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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 Ghuma lake of Ghuma village. Ghuma village is situated in Daskroi taluka of Ahmadabad district, Gujarat State. Current population of Ghuma village is about 15000. Ghuma lake is situated on western side of the village.

The plankton were collected, counted and were identified by using the method suggested by APHA, (1995) Prescott, (1970) and W. T. Edmondson, (1959). The plankton were counted by using Sedgwick Rafter counting cell. During the study period bacillariophyceae was recorded as a dominant class in Ghuma lake. The study was carried out monthly but was tabulated seasonally by using statistical method.

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

KEYWORDS : Ghuma Lake, Physico-chemical parameters and Algal genus pollution index

INTRODUCTION:

Ahmedabad is the largest city of the Gujarat state and is the 7th largest city of India. The Ghuma Lake of Ghuma village is located in the outskirts of the western part of Ahmedabad city. The Ghuma Lake is a natural lake and is located on the western part of Ghuma village. The sewage waste of Ghuma village is directly discharge into this Lake. The People of village also use this Lake to wash their cloths, take bath, sanitation, etc. The cattle of the villagers also take bath in this Lake. The Lake covers an area of 84479 m^2. Peripheral area of the lake is 466.22 m. and depth is 21 feet. Its exact geographical location is 23^0 01' 57.32" N Latitude and 72^0 26' 56.15" E Longitude.

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.

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 through 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 1).

Table 1. 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

RESULTS AND DISCUSSION:

Plankton has long been used as indicator of water quality. Because of their short life spans, plankton responds quickly to environmental changes.

In the present study 4 different genera of cyanophyceae class were recorded from the Lake. The blue green algae recorded in Ghuma Lakes are *Merismopedia sp., Nostoc sp., Oscillatoria sp., and Spirulina sp.* the minimum algal units were recorded during summer season where as maximu was recorded during winter season.

In Ghuma Lake 7 different genera of chlorophyceae class were recorded . In Ghuma Lake the algae recorded are *Closterium sp.,Closteriopsis sp., Coelastrum sp., Mugeotia sp., Spirogyra sp., Tetraedron sp., Scendesmus sp.,* the minimum value was recorded during summer season whereas maximum was recorded during monsoon season.

From the Ghuma Lake 7 different genera of bacillariophycea were recorded. In Ghuma Lake the diatom for bacillariophycea class recorded are *Cyclotella sp., Cymbella sp., Gomphonema sp., Gyrosigma sp., Navicula sp., and Nitzschia sp.* The minimum units of diatom were recorded during winter season whereas maximum unit of diatoms were recorded during summer season.

In the Lake 2 genera of euglenoids were recorded. The euglenoid recorded in the lake are *Euglena sp.* and *Phacus sp.* In Ghuma Lake the

minimum units of euglenoids were recorded during summer season and maximum unit of euglenoids were recorded during summer season. Density of phytoplankton and season wise phytoplankton count was mention in table -2.

During investigation season wise and over all Palmer pollution index was calculated for Ghuma Lake and it is found that out of 20 Genus, 7 pollution indicators Genus were found (Table 3).

CONCLUSIONS:

Therefore from the above study it is concluded that the total phytoplankton count/ml. is more in summer season and basillariophyceae is dominant in Ghuma Lake. The total phytoplankton count/ml. is minimum in monsoon season **158/ml** and maximum in summer season **296/ml**. (Fig. 1 and Table 2).

During monsoon season pollution index 16, winter season and summer season pollution index was 17 and over all pollution index 16.66 showed that probable organic pollution in Ghuma lake (Table 1 and 3). Palmer, (1969) suggested that algae are reliable indicators of water pollution as it was true in present study.

TABLE 2: SEASONAL VARIATION OF PHYTOPLANKTON IN GHUMA LAKE

PHYOTOPLANKTON		SAMPLING SEASON		
CLASS	GENERA	MONSOON MEAN	WINTER MEAN	SUMMER MEAN
CHLOROPHYCEAE				
	Closteriopsis Sp.	10	0	0
	Coelastrum Sp.	8	0	0
	Mugeotia sp.	0	14	8
	Pandorina Sp.	4	0	0
	Scenedesmus Sp.	0	0	2
	Spirogyra sp.	0	12	0
	Tetraedron Sp.	6	0	8
Total		28	26	18
CYANOPHYCEAE				
	Merismopedia Sp.	4	0	0
	Nostoc Sp.	0	4	0
	Oscillatoria Sp.	14	24	0
	Spirulina Sp.	6	0	0
Total		24	28	0
BACILLARIOPHYCEAE				
	Amphiplrura sp.	2	0	0
	Cyclotella sp.	2	0	2
	Cymbella Sp.	4	0	4
	Gomphonema Sp.	0	8	4
	Gyrosigma sp.	0	0	24
	Navicula Sp.	58	16	96
	Nitzschia sp.	22	20	78
Total		88	44	208
EUGLENOPHYCEAE				
	Euglena Sp.	16	54	70
	Phacus sp.	2	2	0
Total		18	56	70
TOTAL PHYTOPLANKTON COUNT/ ML		158	154	296
TOTAL PHYTOPLANKTON COUNT/ L		94800	92400	177600

Table 3. Palmer algal genus pollution index for Ghuma lake

Algal genus	Pollution index	Monsoon	Winter	Summer
Anacystis	1	-	-	-
Ankistrodesmus	2	-	-	-
Chlomydomonas	4	-	-	-
Chlorella	3	-	-	-
Clostrium	1	-	-	-
Cyclotella	1	-	-	1
Euglena	5	5	5	5
Gomphonema	1	-	1	1
Lepocinclis	1	-	-	-
Micractinium	1	-	-	-
Navicula	3	3	3	3
Nitzschia	3	3	3	3
Oscillatoria	5	5	5	-
Pandorina	1	-	-	-
Phacus	2	-	-	-
Phormidium	1	-	-	-
Scenedesmus	4	-	-	4
Stigeoclonium	2	-	-	-
Synedra	2	-	-	-
Palmer algal genus pollution index value of Ghuma lake		16	17	17
Over all Palmer algal genus pollution index value of Ghuma lake		16.66		

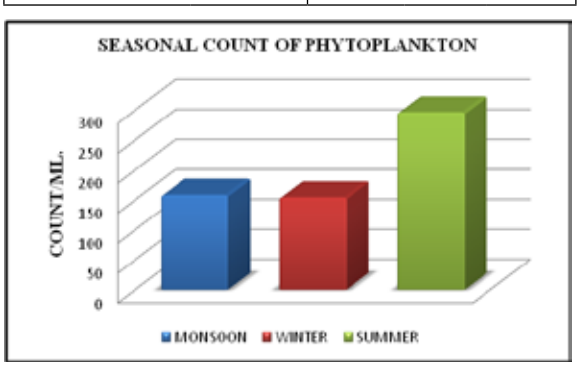

Fig. No.1 Season wise phytoplankton count

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