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Diversity of Aquatic Macrophytes of Govardhan Sagar water body at Ujjain (M.P.) India

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Abstract

In the present study diversity of aquatic macrophytes of Govardhan Sagar water body was investigated in the year 2010-11.This pond is biotical affected by various anthropogenic factors. This pond receives a large amount of sewage in rainy season. It is a high polluted water body with dens macrophytic vegetation. High diversity of aquatic macrophytes was observed during study period in the selected water body. Nine macrophytic species *Eichhornia crassipes, Ipomoea aquatica, Spirodela polyrhiza, Lemna trinervis, Limnophila sessiliflora, Elodea sp., Wolffia arrhiza, Typha angustifolia and Ipomoea fistulosa* were reported in Govardhan Sagar water body.

Keywords: Macrophytic diversity, Govardhan Sagar, Eichhornia crassipes, Ipomea aquatic, *Typha angustifolia.*

Introduction

In an aquatic ecosystem, the density and diversity of organisms depend on availability and quality of water. Thus, the water is an essence of life on the earth that totally dominates the chemical composition of all organisms (Wetzel, 2001). Fresh water is essential for agriculture, industry and human existence. It is a finite resource of earth. Rapid growth of urban areas directly or indirectly affected existence of the pond such as over exploitation of resources and improper waste disposal practice (Thilaga *et al.*, 2005). Limnology plays a very important role in the decision making process in aquaculture practices. A change in water quality affects the biotic community of an aquatic ecosystem ultimately reducing the primary productivity (Iwama *et al.*, 2000).

Further, Fresh water is the most suitable and cheapest source for domestic and industrial needs and they provide convenient west disposal system. The increased demand of water as a consequence of population growth, agriculture and industrial development has forced environmentalists to determine the chemical, physical and biological characteristics of natural water resources (Regina and Nabi, 2003). Water of good quality is required for living organisms. Ponds have been used since time immemorial as a traditional source of water supply in India. However, the water of the ponds, lakes and river are polluted mainly due to discharged waste water from residential areas, sewage outlets, solid wastes, detergents, automobile oil wastes, fishing facilities and agricultural pesticides from farmlands (Srivastava *et al*., 2003; Hasan *et al*., 2007). An ecosystem consists of biotic and abiotic components. Therefore, there is a regular and uninterrupted interaction between biotic and abiotic components in fresh water habitat. There are many types of macrophytes and phytoplanktons grow in water bodies such as *Hydrilla, Ceretophylum, Eichhornia, Trapa bispinossa, Potamogitones* etc. have ability to maintain water quality. The climatic

characteristic influences the water quality and quantity affects the biodiversity (Boyd and Tucker, 1998). These water bodies are an integral component of the daily life activities of rural people for their subsistence and thereby tropical ecosystems are more vulnerable to eutrophication due to their rampant anthropogenic use. Therefore, regular monitoring of limnological parameters, using inexpensive methods, are much needed (Mukhopadhyay and Dewanji, 2005). Aquatic environments with low nutrient content usually have vegetation dominated by relatively small plants. With moderate nutrient loading, the biomass and proportion of aquatic macrophytes increases and plants can fill the entire water column (Zingel *et al.*, 2006).

Govardhan Sagar pond receives a large amount of sewage in rainy season. This pond has high diversity of macrophytes. The aim of present study is the investigation of macrophytic diversity of Govardhan Sagar water body at Ujjian (M.P.) India.

Materials and Methods

Govardhan Sagar is known by 4th water body of Sapt Sagar at Ujjain (M.P). It has high diversity of macrophytes. Whole surface of water is covered by dense mat of various macrophytes in this water body. This water body is situated on Ankpat Road and near patel colony at Ujjain city.

Photo plate 1. Photo showing High growth and dense mat of various Macrophytes in Govardhan Sagar water body at Ujjain (M.P.), India.

Different species of macrophytes were collected on monthly basis throughout the year walking along the margin of pond as well as from the boat. All collected plants were kept in plastic bags and transported to laboratory where they were washed thoroughly to remove silt, snails, epiphytes and other unwanted materials. Identification was followed according to Sculthore (1971); Holm *et al*., (1997) and Fassett (2006). Percentage frequency of macrophytic species was calculated by quadrat method. The Size of quadrat was 1×1 m². Quadrat was thrown randomly on water surface of water body and calculated the Percentage frequency of macrophytic species by following formula.

Calculations

$$\%F = \frac{\text{Total number of quadrats in which a macrophytic species occurred}}{\text{Total number of quadrats studied}} \times 100$$

% F = Percentage frequency of macrophytic species.

Results and Discussion

All Macrophytic species of Govardhan Sagar water body were identified with their % frequency during study period.

In the present study, nine macrophytic species *Eichhornia crassipes* (70 % F), *Ipomoea aquatic* (60% F), *Spirodela polyrhiza* (60% F), *Lemna trinervis* (65% F), *Limnophila sessiliflora* (50 % F), *Elodea sp.* (20 % F), *Wolffia arrhiza* (40 % F), *Typha angustifolia* (40% F), *Ipomoea fistulosa* (30 % F) were reported in Govardhan Sagar water body (Table -1 and fig. 1).

Identified Dominant Macrophytic Species

Eichhornia crassipes

Eichhornia crassipes was reported in selected water body with high frequency. It was first introduced as an

ornamental plant in India in 1896 from Brazil (Rao, 1988). In India, water hyacinth has stretched over 2, 00,000 ha of water surface in the country (Murugesan *et al*., 2005). Water hyacinth (*Eichhornia crassipes)* is a free floating (but sometimes rooted) freshwater plant of the family *Pontederiaceae* that has proven to be a significant economic and ecological burden to many sub-tropical and tropical regions of the world. (Bartodziej and Weymouth, 1995).

Table -1. Macrophytic species of Govardhan sagar water body with their % Frequency.

S. No.	Name of Macrophytic species	% Frequency
1	*Eichhornia crassipes*	70
2	*Ipomoea aquatica*	60
3	*Spirodela polyrhiza*	60
4	*Limnophila sessiliflora*	50
5	*Elodea* sp.	20
6	*Lemna trinervis*	65
7	*Wolffia arrhiza*	40
8	*Typha angustifolia*	40
9	*Ipomoea fistulosa*	30

% Frequency of a Macrophytic species is given as average value of % Frequencies of 12 months.
If average value of % Frequencies of 12 months was ranged from 1 % to 5% than it included in to 5 % frequency category.

eg. 5.1% to 10% included in to 10% frequency category.

10.1% to 15% included in to 15% frequency category.

Ipomoea aquatica

Ipomoea aquatica is a trailing vine with milky sap. Stems are hollow, up to 3m long or more, rooting at the nodes, floating in aquatic situations." Stone (1970) describes the leaves as being variable but commonly 5-15cm long and 2-10cm wide and oblong-lanceolate (arrowhead shaped) in shape. The flowers are described as being, showy, funnel form like morning-glory blooms, solitary or in few-flowered clusters at leaf axils; petals white to pink-lilac; the fruit as being, an oval or spherical capsule, woody at maturity, about 1cm wide, holding 1-4 grayish seeds, these often short-hairy (Langeland K.A. & Burks K.C, 1999).

Spirodela polyrhiza

Spirodela polyrhiza is the member of Araceae. Giant duckweed is most often found in quiet permanent waters. In mixtures with other duckweeds, it frequents low-lying roadside ditches, sheltered bays, pockets in floating bogs, and sites where town sewage and farm run-off have made waters nutrient rich. It is often seen in mixtures with larger aquatic species on the vegetation-choked shores of reservoirs, ponds and lakes (Holm *et al*., 1997).

Limnophila sessiliflora

Limnophila (family: Scrophulariaceae) is originated from a *Latin* word that means pond-loving indicating its existence in aquatic environments. It is commonly known as 'Ambulia' (Asian marsh weed). It is a perennial herb from Southeast Asia, tropical to subtropical Africa, Australia, and Pacific Islands; also finds adventive distribution in North America. *Limnophila* plants are widely distributed throughout India (Philcox, 1970).

Lemna sp.

Duckweed is well known for its high productivity and high protein content in temperate climates. They are green and have a small size (1-3 mm). They also have short but dense roots (1-3cm) (Altay *et al*., 1996).

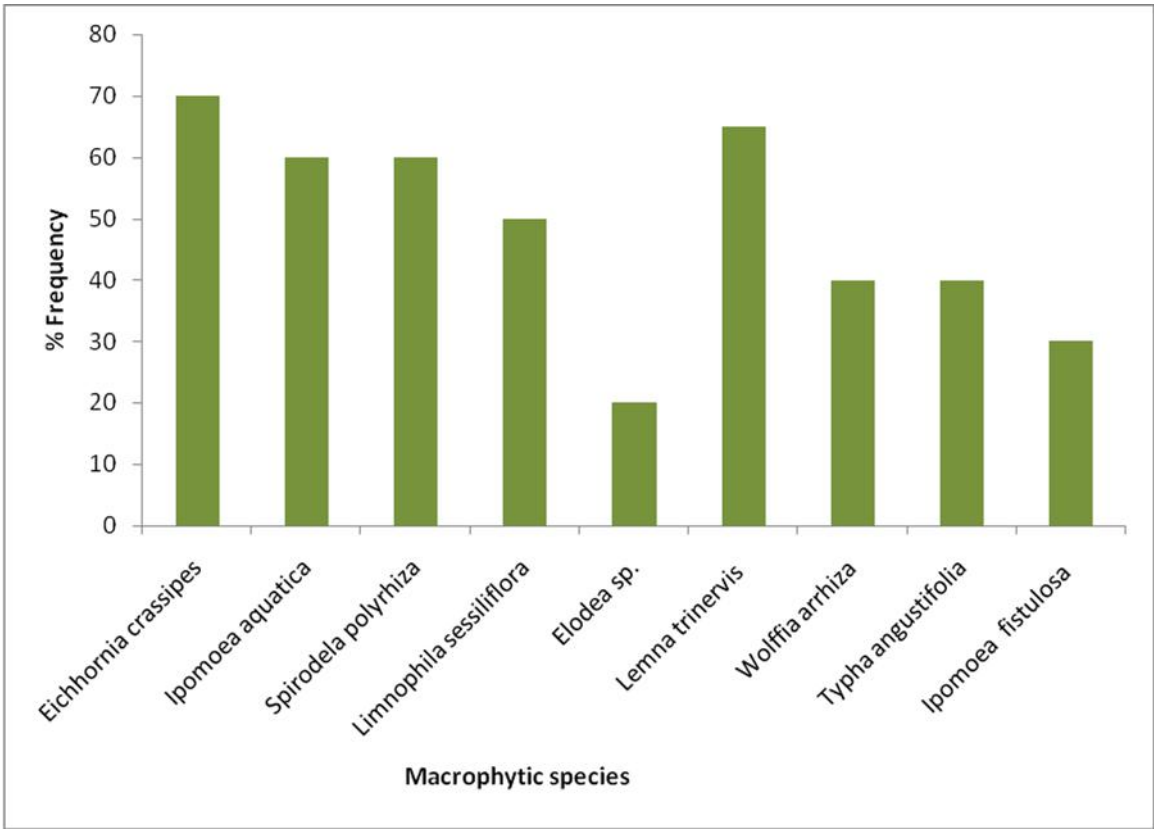

Figure 1. Macrophytic species with their % frequency in Govardhan sagar during July 2010 to June 2011.

Conclusion

Eichhornia crassipes, Ipomoea aquatica, Spirodela polyrhiza, Limnophila sessiliflora and Lemna sp. were reported as dominant macrophytic species in selected water body. These dominant species were able to grow rapidly to dense proportions.

Most of the area of water body is covered by these 5 dominant species. The minor species were reported as, *Elodea sp., Wolffia arrhiza, Typha angustifolia* and *Ipomoea fistulosa*. Thus rapid growth of macrophytes was observed in Govardhan Sagar water body. This dense growth of aquatic weeds in water body is a sign of pollution. Water quality has been affected due to dense growth of macrophytic vegetation.

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