Indian J.Sci.Res. 13 (1): 151-155, 2017 ISSN: 0976-2876 (Print)
ISSN: 2250-0138 (Online)

A CONTRIBUTION TO THE STUDY OF MURAL FLORA OF BURDWAN IN WEST BENGAL STATE OF INDIA

DEBASHREE DEY[a1], MOUMITA DAS[b] AND AMBARISH MUKHERJEE[c]

[abc]UGC- CAS (Phase II) Department of Botany, The University of Burdwan, Burdwan, West Bengal, India

ABSTRACT

The wall flora composes a very interesting group of stress tolerant plants capable of thriving in nutritionally deficient substrates. The walls provide shelter to the species seeking refuge in then. While doing so the walls in rural as well as urban areas contribute towards conservation of rare and threatened plants. Some species settled on walls often prove damaging to buildings and must be eradicated. The present work which covered the wall flora of five major zones of Barddhaman viz north, east and west Barddhaman, Kanchannagar and Sadarghat, could record as many as 28 species belonging to 24 genera of 16 families. Incidentally all families were dicotyledonous. The climate was very dry and hot during the pre-monsoon seasons in Barddhaman which didn't allow a rich mural flora during the tenure of the present work. Even the grasses which were presumably annuals appeared during monsoon which were observed but not recorded. Taxonomic analysis of the wall flora revels Asteraceae to be most successful with 6 species which was followed by Moraceae and Acanthaceae each with 4 species. Cucurbitaceae has 2 representative species. Habit analysis of wall plants shows species of 19 herbs, 3 shrubs and 6 trees. Among the herbs 4 species are climbers with roots anchored on wall and 6 species are creepers. Thus habit of wall plant shows full range of diversity. The number of species was highest in walls of Kanchannagar area. The next to come in the list is Sadarghat area with 9 species. There were 5 species in Barddhaman north and 3 species in each case of Barddhaman east and west. When the flora is analyzed according to the type of supporting wall very interesting results were obtained. Of the six different types of walls studied the cemented brick walls sustained the highest number of species i.e. 27. The work on wall flora is emphasized since it can not only unveil many mysteries of plant adaptation but also hand over information in landscape planning, protection of old buildings especially the heritage buildings and monuments.

KEYWORDS: Wall Flora, Stress Tolerant Plants, Landscape Planning

Plants, especially angiosperms, have a wide range of diversity in their forms and functions concomitantly with a broad spectrum of habitats. Angiosperms, the highest evolved among plants, are ubiquitous with distribution in terrestrial as well as aquatic systems spreading from the equator to the near arctic regions of the globe. Their adaptive radiation and evolutionary flexibility and rapidity are praiseworthy. They grow in wild abodes as well as human cared systems organized according to the principles and practices off agriculture, horticulture, silviculture, aquaculture etc. They are well adapted to epiphytic lifestyle, mycotrophism, insectivory etc. Certain plants design their biology for extraterrestrial life on walls in addition to their life in natural habitats as an additional strategy to interact with other species in such a way so as to avoid completion and exclusion from the ecosystem so as to compromise through spatial resource partitioning. It is also likely that such plants use the walls as a stepping stone for future success in their ecological growth and spread. It is simply a matter of occupying space inclement with limited nutrition and water by one plant on walls of building as well as fences without any special obligation. These plants usually have wide range of adaptations from mesic (moderate state of hydration) to xeric (dehydrated state) conditions. Their reproductive biology is stretched to the extent of sexual as well as asexual reproduction on walls, development of fertile, vigorous seeds and contrivances for their efficient dispersal. Studies on extraterrestrial plant life mostly concern the epiphytes (Mukherjee, 1991). The ecological aspect of these extraterrestrial plants has been envisaged in the work of Segal (1969) and Varshney (1968). Work on wall flora is rather meager in India (Ghosh and Pal, 1997; Ghosh and Das, 1998; Pal *et al*., 2000) although these plants occupy very important structural as well as functional positions in the trophic framework of the rural as well as urban ecosystems. Moreover, in urban areas where there is a paucity of natural habitats, the walls provide refuge to a good number of species of herbs, shrubs and trees. They serve as a matrix for a flora assembled mainly through anemochory, ornithochory and myrmecochory. In view of tremendous importance of stocktaking of biodiversity, especially the rare and threatened species, the need to undertake census of epimural plants has been escalated. Moreover, the wall flora proves to be damaging to buildings and other constructions. As such there should be a periodic surveillance to control the wall flora and rehabilitate the useful and threatened ones in a safe natural home or in fields for cultivation and conservation. In view of the importance of the wall flora, the present work was undertaken in such a historically important place as Barddhaman which with a cultural heritage of great admiration is the Headquarters of the District as well as Division named after itself. Burdwan district spreads from 22°56/ to 23°53/ North latitude and from 86°48/ to 88°25/ East longitude. The Royal palace and

[1]Corresponding author

gardens in Golapbag and Tarabag, Ramnabagan, age old temples and mosques, palatial buildings, trading centres, the peripheral rural settings have proved to be an optimum matrix nurturing unity in cultural diversity hand in hand with plant diversity of esteem. It is aptly called the Granary of West Bengal for its overwhelming virtues in production of rice.

SOWING STUDY SITE WITH MAP

Figure 1: Burdwan District Map

Study Site

Burdwan district extends from 22^0 56′ to 23^0 53′ North latitude and from 86^0 48′ to 88^0 25′ East longitudes. Lying within Buudwan Division, the district is bounded on the north by Dumka (Jharkhanda State), Birbhum and Mursidabad, on the east by Nadia, on the South by Hooghly, Bankura and Purulia and on the west by Dhanbad district of Jharkhand State. The river Barakar froms the state boundary to the west; the Ajay separates Birbhum and Dumka to the north with exception of a portion of Katwa subdivision, the Damodar froms a Southern boundary with Purulia and Bankura districts, while Bhagirathi forms the main eastern boundary with a few exceptions. The maximum length from east to west is 280Km while the maximum breadth from north to south is 112Km. In shape the district resembles a hammer. The study area of the present work lies in Bardhhaman Sadar selecting localities in and around Burdwan-North, Bardhhaman-Kanchannagar area, Burdhhaman-Sadarghat area, Bardhhaman-East, Bardhhaman-West.

MATERIALS AND METHODS

The present study was initiated in March 2015 and field studies were performed from time to time during the pre-monsoon season. Plants growing-on walls and fences of rural and urban regions of Bardhhaman were collected, processed for herbarium preservation and identified following standard methods involving dissection, description and reference to (fig 1 and 2) literature (Prain, 1903; Guha Bakshi, 1984; Bennet, 1987, Murti and Panigrahi,1999; Panigrahi and Murti, 1989), and the rest processed for herbarium preservation as voucher specimens following Jain and Rao (1977) and authentic specimens preserved in BURD, i.e. the Herbarium of the department of Botany of the University of Burdwan. The species have been arranged alphabetically with other

necessary information pertaining to its family name, wall type, exact location of habitat on the wall etc. and put under the headings of respective data points, i.e. localities within the study site, i.e. Barddhaman.

RESULTS

Table 1: An account of prevalence of the plant Species in different walls.

Sl no.	Name of the plant	Family	Attendance in study site					Prevalence (%)
			BN	K	BS	BE	BW	
1.	*Acalypha indica*	Euphorbiaceae	-	+	-	-	-	20 %
2.	*Amaranthus viridis*	Amaranthaceae	-	+	-	-	-	20 %
3.	*Andrographis paniculata*	Acanthaceae	-	+	-	-	-	20 %
4.	*Argemone mexicana*	Papaveraceae	-	-	+	-	-	20 %
5.	*Azadirachta indica*	Meliaceae	-	-	+	-	-	20 %
6.	*Barleria cristata*	Acanthaceae	-	+	-	-	-	20 %
7.	*Blumea lacera*	Asteraceae	-	+	-	-	-	20 %
8.	*Boerhaavia repens*	Nyctaginaceae	-	+	-	-	-	20 %
9.	*Cajanus scarabaeoides*	Papilionaceae	-	-	-	-	+	20 %
10.	*Cayratia carnosa*	Vitaceae	-	-	+	+	-	40 %
11.	*Clerodendrum viscosum*	Verbinaceae	-	-	+	-	-	20 %
12.	*Coccinia grandis*	Cucurbitaceae	-	-	-	-	+	20 %
13.	*Dentella repens*	Rubiaceae	-	+	-	-	-	20 %
14 .	*Eclipta alba*	Asteraceae	+	+	-	-	-	40 %
15.	*Ficus benghalensis*	Moraceae	-	-	+	-	-	20 %
16.	*Ficus hispida*	Moraceae	-	-	+	-	-	20 %
17.	*Ficus racemosa*	Moraceae	-	+	-	-	-	20 %
18.	*Ficus religiosa*	Moraceae	+	-	+	+	+	80 %
19.	*Glinus oppositifolius*	Molluginaceae	+	+	-	+	-	60 %
20.	*Gnaphalium polycaulon*	Asteraceae	-	+	-	-	-	20 %
21.	*Hemigraphis hirta*	Acanthaceae	-	+	+	-	-	40 %
22.	*Oxalis corniculata*	Oxalidaceae	+	-	-	-	-	20 %
23.	*Parthenium hysterophorus*	Asteraceae	+	-	-	-	-	20 %
24.	*Rungia parviflora*	Acanthaceae	-	+	-	-	-	20 %
25.	*Trema orientalis*	Ulmaceae	-	+	-	-	-	20 %
26.	*Trichosanthes cucumerina*	Cucurbitaceae	-	+	-	-	-	20 %
27.	*Tridax procumbens*	Asteraceae	-	+	-	-	-	20%
28.	*Vernonia cinerea*	Asteraceae	-	+	-	-	-	20 %

Table 2: Species distribution on walls of different regions of Burddhaman

Serial No.	Place /Data Point	Number of plant species growing on wall
1.	Barddhaman North	5
2.	Barddhaman- Kanchannagar	17
3.	Barddhaman -Sadarghat Area	9
4.	Barddhaman -East	3
5.	Barddhaman- West	3

DISCUSSION

The present work which covered the wall flora of five major zones of Barddhaman, viz. north-, east- and west- Barddhaman, Kanchannagar and Sadarghat, could record as many as 28 species belonging to 24 genera of 16 families. Incidentally all the families were dicotyledonous. The number of species appears to be

quite low compared to the ruderal flora associated with the walls studied. The reasons are obvious. The climate was very dry and hot during the pre-monsoon season in Barddhaman which did not allow a rich mural flora. Even the grasses which were presumably annuals appeared during monsoon which were observed but not recorded.

The number of species was highest in walls of Kanchannagar area. The next to come in the list is Sadarghat area with 9 species. There were 5 species in Burdwan North and 3 species in each case of Barddhaman East and West (Tables 1 and 2).

When the flora is analyzed according to the type of supporting wall very interesting results were obtained. Six different types of walls were studied of which cemented brick walls sustained the highest number of species i.e. 27.The walls made of brick, mud and lime could accommodate 4 species and simply mud walls and stone-brick walls sustained 3 species each. Other two types of walls, i.e. brick wall and mud-brick wall supported on species each. Since the muds were compact, dry and impervious the plants were incapable of settling on walls. Only the highly xeric species like *Ficus religiosa, F. racemosa, F.bengalensis* and *F. hispida* were capable of thriving under such stressful habitats. *Ficus* was the most successful among all the genera recorded in the present work by virtue of its four species. The cemented brick walls were mostly old with cracks and porosity due to sand mixed with cement. The conditions thus were suitable for 27 species in procuring retained water and moisture and aeration in walls (Table 1).

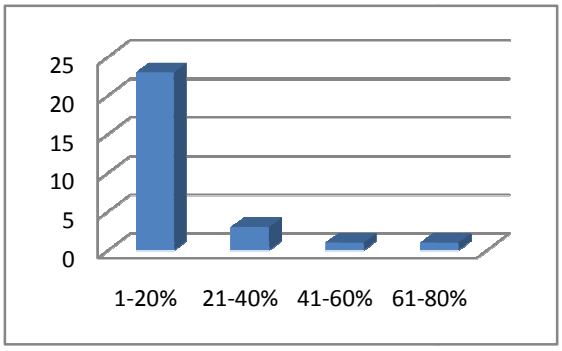

Figure 2: Prevalence categories of species composing wall flora

Taxonomic analysis of the wall flora revals Asteraceae to be most successful with 6 species which was followed by Moraceae and Acanthaceae each with with 4 species. Cucurbitaceae had 2 representative species. Each of the remaining 12 families was represented by a single species.

Habit analysis of wall plants shows species of 19 herbs, 3 shrubs and 6 trees. Among the herbs four species are climbers with roots anchored on walls and six species are creepers. Thus habit of wall plants shows full range diversity.

When prevalence values of the concerned species were considered no less than 23 species were very preferential as evident from their utilization of 20% of the wall types. Only three species could be seen to occupy 21-40% of the wall types which speaks of their broader ecological amplitude. Only one species each showed their efficiency to use 41-60% (*Glinus oppositifolius*) and 61-80% (*Ficus religiosa*) of the different wall types studied. Thus these species are rather more non-selective than majority of the species. Interestingly no totally indifferent species (81-100% prevalence value) could be recorded.

CONCLUSION

The wall flora composes a very interesting group of stress tolerant plants capable of thriving in nutritionally deficient substrates. The walls provide shelter to the species seeking refuge in them. While doing so the walls in rural as well as urban areas contribute towards conservation of rare and threatened plants. The tree species settled on walls often prove damaging to buildings and must be eradicated. Work of this kind can afford opportunity to formulate strategies for conservation of rare and useful species in one hand and work out strategies for weed control on walls on the other hand. Extensive studies are thus needed for a better understanding of the biology of the biology of the wall plants since they might have several benevolent implications still not known to us.

REFERENCES

Altay V., Özyigit I. and Yarci C., 2010. Urban ecological characteristics and vascular wall flora on the Anatolian side of Istanbul, Turkey. Maejo International Journal of Science and Technology, **4**(3): 483-495.

Bennet S. S. R., 1987. Name changes in flowering plants of India and adjacent regions. – Triseas Publishers, Dehradun.

Brandes D., 1995. Flora of old town centres in Europe. In: Skupp H, Numata M, Huber A (eds),Urban Ecology as the Basis of Urban Planning, SPB Academix Publishing, Amsterdam, pp. 49-58.

Brandes D., 2002. Some remarks on the flora of walls and ruins in eastern Crete, Elektron.Veröff.: http://opus.tu-bs.de/opus/volltexte/2002/291.

Brandes D., 2004. Spontaneous flora of the old town centre of Metz (France) – Flore spontanée de la vieille cité de Metz (France). http://www.biblio.tu-bs.de/geobot/metz.pdf.

Brandes D., 2008. Notizen zur Stadtflora von Istanbul (Türkei), http://www.ruderalvegetation. de/epub/istanbul.pdf (2008-4-1).

Cleere H., 1984. Approaches to the Archaeological heritage: A Comparative Study of World Cultural Resource Management Systems. Cambridge University Press, Cambridge.

Cleere H., 1989. Archaeological heritage management in the Modern World. Unwin Hyman, London.

Darlington A., 1981. Ecology of Walls. Heinemann Educational Books Ltd., London.

Francis R.A., 2011. Wall ecology: A frontier for urban biodiversity and ecological engineering. Progress in Physical Geography, **35**(1): 43-63.

Guha Bakshi D.N., 1984. Flora of Murshidabad District. Scientific Publishers, Jodhpur.

Hooker J. D. 1875-1897. The flora of British India. 7 Vols., L. Reeve & Co., London, U. K.

Jain S. K. and Rao R. R., 1977. A handbook of field and herbarium methods. – Today & Tomorrow's Printers and Publishers, New Delhi, 157 pp.

Kelcey J.G. and Müller N. (eds), 2011. Plants and Habitats of European Cities. Springer, New York, Dordrecht, Heidelberg, London.

Krigas N., Lagiou E., Hanlidou E. and Kokkini S., 1999. The vascular flora of the Byzantine Walls of Thessaloniki (N Greece). Willdenowia, **29**: 77-94.

Mukherjee A., 1991. Epiphytism - a unique style of plant life. Everyman's Science, **26**(5):148-153.

Murti S. K. and Panigrahi G., 1999. Flora of Bilaspur District, M. P. – Botanical Survey of India, Calcutta, Vol. 2, pp. 397–906.

Narain S., 2010. Observations on the flora of Hamirpur and Mahoba districts of Uttar Pradesh, India. Indian J. For., **33**(3): 455-462.

Nedelcheva A., 2011. Observations on the wall flora of Kyustendil (Bulgaria). Eurasia J Biosci., **5**: 80-90.

Pal B., Palit D. and Mukherjee A., 2000. Plant diversity in mural habitats of Hooghly District, West Bengal. Geobios., **27**(4) : 183-187.

Pangtey Y. P. S. and Rawat G. S., 1987. Studies on the wall flora of Nainital. J. Econ. Taxon. Bot., **9** (1): 209-229.

Panigrahi G. and Murti S. K., 1989. Flora of Bilaspur District, M. P. – Botanical Survey of India, Calcutta, **1**:1–396.

Pavlova D. and Tonkov S., 2005. The wall flora of the Nebet Tepe architectural Reservein the city of Plovdiv (Bulgaria). Acta Bot. Croat., **64**(2):357–368.

Prain D., 1903. Bengal Plants. Calcutta.

Sahu T. R., 1984. Studies on the wall flora of man-made habitats of Sagar. Indian J. For., **7**: 232-238.

Singh C. S. and Choudhary, R. L., 1975. Seasonal distribution of the wall vegetation of Ayodhya. The Botanique, **4**: 87-92.

Singh S. K., Dixit S. N., Srivastava A. K. and Singh S. D. 1979. Wall flora of Gorakhpur. Environ. India, **2**(1): 5-14.

Singh A., 2011.Observations on the Vascular Wall Flora of Banaras Hindu University Campus, India. Bulletin of Environment, Pharmacology & Life Sciences, **1**(1): 33-39.

Varshney C. K., 1967. Seasonal aspects of the wall vegetation of Varanasi. Trop. Ecol., **8:** 22-29.

Varshney C. K., 1971. Observations on the Varanasi wall flora. Vegetatio, **22**(6): 355-372.

Zerbe S., Maurer U., Schmitz S. and Sukopp H., 2003. Biodiversity in Berlin and its potential for nature conservation. Landscape and Urban Planning, **62**: 139-148.