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RESEARCH ARTICLE

Distribution pattern of Algal species in Shahpura Lake, Bhopal, with respect to physico-chemical parameters.

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ABSTRACT

Shahpura Lake is situated in the posh area of Bhopal city. It is a man –made perennial lake, constructed during 1974-75.Lake water is extensively used for recreational and fishing activity. Lake is surrounded by human habitation and receives untreated domestic sewage from various points. A regular monitoring in physico-chemical parameters and distributional pattern of algal species was conducted during rainy and winter season(2016).The study reveals physico-chemicals parameters and their relation to the growth and distribution of algal population .About 29 algal species was recorded, out of which 12 algal species was found to be dominant during study period.

Keywords- Sewage, Physico-chemical parameters, distributional pattern, algal species.

INTRODUCTION

Water is the most vital source for all kinds of life on the earth. Water is an essential component of the environment and it sustains life on the earth. Unfortunately our natural aquatic environment is getting polluted due to anthropogenic activities and it affects aquatic life. Algal flora constitutes a very important part in an aquatic ecosystem and plays a vital role in maintaining the atmospheric level of vital gases of life. Algae are responsive to changes in their environment and therefore many algal species are used as indicator of water quality Reynolds (1997) Reynolds *et al*., (2002) Brettum & Andersen (2005) Medupin (2011).They also play a major role in oxygen enrichment of water, binding and removal of toxic substances Agrawal and Patil, (2014). The algal distribution pattern varies seasonally and their productivity depends on water quality at a given time Meshram and Dhande (2000).Therefore, a regular monitoring of water quality and the algal species provide a scientific way to deal with manmade water bodies. Present work deals with the diversity of algal species in Shahpura Lake. It is an attempt to identify the dominant algal flora along with physicochemical parameters of the water body.

MATERIAL AND METHODS

Study Area

Among the Bhopal Lakes, Shahpura Lake is one of the important lakes, which is known as the third lake of Bhopal. The latitude of the lake is $23^{o}12$ N and longitude of the lake is $77^{o}25$E. Its catchment area is 8.29 km^2 and has a submergence area of 0.96 km^2. The lake is a shallow aquatic ecosystem with mean depth of 1.2 m. On the east side of the lake RCVP Academy of administration building is situated while on the west side Chunabhatti Township is located. The lake receives untreated sewage mainly from the northern side near Ekant Park.

Sampling and analysis of samples

Water sample was collected during rainy and winter season (2016). The samples were collected every month from five different sampling sites of the lake. Samples were collected from depth of 10-30centimeter in sterile bottles. At each sampling site, temperature and pH were measured and transparency of water was measured by immersing secchi disc. The Physico-chemical analysis was carried out according to the methods suggested by Trivedi and Goel (1986) and standard methods of APHA (2012). Experiment was performed in three replicates. Algal samples were preserved in 4% formalin for further study. Glycerin was used for mounting the material and studies were under advanced research microscope.

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The algal genera were identified referring various literature cited.

RESULT AND DISCUSSION

The physico-chemical parameters of Shahpura Lake during study period is given in table 1.

In the present study the range of water temperature was reported between18.5^{o} to 25.4^{o}C which is appropriate for the growth of algae the result is aligned with the finding of Shivhare *et al*., (2014).The transparency of the water body was measured by Secchi disc.The maximum Secchi value was recorded in winter season (month of November and December 2016) and the highest numbers of algal species were also reported in the same month. The pH of water body ranged from 7.55 to 8.37, indicates that slightly alkaline pH is suitable for the algal growth. Conductivity is the best indicator of water pollution as it is the indirect measure of presence of total dissolved solids or nutrients. The maximum conductivity value and total dissolved solids were recorded (689.4 µmho/cm and493.2mg/L) in month of September and minimum algal species were observed, indicates that aquatic conditions were not favorable for algal growth.The highest dissolved oxygen was reported in winter season (month of November and December 2016), these values are due to higher photosynthesis activity of the algal species and low atmospheric temperature. Similar observations were reported by Hazalwood and Parker (1961). The concentration of chloride was found to be between 39.18-50.18 mg/L. Presence of chloride indicates water pollution due to presence of organic and inorganic content of domestic and agricultural wastes as earlier stated by Munawar (1970). The maximum hardness was found to be 293.6 mg/L in month of September (2016) and minimum 219.6 mg/L in August (2016). Calcium is micronutrient and its concentration was reported between 62.7mg/L to 93.87mg/L, indicating that water is rich in calcium. In the present work maximum magnesium was reported 18.73mg/L in month of November(2016) and minimum 12.43mg/L in month of July(2016) and it was reported by Pandey *et al*., (2012) that magnesium is an essential for chlorophyll bearing organisms. Decreased value of magnesium confirms algal growth. Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) of water were found to be higher in the month of July (2016) indicates the presence of higher organic matter which is due to presence of sewage. The maximum value of nitrate and phosphate was found to be maximum in month of December (2016).Phosphorus along with nitrogen supports the growth of algal species Diwedi and Pandey (2002).

Detailed microscopic examination revealed 29 genera of algal species in Shahpura lake is listed in table 2.

Table: 1 Showing Physico-chemical parameters of water sample of Shahpura Lake.

S.NO	Months → Parameter↓	Unit	Rainy Season			Winter Season		
			July	August	September	October	November	December
1	Temperature	^{o}C	25.4	22.2	24.6	24.2	20.3	18.5
2	Transparency	Centimeter	10.5	15.0	21.5	18.5	22.2	22.0
3	pH	pH unit	7.55	8.13	8.27	8.2	8.37	8.14
4	Conductivity	µmho/cm	556	550.2	689.4	588	539.4	556.4
5	Dissolved Oxygen	mg/l	5.5	7.4	6.4	7.6	11.7	10.4
6	Chloride	mg/l	39.18	40.58	51.3	48.98	46.58	50.18
7	Total Hardness	mg/l	220	219.6	293.6	288	234	238
8	Calcium	mg/l	67.55	63.59	93.87	90.46	62.79	68.4
9	Magnesium	mg/l	12.43	14.76	14.37	15.05	18.73	16.02
10	Total Dissolved Solids	mg/l	378	273.2	493.2	380	379	384.4
11	Chemical Oxygen Demand	mg/l	88	63.59	74	60	42	54
12	Biological Oxygen Demand	mg/l	18.4	10.4	17.1	8.8	6.2	7.4
13	Sodium	mg/l	23.7	32.5	37.6	29.8	17.8	34
14	Nitrate	mg/l	12.48	3.31	3.1	3.24	11.85	12.6
15	Phosphate	mg/l	0.56	2.39	2.66	3.7	2.98	3.8
16	Sulphate	mg/l	116.4	32.9	46.59	56.7	46.26	36.74

(Note - Average of five marked station of Shahpura lake water samples mean value is presented.)

Table 2: Algal species reported from Shahpura Lake during study periods (July- December 2016)

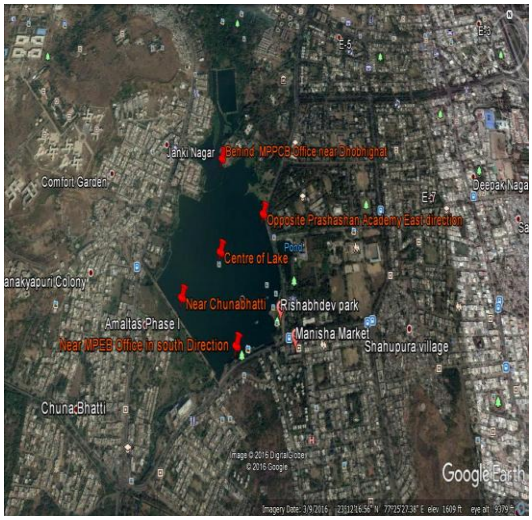
S.No	Name of Algal species	Class	Rainy season			Winter season			Status
			July	August	September	October	November	December	
1	*Closteriumdianae*	**Chlorophyta**	+	+	+	+	-	-	
2	*Scenedesmusquadricauda*	**Chlorophyta**	+	+	-	+	+	+	D
3	*Scenedesmusarmatus*	**Chlorophyta**	+	+	-	+	+	+	D
4	*Volvoxsps*	**Chlorophyta**	-	-	-	+	+	+	
5	*Staurastrumsps*	**Chlorophyta**	+	-	+	+	+	+	
6	*Oscillatoriatenuis*	Cynophyta	+	+	+	+	+	+	D
7	*Oscillatoriaamoena*	Cynophyta	-	-	-	+	+	+	
8	*Microcystisaeruginosa*	Cynophyta	+	+	+	+	+	+	D
9	*Nostocmicroscopicum*	Cynophyta	+	+	+	+	-	-	
10	*Chlorella Vulgaris*	**Chlorophyta**	+	+	-	-	+	+	D
11	*Merismopaediaelegans*	Cynophyta	-	-	-	-	+	+	
12	*Anthrospirajenneri*	Cynophyta	+	+	+	+	+	+	D
13	*Chlorococcussps*	**Chlorophyta**	+	+	+	+	+	+	D
14	*Acntinastrumhantzii*	**Chlorophyta**	+	-	-	+	+	+	
15	*Ankistrodesmusfalcatus*	**Chlorophyta**	-	-	-	-	+	+	
16	*Pediastrumobtusum*	**Chlorophyta**	+	+	+	+	+	+	
17	*Scenedesmusobliques*	**Chlorophyta**	+	+	+	+	+	+	
18	*Spirogyra subsalsa*	**Chlorophyta**	+	+	+	-	+	+	
19	*Ulothrixcylindrcum*	**Chlorophyta**	+	+	-	+	+	+	D
20	*Chlamydomonassps*	**Chlorophyta**	+	+	-	+	+	-	D
21	*Tetraedronregulare*	Bacillariophyta	-	+	-	-	+	+	D
22	*Diatomasps*	Bacillariophyta	-	-	-	+	+	+	
23	*Synedraacus*	Bacillariophyta	-	-	-	+	+	+	
24	*Naviculasps*	Bacillariophyta	-	-	-	+	+	+	
25	*Cyclotellasps*	Bacillariophyta	+	-	-	-	+	+	
26	*Spirullinaprinceps*	Cynophyta	+	+	+	+	+	+	D
27	*Euglinaehrenbergii*	Euglenophyta	-	-	-	-	+	+	
28	*Phacuslongicauda*	Euglenophyta	-	-	-	+	+	+	
29	*Pediastrum tetras*	**Chlorophyta**	-	-	-	+	+	+	D
	Total		**18**	**16**	**11**	**22**	**27**	**26**	**12**

(+ Present, D- Dominant, - absent /rare occurrence)

Out of 29genera, 15 belong to Class Chlorophyta, 7 species to Class Cyanophyta, 5 to Class Bacillariophytaand 2 to Class Euglenophyta. Algal species distribution is represented as in the order of Chlorophyta>Cynophyta>Bacillariophyta>Eugle -nophyta. On the basis of above observation members Chlorophyceae were found to be dominant. The occurrence of species at Shahpura Lake depends on its environmental tolerance and present study provides data of algal species occurrence pattern and its water quality.

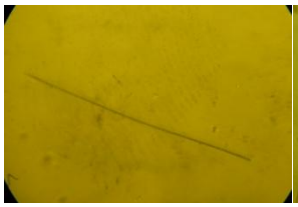
CONCLUSION

The overall variety in population of algal was found to be low during the rainy seasons (July and August 2016) which are due to lower light intensity, low transparency, low nutrient concentration and high wind velocity or wavy action of currents. A steady increase of algal species was observed during winter season confirms the presence of nitrates and phosphates. Hence, the present study reveals the important of physicochemical parameters and their effect on algal diversity in Shahpura lake of Bhopal city.

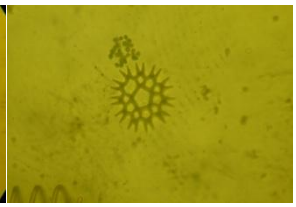


Sampling Sites of Sapura Lake, Bhopal

Shahpura Lake



***Oscilatoria* sps.**



Pediastrum duplex

***Spirulina* sps.**

Scendesmus quadricauda

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