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Assessment of Lake Water Quality by Using Palmer's Pollution Genus Index in Manipur Lake, District Ahmedabad

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Abstract: ***The present study was carried out on Manipur lake of Ahmadabad. The phytoplankton were collected, counted and were identified by using the method suggested by APHA (1995) Prescott (1970) and Fresh water biology (W. T. Edmondson-1959). The phytoplanktons were counted by using Sedgwick Rafter counting cell. Different class such as cyanophyceae, chlorophyceae, bacillariophyceae and euglenophyceae were identified during the study. Among all these classes the listed phytoplankton such as Ankistrodesmus sp. and Scenedesmus sp. from chlorophyceae, merismopedia sp. from cyanophyceae, navicula sp. and nitzschia sp., euglena sp. from euglenophyceae recorded more in number during investigation period in Manipur lake. Chlorophyceae as a dominant genera 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.***

Keywords: Manipur Lake, Phytoplankton and Palmer's genus pollution index.

I. INTRODUCTION

Manipur lake is located at the western side of the village. 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 m^2, peripheral area of the lake is 949 m. and depth is 19 feet. Its Latitude and Longitude are 23^0 02' 07.13" N and 72 ^{0} 25' 26.37" E respectively, and 146 feet above sea level.

II. MATERIALS AND METHODS

The standard method suggested in APHA used for assessing water quality includes collection, counting and identification of phytoplankton. Plankton net number 25 of mesh size 20 µm was used for collecting samples. 50 liters 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. Plankton is preserved by using 4% 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. The total volume of the cell is 1 ml. A binocular compound microscope is used to count the plankton with different eyepieces such as 10X and 40X. Formula to convert unit/ml of plankton into unit/liter is

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

Where,
n = Number of plankton / liter of water.
a = Average no. of plankton in one small counting chamber of S-R cell.
c = ml of plankton concentrate.
l = Volume of original water filtered in liter.

Palmer reviewed a 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. 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 through 5 has

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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 1 and 2).

Table 1. Algal genus pollution index (Palmer 1969)

Algal genus	Pollution index	Algal genus	Pollution index
Anacystis	1	Micractinium	1
Ankistrodesmus	2	Navicula	3
Chlomydomonas	4	Nitzschia	3
Chlorella	3	Oscillatoria	5
Clostrium	1	Pandorina	1
Cyclotella	1	Phacus	2
Euglena	5	Phormidium	1
Gomphonema	1	Scenedesmus	4
Lepocinclis	1	Stigeoclonium	2
Melosira	1	Synedra	2

Table 2. 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

III. RESULT AND DISCUSSION

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

In Manipur Lake 10 different genera of chlorophyceae class were recorded, the recorded algae are *Ankistrodesmus Sp., Actinastrum sp., Closteriopsis sp., Closterium sp., Coelastrum sp., Crucigenia sp., Gonium sp., Pediastrum sp., Scenedesmus sp., Tetraedron sp.*

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.

From the Manipur lake 6 different genera of bacillariophycea were recorded. In Ghuma Lake the diatom for bacillariophycea class recorded are *Amphiplrura sp., Cyclotella sp., Cymbella Sp., Navicula sp., Nitzschia sp., Synedra sp.*

In the Lake 2 genera of Euglenoids were recorded. The euglenoid recorded in the lake are *Euglena sp.* and *Phacus sp.*(Table-I). *Among all these classes the listed phytoplankton such as Ankistrodesmus sp. and Scenedesmus sp. from chlorophyceae, merismopedia sp. from cyanophyceae, navicula sp. and nitzschia sp., euglena sp. from euglenophyceae recorded more in number* during *investigation period in Manipur lake. Chlorophyceae as a dominant genera in Manipur lake.*

Season wise and over all pollution index showed that probable organic pollution in Manipur lake (Table 4). Palmer, (1969) suggested that algae are reliable indicators of water pollution as it was true in present study. These pollution tolerant algae can be used for remediation of domestic wastewater. During investing period *Ankistrodesmus sp., Scenedesmus sp., Navicula sp., Nitzschia sp.,and Euglena sp.*recorded which are pollution indicator genus, Palmer (1969).

Table 3. seasonal variation of phytoplankton in Manipur lake

PHYTOPLANKTON COMPOSITION		SAMPLING SEASON		
CLASS	GENERA	SUMMER MEAN	MONSOON MEAN	WINTER MEAN
CHLOROPHYCEAE				

	Ankistrodesmus sp.	16	12	14
	Actinastrum sp.	0	0	2
	Closteriopsis sp.	6	8	2
	Closterium sp.	2	4	2
	Coelastrum sp.	2	4	2
	Crucigenia sp.	2	4	0
	Gonium sp.	4	1	2
	Pediastrum sp.	0	2	4
	Scenedesmus sp.	10	12	6
	Tetraedron sp.	8	8	0
TOTAL		**50**	**55**	**34**
CYANOPHYCEAE				
	Anabaena sp.	2	1	2
	Merismopedia sp.	21	10	8
TOTAL		**23**	**11**	**10**
BACILLARIOPHYCEAE				
	Amphiplrura sp.	0	2	2
	Cyclotella sp.	2	0	2
	Cymbella sp.	4	0	2
	Navicula sp.	33	16	23
	Nitzschia sp.	12	11	18
	Synedra sp.	3	2	2
TOTAL		**54**	**31**	**49**
EUGLENOPHYCEAE				
	Euglena sp.	15	5	18
	Phacus sp.	3	2	0
TOTAL		**18**	**7**	**18**
TOTAL PHYTOPLANKTON COUNT / ML		**145**	**104**	**111**
TOTAL PHYTOPLANKTON COUNT / L		87000	62400	66600

Table 4. Palmer algal genus pollution index for Manipur lake

Algal genus	Pollution index	Monsoon	Winter	Summer
Anacystis	1	-	-	-
Ankistrodesmus	2	2	2	2
Chlomydomonas	4	-	-	-
Chlorella	3	-	-	-
Clostrium	1	-	-	-
Cyclotella	1	-	-	-
Euglena	5	5	5	5
Gomphonema	1	-	-	-
Lepocinclis	1	-	-	-
Micractinium	1	-	-	-
Navicula	3	3	3	3
Nitzschia	3	3	3	3
Oscillatoria	5	-	-	-
Pandorina	1	-	-	-

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Phacus	2	-	-	-
Phormidium	1	-	-	-
Scenedesmus	4	4	4	4
Stigeoclonium	2	-	-	-
Synedra	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		

IV. CONCLUSION

The total phytoplankton count/ml. is more in summer season and basillariophyceae is dominant. The total phytoplankton count/ml. is minimum in monsoon season (**104/ml**) and maximum in summer season (**145/ml)**. Season wise and over all pollution index showed that probable organic pollution in Manipur lake (Table 1 and 4). Palmer, (1969) suggested that algae are reliable indicators of water pollution as it was true in present study. These pollution tolerant algae can be used for remediation of domestic wastewater. During investing period *Ankistrodesmus sp., Scenedesmus sp., Navicula sp., Nitzschia sp.,and Euglena sp.* recorded which are pollution indicator genus, Palmer (1969). During study period Palmer algal genus pollution index value of Manipur lake recorded 17. At the time of investigation over all Palmer's algal genus pollution index value of Manipur lake was 17, it shows that Manipur lake was probable organic polluted (Table 1 and 4). Water quality is good and utilize for agriculture, but not totally safe for human consumption.

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