Chemical Analysis of Plant Nutrients in Macrophytes of Surhatal Lake at Ballia

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Abstract

Surhatal is situated in the rural environs of north India. The lake is utilized for lifting canal water, aquaculture fishing and extensive cultivation of floating vice. Three different sites i.e., Maritar, Katholi and Tila were selected for sampling of aquatic macrophytes. The study of chemical analysis with reference to plant nutrients. The result depicts that maximum and minimum percentage values of nitrogen, phosphorus and potassium vary at different sites. Lake occupies an area of about 3600 hectares. The area of the lake is continuously decreasing due to heavy siltation load by decomposition of aquatic weeds (about 70 sp.). Only ***Eichhornia crassipes*** occupies about 1/3 of lake area. The highest percentage contribution of nitrogen and potassium at Katholi.

KEYWORDS : Biotic features, Lake utilization, Macronutrients, Macrophytes, Aquaculture, Biomass, Eutrophication

INTRODUCTION-

Location

Surhatal is an ox-bow lake located 8km north of Ballia city (25. 5` lat, 84. 8`E long) and about 150 km east of Varanasi. The lake is somewhat semicircular in shape and its water covered area is about 3500 ha during rainy season. During winter and summer seasons the water covered area is about 2500 and 1200 ha respectively. The lake is connected with river Ganga by a narrow zig-zag stream called Katihar nala. The lake is surrounded from all sides by small villages and cultivated cropland.

Biotic features

The cultivation of rice is carried out right into the lake upto several hundred meters from the shorelines by a traditional variety of floating rice (often 3 metres or more in length). Wild rice also grows in small patches. The seeds of this called Tinni is harvested by local people and marketed as it is eaten on religious occasions. Large flocks of migratory birds visit the lake during November and March. The native bird population is also very rich, as they get sufficient food (fishes, macrophytes, crustaceans, insects and cultivated wild rice)

Lake Utilization

The lake is utilized for its water and biotic resources extensively, mostly by traditional methods. Water is lifted and supplied through a network of canals to agricultural fields located around upto 50 sq km. The local inhabitants derive their drinking and domestic water needs from the lake. They use small fish nets or hooks for their day to day fish needs. Molluscs are also collected and eaten. Fishermen harvest rice crop of highly priced varieties of fishes like Rohu(*Labeo rohita*), Katla (*Catala catala*) and Mangur (*Clarias batrachus*) etc.

Problem areas

The problems of Surhatal lake are becoming serious during the recent decades because of the lack of the scientific management programme on the one hand and over exploitation of both the biotic and abiotic resources by the growing human population. Ballia is one of the most densly populated districts in the region.

The most serious problem of Surhatal lake is its possible shallowing due to deposition of silt and debris in increasing quantities year after year.

We can briefly examine the ecology of the lake in respect of the macrophytes biomass production with a note on possible nutrients from the surrounding uplands and removal of organic products from the lake. The lake appears at a fairly high degree of natural eutrophication.

Macrophytes are important in lake productivity, nutrient cycling and as a habitat for both invertebrates vertebrates (Farmer, 1990). Macrophytes are the dominant flora of shallow water bodies. Their presence in the water body makes them integral part of the bio-geochemical cycle of the ecosystem. Mineral balance and mineral cycling in an ecosystem is of great consequence for its functioning and vitality of its inhabitants(Schaitzle,1990). Nutrients are needed for the growth and survival of plants.

Ecological pattern and comparative nutrients dynamics of natural and agricultural Mediterranean type ecosystems is studied by Arhonditris *et. al.* (2000).

In India some important nutrient studies of macrophytes have been made by Kaul *et. al.* (1980). Relationship of nutrients in water with biomass and nutrient accumulation of submerged macrophytes of a tropical wetland is studied by Shardendu and Ambasht(1991). In India some important nutrient studies of macrophytes have been made by Kaul *et. al.* (1980). Billore *et. al.* (1982,1983) Srivastava(1990), Shardendu and Ambasht(1991) and Mishra(1993).

Nitrogen distribution in the lakes and lacustrime of China has been worked out by Sum and Zhang (2000). Nitrogen removal in constructed wetlands employed to treat domestic waste water is studied by Huang *et al.* (2000).

Phosphorus dynamics in shallow subsurface water in an uncut and cut subcatchment of a lake of the Boreal plain was studied by Evans(2000). Quantitative phosphate analysis of

the main submerged communities in Honghu Lake IV. ***Ceratophyllum demersum, Potamogeton crispus, Myriophyllum spicatim*** community is done by Li Wei and Chang Yu(2000).

MATERIALS AND METHODS

The sampled materials were transported to the laboratory for the analysis of plant nutrients. The work was conducted during January 95-March 96 with free sampling of aquatic weeds at three different sited viz., Maritar, Katholi and Tila and at each site samples of macrophytes were collected with reference to chemical analysis and analysed by using methods as described by Jackson(1958).

RESULTS AND DISCUSSION

Table I

Percentage contribution of nutrients in macrophytes at different study sites

Site	Name of the sp.	NUTRIENTS		
		Nitrogen(%)	Phoshphorus(%)	Potassium(%)
KATHOLI	*Najas graminea*	2.42	0.33	3.66
	Potamogeton crispus	2.60	0.35	2.94
	Hydrilla verticillata	3.58	0.44	3.59
MARITAR	*Najas graminea*	2.95	0.19	3.55
	Potamogeton crispus	1.50	0.22	3.47
	Eleocharis palustris	2.12	0.26	3.43

	Najas graminea	**2.62**	**0.39**	**3.59**
	Potamogeton crispus	**1.88**	**0.31**	**3.35**
TILA	***Hydrilla verticillata***	**3.25**	**_**	**_**
	Ceratophyllum demersum	**_**	**0.31**	**3.26**

The results depict that percentage of nitrogen ranged from (1.50 to 3.58) in different species at intensive study sites. The results of macrophytes analysis the maximum value percentage of nitrogen was recorded (2.95) in ***Najas graminea*** at Maritar site and minimum (2.42) recorded at Katholi sites. The maximum value percentage of nitrogen (2.60) in ***Potamogeton crispus*** at Katholi site and minimum(1.50) at Maritar site. The maximum value percentage of nitrogen was recorded (3.50) in ***Hydrilla verticillata*** at Katholi site and minimum (3.25) at Tila site.

Phosphorus content of the macrophytes ranged from (0.19)to(0.44) in different species at intensive study sites. The maximum value of phosphorus was recorded(0.39) in ***Najas graminea*** at Tila site and minimum (0.19) at Maritar site. In ***Potamogeton crispus*** the maximum percentage of phosphorus (0.35) at Katholi site and minimum (0.22) at Maritar site.

Potassium concentration ranged from (2.94) in ***Potamogeton crispus (3.59)*** in ***Hydrilla verticillata*** and ***Najas graminea*** at Katholi and Tila site. The maximum concentration of potassium content in ***Potamogeton crispus (2.94)*** at Katholi site.

The percentage concentration of nutrients in macrophytes at different study sites showing Table I.

CONCLUSION

Surhatal a major ox-bow lake (wetland) in the Ballia district is polluted mainly by anthropogenic activities like agricultural operations, fertilizers and pesticides. It occupies an area of about 3600 hectares and provides cattle feed, fish and a unique quality of rice known as Surha rice which grows even upto 3 metres height depending upon water depth of the lake.

The area of lake is continuosly decreasing due to heavy siltation load by agricultural runoff and decomposition of aquatic weeds(about 70 sp). A nuisance aquatic weed ***Eichhornia crassipes*** occupies about 1/3 rd of lake area during winter season which reduces the productivity of other submerged species. The death and decomposition of this weed induces the eutrophication of water and reduces the mortality rate of the fishes.

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