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A study on Macrophytic diversity in Vishnu Sagar water body at Ujjain (M.P.) India

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Abstract

The present study deals with the investigation of macrophytic diversity of Vishnu Sagar water body at Ujjain (M.P.) India. Macrophytic diversity of Vishnu Sagar was studied 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. High diversity of macrophytes was observed during study period. Eleven macrophytic species *Spirodela polyrhiza, Lemna trinervis, Eichhornia crassipes, Ipomoea aquatica, Limnophila sessiliflora, Elodea sp., Nuphar lutea, Nymphaea rubra, Nelumbo nucifera, Trapa natans and Cyperus rotundus* were reported in this water body.

Keywords: Macrophytic diversity, Vishnu Sagar, Eichhornia crassipes, Nuphar lutea, Ipomea aquatica.

Introduction

Water supports life on earth and around which the entire fabric of life is woven. Ponds, as sources of water, are of fundamental importance to man. However, pond may have been natural water sources exploited by man at different time to meet different needs, or may have been created for a multitude of different purpose e.g. domestic or agricultural use, for transport, defense, ritual or industrial use, social aggrandizement, swimming, fish farming or the creation of the picturesque (Rees, 1997; Narayan *et al.*, 2007; Bishnoi and Malik, 2008).

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). In some developing countries they are contributing source of water for domestic use such as washing clothes, bathing and sometimes as a source of drinking water (Chia *et al*., 2009). 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. The climatic characteristic influences the water quality and quantity affects the biodiversity (Boyd and Tucker, 1998).

Many studies have correlated the distribution of different aquatic macrophytes with water chemistry in lakes (Spence, 1967; James *et al*., 2005). All living organisms have tolerable limits of water quality parameters in which they perform optimally. A sharp drop or an increase within these limits has adverse effects on their body functions (Davenport, 1993). Vishnu Sagar pond receives a large amount of sewage in rainy season. This pond has high biodiversity of macrophytes.

The aim of present study is the investigation of macrophytic diversity of Vishnu Sagar water body at Ujjian (M.P.) India.

Materials and Methods

Vishnu Sagar is known by sixth water body of Sapt Sagar at Ujjain (M.P.). It is situated on Ankpat road. Its depth is approximately 12- 15 feet. It is round shaped and expansion of pond is 1 km. It receives domestic effluents from residential buildings around the pond. The area of pond is 5 hac. The pond water is used for bathing, washing and other purposes also. Water surface of pond is covered by various macrophytes.

Figure.1- Photo showing dense growth of macrophytes and water quality of Vishnu 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

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

% F = Percentage frequency of macrophytic species.

Results and Discussion

Excessive growth of aquatic plants in a water body can cause further deterioration of water quality (Krenkel *et al*., 1979). In the present study eleven macrophytic species *Spirodela polyrhiza* (60 % F), *Lemna trinervis* (55% F), *Eichhornia crassipes*, (10 % F), *Ipomoea aquatica* (40 % F), *Limnophila sessiliflora* (45 % F) ,*Elodea sp.* (30 % F), *Nuphar lutea* (30 % F), *Nymphaea rubra* (25 % F), *Nelumbo nucifera* (20 % F), *Trapa natans* (10 % F), *Cyperus rotundus* (15 % F) were reported in the Vishnu sagar water body (Table -1).

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

S. No.	Name of Macrophytic species	% Frequency
1	*Eichhornia crassipes*	10
2	*Ipomoea aquatica*	40
3	*Spirodela polyrhiza*	60
4	*Limnophila sessiliflora*	45
5	*Elodea sp.*	30
6	*Lemna trinervis*	55
7	*Nuphar lutea*	30
8	*Nymphaea rubra*	25
9	*Nelumbo nucifera*	20
10	*Trapa natans*	10
11	*Cyperus rotundus*	15

% Frequency of a Macrophytic species is given as average value of % Frequencies of 12 months.

Identified Dominant Macrophytic Species

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).

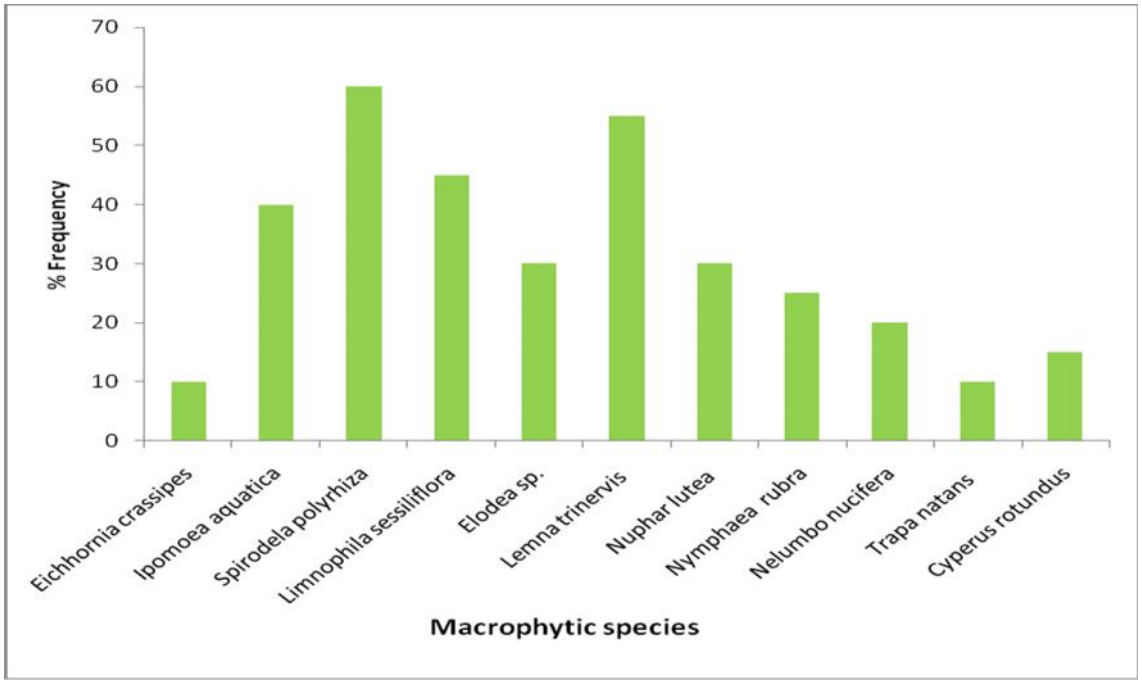

Figure 2. Macrophytic species with their % frequency in Vishnu Sagar during July 2010 to June 2011.

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, funnelform 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).

Conclusion

Ipomoea aquatic, 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 4 dominant species. The minor species were reported as *Eichhornia crassipes, Elodea sp., Nuphar lutea, Nymphaea rubra, Nelumbo nucifera, Trapa natans* and *Cyperus rotundus*. Thus rapid growth of macrophytes was observed in Vishnu 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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