Indian J.Sci.Res. 7(1) : 183-192, 2016

ISSN : 0976-2876 (Print)
ISSN : 2250-0138 (Online)

A TAXONOMIC CENSUS OF PLANTS IN SOME PLACES OF RELIGIOUS ACTIVITIES IN KOLKATA

MOUSUMI BANERJEE[a1] AND AMBARISH MUKHERJEE[b]

[ab]UGC CAS Department of Botany, Burdwan University, Golapbag, Burdwan, West Bengal, India

ABSTRACT

Considering revelation of the Man, Plant and Environment relationships sustained traditionally in different religious places as very important in optimization of environment and invigoration of environmental ethics, the present study was strategically undertaken in some sacred areas of Kolkata (one of the busiest metropolises in India) like Dakshineshwar, Adyapeath and Udyan Bati. The overall number of vascular plant species was recorded to be 116; species ratio of dicot, monocot and gymnosperm being 79 : 35 : 2. Family: genus: species ratio (on total basis) was found to be 1:2.19:2.52. At specific, generic and family levels, dicots scored higher prevalence percentages over monocots. The value of Coefficient of Generic Diversity (87.06) and high number of families with a low species quota indicate habitat heterogeneity essential for imparting stability to the community in concern.

KEYWORDS : Man, Plant and Environment Relationship, Taxonomic Census, Vascular Plants

The interaction between man, plant and environment depends largely on the social and religious practices. There is the practice of worshipping various gods and goddesses in different religions throughout the world. Various plants and plant parts like bark, twigs, leaves flowers, fruits and seeds are offered to them . There are many plants grown near the different religious places / institutions are regarded as sacred plants by different ethnic groups worldwide. They preserve the plants by all means which are used in different rituals. In view of this, the present authors prioritized identification and documentation of vascular plants in some selected areas of Kolkata, one of the busiest metropolises in India, where there is a perpetual man-plant relationship prevailing over the years for religious fulfilment and spiritual accomplishment. The present work considers taxonomic documentation of plants sustained in the custody of the religious organization like Dakshineshwar, Adyapeath and Cossipore Udyan Bati maintained by them for growing species of aesthetic, nutritional and medicinal values. This work is a part of the research programme undertaken on study of man-plant-environment interrelationships in the above mentioned selected sacred places (Banerjee and Mukherjee, 2013, 2014, 2015).

Study Site

Kolkata is located in the eastern part of India at around latitude 23°34' N and longitude 82°2'E and is the capital of the state of West Bengal. It is situated on eastern bank of Hugli River but which in fact is a distributary of the main Ganga river. The city, about 130 km north of the Bay of Bengal, is the gateway to the eastern and north-eastern India and is well connected by road, rail and air. climate of Kolkata is very much influence by the sea, Bay of Bengal. The annual mean temperature is about 27°C monthly mean a temperature ranges from 19°C to 30°C. Kolkata is dominated by 3 seasons namely- summer, monsoon and winter. Truly like a cosmopolitan city it shows a blend of different religions and reflects socio-cultural and other perspectives of life including religions and customs. Kolkata Religion 2011 census, Hinduism is majority religion in the city with 76.51 % followers. The present work selected certain locations in and around the city, such as Dakshineshwar, Adyapeath and Udyan Bati.

MATERIALS AND METHODS

Field work was performed in different seasons, viz. pre-monsoon, monsoon and post-monsoon in different areas of the study site. Specimens of the constituent species were collected some of which were processed for herbarium preservation (Jain and Rao, 1977) and the rest were dissected, described and identified with the help of pertinent taxonomic literature (Prain, 1903; Guha Bakshi, 1984; Bennet, 1987; Murti and Panigrahi, 1999) and authentic specimens preserved in the herbarium of Burdwan University (BURD).The specimens were identified and the coefficient of generic diversity (CGD) (Jacard, 1901) was

[1]**Corresponding author**

Figure 1: Maps showing location of Study Site

calculated using the formula:

CGD = 100 x G/S), where G and S are genus and species respectively.]

RESULTS

A checklist of 116 species of common terrestrial plants growing in the study area could be prepared (Table 1), a taxonomic analysis of which reveals the total number of angiosperms and gymnosperms with their percentage values at the levels of family, genus and species (Table 2). An analysis of their habits was also made in the same table to reveal the structural/growth-form heterogeneity.

DISCUSSION

Taxonomic census of vascular plants was performed to determine diversity in species composition which is necessary to characterize community structures. The total number of vascular plant species that could be recorded for these sacred places located in Kolkata is 116, the species ratio of dicots, monocots and gymnosperm being79: 35: 2. (Table 1& 2).

The species quota for each genus is 1.14; each family is allotted with 2.19 genera and 2.52 species respectively.

Family: genus: species ratio (on total basis) is 1.00:2.9:2.63. At all specific, generic and family levels, dicots scored high percentages over monocots. The value of Coefficient of Generic Diversity (87.06) and high number of families, most of which were with few species, give an indication of habitat heterogeneity.

Observed ratio of tree : shrub : herb and vine was 4 : 2.25 : 2.16:1 and their relative percent values (partial abundance) were Trees: 42.24 %,, Shrubs : 23.27 %,Herbs: 22.41% & Vines: 10.34 % (Table 2) the ratio indicated richness in woody plants in general and trees diversity in particular. Value of vines and herbs indicated that at some sites canopy is dense to provide niches for vine and on other hand presence of herbs indicated discontinuous canopy allowing sunlight for herbal growth (Figure 1-3).

Since as many as 78 ligneous species composed by 49 tree, 27 shrubs and 2 lianas could be recorded. It would be logical to infer regarding the availability of resources optimum for their sustenance (Figure 4).

Habitat Diversity: The site shows a high degree of habitat diversity as well as heterogeneity. Approaching road runs through the religious campus that contributes to increase species diversity by adding some ruderal (road-side) species like *Acalypha indica*, *Achyranthes aspera*, *Ageratum conyzoides*, *Commelina benghalensis*, *C. obliqua*, *C. paludosa* etc. and this might result in ecological fragmentation and shrinkage of ecological niche of phanerophytes. The meadows and open ground of temple area are harbouring some grass species, *Brachiaria ramosa*, *Cynodon dactylon*, *Digitaria ciliata*, *Panicum repens*, *Cassia sophera*, *Eleusine indica*, *Imperata cylindrica* etc.

The boundary walls provide mural habitats for *Ficus religiosa*, *Ipomoea batatus*, etc. Anthropogenic introduction of species for religious purpose are *Anthocephalus chinensis*, *Hibiscus rosa-sinensis*, *Tabernaemontana divaricata*, *Plumeria alba* etc. There are

Table 1: An Enumeration of the Vascular Plants Recorded from the Some Places of Religious Activities in Kolkata

A. Trees and Under- Trees

Sl. No.	Name of the Species	Common Name	Family
1.	*Acacia auriculiformis* L.	Akasmoni	Mimosaceae
2.	*Aegle marmelos* Corr.	Wood apple,Bel	Rutaceae
3.	*Areca catechu* L.	Supari /Betel nut	Arecaceae
4.	*Artocarpus intiger* Lam.	Jackfruit/kanthal	Moraceae
5.	*Averrhoa carambola* L.	Kamranga	Averrhoaceae
6.	*Azadirachta indica* A. Juss.	Neem	Meliaceae
7.	*Bombax ceiba* DC.	Shimul	Malvaceae

to be continued....

8.	*Borassus flabellifer* L.	Taal/Plamyra Palm	Arecaceae
9.	*Butea monosperma* (Lamk.)Taub.	Palas	Fabaceae
10.	*Caryota urens* L.	Fish tail palm	Arecaceae
11.	*Ceiba pentandra* (L.) Gaertn.	White silkcotton ,Swet shimul	Malvaceae
12.	*Cocos nucifera* L	Coconut Palm	Arecaceae
13.	*Couroupita guianensis* Aubl.	Shiblingam	Lecythidaceae
14.	*Dalbergia sissoo* Roxb.	Sissoo	Fabaceae
15.	*Delonix regia* Raf.	Gold Mohur	Caesalpiniaceae
16.	*Dillenia indica L.*	Chalta	Dilleniaceae
17.	*Dypsis lutescens* (H.Wendl.) Beentje & J.Dransf.	Palm tree	Arecaceae
18.	*Ficus benghalensis* L.	Banyan/Bot	Moraceae
19.	*Ficus elastica* Roxb. ex Hornem..	Rabar bot	Moraceae
20.	*Ficus religiosa* L.	Peepal/Ashwathha	Moraceae
21.	*Ficus hispida* L.f.	Dumur	Moraceae
22.	*Ficus infectoria* Willd.	Pakur	Moraceae
23.	*Ficus krishnae* C.DC.	Noni bot,Thonga bot	Moraceae
24.	*Licuala peltata* Roxb.exBuch.Ham.	Licuala	Arecaceae
25.	*Livistona chinensis* (Jacq.)R.Br.ex Mart.	Chinese Fan	Arecaceae
26.	*Madhuca longifolia* var. latifolia (Roxb.) A.Chev.	Mahua	Sapotaceae
27.	*Magnolia champaca* (L.)Baill.ex Pierre	Swarna Champa	Magnoliaceae
28.	*Magnolia grandiflora* L.	Champa	Magnoliaceae
29.	*Mangifera indica* L.	Mango/Aam	Anacardiaceae
30.	*Manilkara zapota* (L.) P.Royen	Sabeda	Sapotaceae
31.	*Mimusops elengi* L.	Bakul	Sapotaceae
32.	*Pavetta indica* L.	Jui	Rubiaceae
33.	*Phoenix sylvestris* Roxb.	Khejur/Date Palm	Arecaceae
34.	*Plumeria alba* L.	Gulancha sada	Apocynaceae
35.	*Plumeria rubra* L.	Gulancha lal	Apocynaceae
36.	*Plumeria obtusa* L.	Gulancha/Kathgolap	Apocynaceae
37.	*Polyalthia longifolia* (Sonn.) Thwaites	Debdaru	Annonaceae
38.	*Psidium guajava* L.	Guava /Peara	Myrtaceae
39.	*Pterospermum acerifolium* Willd.	Kanakchampa, Muchkunda	Sterculiaceae
40.	*Roystonea regia* (Kunth) O.F.Cook	Royal palm	Arecaceae
41.	*Saraca asoca* (Roxb.) Willd.	Ashok	Caesalpiniaceae
42.	*Swietenia mahagoni* (L.) Jacq.	Mehogony	Meliaceae
43.	*Syzygium cumini* (L.) Skeels	Kalo jam	Myrtaceae
44.	*Syzygium samarangense* (Blume) Merr. & L.M.Perry	Jamrul	Myrtaceae
45.	*Tamarindus indica* L.	Tentul/Tamarind	Fabaceae
46.	*Terminalia arjuna* W & A	Arjun	Combretaceae
47.	*Terminalia catappa* L.	Indian Almond	Combretaceae
48.	*Terminalia chebula* Retz.	Haritaki	Combretaceae
49.	*Trema orientalis* (L.) Blume	Jiban	Ulmaceae

B. Shrubs and Under-shrubs

Sl. No.	Name of plants(Species)	Common Name	Family
1.	*Callistemon linearis* (Schrad. & J.C.Wendl.) Colv. ex Sweet	Bottle Brush, Brushful	Myrtaceae
2.	*Cascabela thevetia* (L.) Lippold	Kolke	Apocynaceae
3.	*Citrus maxima*	Lebu	Rutaceae
4.	*Codiaeum variegatum* (L.)Rumph. exA.Juss.	Patabahar	Euphorbiaceae
5.	*Cordyline fruticosa* (L.) A.Chev.	Good luck plant/Palm lily	Asparagasceae
6.	*Duranta erecta* L.	Duranto	Verbenaceae
7.	*Euphorbia trigona* Haw	Cactus	Euphorbiaceae
8.	*Euphorbia mellii* Ch. Mont.	Not known	Euphorbiaceae
9.	*Furcraea acaulis* (Kunth)B.Ullrich	Patabahar	Asparagaceae
10.	*Gardenia jasminoides* J.Ellis	Gandharaj	Rubiaceae
11.	*Ixora coccinea* L.	Ixora	Rubiaceae
12.	*Jasminum pubescens* Buch. –Ham.ex Wall.	Beli	Oleaceae
13.	*Murraya koenigii* (L.) Spreng.	Karipata	Rutaceae
14.	*Murraya paniculata* (L.) Jack	Kamini	Rutaceae
15.	*Musa × paradisiaca* L.	Kela	Musaceae
16.	*Mussaenda erythrophylla*'Rosea' Schum.&Thonn.	Mussanda	Rubiaceae
17.	*Nerium oleander* L.	Karavi	Apocynaceae
18.	*Nolina recurvata* (Lem.)Hemsl.	Elephant foot, Poney-tail palm	Asparagaceae
19.	*Nyctanthes arbor-tristis* L.	Shiuli	Oleaceae
20.	*Pedilanthus tithymaloides* Poit	Rangchita	Euphorbiaceae
21.	*Phyllanthus emblica* L.	Amlaki	Euphorbiaceae
22.	*Phyllanthus reticulatus* Poir.	Panjuli, Chitki, Pankushi	Euphorbiaceae
23.	*Ravenala madagascariensis* Sonn.	Pantho padap	Strelitziaceae
24.	*Ricinus communis* L.	Rehri	Euphorbiaceae
25.	*Streblus asper* Lour.	Sheora	Moraceae
26.	*Tabernaemontana divaricata* (L.)R.Br.ex Roem. & Schult.	Tagar	Apocynaceae
27.	*Vitex negundo* L.	Nishinda	Verbanaceae

C. Herbs, Grasses and Sedges

Sl. No.	Name of Plants (Species)	Common Name	Family
1	*Acalypha indica* L.	Muktojhuri	Euphorbiaceae
2	*Ageratum conyzoides* L.	Uchunti	Compositae
3	*Allamonda neriifolia* Hook.	Allamanda	Apocynaceae
4	*Blumea lacera* (Burm.f.) DC.	Bara Kukshima	Compositae
5	*Brachiaria ramosa* (L.) Stapf	Running grass/ Para Ghas	Poaceae
6	*Canna glauca* L. var angusta	Kalabati	Cannaceae
7	*Colocasia antiquorum* Schott.	Kochu	Araceae
8	*Commelina benghalensis* L.	Kanshira	Commelinaceae
9	*Commelina obliqua* Vahl	Kane saak	Commelinaceae
10	*Commelina paludosa* Blume	Jatakanchira	Commelinaceae

to be continued ...

11	*Cyanthillium cinereum* (L.) H.Rob.	Kukshim	Compositae
12	*Cynodon dactylon* (L.) Pers.	Durba	Poaceae
13	*Cyperus rotundus* L.	Mutha	Cyperaceae
14	*Dichanthium annulatum* (Forssk.)Stapf	Marvel Grass	Poaceae
15	*Digitaria ciliata* Lag.	Pangloa / Digit grass	Poaceae
16	*Digitaria longiflora* (Retz.) Pers.	Finger-grass	Poaceae
17	*Eleusine indica* (L.) Gaertn.	Chapra ghas	Poaceae
18	*Globba bulbifera* Roxb.	Kanda Puspa	Zingiberaceae
19	*Hedychium speciosum* Wall.	Dolon Champa	Zingiberaceae
20	*Imperata cylindrica* (L.) Raeusch.	Ulu ghas	Poaceae
21	*Panicum repens* L.	Torpedo ghas	Poaceae
22	*Peperomia pellucida* (L.) Kunth	Patabahar	Piperaceae
23	*Saccharum officinarum* L.	Sugarcane/Aakh	Poaceae
24	*Solanum nigrum* L.	Kakmachi	Solanaceae
25	*Typhonium trilobatum* (L.) Schott	Kharkol	Araceae
26	*Wedelia calendulaceae* Less.	Bhringaraj	Compositae

D. Climbers and Lianas

Sl. No.	Name of Plants(Species)	Common Name	Family
1.	*Aristolochia indica* L.	Iswarmul	Aristolochiaceae
2.	*Combretum indicum* (L.)DeFilips	Madhabilata	Combretaceae
3.	*Ficus pumila* L.	Creeping fig	Moraceae
4.	*Hiptage benghalensis* (L.) Kurz	Madhab lata	Malpighiaceae
5.	*Ipomoea batatas* (L.) Lam.	Ranga aloo	Convolvulaceae
6.	*Mikania micrantha* Kunth	Climbing hemp, Tarulata	Compositae
7.	*Mukia maderaspatana* (L.)M. Roem.	Coccinia/Telakachu	Cucurbitaceae
8.	*Pothos scandens* L.	Hatilata, Hijing chinepata	Araceae
9.	*Raphidophora decursiva* (Roxb.) A.Schott	Raphidophora	Araceae
10.	*Scindapsus officinalis* (Roxb.) Schott	Gajpeepal	Araceae
11.	*Tinospora sinensis* (Lour.) Merr.	Gulancha lata	Menispermaceae
12.	***Trichosanthes cucumerina*** L.	Chichinga	Cucurbitaceae
	Gymnosperm:		
1.	*Araucaria cooki* R.Br.exD.Don	Araucaria	Coniferaceae
2.	*Cycas revoluta* Bedd.	Cycas	Cycadaceae

Table 2 : Analysis of Habits and Taxonomy of the Concerned Plant Species in Kolkata Data Points

<table>
<tr><td colspan="3">Habit Analysis
Tree: Shrub: Herb : Vines :: 49:27:26:12 :: 4 : 2.25 : 2.16:1
% values – Tree:42.24 %,Shrub 23.27 %,,Herb 22.41 % & vines 10.34 %</td></tr>
<tr><td colspan="3">Taxonomic Analysis</td></tr>
<tr><td colspan="3">Total No. Of plant family: 4 6{33 Dicot + 11 Monocot +2 Gymno.},Total no. of plant genera:{101,(101-35) =66 dicot+33 Monocot + 2 Gymnosperm.},Total no. of plant sp:116{116 –(35+2)=79 dicot +35 monocot+ 2 Gymnosperm}</td></tr>
<tr><td>Total no.of plant species:116</td><td>family:genus:species:: 44:101:116::1:2.29:2.63</td><td rowspan="2">Coefficient of Generic diversity(total basis)

= 100*G / S = 100 * 101 / 116 = 87.06</td></tr>
<tr><td>Total no.of Dicotyledonous species:79</td><td>family: genus : species:: 33:66:79:: 1: 2: 2.39</td></tr>
</table>

to be continued ...

<table>
<tr><td colspan="3">Total no.of Monocotyledonous species:35</td><td colspan="5">family:genus:species :: 11:33:35:: 1: 3: 3</td><td colspan="3" rowspan="2"></td></tr>
<tr><td colspan="3">Gymnosperm:2</td><td colspan="5">family:genus:species ::2:2:2::1:1:1</td></tr>
<tr><td colspan="3" rowspan="3">Dicot: monocot ratio</td><td colspan="5">dicot fam : monocot fam ::33:11::3:1</td><td rowspan="3">Species quota for each family (total basis)</td><td rowspan="3">Species quota for each genus (total basis)</td><td rowspan="3">Genus quota for each family (total basis)</td></tr>
<tr><td colspan="5">dicot genus : monocot genus :: 66:33:: 2:1</td></tr>
<tr><td colspan="5">dicot sp : monocot sp :: 79:35 :: 2.25:1</td></tr>
<tr><td>%values</td><td>Total Vascular Plants</td><td colspan="2">Dicots</td><td colspan="2">Monocots</td><td>Gymno sperms</td><td>116/46 =2.52</td><td>116/101 =1.14</td><td>101/46 = 2.19</td></tr>
<tr><td rowspan="3"></td><td>Family : 46</td><td>33</td><td>75%</td><td>11</td><td>25%</td><td>2</td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td>Genus : 101</td><td>66</td><td>65.3%</td><td>33</td><td>32.67%</td><td>2</td></tr>
<tr><td>Species:116</td><td>79</td><td>68.10%</td><td>35</td><td>30.17%</td><td>2</td></tr>
</table>

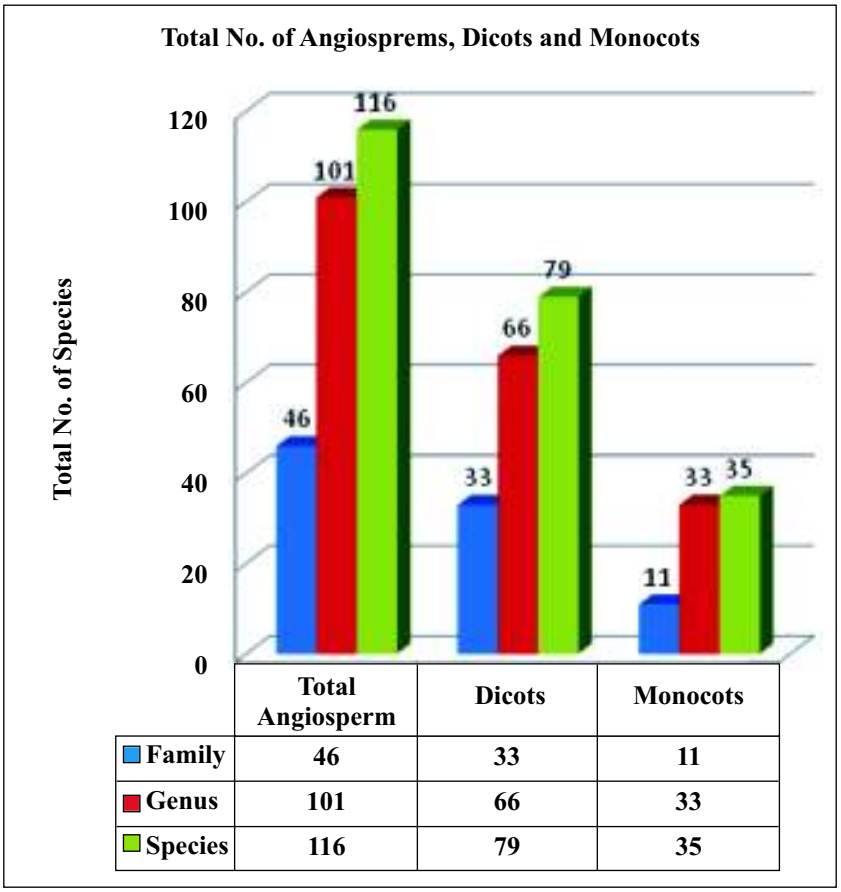

Figure 1: Number of Total Angiosperm, Dicots and Monocots At Family, Genus and Species Levels

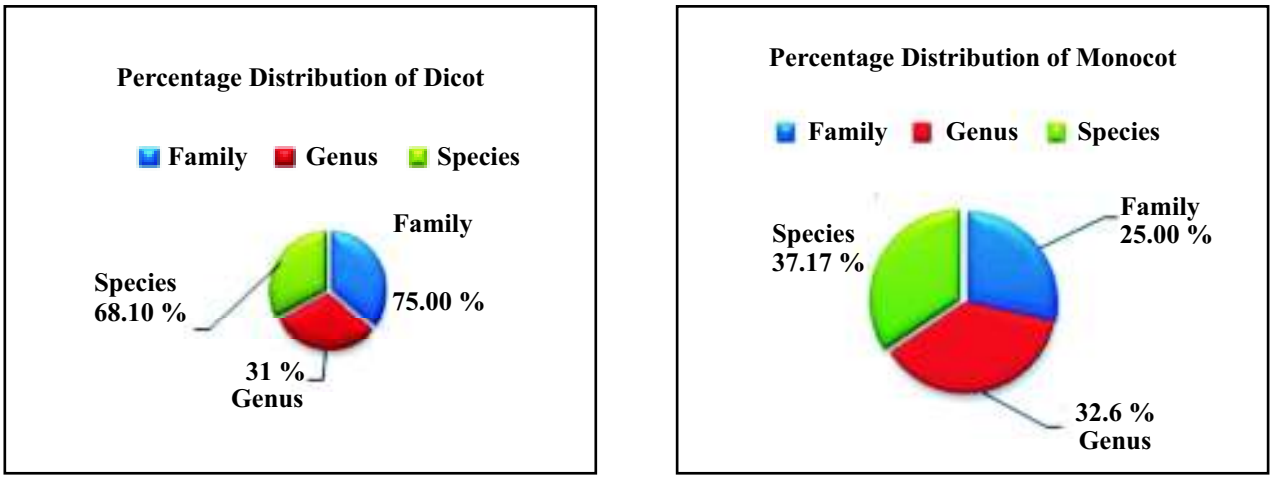

Figure 2 : Percentage Values of Dicot and Monocot at the Levels of Family, Genus and Species

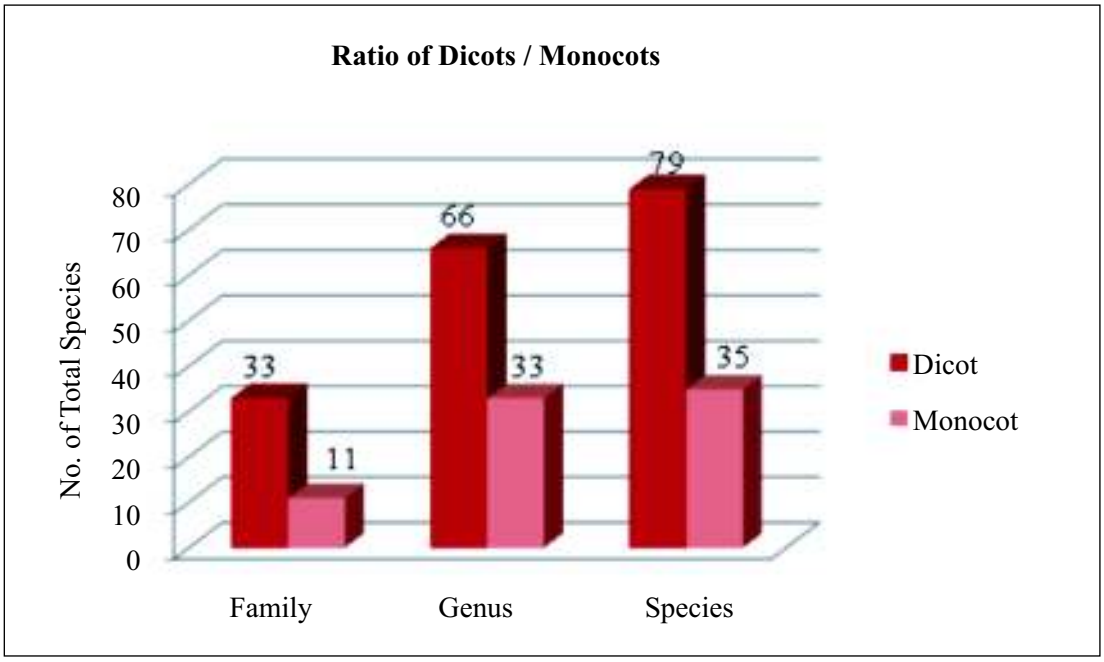

Figure 3 : Ratio of Dicots/Monocots at the Levels of Family, Genus and Species

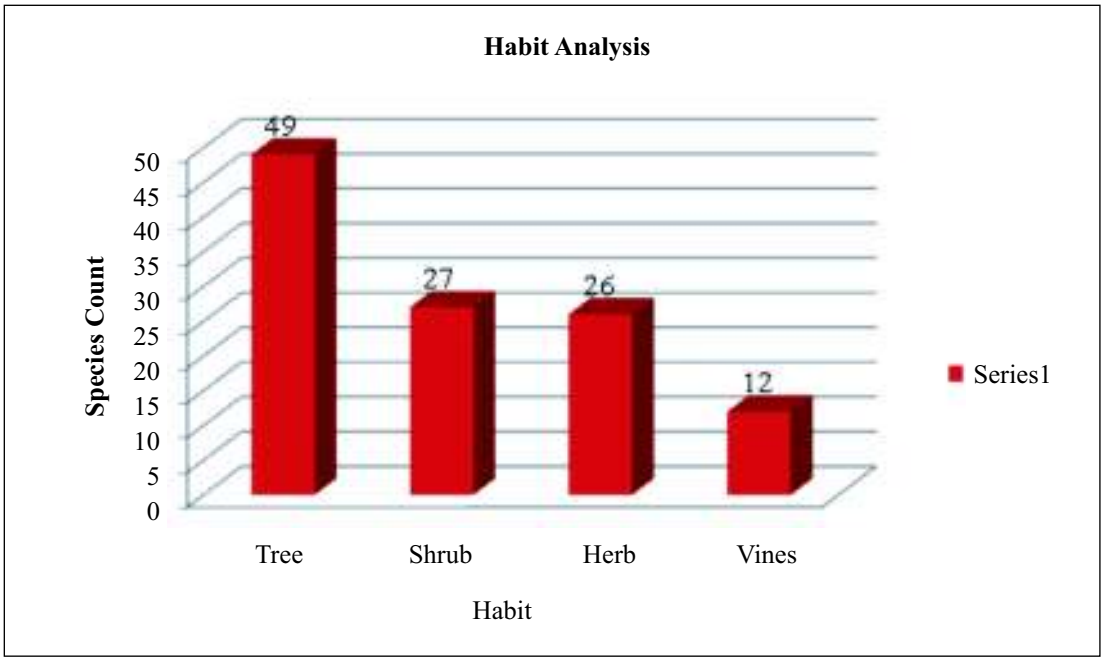

Figure 4: Habit Analysis of the Flora

also some horticultural species such as *Citrus maxima*, *Clitoria ternatea*, *Musa paradisiaca* sp. etc. Certain other species, which once upon a time were introduced and fostered as garden plants, e.g. *Canna glauca*, *Quisqualis indica*, *Scindapsus officinalis*, *Ixora coccinea*, etc. now grow as escape species.

CONCLUSION

A close man-plant-environment relationship was found to exist in the places of religious activities studied where the environment is more comfortable than elsewhere for the greenery sustained therein. The plants so long sustained were either wilfully planted or have been naturally occurring since remote past. Many of the plants thus sustained are useful in various ways by virtue of their consumptive, ecological and aesthetic values. It is the sacredness attached by man with the vegetation that ensures its perpetual protection. Thus socio-cultural perspectives of life adhering to biodiversity can prove essential to optimize environment and improve quality of life.

ACKNOWLEDGEMENTS

Authors are thankful to the authorities of Dakshineshwar, Adyapeath and Udyan Bati for their kind cooperation. Authors also express their gratitude to the Head, Department of Botany, Burdwan University for providing working facilities.

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