

## **Phytospectroscopy of Barasat Govt. College Campus at Barasat in District North 24-Parganas, West Bengal**

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### ABSTRACT

Considering phytospectroscopy of plants in Barasat Govt. College Campus [Barasat, North 24-Parganas, West Bengal], present effort enumerates that from a total of **125** species of vascular plants, the biological spectrum is as follows: Ph: Ch: Hcr: Cr: Th:: **44.8(%)**: **27.2(%)**: **16(%)**: **9.6(%)**: **2.4(%)**. This **phanero-chamaephytic** phytoclimate is normal under tropical, warm, humid geoclimate. Higher percentage of chamaephytes is due to paucity in canopy development permitting sun light to enhance these plants; this causes changes in microhabitats and regeneration-niche. Poor representation of hemicryptophytes and therophytes and abundance of cryptophytes decipher that the soil milieu is highly disturbed and ultimately it fails to act as natural seed bank. Cluster analysis shows that the phytoclimate has closest affinity to Bardhaman and Hooghly Districts; Nadia is rather somewhat distant.

**Key words:** Phanero-chamaephytic phytoclimate, soil milieu, natural seed bank, tree diagram.

**T**he Barasat Govt. College is situated at Barasat town (Headquarters) of the District North 24 Parganas in southern West Bengal, India. The natural vegetation of the district consists of both indigenous flora and patches of dispersed urban community intermingled with human settlements. Now-a-days, the urban vegetation also deserves immense importance as it acts like the green lungs of the

settlements; so its documentation is essential. As a part of this, the phytospectroscopy of Barasat Govt. College (BGC) Campus has been considered.

The percent distribution or relative proportion of different life-forms in the flora of a region is known as the biological spectrum of that place<sup>20</sup>. Phytospectroscopy is the

methodology to determine and calculate biological spectrum. This assessment, a kind of biomonitoring, at a periodic interval is likely to set guidelines for eco-restoration and environmental management.

*Study site:*

The District North 24-Parganas lies within the Ganga-Brahmaputra delta, from latitude 22°11'6"-23°15'2" N and from longitude 88°20'-89°5'E. It is bordered to Nadia by north, to Bangladesh by north and east, to South 24 Parganas and Kolkata by south and to Kolkata, Howrah and Hooghly by west<sup>1</sup> (Fig. 1). Elevation of the district is 2,134 m (7,001 ft). Soil status varies from alluvial to clay loam. Annual rainfall is 1579 mm. Temperature remains 41°C in May (Max) and 10°C in January (Min). Relative humidity remains between 50% in March & 90% in July<sup>11,25</sup>. Barasat Govt. College is situated on the KNC Road (10 KNC Road) of Barasat town. It was established in 1950. The College Campus is a small area with five buildings.

The BGC Campus was botanized thoroughly and frequently. Different life-forms of the plants according to the system of Raunkiaer<sup>20</sup> as modified by Muller-Dombois and Ellenberg<sup>17</sup> were determined. The percent distribution of the constituent species in different life-form categories was calculated for preparation of biological spectrum of the area.

Cluster analysis was performed with the help of the software 'Statistica' version 7. For analysis purpose, the distance was measured by '**Euclidean Distance**' which is the actual geometric distance in the multidimensional

space used. The distance was calculated as per the formula:

$$\text{Distance (X, Y)} = \left\{ \sum_{i=1}^n (V_{xi} - V_{yi})^2 \right\}^{1/2}$$

[where d(X, Y) = distance between X and Y; n=total number of characters; V<sub>xi</sub>=the character-state value of X for character I; V<sub>yi</sub> is the character state value of Y for character i]

From the study, it is revealed that the BGC Campus harbours 125 species of vascular plants. The observed biological spectrum is as follows: **44.8(%)**: **27.2(%)**: **16(%)**: **9.6(%)**: **2.4(%)**; while normal values in **Raunkiaer's Normal Spectrum** are **46**, **9**, **26**, **6** and **13** respectively; the two spectra are compared in **Fig. 2**.

- i. Here phanerophytes top the list in respect of numerical strength and therophytes lie at the bottom. The phytoclimate is **phanero-chamaephytic** which is normal under tropical, warm, humid geoclimate. Dominance of phanerophytes indicates a tropical monsoonic biome<sup>18</sup>.
- ii. Chamaephytes show much higher percentage than the respective Raunkiaer's normal value. This deciphers an appreciable degree of chamaephyte diversity, although this is a sign of poverty in canopy development in the area permitting sun light to reach the soil to enhance chamaephytes. This is the result of felling of trees and shrubs. This would bring changes in microhabitats and regeneration-niche of trees and shrubs, which in turn, is likely to affect the regeneration-status of the whole community.
- iii. On soil surface hemicryptophytes show much less attendance than the Raunkiaer's normal value. Scarcity of in hemicryptophytes, which act as the soil binders, soil

conservers and preservers of nutrient status and water content, proves that the soil niche is highly disturbed and vulnerable to erosion.

- iv. Higher percentage of cryptophytes exhibits the arid nature of soil resulting from deficiency in soil organic matter that confers the soil its low water holding capacity.
- v. In the campus therophytes exhibit much less value than the normal value. In the ecotope, as the soil as well as the whole natural environment is highly disturbed due to scattered constructional work and solid waste dumps, therophyte percentage should be high. But actually the soil is so much disturbed that it fails to act as a rich natural seed bank, while therophyte diversity is direct function of the richness of soil seed bank as those species perpetuate their existence as seeds in soil during most part of the year.

#### *Cluster Analysis:*

The biological spectrum of BGC Campus is listed along with those of different regions in India for cluster analysis<sup>2-10, 12-16, 18-25</sup> (**Table-1**). The cluster analysis method finds out overall similarity (or conversely distance) in pairs between Operational Site Units (**OSUs** *i.e.* 22 Sites and the Normal Spectrum) and classifies all of them in accordance with their affinity (at present, on the basis of biological spectrum values). This ultimately yields a tree diagram or dendrogram (**Fig. 3**).

The dendrogram (**Fig. 3**) shows that at the linkage distance 32 two major groups or clusters (OSU) are recognizable, *viz.* the Indian Desert and the group of others. At distance 21 Berhampur and the group of others segregate.

At distance 19 **Group 1** and **Group 2** separate from each other. Gr. 2 consists of arid and semi arid zones of North and South India, Punjab, Rajasthan and Haryana and Indian Desert. Gr. 1 contains the non-arid Districts of Gangetic plain and allied regions *viz.* Bankura (Sonamukhi), Hooghly (Chandur), Bardhaman (Ramnabagan, Bishtupur and other forest patches), North 24-Parganas (Kishalay) and Nadia (Bethuadahari and Bahadurpur). As per the tree-diagram the phytoclimate of BGC flora shows its closest affinity to Bardhaman and Hooghly Districts, Nadia is rather somewhat distant. This is interesting because Nadia is the closer neighbour to North 24-Parganas than Bardhaman which is separated from North 24-Parganas by Nadia and Hooghly. Edaphoclimate might be responsible for the matter. Another interesting feature is that BGC flora (SC 1) doesn't come in the same subcluster with Kishalay flora (SC 2), although both places are in North 24-Parganas. This proves what anthropogenic influence can do – it pushes away two flora (BGC and Kishalay) from each other of the same district and on the other hand makes two sites from two different districts as closest (BGC and Bhalki-Machan).

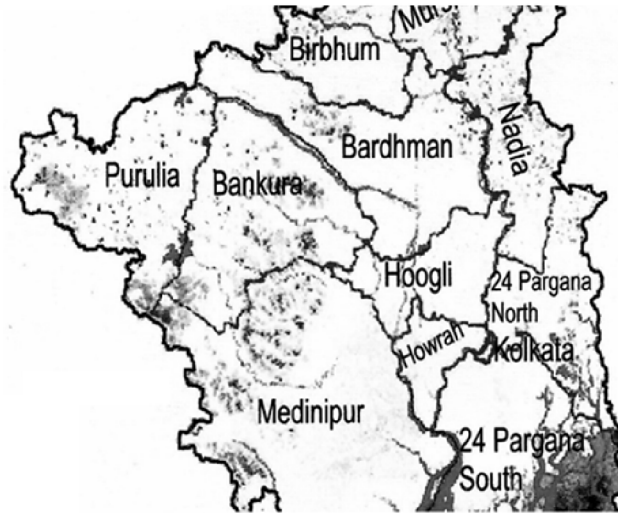
#### *Note:*

The calculation of biological spectrum has been performed on the site which is under stringent anthropogenic modification and manipulation. During the constructional work it was not possible to consider the ecological and botanical health of the site. Any avenue or arboretum is absent in the campus, shrubs also are not protected from ecological interest. Only weeds, some shrubs and herbs as phanerophytes, chamaephytes and cryptophytes

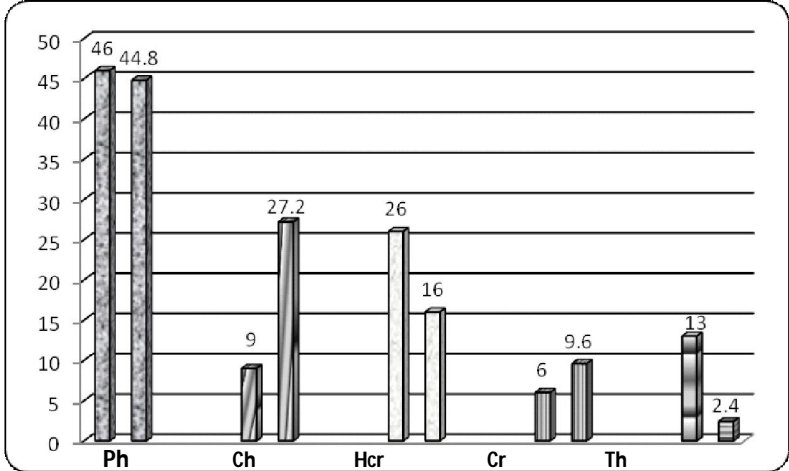
Table-1. Biological Spectra of Different Eco-climatic Zones in India

Eco-climatic zones in India		Percent distribution of life-forms					Phytoclimate or Bioclimate
		Ph	Ch	Hcr	Cr	Th	
1.	Normal Spectrum <sup>20</sup>	46	9	26	6	13	Normal spectrum
2.	Semi-arid zone of N. India <sup>14</sup>	30.3	18.3	10.4	8.2	33	Thero-chamaephytic
3.	Semi-arid zone of S. India <sup>14</sup>	38.3	12.4	11	10	28	Thero-chamaephytic
4.	Extreme arid regions of Indian Desert <sup>15</sup>	34	9	6	2	49	Therophytic
5.	N-E Rajasthan <sup>24</sup>	20	8.8	9.7	15.3	46.2	Thero-cryptophytic
6.	N-E Haryana <sup>12</sup>	23.9	22.8	5.1	5.2	42.5	Thero-chamaephytic
7.	Rajasthan desert <sup>19</sup>	31	3	13	14	39	Thero-cryptophytic
8.	Punjab State <sup>23</sup>	21.7	4.4	7.4	19.2	47.3	Thero-cryptophytic
9.	Semi-arid Punjab <sup>22</sup>	13.7	6.7	13.9	10.9	54.8	Thero-cryptophytic
10.	Punjab Shivaliks <sup>21</sup>	29.9	3.5	8.4	18.3	39.9	Thero-cryptophytic
11.	Berhampur <sup>16</sup>	5.7	25.7	14.5	5.7	48.6	Thero-chamaephytic
12.	Indian Desert <sup>8</sup>	22.1	18.9	15.5	40	3.5	Therophytic
13.	West Rajasthan Desert <sup>7</sup>	24	19	9	2	46	Therophytic
14.	Sonamukhi forest in Bankura District, West Bengal <sup>2</sup>	38.4	25.32	6.75	13.08	16.46	Phanero-chamaephytic
15.	Chandur Forest in Hooghly District, West Bengal <sup>13</sup>	46.2	20	8.97	20	4.83	Phanero-chamaephytic
16.	Bahadurpur Forest in Nadia District, West Bengal <sup>11</sup>	57.59	6.33	8.23	22.15	5.7	Phanero-therophytic
17.	Bethuadahari Wildlife Sanctuary in Nadia District, West Bengal <sup>9</sup>	61.16	15.7	5.79	4.13	13.22	Phanero-chamaephytic
18.	Ramnabagan Wildlife Sanctuary in Bardhaman District, West Bengal <sup>18</sup>	51.40	16.78	9.09	9.19	13.28	Phanero-chamaephytic
19.	Bhalki-Machan Forest in Bardhaman District, West Bengal <sup>4</sup>	52.78	10.19	12.96	5.56	18.52	Phanero-therophytic
20.	Bishtupur Forest in Bardhaman District, West Bengal <sup>5</sup>	48.21	17.86	9.82	12.5	11.61	Phanero-chamaephytic
21.	Forest Patches of Bardhaman District, West Bengal <sup>3</sup>	46.86	20.16	12.83	11.78	8.38	Phanero-chamaephytic
22.	Kishalay Campus in North 24-Parghanas District, West Bengal <sup>6</sup>	48.91	21.17	15.33	5.12	9.49	Phanero-chamaephytic
23.	Barasat Govt. College Campus in North 24-Parghanas District, West Bengal	44.8	27.2	16	9.6	2.4	Phanero-chamaephytic

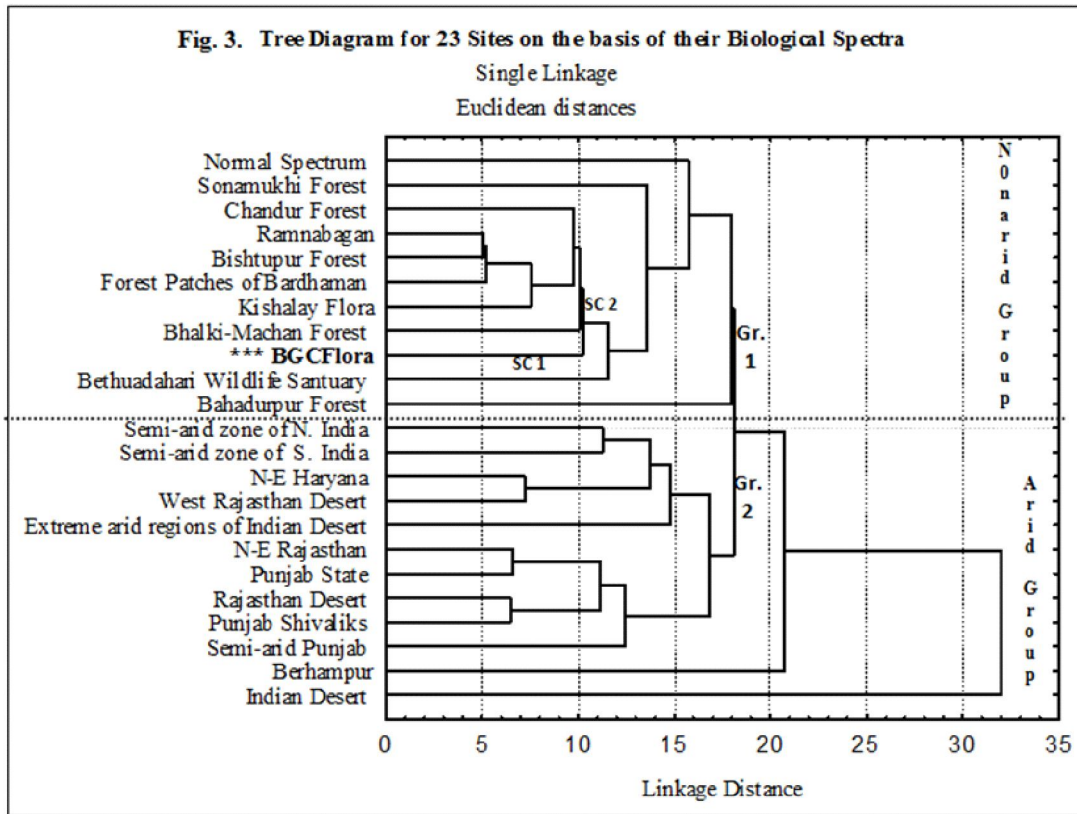
Ph = Phanerophytes, Ch = Chamaephytes, Hcr = Hemicryptophytes, Cr = Cryptophytes, Th = Therophytes



**Fig.1. Adjacent Districts of North 24-Parganas [Source: State of Forest Report 2003]**



**Fig. 2. Biological Spectrum of Barasat Govt. College Campus, with Normal Spectrum of Raunkiaer [each column-duo stands for a specific life-form category defined just below it; in each column-duo the left one stands for Raunkiser's Normal Value while the right one stands for observed value, the values are indicated on the top of each bar]**



dominate the area. So the result should be taken with a pinch of salt as it relates to an anthropo-influenced site rather than a natural community.

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