



RESEARCH ARTICLE.....

Seasonal variation of phytoplankton diversity, density and palmer's pollution index of freshwater lake, rural area of Ahmedabad

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ABSTRACT..... The present study was carried out on Manipur lake of Manipur village. The plankton were collected, counted and were identified by using the method suggested by APHA (1985); Prescott (1970) and Edmondson (1959). The planktons were counted by using Sedgwick Rafter counting cell. Different class such as cyanophyceae, chlorophyceae, bacillariophyceae and euglenophyceae. Among all these classes the listed phytoplankton such as *Anabaena* sp., *Merismopedia* sp., *Ankistrodesmus* sp., *Actinastrum* sp., *Closteriopsis* sp., *Closterium* sp., *Coelastrum* sp., *Crucigenia* sp., *Gonium* sp., *Pediastrum* sp., *Scenedesmus* sp., *Tetraedron* sp., *Amphiplura* sp., *Cyclotella* sp., *Cymbella* sp., *Navicula* sp., *Nitzschia* sp., *Synedra* sp., *Euglena* sp. and *Phacus* sp. were recorded in Manipur lake. The study was carried out monthly but was tabulated seasonally by using statistical method. From the listed data the quality of water was concluded. Palmer stated that composite rating of algae, tolerating organic pollution and developed an index to establish the status of the aquatic body. In this method to determine the level of organic pollution by studying the algae present in a sample of water.

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INTRODUCTION.....

Manipur lake is located at the western side of the village. Current population of Manipur village is 3000. It is natural water body. Rain water enters from the surroundings into the lake. One portion of the lake is covered by local people who are engaged in washing clothes and discharge soap water into the lake. Manipur Lake covers an area of 71832 m², peripheral area of the

lake is 949 m. and depth is 19 feet. Its latitude and longitude are 23° 02' 07.13" N and 72° 0' 25' 26.37" E, respectively and 146 feet above sea level.

Phytoplankton such as *Anabaena* sp., *Merismopedia* sp., *Ankistrodesmus* sp., *Actinastrum* sp., *Closteriopsis* sp., *Closterium* sp., *Coelastrum* sp., *Crucigenia* sp., *Gonium* sp., *Pediastrum* sp., *Scenedesmus* sp., *Tetraedron* sp., *Amphiplura* sp.,

Cyclotella sp., *Cymbella* sp., *Navicula* sp., *Nitzschia* sp., *Synedra* sp., *Euglena* sp. and *Phacus* sp. were found in Manipur lake. Over all Palmer's pollution index 17 showed that probable organic pollution in Manipur lake.

RESEARCH METHODS.....

The standard method suggested in APHA (1995); Prescott (1970) and Edmondson (1959) is used for assessing water quality includes collection, counting and identification of phytoplankton and zooplankton. Plankton net number 25 of mesh size 20 µm was used for collecting samples. 50 litres of water was measured in a graduated bucket and filtered through the net and concentrated in a 100 ml bottle. Samples were collected as close to the water surface as possible in the morning hours. The samples were labeled with the date, time and study area *i.e.* name of lake and the volume measured and pasted on the containers. Plankton is preserved by using 4 per cent formalin. The sample was allowed to settle for 24-48 hours and was further concentrated to approximately 30 ml by decanting. Sedgwick Rafter counting cell is used to count the plankton. Sedgwick Rafter cell is approximately 50 mm long, 20 mm wide and 1 mm deep. The total volume of the cell is 1 ml. A trinocular compound microscope with microphotography attachment is used to count the plankton with different eyepieces such as 10 x and 40 x. The microscope is calibrated using an ocular micrometer. Formula to convert unit/ml of plankton into unit/liter is :

$$n = \frac{(a \times 1000)c}{l}$$

where,

n = Number of plankton / litre of water.

a = Average number of plankton in one small counting chamber of S-R cell.

c = ml of plankton concentrate.

l = Volume of original water filtered in litre.

In Palmer's pollution index method to determine the level of organic pollution by studying the algae present in a sample of water. If there are 5 or more cells of a particular kind of algae on a slide, the alga must be identified and recorded. The index numbers of the algae are then added. Any algae that are not listed have a pollution factor of zero. A pollution index factor of 1 to 5 has been assigned to each of the 20 types of algae that are most tolerant to organic pollution. Types of algae most tolerant of organic pollution were assigned a factor

of 5. Less tolerant types were assigned a lower number. If the pollution index score is 20 or more, the score is evidence of high organic pollution. A score of 15-19 indicates probable organic pollution. Lower scores usually indicate less organic pollution, but they may also occur if something is interfering with algae growth (Table A).

Table A : Palmer pollution index score	
Pollution index score	pollution status
20 or more	High organic pollution
15 - 19	Probable organic pollution
Less than 15	Less organic pollution

RESEARCH FINDINGS AND ANALYSIS.....

Plankton has long been used as indicator of water quality. Because of their short life spans, plankton responds quickly to environmental changes. They flourish both in highly eutrophic waters while a few others are very sensitive to organic and/or chemical wastes. Phytoplankton growth is dependent on sunlight and nutrient concentrations Edmondson (1959).

In the present study 2 different genera of cyanophyceae class were recorded from the lake. The blue green algae recorded in Manipur lake are *Anabaena* sp., *Merismopedia* sp., the minimum algal units were recorded during winter season where as maximum was recorded during summer season and *Merismopedia* sp. was dominant in Manipur lake.

In Manipur lake 10 different genera of chlorophyceae class were recorded. In Manipur lake the algae recorded are *Ankistrodesmus* sp., *Actinastrum* sp., *Closteriopsis* sp., *Closterium* sp., *Coelastrum* sp., *Crucigenia* sp., *Gonium* sp., *Pediastrum* sp., *Scenedesmus* sp., *Tetraedron* sp., the minimum value was recorded during winter season whereas maximum was recorded during monsoon season and *Ankistrodesmus* sp. and *Scenedesmus* sp. were dominant in Manipur lake.

From the Manipur lake 6 different genera of bacillariophyceae were recorded. The minimum units of diatoms were recorded during monsoon season whereas maximum unit of diatoms were recorded during summer season and *Navicula* sp. was dominant in Manipur lake. Khapekar and Deshpande (2007) also studied on Phytoplankton composition and assessment of pollution status in fresh water body.

In the lake 2 genera of Euglenoids were recorded.

The euglenoid recorded in the lake are *Euglena* sp. and *Phacus* sp. In the Manipur lake minimum units of euglenoids were recorded during monsoon season and maximum unit of euglenoids were recorded during summer season. *Euglena* sp. was dominant in Manipur lake. Seasonal variation and density of phytoplankton and season wise phytoplankton count was mention (Fig. 1 and Table 1).

During investigation season wise and over all Palmer pollution index was calculated for Manipur lake similar study by Jafari and Gunale (2006). During study period it is found that out of 20 Genus, five pollution

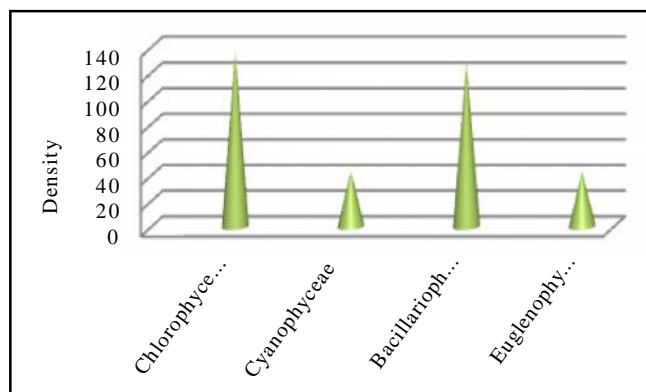


Fig. 1 : Phytoplankton density

Table 1 : Seasonal variation of phytoplankton in Manipur lake

Class	Phytoplankton composition Genera	Sampling season		
		Summer mean	Monsoon mean	Winter mean
Chlorophyceae				
	<i>Ankistrodesmus</i> sp.	16	12	14
	<i>Actinastrum</i> sp.	0	0	2
	<i>Closteriopsis</i> sp.	6	8	2
	<i>Closterium</i> sp.	2	4	2
	<i>Coelastrum</i> sp.	2	4	2
	<i>Crucigenia</i> sp.	2	4	0
	<i>Gonium</i> sp.	4	1	2
	<i>Pediastrum</i> sp.	0	2	4
	<i>Scenedesmus</i> sp.	10	12	6
	<i>Tetraedron</i> sp.	8	8	0
Total		50	55	34
Cyanophyceae				
	<i>Anabaena</i> sp.	2	1	2
	<i>Merismopedia</i> sp.	21	10	8
Total		23	11	10
Bacillariophyceae				
	<i>Amphiplrura</i> sp.	0	2	2
	<i>Cyclotella</i> sp.	2	0	2
	<i>Cymbella</i> sp.	4	0	2
	<i>Navicula</i> sp.	33	16	23
	<i>Nitzschia</i> sp.	12	11	18
	<i>Synedra</i> sp.	3	2	2
Total		54	31	49
Euglenophyceae				
	<i>Euglena</i> sp.	15	5	18
	<i>Phacus</i> sp.	3	2	0
Total		18	7	18
Total phytoplankton count / ml		145	104	111
Total phytoplankton count / l		87000	62400	66600

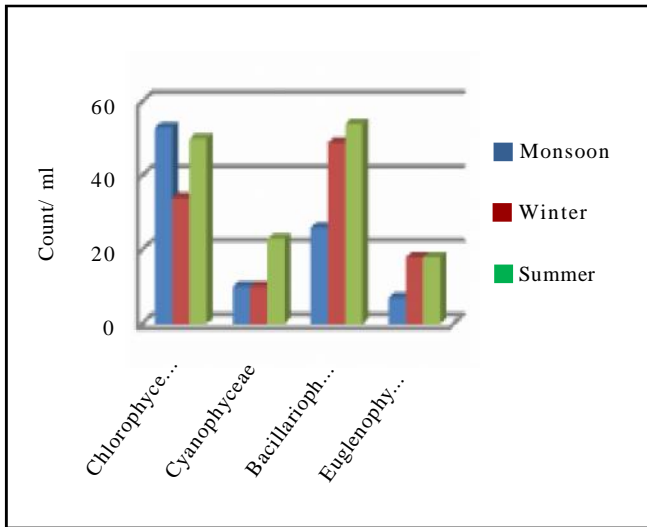


Fig. 2 : Phytoplankton count/ml

indicators Genus were found as per Palmer’s pollution index (Table 2).

Conclusion :

Therefore from the above study it is concluded that the total phytoplankton count/ml is more in summer season and chlorophyceae is dominant. The total phytoplankton count/ml is minimum in monsoon season (104/ml) and maximum in summer season (145/ml). Cyanophyceae algae are considered as ecological indicator, generally these are found in polluted water. From the above result it is concluded that the amounts of cyanophyceae algae were found in Manipur lake hence, water body may be polluted (Table 1).

During investigation period summer season pollution

Table 2 : Palmer algal genus pollution index for Manipur lake

Algal genus	Pollution index	Summer	Winter	Monsoon
<i>Anacystis</i>	1	-	-	-
<i>Ankistrodesmus</i>	2	2	2	2
<i>Chlomydomonas</i>	4	-	-	-
<i>Chlorella</i>	3	-	-	-
<i>Clostridium</i>	1	-	-	-
<i>Cyclotella</i>	1	-	-	-
<i>Euglena</i>	5	5	5	5
<i>Gomphonema</i>	1	-	-	-
<i>Lepocinclis</i>	1	-	-	-
<i>Micractinium</i>	1	-	-	-
<i>Navicula</i>	3	3	3	3
<i>Nitzschia</i>	3	3	3	3
<i>Oscillatoria</i>	5	-	-	-
<i>Pandorina</i>	1	-	-	-
<i>Phacus</i>	2	-	-	-
<i>Phormidium</i>	1	-	-	-
<i>Scenedesmus</i>	4	4	4	4
<i>Stigeoclonium</i>	2	-	-	-
<i>Synedra</i>	2	-	-	-
Palmer algal genus pollution index value of Manipur lake		17	17	17
Over all Palmer algal genus pollution index value of Manipur lake			17	

index 17, winter season and summer season pollution index was 17 and over all pollution index 17 showed that probable organic pollution in Manipur lake (Table 1 and 2). Palmer (1969) suggested that algae are reliable indicators of water pollution as it was true in present study.

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