

An assessment of Floral Diversity of Upwan area of Jubilee park of Jamshedpur, Jharkhand

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ABSTRACT

The present study reveals the floristic diversity of Upwan area of Jubilee Park. Today biodiversity is declining seriously on a global scale, underscoring the importance of conservation planning. There are 24 species of trees present in site. Among the trees *Adina cordifolia* Hook f, *Albizia odoratissima* (L.f.) Benth and *Bombax ceiba* L. were found to be having highest frequency of 100% followed by *Dalbergia latifolia* Roxb. (80%), *Bauhinia purpurea* L. (80%), *Ficus auriculata* Lour (80%) and *Tamarindus indica* L. (40%). The examination of data recorded for trees showed that *Adina cordifolia*, Hook f., *Albizia odoratissima* (L.f.) Benth and *Bombax ceiba* L. had highest importance value index (IVI) i.e. 28.96 and 24.11. It was followed by another most dominant species *Alstonia scholaris* (L.) R.Br. with IVI 15.28, *Caesalpinia pulcherima* (L.) SW. with IVI 21.03 etc. The minimum IVI found in *Shorea robusta* Gaertn. is 6.8, *Artocarpus integrifolius* auct. Non L. is 6.85 etc.

Keywords: Diversity, Importance Value Index, frequency

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INTRODUCTION

Today biodiversity is declining seriously on a global scale, underscoring the importance of conservation planning. Jubilee Park is the famous park of the city which is situated in the heart of the town near the bank of Swarnrekha River. The Plantation Programme on this area (Jubilee Park) was undertaken by TATA STEEL, It started 55 year ago and total area of the Park is 235.75 acres. Due to plantation vast area was converted as a natural forest. The floristic composition of TISCO managed Jubilee Park showed higher species diversity compared to the natural Riverian area, surrounding the jubilee park. Extensive surveys of biodiversity in protected areas have not been conducted for a majority of taxonomic groups and ecosystem types, which makes it difficult to assess how large a portion of biodiversity is at least potentially under protection.

MATERIAL AND METHODS

The study area "Jubilee Park" is located in Chhotanagpur plateau. The study area is situated nearly 86°11' E longitude and 22°40' N latitude. Jubilee Park is situated at an elevation 159m ASL. The climate of the Jubilee Park is of typical monsoon type. The minimum annual temperature varies from 24°C to 27°C.

Phytosociological Studies

The vegetation survey in rehabilitated site was conducted during the month of January (winter season), May – June (Summer season) and August – September (Rainy season) from the year 2009 to 2011 to ascertain the floristic composition of that sites using nested quadrat method. Mark the quadrat site of visit. Five quadrates were laid randomly in the area. The quadrat size was 100m x 100m for trees in each quadrat. The data was recorded for number of species, number of individuals of a species, diameter for trees. This

process was repeated time to time in different season. The data obtained was tabulated and analysed for frequency, density, dominance, importance value index (IVI) and diversity indices. The species richness and diversity were also calculated.

Abundance/Frequency (A/F) Ratio

Abundance and frequency ratio gives an idea of the pattern of species distribution. This ratio indicates distribution pattern of a species as regular (<0.025), random (0.025 – 0.05) and contagious (>0.05).

Basal Area

Basal area refers to ground actually penetrated by the stems. It is one of the two this is measured either at 2.5cm above ground level (herbs) or at breast height (for trees). Measuring tape was used for recording the circumference in the field. The circumference measured is converted into diameter.

$$2r = \frac{\text{Circumference}}{\pi}$$

Diameter values thus obtained for trees were converted to basal area.

$$\text{Average basal area} = \pi r^2$$

$$\text{Where } r (\text{radius}) = \text{diameter}/2$$

Average basal area of species is calculated and the same multiplied by density to get total basal area of the species.

$$\text{Total basal area} = \text{Avg. Basal area} \times \text{Density} \\ (\text{per unit area})$$

For grasses and herbs the vegetation cover was plotted on graph paper to obtain their cover expression.

$$\text{Cover (\%)} = \frac{\text{Area occupied by a species in the quadrat}}{\text{Area occupied by all species in the quadrat}}$$

Importance Value Index

The index has been developed to express the dominance an ecological successes of any species at a given site. It is the sum of all the following :-

(i) Relative frequency

(ii) Relative density

(iii) Relative dominance

These are calculated as :-

$$\text{Relative frequency} = \frac{\text{Frequency of the species}}{\text{Total frequency of all the species}} \times 100$$

$$\text{Relative density} = \frac{\text{Density of the species}}{\text{Total density of all the species}} \times 100$$

$$\text{Relative dominance} = \frac{\text{Dominance (cover) of the species}}{\text{Total dominance of all the species}} \times 100$$

Diversity Index

Σ Diversity Index is calculated as $H' = \pi \ln \pi$

Where $\pi = n_i/N$

n_i = Number of individuals of a species

N = Total number of individuals of all species.

\ln = Natural logarithm (to the base)

H' = Diversity Index

The diversity index is always in positive values. The minus sign in the formula is nullified by the $\log \pi$, which is always a minus quantity. The unit of diversity index, calculated by the formula is pits per individuals.

The maximum possible diversity consisting K categories (number of species here) was calculated by using the formula :-

$$H'_{\max} = \ln K$$

In addition to H' another parameter called J' was calculated.

$$J' = H'/H'_{\max}$$

J' is termed as evenness. It may also be termed as homogeneity of r **Richness Index**

This is measure of number of species in a community. It was calculated as :-

$$D = \frac{S - 1}{\ln(N)}$$

Where, D is Margalefs index

S is number of species

N is total number of individuals

RESULT AND DISCUSSION

The data recorded from the “Upwan area of Jubilee Park” for floristic structure and composition showed different species of trees. There is 24 species of trees, all the species of trees, vary in their pattern of occurrence, density and abundance.

The examination of data recorded for trees showed that *Adina cordifolia*, Hook f., *Albizia odoratissima* (L.f.) Benth. And *Bombax ceiba* L. had highest frequency of 100% followed by *Dalbergia latifolia* Roxb. (80%), *Bauhinia purpurea* L. (80%), *Ficus auriculata* Lour. (80%) and *Tamarindus indica* L. (40%)

Basal Area

The average basal area was calculated by taking DBH or collar diameter for trees. The data shows that highest basal area per tree was recorded for *Adina cordifolia*, Hook f., *Bombax ceiba* L., and *Albizia odoratissima* (L.f.) Benth. The examination of data recorded for trees showed that *Adina cordifolia*, Hook f., *Albizia odoratissima* (L.f.) Benth. and *Bombax*

ceiba L. had highest frequency of 100% followed by *Dalbergia latifolia* Roxb. (80%), *Bauhinia purpurea* L. (80%), *Ficus auriculata* Lour. (80%) and *Tamarindus indica* L. (40%). The frequency distribution shows that most of species belonged to the class E and C i.e. having frequency 81-100% and 40-60%. Total trees density of 340 was recorded for this site. It was found that highest density was shown by *Adina cordifolia*, Hook f. (44), *Albizia odoratissima* (L.f.) Benth. (37) followed by *Caesalpinia pulcherima* (L.) Sw. (26), *Bombax ceiba* L. (22) etc.

The lowest density was recorded for *Shorea robusta* Gaertn. (3), followed by *Terminalia chebula* Retz. (7), *Artocarpus integrifolius* auct. non L. (4) etc.

Table-1 showed that the *Adina cordifolia*, Hook f. was the most abundant species (6.0) followed by *Caesalpinia pulcherima* (L.) Sw. (4.4), *Acacia* (3.2), *Shorea robusta* Gaertn. (1.2) etc.

Table-1 : Structural Attributes of the Trees of “Jubilee park” (Upwan)

Sl. No.	Species	% Frequency	Density	Abundance	A/F
1	<i>Adina cordifolia</i> , Hook f.	100	8.8	6.0	0.060
2	<i>Alangium salvifolium</i> (L.f.) Wang.	60	1.8	1.2	0.020
3	<i>Albizia odoratissima</i> (L.f.) Benth.	100	7.4	4.3	0.043
4	<i>Alstonia scholaris</i> (L.) R. Br.	80	3.8	2.9	0.036
5	<i>Zizipus jujuba</i> (L.) Gaertn.	60	1.2	1.1	0.018
6	<i>Artocarpus integrifolius</i> auct. non L.	60	0.8	1.2	0.020
7	<i>Carica papaya</i> L.	60	1.2	2.0	0.030
8	<i>Bauhinia purpurea</i> L.	80	1.6	2.1	0.026
9	<i>Sapindus trifoliata</i> L.	60	1.4	1.9	0.032
10	<i>Spondias mangifera</i> Willd.	100	2.4	2.1	0.021
11	<i>Bombax ceiba</i> L.	100	4.4	3.1	0.031
12	<i>Bombax malabarica</i> DC.	60	1.0	1.1	0.018
13	<i>Pterocarpus marsupium</i> Roxb.	60	1.8	1.5	0.025
14	<i>Ficus auriculata</i> Lour.	80	1.6	1.2	0.015
15	<i>Cedrela toona</i> Roxb. ex Rottl.	60	2.0	2.2	0.037

Sl. No.	Species	% Frequency	Density	Abundance	A/F
16	<i>Diospyros montana</i> Roxb.	80	1.6	2.1	0.026
17	<i>Terminalia chebula</i> Retz.	60	1.4	2.3	0.038
18	<i>Shorea robusta</i> Gaertn.	40	0.6	1.2	0.030
19	<i>Tamarindus indica</i> L.	40	4.4	3.2	0.080
20	<i>Psidium guajava</i> L.	40	4.6	3.9	0.097
21	<i>Callistemon lanceolatus</i> DC.	60	3.0	2.8	0.070
22	<i>Dalbergia latifolia</i> Roxb.	80	3.4	3.9	0.048
23	<i>Caesalpinia pulcherrima</i> (L.) Sw.	100	5.4	4.4	0.044
24	<i>Acacia pennata</i> (L.) Willd.	40	2.6	3.2	0.080

A/F Ratio

The data on abundance frequency ratio showed that 16 species showed contagious distribution and 8 species showed random distribution.

Importance Value Index (IVI)

From the analysis of phytosociological data the importance value index (IVI) values for each species were calculated. They are presented in table-2 ,the

trees it is found that *Adina cordifolia*, Hook f. and *Albizia odoratissima* (L.f.) Benth. are dominant species having IVI Value of 28.96 and 24.11. It was followed by another most dominant species. *Alstonia scholaris* (L.) R. Br. with IVI 15.28, *Caesalpinia pulcherrima* (L.) Sw. with IVI 21.03 etc. The minimum IVI found in *Shorea robusta* Gaertn. is 6.8, *Artocarpus integrifolius* auct. non L. is 6.85 etc.

Table-2 : Importance Value Index of Trees

Sl. No.	Species	Relative Frequency	Relative Density	Relative Abundance	IVI
1	<i>Adina cordifolia</i> , Hook f.	6.17	12.94	9.85	28.96
2	<i>Alangium salvifolium</i> (L.f.) Wang.	3.70	2.64	1.97	8.31
3	<i>Albizia odoratissima</i> (L.f.) Benth.	6.17	10.88	7.06	24.11
4	<i>Alstonia scholaris</i> (L.) R. Br.	4.93	5.59	4.76	15.28
5	<i>Zizipus jujuba</i> (L.) Gaertn.	3.70	1.76	1.80	7.26
6	<i>Artocarpus integrifolius</i> auct. non L.	3.70	1.18	1.97	6.85
7	<i>Carica papaya</i> L.	3.70	1.76	3.28	8.74
8	<i>Bauhinia purpurea</i> L.	4.93	2.35	3.44	10.72
9	<i>Sapindus trifoliata</i> L.	3.70	2.05	3.11	8.86
10	<i>Spondias mangifera</i> Willd.	6.17	3.53	3.44	13.14
11	<i>Bombax ceiba</i> L.	6.17	6.47	5.10	17.74
12	<i>Bombax malabarica</i> DC.	3.70	1.47	1.80	6.97

Sl. No.	Species	Relative Frequency	Relative Density	Relative Abundance	IVI
13	<i>Pterocarpus marsupium</i> Roxb.	3.70	2.64	2.46	8.80
14	<i>Ficus auriculata</i> Lour.	4.93	2.35	1.97	9.25
15	<i>Cedrela toona</i> Roxb. ex Rottl.	3.70	2.94	3.61	10.25
16	<i>Diospyros montana</i> Roxb.	4.93	2.35	3.44	10.72
17	<i>Terminalia chebula</i> Retz.	3.70	2.05	3.61	9.36
18	<i>Shorea robusta</i> Gaertn.	2.47	0.89	3.44	6.80
19	<i>Tamarindus indica</i> L.	2.47	6.47	5.25	14.19
20	<i>Psidium guajava</i> L.	2.47	6.76	6.40	15.63
21	<i>Callistemon lanceolatus</i> DC.	3.70	4.41	4.59	12.70
22	<i>Dalbergia latifolia</i> Roxb.	4.93	5.00	6.40	16.33
23	<i>Caesalpinia pulcherrima</i> (L.) Sw.	6.17	7.64	7.22	21.03
24	<i>Acacia pennata</i> (L.) Willd.	2.47	3.82	5.25	11.54

Diversity Index

In this table-3 , the highest diversity index was recorded for *Adina cordifolia*, Hook f. with its value - 0.265 followed by *Alstonia scholaris* (L.) R. Br. (-

0.161), *Bauhinia purpurea* L. (-0.088) etc. and lowest diversity index was observed for *Shorea robusta* Gaertn. with its value -0.042 followed by *Terminalia chebula* Retz. (-0.080).

Table-3: Dominance Index, Diversity Index and Richness Index of Trees

Sl. No.	Species	Dominance Index	Diversity Index	Richness Index
1	<i>Adina cordifolia</i> , Hook f.	0.0167	-0.265	7.377
2	<i>Alangium salvifolium</i> (L.f.) Wang.	0.0007	-0.096	1.372
3	<i>Albizia odoratissima</i> (L.f.) Benth.	0.0118	-0.241	6.176
4	<i>Alstonia scholaris</i> (L.) R. Br.	0.0031	-0.161	3.088
5	<i>Zizipus jujuba</i> (L.) Gaertn.	0.0003	-0.071	0.858
6	<i>Artocarpus integrifolius</i> auct. non L.	0.0001	-0.052	0.515
7	<i>Carica papaya</i> L.	0.0003	-0.071	0.858
8	<i>Bauhinia purpurea</i> L.	0.0006	-0.088	1.201
9	<i>Sapindus trifoliata</i> L.	0.0004	-0.080	1.029
10	<i>Spondias mangifera</i> Willd.	0.0012	-0.118	1.887
11	<i>Bombax ceiba</i> L.	0.0042	-0.177	3.603
12	<i>Bombax malabarica</i> DC.	0.0002	-0.062	0.686

Sl. No.	Species	Dominance Index	Diversity Index	Richness Index
13	<i>Pterocarpus marsupium</i> Roxb.	0.0007	-0.096	1.372
14	<i>Ficus auriculata</i> Lour.	0.0006	-0.088	1.201
15	<i>Cedrela toona</i> Roxb. ex Rottl.	0.0009	-0.104	1.544
16	<i>Diospyros montana</i> Roxb.	0.0006	-0.088	1.201
17	<i>Terminalia chebula</i> Retz.	0.0004	-0.080	1.029
18	<i>Shorea robusta</i> Gaertn.	0.0001	-0.042	0.343
19	<i>Tamarindus indica</i> L.	0.0042	-0.177	3.603
20	<i>Psidium guajava</i> L.	0.0046	-0.182	3.774
21	<i>Callistemon lanceolatus</i> DC.	0.0019	-0.138	2.402
22	<i>Dalbergia latifolia</i> Roxb.	0.0025	-0.150	2.745
23	<i>Caesalpinia pulcherrima</i> (L.) Sw.	0.0058	-0.197	4.289
24	<i>Acacia pennata</i> (L.) Willd.	0.0015	-0.125	2.059

Concentration of Dominance/Dominance Index

It was found that the concentration of dominance was highest in *Adina cordifolia*, Hook f. with its value 0.0167 followed by *Bauhinia purpurea* L. (0.0006), *Alangium salvifolium* (L.f.) Wang. (0.0007) etc. and lowest with its value 0.0001 of *Shorea robusta* Gaertn. followed by *Spondias mangifera* Willd. (0.0012), *Terminalia chebula* Retz. (0.0004) etc.

Richness Index

Among trees, species richness was highest in *Adina cordifolia*, Hook f. with its value 7.377 followed by *Albizia odoratissima* (L.f.) Benth. (6.176), *Alstonia scholaris* (L.) R. Br. (3.088) etc. and lowest with its value 0.343 of *Shorea robusta* Gaertn. followed by *Bombax malabarica* DC. (0.686), *Carica papaya* L. (0.858) etc.

CONCLUSION

Floristic diversity assessment is tried at local and regional levels to understand the present status and to make effective management strategies for conservation. In this regard, various sampling techniques and measurements methods are followed based on objectives of the studies and in

majority of the studies. The natural beauty of Upwan area of Jubilee Park, with its native plants diversity, introduced ornamentals and cultivated plant species with great aesthetic value, ecological uniqueness and resource importance. On a global level it thus involves not only the protection of wild species and their habitats but also the safeguarding of the genetic diversity of cultivated and domesticated species and their wild relatives.

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