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PHYTODIVERSITY IN SEMIPROTECTED RIVERBANKS OF AGRA

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ABSTRACT

Riverbank ecosystem presents special habitat features of sloping topography, periodic inundation resulting in the temporary submergence of the vegetation which also faces the erosive forces of floodwaters. During the summer months, it is subjected to intense drought conditions. Under such unstable and challenging conditions certain plant species colonize the riverbanks and form plant communities. After raining season with the receding of flood waters the vegetation appears in the form of characteristic belts which are quite distinct due to their shape, number and continuity along the Yamuna riverine slopes. The plant species inhabiting the riverbanks are certain wetland winter annuals with a very short life span. The seed stock of these species is readily available on the bank and when the river comes in spate, the seeds are disseminated through the water currents.

INTRODUCTION

Phytodiversity is a term used to refer to all of the diversity and variability of plants in nature, which is the result of evolution and natural selection. Riverbanks are the ecotone between the open water and the terrestrial ecosystem, endowed with specific structural and functional attributes performing major roles in biosphere. The vegetation occurring on riverbanks not only helps in conservation of soil, but also has many ecological functions. It acts as filter for nutrients entering the river from uplands and thus help in regulating the water quality (Lawrance *et al.*, 1984).

The present study on phytodiversity on riverbank vegetation has been conducted along the course of river Yamuna. It passes through the district for a distance of nearly 71 km. and forms the most dominating feature of Agra. The river is flanked on both the sides by alluvial banks of varying width ranging from 10- 150 meters. Man's attachment and reverence for river is as old as the history of man on this earth and riverbanks have always been closely associated with people.

There is no systematic account of plant diversity along the entire stretch of river Yamuna available, although a number of researchers and explorers have attempted one or other region of this river basin (Gupta, 1961; Maheshwari, 1963; Singh, 1965; Sharma, 1980; Prakash, 1982; Dhingra, 1989; Sah, 1990; Mathur, 1994). Keeping this in view, the study area was selected to ascertain the phytodiversity potential.

METHODS

The study was conducted over a period of 3 years (1997-2000), which included extensive and intensive field survey of the semi protected riverbanks of Yamuna at Agra. Field trips were undertaken once in every fortnight at different sites and field notes were recorded. In the present study riverine vegetation constituting the plant species occurring in the river water along with semi aquatic plants and riparian vegetation along the flood plain zone were considered from the phytodiversity point of view.

An attempt was made to identify the plants so far collected from fresh materials as far as possible, but such provisional identifications were confirmed after consulting reputed herbaria.

RESULTS

The plants collected and identified, as above, yielded 85 species belonging to 70 genera and 41 families of Angiosperms. The number of families, genera and species representing the Dicotyledons and Monocotyledons are given in the Table 1:

Table-1: Number of Families, Genera and Species occurring on the Yamuna Riverbank at Agra.

Division	Families	Genera	Species
Dicots	31	50	56
Monocots	10	20	29
Total	41	70	85

The systematic enumeration of species is given in theTable-2.

Table 2 : Vegetation along river Yamuna at Agra.

SL. No	Family	Name of species
(a)	Aquatic macrophytes	
1.	Aponogetonaceae	*Aponogeton natans*
2.	Ceratophyllaceae	*Ceratophyllum demersum*
3.	Cyperaceae	*Eleocharis palustris, Scirpus articularis*
4.	Hydrocharitaceae	*Hydrilla verticillata, Vallisneria spiralis*
5.	Pontederiaceae	*Eichhornia crassipes*
6.	Potamogetonaceae	*Potamogeton crispus, P. pectinatus*
(b)	Riparian macrophytes	
1.	Acanthaceae	*Pristrophe bicalyculata*
2.	Aizoaceae	*Trianthema portulacastrum*
3.	Amaranthaceae	*Achyranthes aspera, Alternanthera sessilis, Nothosaerva brachiata*

SL. No	Family	Name of species
4.	Arecaceae	*Phoenix sylvestris*
5.	Asclepiadaceae	*Calotropis procera, Pergularia daemia, Oxystelma secamone.*
6.	Asteraceae	*Eclipta prostrata, Cotula hemisphaerica, Gnaphalium indicum, Grangea maderaspatana, Pluchea lanceolata, Pulicaria crispa, Soliva anthemifolia, Xanthium strumarium*
7.	Boraginaceae	*Heliotropium eichwaldi, H. strigosum*
8.	Chenopodiaceae	*Chenopodium album, Suaeda maritima*
9.	Commelinaceae	*Commelina benghalensis, C.forskalii*
10.	Convolvulaceae	*Ipomoea coptica, I. pes-tigridis*
11.	Cucurbitaceae	*Coccinia indica, Melothria maderaspatana*
12.	Cyperaceae	*Cyperus triceps, C.niveus, C.rotundus, Fimbristylis bisumbellata, F.dichotoma, Kyllinga brevifolia, Scirpus affinis, S. maritimus, S. michelianus, S.tuberosus*
13.	Elatinaceae	*Bergia ammannioides*
14.	Euphorbiaceae	*Acalypha indica, Euphorbia geniculata, E.hirta, Ricinus communis, Melanthesa rhamnoides*
15.	Gentianaceae	*Centaurium ramosissimum*
16.	Juncaceae	*Juncus bufonius*
17.	Lamiaceae	*Leucas aspera*
18.	Lythraceae	*Ammannia baccifera*
19.	Malvaceae	*Abutilon indicum*
20.	Meliaceae	*Azadirachta indica*
21.	Mimosaceae	*Acacia arabica, A. leucophloea, Prosopis juliflora*
22.	Molluginaceae	*Mollugo nudicaulis*
23.	Nyctaginaceae	*Boerhavia diffusa*
24.	Papilionaceae	*Alhagi pseudalhagi,Alysicarpus vaginalis, Rhynchosia minima,*
25.	Pedaliaceae	*Pedalium murex*
26.	Primulaceae	*Anagallis arvensis*
27.	Poaceae	*Cynodon dactylon, Dichanthium annulatum, Dactyloctenium aegyptium, Eragrostis poaeoides, Polypogpon monspeliensis, Saccharum spontaneum*
28.	Polygonaceae	*Polygonum plebium, P.glabrum, Rumex dentatus*
29.	Ranunculaceae	*Ranunculus sceleratus*
30.	Rosaceae	*Potentilla supina*
31.	Scrophulariaceae	*Verbascum chinense, Veronica anagallis-aquatica*
32.	Solanaceae	*Nicotiana plumbaginifolia, Dalbergia sissoo, Withania somnifera*
33.	Tamaricaceae	*Tamarix dioica*

SL. No	Family	Name of species
34.	Tiliaceae	*Corchorus capsularis, C. depressus, Triumfetta rhomboidea*
35.	Verbenaceae	*Phyla nodiflora*
36.	Vitaceae	*Cayratia carnosa*

DISCUSSION

The phytodiversity along Yamuna river may be classified into two categories *viz.* 1) Riverine vegetation which refers to plants occurring in and along the river current and 2) Riparian vegetation which refers to the vegetation along the banks comprising chiefly the macrophytes (Kumar, 2001).

In the present study a total number of 85 plant species belonging to 41 families under 10 monocot and 31 dicots, have been listed from the various study sites, out of which, 9 species are aquatic and 76 species found occurring along the bank of river.

Cyperaceae and Poaceae are the major famileis in the area. Other families are arranged in the following descending order : Asteraceae, Euphorbiaceae followed by Amaranthaceae, Asclepiadaceae, Mimosoideae, Papilionaceae, Solanaceae and Tiliaceae having 3 genera each. Boraginaceae, Chenopodiaceae, Convolvulaceae, Cucurbitaceae, Hydrocharitaceae, Polygonaceae, Potamogetonaceae and Scrophulariaceae having 2 genera each followed by single member in families like: Acanthaceae, Aizoaceae, Aponogetonaceae, Arecaceae, Boraginaceae, Capparidaceae, Ceratophyllaceae, Elatinaceae, Gentianaceae, Lamiaceae, Lythraceae, Malvaceae, Meliaceae, Molluginaceae, Nyctaginaceae, Pedaliaceae, Pontederiaceae, Primulaceae, Ranunculaceae, Rosaceae, Tamaricaceae, Verbenaceae and Vitaceae.

The composition of plant life along the river banks of Yamuna is very rich and is determined by various factors like physico-chemical properties of river water, soil structure, prevailing micro-climatic conditions, duration of flood, topography, etc.

The growth of vegetation on riverbanks starts with the recession of flood waters starting from October till the month of March except sedges and grasses. These plant species change phases of activity in relation to seasonal sequence of climatic factors. The sites chosen along the course of river Yamuna differ in the degree of biotic interference as well as in the duration of inundation which also affects the diversity of plant species in a particular site (Grime, 1974, 1979).

The vegetation comprises of annuals, ephemerals and perennials including the wetland species appearing on the riverbanks, whereas the upland constitute mostly the woody plants. During the summer season grasses predominantly cover the vast area of the floodplain. The riparian vegetation acts as a sieve and helps in prevention of river pollution, siltation and check the adverse effects of floods. The species, like *Cynodon dactylon, Cyperus rotundus, Nothosaerva brachiata, Phyla nodiflora, ,Saccharum spontaneum, Tamarix dioica, Xanthium strumarium,* etc., are good soil binders and check soil erosion (Bilgrami, 1991).

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