Bamdah Sub-Beat, Chakai Beat	27	2.238	0.213	0.679	24	2.675	0.095	0.842	28	2.954	0.066	0.887
2.	Narganjo North Sub-Beat, Jhajha Beat, Jhajha Range	13	1.571	0.376	0.612	26	2.591	0.116	0.795	34	3.163	0.055	0.897
3.	Dahiyari Sub-Beat, Batia Beat, Jhajha Range	14	2.170	0.156	0.822	28	2.678	0.104	0.804	25	2.590	0.109	0.805
4.	Mircha Sub Beat, Khaira Beat, Jhajha Range	15	1.955	0.246	0.722	33	2.821	0.104	0.807	35	2.969	0.090	0.835
5.	Lachchuar Sub-Beat, Sikandra (Mathurapur) (P.F.) Beat, Jamui Range	17	2.402	0.126	0.848	26	2.714	0.099	0.833	38	3.099	0.065	0.852
	(SR= Species Richness; H=Diversity index; cd=Concentration of dominance; E=Evenness)												

Table 2: Tree species reported from the study area.

Sr. No.	Species	Family
1.	*Acacia catechu* (L.f.) Willd.	Mimosaceae
2.	*Adina cordifolia* (Roxb.) Hook.f. ex Brandis	Rubiaceae
3.	*Aegle marmelos* (L.) Corr. in Trans. L. Soc.	Rutaceae
4.	*Alangium salvifolium* (L.f.) Wang.	Alangiaceae
5.	*Anogeissus latifolia (*Roxb. ex DC.) Wall. exGuill. &Perr.	Combretaceae
6.	*Annona squamosa* L.	Annonaceae
7.	*Azadirachta indica* A. Juss.	Meliaceae
8.	*Barleria cristata L.*	Acanthaceae
9.	*Bauhinia racemosa* Lam.	Caesalpiniaceae
10.	*Bombax ceiba* L.	Bombacaceae
11.	*Boswellia serrata* Roxb. ex Colebr	Burseraceae
12.	*Buchanania lanzan* Spreng.	Anacardiaceae
13.	*Butea monosperma* (Lam.) Taub.	Fabaceae
14.	*Casearia tomentosa* Roxb.	Flacortiaceae
15.	*Cassia fistula* L.	Caesalpiniaceae
16.	*Cassineglauca*(Rottb.) Kuntze	Celastraceae
17.	*Catunaregam spinosa* (Thunb.) Tirveng.	Rubiaceae
18.	*Cochlospermum religiosum* (L.) Alston, Handb. Fl.Ceyl.	Cochlospermaceae
19.	*Croton roxburghii* Balak	Euphorbiaceae
20.	*Dalbergia lanceolaria* L.	Fabaceae
21.	*Dalbergia sissoo* Roxb.	Fabaceae
22.	*Diospyros melanoxylon* Roxb.	Ebenaceae
23.	*Diospyros melanoxylon* Roxb.var. *tupru* (Buch.-Ham.) V.Singh	Ebenaceae
24.	*Ehretia laevis Roxb.*	Boraginaceae
25.	*Erythrina variegata* L.	Fabaceae
26.	*Ficus benghalensis* L.	Moraceae
27.	*Ficus racemosa* L.	Moraceae
28.	*Ficus religiosa* L.	Moraceae
29.	*Flacourtia indica* (Burm.f.) Merr.	Flacortiaceae
30.	*Gardenia latifolia* Ait.	Rubiaceae
31.	*Helicteres isora* L.	Sterculiaceae
32.	*Holarrhena pubescens* (Buch.-Ham.) Wall.ex.G.Don	Apocynaceae
33.	*Holoptelea integrifolia* (Roxb.) Planch	Ulmaceae
34.	*Ixora pavetta*Andr	Rubiaceae
35.	*Lagerstroemia parviflora* Roxb.	Lythraceae
36.	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae
37.	*Madhuca longifolia* (Koenig) Macbr.*var.latifolia*	Sapotaceae
38.	*Mangifera indica* L.	Anacardiaceae
39.	*Miliusa tomentosa* (Roxb.) Finet & Gagenpain	Annonaceae
40.	*Nyctanthes arbor-tristis* L.	Oleaceae
41.	*Oroxylum indicum* (L.) Vent.	Bignoniaceae
42.	*Phoenix sylvestris (L.) Roxb.*	Arecaceae
43.	*Phyllanthus emblica* L.	Phyllanthaceae
44.	*Premna latifolia* Roxb.	Verbenaceae
45.	*Schleichera oleosa* (Lour.) Oken	Sapindaceae
46.	*Shorea robusta* Gaertn.f., Fruct.	Dipterocarpaceae
47.	*Sterculia urens* Roxb., Pl. Coram	Sterculiaceae
48.	*Streblus asper* Lour.	Moraceae
49.	*Syzygium cumini* (L.) Skeels	Myrtaceae
50.	*Tamarindus indica* L.	Caesalpiniaceae
51.	*Tectona grandis* L.f.	Verbenaceae
52.	*Terminalia arjuna* (Roxb. ex DC.) Wight. &Arn.	Combretaceae
53.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae
54.	*Tremapolitoria* (Planch.) Blume	Cannabaceae
55.	*Walsuratrifoliolata* (Juss.) Harms	Meliaceae
56.	*Wendlandia tinctoria* (Roxb.) DC	Rubiaceae
57.	*Wrightia tinctoria* (Roxb.) R.Br.	Apocynaceae
58.	*Ziziphus mauritiana* Lam.	Rhamnaceae
59.	*Ziziphus mauritiana* var. *mauritiana* Lam.	Rhamnaceae

Table 3: Shrub species reported from the study area.

Sr. No.	Species	Family
1.	*Calotropis procera* (Aiton) Dryand	*Apocynaceae*
2.	*Capparis zeylanica* L.	Capparaceae
3.	*Carissa opaca* Stapf ex Haines	Apocynaceae
4.	*Cassia occidentalis* (L.) Rose.	Fabaceae
5.	*Clerodendrum viscosum* Vent.	Verbenaceae
6.	*Dendrophthoe falcate* (L.f.) Ettingsh.	Loranthaceae
7.	*Eupatorium odoratum* L.	Asteraceae
8.	*Euphorbia nivulia* Buch.-Ham.	Euphorbiaceae
9.	*Grewia hirsuta* Vahl	Malvaceae
10.	*Ipomoea carnea* Jacq.	Convolvulaceae
11.	*Jasminum arborescens* Roxb.	Oleaceae
12.	*Jatropha gossypifolia* L.	Euphorbiaceae
13.	*Lantana camara* L. *var. aculeata* (L.) Mold.	Verbenaceae
14.	*Mimosa himalayana* Gamble	Mimosaceae
15.	*Olax scandens* Roxb.	Malvaceae
16.	*Phyllanthus reticulatus* Poir.	Phyllanthaceae
17.	*Securinega virosa* (Roxb. ex Willd.) Baill.	Phyllanthaceae
18.	*Thespesia lampas* (Cav.) Dalzell	Malvaceae
19.	*Urena lobata* L.	Malvaceae
20.	*Vitex negundo* L.	Verbenaceae
21.	*Woodfordia fruticosa* (L.) Kurz	Lythraceae

Table 4: Climber species reported from eleven forest sites of Jamui district.

Sr. No.	Species	Family
1.	*Abrus precatorious* L.	Fabaceae
2.	*Acacia pennata* (L.) Willd	Mimosaceae
3.	*Asparagus racemosus* Willd.	Liliaceae
4.	*Atylosia scarabaeoides* (L.) Benth.	Fabaceae
5.	*Atylosia volubilis* (Blanco) Gamble	Fabaceae
6.	*Bauhinia vahlii* Wight &Arn	Caesalpiniaceae
7.	*Butea parviflora* Roxb.	Fabaceae
8.	*Celastrus paniculatus* Willd.	Celastraceae
9.	*Cissampelos pareira* L. var. *hirsuta* (Buch.-Ham.ex DC.) Forman	Menispermaceae
10.	*Combretum roxburghii* Spreng	Combretaceae
11.	*Cryptolepis buchanani* Roem. &Schult.	Periplocaceae
12.	*Cuscuta reflexa* Roxb.	Convolvulaceae
13.	*Dioscorea bulbifera* L.	Dioscoreaceae
14.	*Erycibe paniculata* Roxb.	Convolvulaceae
15.	*Ichnocarpus frutescens* (L.)	Apocynaceae
16.	*Smilax zeylanica* L.	Smilacaceae
17.	*Ventilago denticulata* Willd.	Rhamnaceae
18.	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae

Table 5: Herb species reported the study area.

Sr. No.	Species	Family
1.	*Acrocephalus hispidus* (L.) Nicolson & Sivad.	Lamiaceae
2.	*Andrographis paniculata* (Burm.f.) Nees	Acanthaceae
3.	*Bacopa monnieri* (L.) Wettst.	Plantaginaceae
4.	*Blumea mollis* (D. Don) Merr.	Asteraceae
5.	*Cassia tora* L.	Caesalpiniaceae
6.	*Centella asiatica* (L.) Urb.	Apiaceae
7.	*Desmodium gangeticum* (L.) DC.	Fabaceae
8.	*Desmodium heterocarpon* (L.) DC.	Fabaceae
9.	*Desmodium triflorum* (L.) DC.	Fabaceae
10.	*Elephantopus scaber* L.	Asteraceae
11.	*Euphorbia hirta* L.	Euphorbiaceae
12.	*Evolvulus alsinoides* (L.) L	Convolvulaceae
13.	*Evolvulus nummularius* (L.) L	Convolvulaceae
14.	*Hyptis suaveolens* (L.) Poit.	Lamiaceae
15.	*Justicia simplex* D. Don	Acanthaceae
16.	*Polygala arvensis* Willd.	Polygalaceae
17.	*Rungia pectinata* (L.) Nees	Acanthaceae
18.	*Sida cordata* (Burm.f.) Borassum	Malvaceae
19.	*Sida cordifolia* L.	Malvaceae
20.	*Sida rhombifolia* L.	Malvaceae
21.	*Vanda tessellate* (Roxb.) Hook. ex G.Don	*Orchidaceae*
22.	*Vernonia cinerea* (L.)	Asteraceae
23.	*Vicoa indica* (L.) DC.	Asteraceae

Table 6: Grasses and Pteridophytes reported from study area.

Sr.No.	Species	Family
Grass		
1.	*Aristida adscensionis* L.	Poaceae
2.	*Bothriochloa pertusa* (L.) A. Camus	Poaceae
3.	*Dendrocalamus strictus* (Roxb.) Nees	Poaceae
4.	*Desmostachya bipinnata* (L.) Stapf	Poaceae
5.	*Eragrostis coarctata* Stapf	Poaceae
6.	*Heteropogon contortus* (L.)	Poaceae
7.	*Imperata cylindrica* (L.)	Poaceae
Pteridophyte		
1.	*Lygodium flexuosum* (L.) Sw.	Lygodiaceae

Plant species vary in their responses to environmental factors. A given species will have a unique set of tolerances to environmental variables such as light, temperature, moisture and nutrients. The status of a species is an important indicator for its conservation and sustainable utilization. The Importance Value Index (IVI) is a measure of how dominant a species is in a given forest area. The highest IVI species in different sites for tree, shrubby and herbaceous layers are presented in Figs. 2-4 respectively. In the tree layer, *Shorea robusta* was the most dominant species with the highest IVI values in 3 sites, i.e. site-II (109.39), site-I (86.24) and Site-IV (80.07). In site-III and site-V, the highest IVI was estimated for *Lannea coromandelica* (72.39) and *Terminalia bellirica* (69.36) respectively. In the shrubby layer, the highest IVI estimated for Sites I, II, III, IV and V were 45.82 (*Diospyros melanoxylon* var. *tupru*), 49.71 (*Holarrhena pubescens*), 58.34 (*Shorea robusta*), 86.30 (*Cassia opaca*) and 55.74 (*Combretum roxburghii*) respectively. The herbaceous layer was dominated by *Holarrhena pubescens* in 2 sites, i.e., site-IV (34.10) and site-V (42.16). *Shorea robusta*, *Woodfordia fruticosa* and *Eupatorium odoratum* had the highest IVI values at site-I (30.36), site-II (55.96) and site-III (46.44) respectively.

Different diversity indices such as Shannon-Wiener Diversity Index (H), Concentration of Dominance (cd), Evenness (E) and Species Richness (SR) for different growth forms at different sites in the Jamui district were estimated for comparison. The study reveals that in the tree layer, highest Species Richness (SR) was observed at the Bamdah Sub-beat site (27 spp.), followed by the Lachchuar Sub-beat (17 spp.), Mircha Sub-beat (15 spp.) and the lowest was found at the Narganjo North Sub-beat (13 spp.). In the case of shrubby layer, highest Species Richness (SR) value was found at Mircha Sub-beat (33 spp.), followed by Dahiyari Sub-beat (28 spp.), Narganjo North Sub-beat and Lachchuar Sub-beat (26 spp. each) and lowest at Bamdah Sub-beat (24 spp.). The herbaceous layer had highest Species Richness (SR) at Lachchuar Sub-beat (38 spp.) followed by Mircha Sub-beat (35 spp.), Narganjo North Sub-beat (34 spp.) and lowest at Dahiyari Sub-beat (25 spp.).

In the tree layer, the highest Diversity Index (H) was estimated for Lachchuar Sub-beat site (2.402), followed by Bamdah Sub-beat (2.238), Dahiyari Sub-beat (2.170) and lowest at Narganjo North Sub-beat (1.572). In the shrubby layer, highest Diversity Index (H) value was estimated for Mircha Sub-Beat (2.821) followed by Lachchuar Sub-beat (2.714), Dahiyari Sub-beat (2.678) and lowest for Narganjo North Sub-beat (2.591).

In the herbaceous layer, highest Diversity Index (H) was estimated for Narganjo North Sub-beat (3.163) followed by Lachchuar Sub-beat (3.099), Mircha Sub-beat (2.969) and lowest for Dahiyari Sub-beat (2.590). The higher value of Diversity Index (H) indicates heterogeneity in communities whereas lower value reflects homogeneity. In the present study, diversity index value range was within 0.67 to 4.03 as reported in tropical forests of the Indian subcontinent by various worker (Kumar *et al.*, 2010; Sundarapandian and Swamy, 2000; Verma *et al.*, 2015; Himanshi and Jakhar, 2020; Chandra *et al.*, 2021).

In the tree layer, the Concentration of Dominance (cd) was highest in the case of Narganjo North Sub-beat site (0.376), followed by Mircha Sub-beat (0.246), Bamdah Sub-beat (0.213) and lowest in the case of Lachchuar Sub-beat (0.126). The shrubby layer had highest value of Concentration of Dominance (cd) at Narganjo North Sub-beat (0.116), followed by Dahiyari Sub-beat and Mircha Sub-beat (0.104 each) and lowest at Bamdah Sub-beat (0.095). In the herbaceous layer, the highest value of Concentration of Dominance (cd) was estimated for Dahiyari Sub-beat (0.109), followed by Mircha Sub-beat (0.090), Bamdah Sub-beat (0.066) and lowest at Narganjo North Sub-beat (0.055).The higher value of Concentration of Dominance (cd) indicates homogeneity and vice-versa.

In the case of tree layer, the highest Evenness (E) value was estimated for Lachchuar Sub-beatsite (0.848), followed by Dahiyari Sub-beat (0.822), Mircha Sub-beat (0.722) and lowest at Narganjo North Sub-beat (0.612). In the case of shrubby layer, the highest Evenness (E) value was observed for Bamdah Sub-beat (0.842), followed by Lachchuar Sub-beat (0.833), Mircha Sub-beat (0.807) and the lowest was at Narganjo North Sub-beat (0.795). In the herbaceous layer, the highest value of Evenness (E) was estimated for Narganjo North Sub-beat (0.897), followed by Bamdah Sub-beat (0.887), Lachchuar Sub-beat (0.852) and lowest for Dahiyari Sub-beat (0.805). A higher value of Evenness (E) indicates that species are evenly distributed and vice-versa. In the present study, Pielou Index (E) for tree, shrubby and herbaceous layers showed a similar trend reported by different workers in tropical parts of India viz. Udaipur Rajasthan (Kumar *et al.* 2010), Western Ghat (Sundarapandian and Swamy, 2000), Bundelkhand region of Uttar Pradesh (Verma *et al.*, 2015), South West Haryana (Himanshi and Jakhar 2020), Nalanda, Aurangabad and Gaya districts of Bihar (Chandra *et al*., 2021).

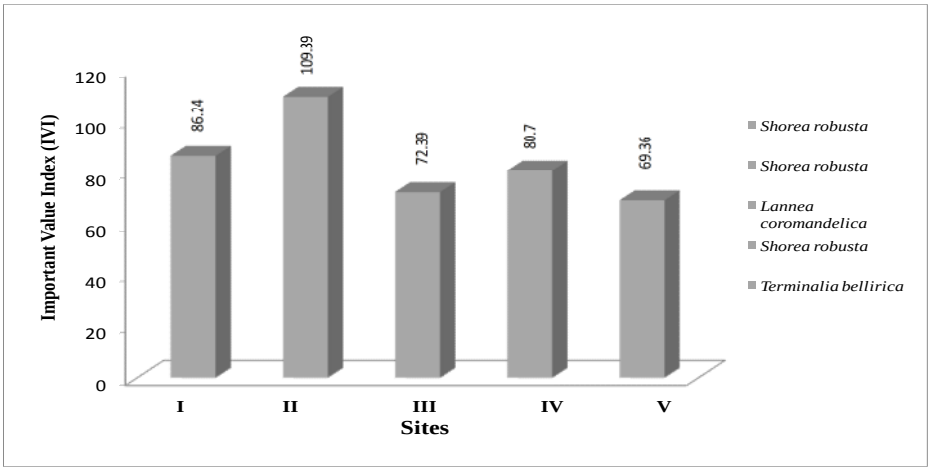

Fig. 2. Highest Important Value Index (IVI) of tree layer species in different sites (I: Bamdah Sub-Beat, Chakai Beat, II- Narganjo North Sub-Beat, Jhajha Beat, III- Dahiyari Sub-Beat, Batia Beat, IV: Mircha Sub Beat, Khaira Beat, V: Lachchuar Sub-Beat, Sikandra (Mathurapur) (P.F.) Beat.

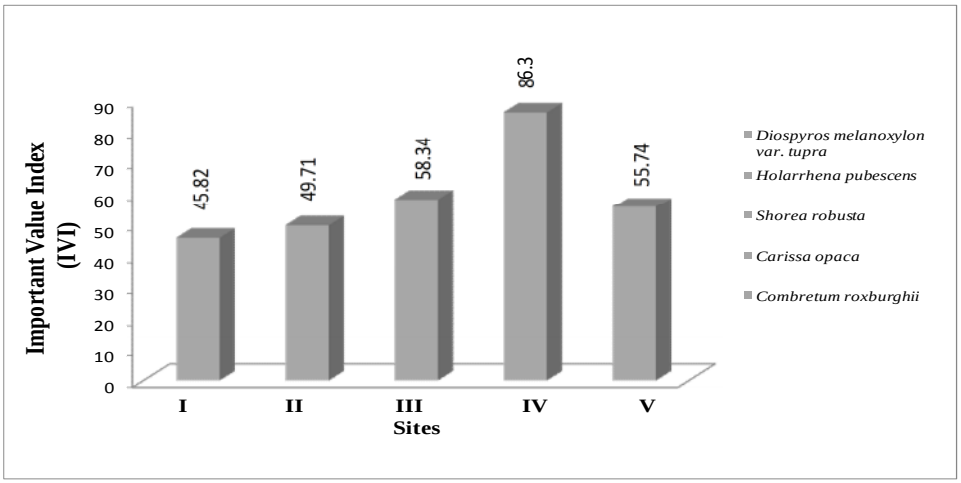

Fig. 3. Highest Important Value Index (IVI) of shrubby layer species in different sites (I: Bamdah Sub-Beat, Chakai Beat, II- Narganjo North Sub-Beat, Jhajha Beat, III- Dahiyari Sub-Beat, Batia Beat, IV: Mircha Sub Beat, Khaira Beat, V: Lachchuar Sub-Beat, Sikandra (Mathurapur) (P.F.) Beat.

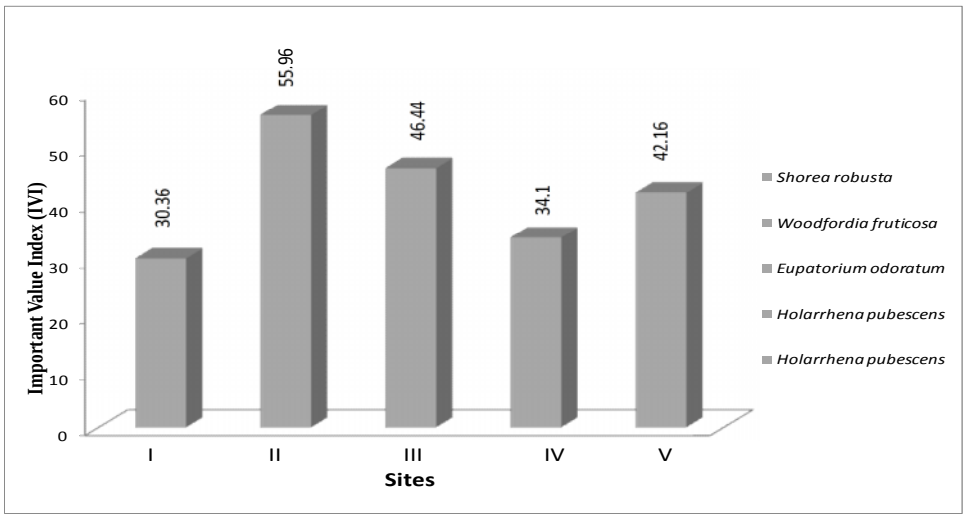

Fig. 4. Highest Important Value Index (IVI) of herbaceous layer species in different sites (I: Bamdah Sub-Beat, Chakai Beat, II- Narganjo North Sub-Beat, Jhajha Beat, III- Dahiyari Sub-Beat, Batia Beat, IV: Mircha Sub Beat, Khaira Beat, V: Lachchuar Sub-Beat, Sikandra (Mathurapur) (P.F.) Beat.

CONCLUSION

It is concluded from the study that Jamui district of Bihar possesses high floristic diversity in the forest area. However, plant diversity is not the same in all areas. On the basis of different diversity attributes in the tree layer, the Lachcuar site is the most diverse site in the Jamui district, followed by Bamdah, Dahiyari, Mircha and Narganjo. In the case of shrubby layer, the Mircha site was the most diverse, followed by Lachchuar, Dahiyari, Bamdah and Narganjo. The herbaceous layer had more diversity at the Narganjo site, followed by Lachchuar, Mircha, Bamdah and Dahiyari. The Narganjo site is relatively less diverse than other sites in the area. Further investigation should be carried out to find the cause of the low diversity at the site and appropriate management strategies should be adopted for its restoration. Both quantitative and quantitative assessments of vegetation are essential for a holistic picture of the diversity of any area for developing conservation and management strategies. Regular inventorization and monitoring of plant diversity is the need of the hour so that the present status of plant diversity can be understood and future management strategies can be made. Therefore, similar kinds of studies should be carried out in different forest sites to assess the present status of plant diversity for conservation and sustainable management.

Acknowledgement. Authors are thankful to the Director, Forest Research Institute, Dehradun, for constant encouragement and support. The authors are also thankful to the PCCF and other forest officials of the Bihar Forest Department for funding and providing the necessary support for carrying out the study.
Conflict of Interest. None.

REFERENCES

Anonymous (2013). The Plant List, Version 1.1., http:www.theplantlist.org

Bhatacharya, P. K. and Sarkar, K. (1998). *Flora of West-Champaran District, Bihar*. Botanical Survey of India, Calcutta.

Billings, W. D. (1952). The environment complex in relation to plant growth and distribution. *Quarterly Review of Biology*, 27: 251-265.

Biswas, D. K. and Maheshwari, J. K. (1980). A contribution to the vegetation of Chaibasa, Singhbhum District in South Bihar. *Bull. Bot. Soc. Bengal, 25*(1-2): 43-51.

Chandra, A., Naithani, H. B., Verma, P. K., Saxena, J. and Prajapati, S. (2021). Plant diversity assessment of selected forests sites of Gaya district of Bihar, India. *Journal of Applied and Natural Science, 13*(2): 424-432.

Chandra, A., Naithani, H. B., Verma, P. K., Saxena, J., and Saini, R. and Kishwan, S. (2021). Assessment of Plant diversity of selected forest sites of Aurangabad district of Bihar. *Int. J. Curr. Microbiol. App. Sci., 10* (02): 462-468.

Chandra, A., Naithani, H. B., Verma, P.K., Saxena, J, Kishwan, S. and Saini, R. (2021). Phyto-diversity Assessment of Nalanda Forest Division of Bihar. *Biological Forum- An International Journal, 13* (1): 01-09.

Dad, J. M. (2019). Phytodiversity and medicinal plant distribution in pasturelands of North Western Himalaya in relation to environmental gragients. *J. Mt. Science, 16*: 884-897.

Forest Survey of India. (2019). *State of Forest Report.* Forest Survey of India. Dehradun

Gautam, M. and Joshi, S. P. (2014). Analysis of vegetation dynamics and phytodiversity from three dry deciduous forests of Doon Valley, Western Himalaya, India. *Journal of Asia-Pacific Biodiversity, 7*: 292-304.

Haines, H. H. (1921-24). *The Botany of Bihar and Orissa.* Adlard and Sons, London.

Himanshi, H. and Jakhar, S. (2020). Floristic diversity and vegetation analysis of the communilty forests of South West Haryana, India. *Current Botany, 11*: 51-59.

Joshi, R.K. and Dhyani, S. (2019). Biomass, carbon density and diversity of tree species in tropical dry deciduous forests in Central India. *Acta Ecologica Sinica., 39*(4): 289-299.

Kershaw, K. A. (1973). *Quantitative and Dynamic Plant Ecology*. London: Edward Arnold Ltd., 308pp.

Knight, D. H. (1963). A distance method for constructing forest profile diagrams and obtaining structural data. *Tropical Ecology, 4*: 89-94.

Kumar, J. I. N., Kumar, R. N., Bhoi, R. K. and Sajish, P. R. (2010). Tree species diversity and soil nutrient status of tropical dry deciduous forest of western India. *Tropical Ecology, 51*(2): 273-279.

Kumar, M. L., Nag, A., Malakar, S. and Joshi, H. G. (2020). Population Structure and Diversity of Trees in Amarkutir, A Tropical Dry Deciduous Forest of West Bengal, India. *Indian Journal of Ecology, 47*(1): 150-154.

Leadley, P. W., Krug, C. B., Alkemade, R., Pereira, H. M., Sumaila, U. R., Walpole, M., Marques, A., Newbold, T., Teh, L. S. L, Van Kolck, J., Bellard, C., Januchowski-Hartley, S. R. and Mumby, P. J. (2014): *Progress towards the Aichi Biodiversity Targets: An Assessment of Biodiversity Trends, Policy Scenarios and Key Actions.* Secretariat of the Convention on Biological Diversity, Montreal, Canada. *Technical Series 78*, 500 pp.

Misra, R. (1968). *Ecological Workbook.* Oxford Press, New Delhi.

Mooney, H. F. (1950). *Supplement to the Botany of Bihar and Orissa*. Catholic Press, Ranchi

Paul, S. R. (1973). On the aquatic and Marsh Flora of Monghyr, Bihar. *Botanique*, 143-152.

Peng, Y., Fan, M., Song, J., Cui, T. and Li, R. (2018). Assessment of plant species diversity based on hyperspectral indices at a fine scale. *Scientific Reports, 8* (4776): 1-11.

Pielou, E. C. (1966). The measurement of diversity in different types of biological collections. *Journal of Theoretical Biology, 13*: 131-144.

Ralhan, P. K., Saxena, A. K. and Singh, J. S. (1982). Analysis of forest vegetation at and around Nainital in Kumaun Himalaya. *Proc. Indian National Sciences, 19*: 307-324.

Risser, P. G. and Rice, E. L. (1971). Diversity in tree species in Oklahoma upland forests. *Ecology, 52*: 876-880.

Sahu, S. C., Dhal, N. K. and Mohanty, R. C. (2012). Tree species diversity, distribution and population structure in a tropical dry deciduous forest of Malygiri hill range, Eastern India. *Tropical Ecology, 53*(2): 163-168.

Shannon, C. E. and Wiener, W. (1963). *The Mathematical Theory of Communities*. University of Illinois press, Urbana.

Simpson, E. M. (1949). Measurement of diversity. *Nature, 163*: 688.

Singh, N. P., Mudgal V., Khanna, K. K, Srivastava, S. C., Sahoo, A. K., Bandhopadhay, S., Aziz, N., Das M., Bhattacharya, R. P. and Hajra, P. K. (2001). *Flora of Bihar-Analysis*. Botanical Survey of India, Calcutta

Sundarapandian, S. M. and Swamy, P. S. (2000). Forest ecosystem structure and composition along an altitudinal gradient in the Western Ghats, South India. *Journal of tropical forest Science*, *12*: 104-123.

Thakur, A. S. (2015). Floristic composition, life-forms and biological spectrum of tropical dry deciduous forest in Sagar Districts, Madhya Pradesh, India. *Tropical Plant Research*, *2*(2): 112-119.

Verma, M. K., Niranjan, R. K. and Pal, A. (2015). Phytosociological attributes of a tropical dry deciduous forest of Bundelkhand region of Uttar Pradesh, India. *Journal of Biodiversity and Environmental Sciences*, *3*(10): 86-89.

Whittakar, R. H. (1965). Dominance and diversity inland plant communities: numerical relations of species express in importance of competition in community function and evolution. *Science*, *147* (3655): 250-260.

How to cite this article: A. Chandra, H.B. Naithani, P.K. Verma, J. Saxena and S. Kishwan (2022). Floristic Diversity Assessment of Forest areas of Jamui District of Bihar. *Biological Forum – An International Journal*, *14*(1): 371-378.