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A comparative study of tree species composition of Panjhora forest beat and Sipchu forest beat of Chalsa forest range, West Bengal, India

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ABSTRACT

This study designed to evaluate the ecological diversity of tree vegetation in Panjhora and Sipchu forest beats of Chalsa forest range, West Bengal, India. Both the forest beats are very well known for their characteristics as dense forest. To screen the ecological status of these forests a stratified random quadrate method was employed in the study. A total of 28 tree species were recorded from Panjhora Forest Beat and 31 tree species were recorded from Sipchu Forest Beat. The work conclude that though both the forest beats belong to same forest range, they differ in pattern of diversity in tree vegetation and specially in regard to the pattern of dominance.

1. INTRODUCTION

Forests are the principal bio-resources and repositories of natural wealth that support human well-being and ecological sustainability. The forest ecosystems provide unequal share to the world's biodiversity [1]. Thus for the maintenance of biodiversity it is essential to attain forest sustainability [12]. It is undoubtedly justified that the long term sustainability of forest ecosystems is greatly concerned with plant diversity and their phytosociological attributes. Plant diversity is widely acknowledged to support many other communities of forests as well as human community. Much of the overall diversity depends on plant diversity, because plants provide both food and habitat for other organisms [6]. The ecological security of any country depends on the health of its forests [7]. Thus management and maintenance of any forest is obligatory. As the over al condition of forest depends on its plant composition, the information on composition, diversity and ecological aspects of plant species is of primary importance in the planning and implementation of forest biodiversity conservation efforts. In a typical forest knowledge of vascular plant diversity and changes that occur with disturbance may provide planning information to Biologists [16]. Among the vascular plants tree species are much important as they are controlling the keystone factor, i.e., entry of light in to forest bed. Analysis and estimation of Tree diversity, in which a combination of physical habitat, vegetation, physiognomy, species composition and community relationship are useful in formulating forest management programme [15]. The inherent variation within communities and ecosystems must be documented and used for base-line data to effectively predict the outcome of disturbances, such as regeneration harvest methods, on floristic diversity and richness [15].

2. MATERIAL AND METHOD

2.1 Description of Study Site

The present study has been carried out in two beat forests of Chalsa Forest Range of Jalpaiguri Forest Division, West Bengal, India, namely Panjhora Beat and Sipchu Beat. Both the forest beats are located on the undulating plain of Himalayan foothill, which create a great floral and faunal diversity. It is located in close proximity to Chapramari Wildlife Sanctuay. The forest is situated very close to the bank of the Jaldhaka and Murti River**.** Sipchu forest Beat covers 1757.58 Ha area and Panjhora forest beat Covers 2255.92 Ha. These forests are characterized by the presence of natural water passages, called 'Jhora'.

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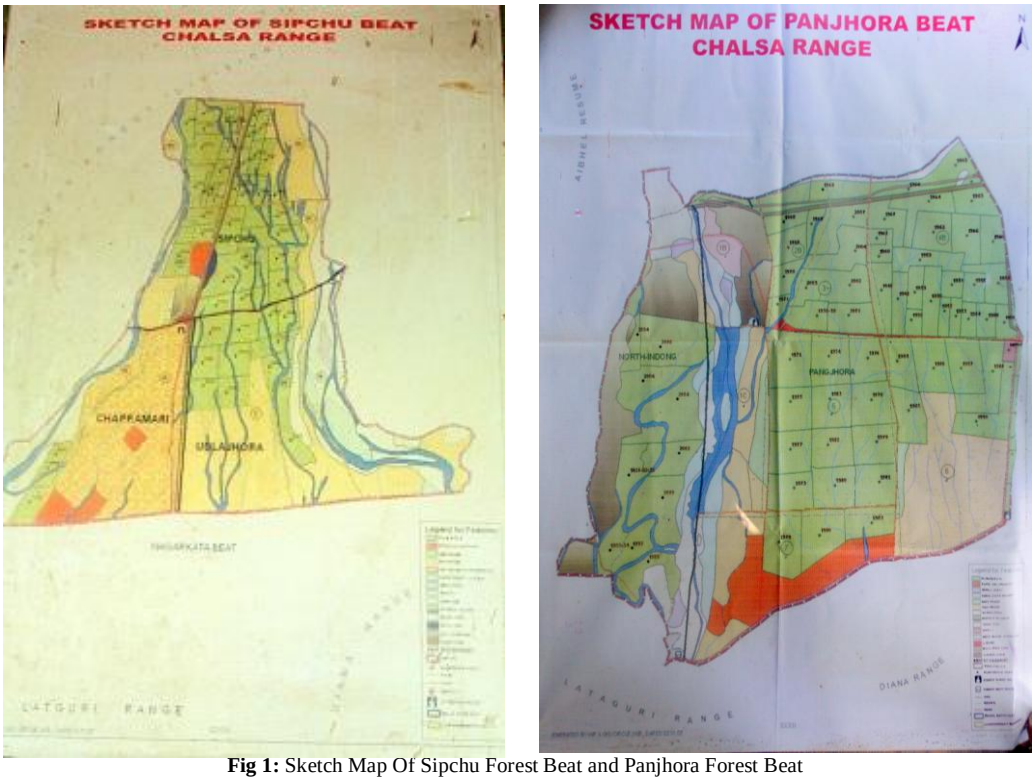


Fig 1: Sketch Map Of Sipchu Forest Beat and Panjhora Forest Beat

2.2 Study of Tree vegetation composition and structure

For phytosociological studies of tree vegetation in the selected beat forest of Chalsa forest range, the quadrate methods were used. In each beat forest, a total of 20 sampling sites representing various categories of natural forests and plantations were selected for vegetation sampling. At each sampling site four quadrates (20 m x 20 m) were laid to quantify various tree vegetation. The use of local name of each forest site was adopted from the knowledge of Forest guards. Different topography and altitudes, had different types and levels of disturbance intensity; and the dominant and character species for each of the twenty forest community sites were different. Tree species found within each sampling plot were photographed and identified by their vernacular names (adopted from Range Officer, Beat Officer, Forest Guards and local people) and scientific names using various books, articles[5;18] and internet. In order to analyze the diversity of tree vegetation Frequency, Relative frequency, density and Relative density were calculated. Importance Value Index was calculated by adding Relative frequency Relative density and Relative Basal Aea [3, 13].

(a) Frequency (%)

This term refers to the degree of dispersion of individual species in an area and usually expressed in terms of percentage. It is calculated by the equation:

$$\text{Frequency}(\%) = \frac{\text{No. of plot in which the species is present}}{\text{Total No. of plots sampled}} \times 100$$

(b) Relative Frequency (%)

The degree of dispersion of individual species in an area in relation to the number of all the species occurred.

$$\text{Relative Frequency}\ (\%) = \frac{\text{Frequency of the species}}{\text{Frequency of all the species}} \times 100$$

(c) *Density*

Density is an expression of the numerical strength of a species where the total number of individuals of each species in all the quadrats is divided by the total number of quadrats studied. Density is calculated by the equation:

$$\text{Density} = \frac{\text{No. individuals of the species}}{\text{Total No. of plots sampled}}$$

(d) *Relative Density (%)*

Relative density is the study of numerical strength of a species in relation to the total number of individuals of all the species and can be calculated as:

$$\text{Relative Density} = \frac{\text{Density of the species}}{\text{Density of all the species}} \text{ x } 100$$

(e) *Relative Dominance (%)*

Dominance of a species is determined by the value of the basal area. Relative dominance is the coverage value of a species with respect to the sum of coverage of the rest of the species in the area.

$$\text{Basal Area} = \frac{(\text{Circumference at breast height})2}{12.56}$$

Relative dominance or Relative Basala Area

$$= \frac{\text{Basal Area of the species}}{\text{Basal Area of all the species}} \text{ x } 100$$

(f) *Abundance*

It is the study of the number of individuals of different species in the community per unit area. By quadrats method, samplings are made at random at several places and the number of individuals of each species was summed up for all the quadrats divided by the total number of quadrats in which the species occurred. It is represented by the equation:

$$\text{Abundance} = \frac{\text{No. individuals of the species}}{\text{Total No. of plots in which the species is present}}$$

(g) *Importance Value Index*

This index is used to determine the overall importance of each species in the community structure. In calculating this index, the percentage values of the relative frequency, relative density and relative dominance (Relative Basala Area) are summed up together and this value is designated as the Importance Value Index or IVI of the species.

IVI= Relative Frequency + Relative Density + Relative dominance

2.3. Data processing and Phytosociological Analysis:

All the data both spatial and especial collected from different sources has been tabulated and analyzed separately. The data collected were used to compute community indices like

(a) Species diversity (H')

Species diversity of different tree species; it was calculated using the Shannon- Weiner Index: (Shannon and Weiner, 1963).

$$(H') = -\sum [(ni / N). \ln (ni / N)]$$

Where 'ni' is the IVI of individual species and N is the total IVI of all the species [17].

(b) Species dominance (Cd)

Species dominance was calculated following Simpson:

$$Cd = \Sigma (ni/N)^2,$$

where, ni and N are the same as those for Shannon Weiner information function [18].

(c) Equitability of evenness (e)

Equitability of evenness refers to the degree of relative dominance of each species in that area. It was calculated as: Evenness (e) = H'/log S

where, H'= Shannon index, S = number of species [14].

(d) Species richness (D)

Species richness was determined by Margalef index (1968) as:

$$D=(S-1)/\ln N.$$

where, S = number of species.
N= total number of individuals [10].

(e)Menhinick's index (D_{mm})

Menhinick's index (Whittaker, 1977). is expressed as $D_{mm}=S/\sqrt{N}$, where N is the number of individuals in the sample and S is the species number [11].

(f) Equitability Index

The Shannon's equitability Index (Lloyd and Ghelard, 1964) is expressed as

$$(EH) = H/Hmax = H/\ln S .$$

Where, H is the Shannon index and S is the species number [9].

(g) Berger-Parker Dominance Index

The Berger-Parker Dominance Index is a simple measure of the numerical importance of the most abundant species and is expressed a d = Nmax/N.
N_{max} is the number of individuals in the most abundant species and N is the total number of individuals in the sample. The increase in the value of reciprocal of Berger-Parker Dominance Index reflects the increase in diversity and a reduction in dominance [2].

3. RESULTS AND DISCUSSION

The present study showed that both the forest beats are rich in tree diversity. A total of 28 tree species were recorded from Panjhora Forest Beat. Among them highest IVI was recorded for *Shorea robusta* Gaertn.(15.483). IVI was also good for *Schima wallichii* Choisy. (10.538) and *Wrightia tinctoria* (Roxb.) R.Br (9.562). The lowest IVI was recorded for *Ailanthus grandis* Prain (0.950). IVI was also poor for few species like *Dillenia indica* L., *Gynocardia odorata* R. Br., *Alstonia scholaris* R. Br., *Butea monosperma* (Lam.) Taub., *Beilschmiedia roxburghiana* Nees, *Toona ciliata* M.Roem., *Altingia excelsa* Noronha. (Table 1). From Sipchu Beat Forest 31 tree species were recorded. Among the tree species highest IVI was recorded for *Beilschmiedia roxburghiana* Nees (43.867).It was also observed that a few species including *Shorea robusta* Gaertn., *Tetrameles nudiflora* R.Br., *Sterculia villosa* Roxb., *Wrightia tomentosa* Roem. & Schult., *Stereospermum tetragonum* DC., *Persea fructifera* Kosterm had quite good IVI (Table 2). The lowest IVI was recorded for *Andromeda elliptica* Siebold & Zucc. (1.015).

Table 1: Different Phytosociological values of tree vegetation of Panjhora Forest Beat.

Sl. No.	Name of The Plant	Family	A	D	Fr	BA	RD	RF	RBA	IVI
1	*Terminalia belerica* Roxb.	Combretaceae	3.00	0.60	20	1099.22	0.038	3.773	0.024	3.835
2	*Terminalia alata* Roth.	Combretaceae	2.40	0.60	25	1198.67	0.038	4.717	0.026	4.781
3	*Dillenia indica* L.	Dilleniaceae	2.00	0.10	5	395.72	0.006	0.943	0.009	0.958
4	*Alstonia scholaris* R. Br.	Apocynaceae	1.00	0.05	5	703.50	0.003	0.943	0.015	0.961
5	*Amoora rohituka* W. & A.	Meliaceae	2.75	0.55	20	1803.84	0.035	3.773	0.039	3.847
6	*Amoora spectabilis* Miq.	Meliaceae	2.40	0.60	25	983.62	0.038	4.717	0.022	4.777
7	*Schima wallichii* Choisy.	Theaceae	3.90	2.15	55	1096.79	0.137	10.377	0.024	10.538
8	*Shorea robusta* Gaertn.	Dipterocarpaceae	5.44	4.35	80	5155.65	0.276	15.094	0.113	15.483
9	Gynocardia odorata R.Br.	Achariaceae	1.00	0.05	5	659.32	0.003	0.943	0.014	0.960
10	*Castanopsis tribuloides* A. DC.	Fagaceae	2.17	0.65	30	2942.07	0.041	5.660	0.065	5.766
11	*Wrightia tinctoria* (Roxb.) *R. Br*	Apocynaceae	4.00	2.00	50	51.33	0.127	9.434	0.001	9.562
12	*Heteropanax fragrans*(Roxb.) *Seem.*	Araliaceae	1.00	0.10	10	42.12	0.006	1.887	0.001	1.894
13	*Wrightia arborea* (Dennst.) Mabb.,	Apocynaceae	2.00	0.20	10	2445.27	0.013	1.887	0.054	1.954
14	*Lagerstromia speciosa* Pers.	Lythraceae	2.80	0.70	25	986.99	0.044	4.717	0.022	4.783
15	Sterculia villosa Roxb	Sterculiaceae	2.50	0.25	10	3046.13	0.016	1.887	0.067	1.970
16	*Tetrameles nudiflora* R.Br.	Datiscaceae	1.00	0.10	10	5804.14	0.006	1.887	0.127	2.020
17	*Butea monosperma* (Lam.) Taub.	Fabaceae	1.00	0.05	5	894.59	0.003	0.943	0.020	0.966
18	Acrocarpus fraxinifolius Arn.	Fabaceae	2.17	0.65	30	612.22	0.041	5.660	0.013	5.714
19	*Stereospermum tetragonum* DC.	Bignoniaceae	2.80	0.70	25	1503.74	0.044	4.717	0.033	4.794
20	*Lagerstroemia parviflora* Roxb.	Lythraceae	2.67	0.40	15	1141.72	0.025	2.830	0.025	2.880
21	*Premna mucronata* Roxb.	Verbenaceae	3.00	0.45	15	1281.93	0.029	2.830	0.028	2.887
22	*Beilschmiedia roxburghiana* Nees	Lauraceae	2.00	0.10	5	1827.41	0.006	0.943	0.040	0.989
23	*Toona ciliata* M.Roem.	Meliaceae	1.00	0.05	5	1264.01	0.003	0.943	0.028	0.974
24	*Dillenia pentagyna* Roxb.	Dilleniaceae	2.00	0.20	10	1560.51	0.013	1.887	0.034	1.934
25	*Syzygium cumini* (Linn.) Skeels	Myrtaceae	2.00	0.50	25	3266.76	0.032	4.717	0.072	4.821
26	*Ailanthus grandis* Prain	Simaroubaceae	2.00	0.10	5	27.25	0.006	0.943	0.001	0.950
27	*Altingia excelsa* Noronha	Hamamelidaceae	2.00	0.10	5	886.17	0.006	0.943	0.019	0.968
28	*Casearia graveolens* Dalz.	Flacourtiaceae	1.00	0.05	5	2874.20	0.003	0.943	0.063	1.009

A= Abundance, D= Density, Fr= Frequency, BA= Basal Area, RD=Relative Density, RF= Relative Frequency, RBA= Relative Basal Area, IVI= Importance Value Index

Table 2: Different Phytosociological values of tree vegetation of Sipchu Forest Beat.

Sl	Name Of The Plant	Family	A	D	F	B A	RD	RF	RBA	IVI
1.	*Amoora rohituka* W. & A.	Meliaceae	2.50	0.50	10	1678.58	3.24	1.388	1.728	6.356
2.	*Acrocarpus fraxinifolius* Wight &Schult	Fabaceae	2.00	0.20	10	2108.88	1.29	1.388	2.172	4.850
3.	*Shorea robusta* Gaertn.	Dipterocarpaceae	2.45	1.35	55	18656.59	8.76	7.638	19.21	35.608
4.	*Terminalia belerica* Roxb.	Combretaceae	2.33	0.70	30	1747.24	4.65	4.166	1.799	10.615
5.	Elaeocarpus lanceaefolium Roxb.	Elaeocarpaceae	2.50	0.50	20	9.75	3.24	2.777	0.010	6.027
6.	*Duabanga sonneratioides* Buch.-Ham.	Lythraceae	2.00	0.30	15	1380.12	1.94	2.083	1.421	5.444
7.	*Castanopsis tribuloides* A. DC.	Fagaceae	2.50	0.25	10	725.37	1.62	1.388	0.747	3.755
8.	*Trewia nudiflora* L.	Euphorbiaceae	1.66	0.25	15	2579.61	1.62	2.083	2.656	6.359
9.	*Andromeda elliptica* Siebold & Zucc.	Ericaceae	1.00	0.05	05	0.71	0.32	0.694	0.001	1.015
10.	*Mallotus philippensis* (Lam.) Muell.-Arg	Euphorbiaceae	1.00	0.05	05	121.09	0.32	0.694	0.124	1.138
11.	*Schleichera oleosa* (Lou.) Oken.	Sapindaceae	2.00	0.20	10	43.96	1.29	1.388	0.045	2.723
12.	*Schima wallichii* Choisy.	Theaceae	1.92	1.25	65	731.77	8.11	9.027	0.753	17.89
13.	*Bauhinia triandra* Roxb	Fabaceae	2.00	0.30	15	977.96	1.94	2.083	1.007	5.030
14.	*Stereospermum tetragonum* DC.	Bignoniaceae	2.37	0.95	40	1780.90	6.16	5.555	1.834	13.549
15.	*Beilschmiedia roxburghiana* Nees	Lauraceae	2.64	2.25	85	16949.46	14.61	11.80	17.457	43.867
16.	*Tetrameles nudiflora* R.Br.	Datiscaceae	1.87	0.75	40	16693.66	4.87	5.555	17.193	27.618
17.	*Sterculia villosa* Roxb.	Sterculiaceae	1.75	1.05	60	5165.38	6.81	8.333	5.320	20.463
18.	*Wrightia tomentosa* Roem. & Schult.	Apocynaceae	2.90	1.60	55	98.03	10.38	7.638	0.100	18.118
19.	*Altingia excelsa* Noronha	Hamamelidaceae	2.16	0.15	30	567.54	0.97	2.083	0.584	3.637
20.	*Polyalthia simiarum* Benth.	Anonaceae	2.50	0.25	10	1529.45	1.62	1.388	1.574	4.582
21.	*Premna mucronata* Roxb.	Verbenaceae	2.00	0.30	15	1096.04	1.94	2.083	1.128	5.151
22.	*Bischofia javanica* Blume	Phyllanthaceae	2.00	0.10	05	1156.07	0.64	0.694	1.190	2.524
23.	*Macaranga indica* Gagnep.	Euphorbiaceae	2.00	0.20	10	812.18	1.29	1.388	0.836	3.514
24.	*Terminalia alata* Roth.	Combretaceae	3.00	0.05	05	1311.19	0.32	0.694	1.350	2.364
25.	*Ailanthus grandis* Prain	Simaroubaceae	2.00	0.20	10	293.83	1.29	1.388	0.302	2.980
26.	*Chuckrasia tabularis* A. Juss.	Meliaceae	2.50	0.25	10	308.02	1.62	1.388	0.317	3.325
27.	*Camphorina cassia (L.) Farw*	Lauraceae	1.50	0.15	10	40.18	0.97	1.388	0.041	2.399
28.	*Persea fructifera* Kosterm	Lauraceae	2.00	0.20	10	13075.44	1.29	1.388	13.467	16.145
29.	*Careya arborea* Roxb.	Lecythidaceae	2.00	0.70	35	2040.00	4.54	4.861	2.101	11.502
30.	*Lagerstroemia parviflora* Roxb.	Lythraceae	1.50	0.15	10	501.05	0.97	1.388	0.516	2.874
31.	*Dillenia pentagyna* Roxb.	Dilleniaceae	1.33	0.20	15	2912.14	1.29	2.083	2.999	6.372

A= Abundance, D= Density, Fr= Frequency, BA= Basal Area, RD=Relative Density, RF= Relative Frequency, RBA= Relative Basal Area, IVI= Importance Value Index

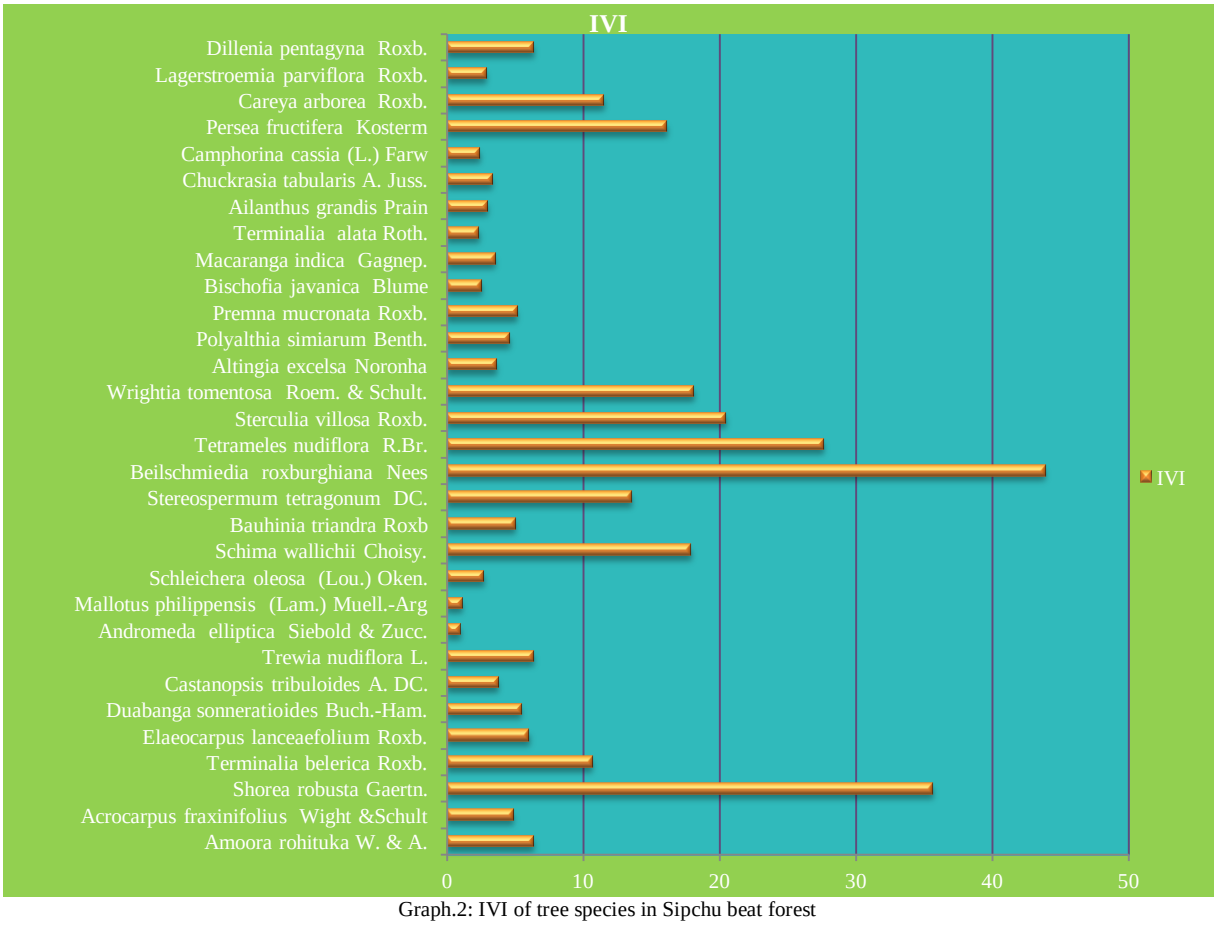
Table 3: Different index values of tree vegetation of Panjhora Forest Beat.

Sl. No.	Name of The Plant	Shannon Index	Species dominance	Evenness
1	*Terminalia belerica* Roxb.	0.12253	0.00138	0.08467
2	*Terminalia alata* Roth.	0.14252	0.00215	0.98491
3	*Dillenia indica* L.	0.04330	0.00008	0.02992
4	*Alstonia scholaris* R. Br.	0.04362	0.00008	0.03014
5	*Amoora rohituka* W. & A.	0.12280	0.00139	0.08486
6	*Amoora spectabilis* Miq.	0.14242	0.00215	0.09842
7	*Schima wallichii* Choisy.	0.23327	0.01047	0.16120
8	*Shorea robusta* Gaertn.	0.28488	0.02260	0.19686
9	Gynocardia odorata R.Br.	0.04379	0.00008	0.03026
10	*Castanopsis tribuloides* A. DC.	0.16140	0.00313	0.10823
11	*Wrightia tinctoria (Roxb.) R. Br*	0.22069	0.00862	0.15250
12	*Heteropanax fragrans (Roxb.) Seem.*	0.07348	0.00033	0.05078
13	*Wrightia arborea* (Dennst.) Mabb.,	0.00752	0.00036	0.05198
14	Lagerstromia speciosa Pers.	0.14256	0.00211	0.09852
15	Sterculia villosa Roxb	0.07569	0.00572	0.05230
16	*Tetrameles nudiflora* R.Br.	0.07711	0.00038	0.05328
17	*Butea monosperma* (Lam.) Taub.	0.04380	0.00008	0.03026
18	*Acrocarpus fraxinifolius* Arn.	0.16045	0.00307	0.11087
19	*Stereospermum tetragonum* DC.	0.14278	0.00216	0.09867
20	*Lagerstroemia parviflora* Roxb.	0.10003	0.00078	0.06912
21	*Premna mucronata* Roxb.	0.10020	0.00076	0.06924
22	*Beilschmiedia roxburghiana* Nees	0.04461	0.00009	0.03083
23	*Toona ciliata* M.Roem.	0.04408	0.00008	0.03109
24	*Dillenia pentagyna* Roxb.	0.07465	0.00035	0.05158
25	*Syzygium cumini* (Linn.) Skeels	0.14332	0.00219	0.09904
26	*Ailanthus grandis* Prain	0.04322	0.00008	0.02991
27	*Altingia excelsa* Noronha	0.04387	0.00009	0.03031
28	*Casearia graveolens* Dalz.	0.04532	0.00009	0.03131

Table 4: Different index values of tree vegetation of Sipchu Forest Beat.

Sl. No.	Name of The Plant	Shannon Index	Species dominance	Evenness
1	*Amoora rohituka* W. & A.	0.08198	0.00045	0.05444
2	*Acrocarpus fraxinifolius* Wight &Schult.	0.06700	0.00026	0.04497
3	*Shorea robusta* Gaertn.	0.25386	0.01428	0.17022
4	*Terminalia belerica* Roxb.	0.11878	0.00126	0.07964
5	*Elaeocarpus lanceaefolium* Roxb.	0.07887	0.00040	0.05288
6	*Duabanga sonneratioides* Buch.-Ham.	0.07312	0.00033	0.04903
7	*Castanopsis tribuloides* A. DC.	0.05513	0.00015	0.03695
8	*Trewia nudiflora* L.	0.08209	0.00045	0.05504
9	*Andromeda elliptica* Siebold & Zucc.	0.01935	0.00001	0.01297
10	*Mallotus philippensis* (Lam.) Muell.-Arg	0.02122	0.00001	0.01422
11	*Schleichera oleosa* (Lou.) Oken.	0.04291	0.00008	0.02877
12	*Schima wallichii* Choisy.	0.16887	0.00360	0.11323
13	*Bauhinia triandra* Roxb	0.06889	0.00028	0.04619
14	*Stereospermum tetragonum* DC.	0.14038	0.00206	0.09413
15	*Beilschmiedia roxburghiana* Nees	0.28205	0.02167	0.18913
16	*Tetrameles nudiflora* R.Br.	0.22046	0.00859	0.14779
17	*Sterculia villosa* Roxb.	0.18394	0.00471	0.12334
18	*Wrightia tomentosa* Roem. & Schult.	0.17026	0.00369	0.11417
19	*Altingia excelsa* Noronha	0.05375	0.00014	0.03604
20	*Polyalthia simiarum* Benth.	0.06420	0.00023	0.04304
21	*Premna mucronata* Roxb.	0.07015	0.00029	0.04704
22	*Bischofia javanica* Blume	0.00404	0.00007	0.02709
23	*Macaranga indica* Gagnep.	0.05236	0.00013	0.03511
24	*Terminalia alata* Roth.	0.03837	0.00006	0.02573
25	*Ailanthus grandis* Prain	0.04604	0.00010	0.03087
26	*Chuckrasia tabularis* A. Juss.	0.05011	0.00012	0.03607
27	*Camphorina cassia (L.) Farw*	0.03881	0.00006	0.02602
28	Persea fructifera Kosterm	0.15797	0.00293	0.10592
29	*Careya arborea* Roxb.	0.12563	0.00149	0.08424
30	*Lagerstroemia parviflora* Roxb.	0.04476	0.00009	0.03002
31	*Dillenia pentagyna* Roxb.	0.08220	0.00045	0.05511

Graph 1: IVI of tree species in Panjhora beat forest



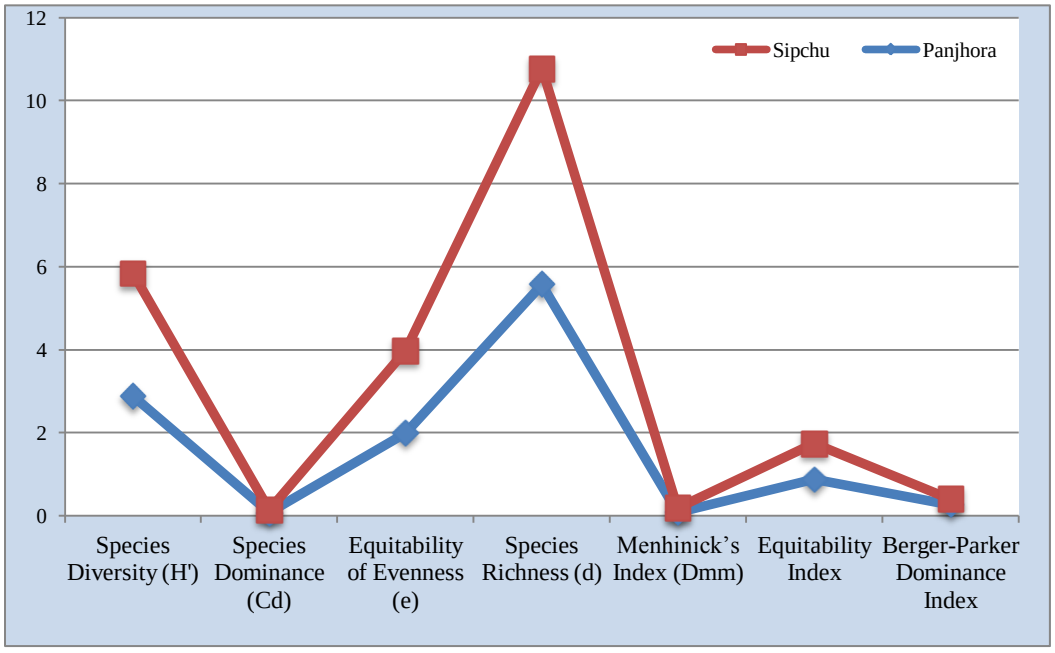
Graph.2: IVI of tree species in Sipchu beat forest

4. CONCLUSION

The paper reflects the phytosociological and ecological characters of tree vegetation in to two beat forests namely Panjhora Beat and Sipchu Beat of Chalsa range area in Jalpaiguri forest division, West Bengal, India. The structural composition of flora found in these beat forests were quite different. The differences were also noticed in the composition of tree vegetation. In Panjhora beat *Shorea robusta* Gaertn. was found as the dominant species and it had quite higher IVI then the other tree species. Where as in Sipchu beat *Beilschmiedia roxburghiana* Nees was found as the dominant species. But in Sipchu few species had nearest IVI in respect to dominant species. Among them *Shorea robusta* Gaertn. had very close IVI in regard to *Beilschmiedia roxburghiana* Nees. Here the Species diversity index value of tree species at Panjhora Beat was found as 2.8785 and Species richness was 5.5725. Where as the Species diversity index value of tree species at Sipchu Beat was found as 2.9575 and Species richness was 5.1980. Both the indices showed that slightly high tree species diversity was accounted in Sipchu Beat than Panjhora Beat. It is important to note that high diversity status in terms of all the above indices was reflected in Sipchu Beat .The evenness indices showed that there was a very little difference in evenness in between the forest beats. The Margalef's and Menhinick's indices also revealed the similar trend like that of evenness index. There was also a significant diference in Berger-Parker Dominance Index. The indeces revealed that Panjhora beat had comparatively low diversity in tree vegetation and high level of Dominance. On the contrary Sipchu beat had high diversity and low level of dominance among tree species. More than one tree species of Sipchu beat showed good IVI and thus it was concluded that the tree vegetation of Siphu beat support the concept of ecological codominance. The study suggested to the followers for the study of soil seed bank and allelopathic interactions among the tree species as well as other plants and microbes in both the forest beats. It is also suggested for the study of successive pattern of the plant communities in these forest beats.

Table 5: Different Community indices of tree vegetation of the Forest Beats

Community indices Value	Panjhora Beat	Sipchu Beat
Species diversity (H')	2.8785	2.9575
Species dominance (Cd)	0.0707	0.0684
Equitability of evenness (e)	1.9893	1.9831
Species richness (d)	5.5725	5.1980
Menhinick's index (D_{mn})	0.0828	0.0965
Equitability Index	0.8734	0.8612
Berger-Parker Dominance Index	0.2668	0.1401



Graph 3: Community indices of tree vegetation of the Forest Beats.

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