Evaluation of Phytoplankton Abundance With Reference To Physico-Chemical Properties of Tapi River at Galteshwar, Surat,Gujarat, India

Taruni Sarang, Kapila Manoj

Department of Aquatic Biology, Veer Narmad South Gujarat University Surat-395007 (Gujarat), INDIA

Abstract:–**The present investigation deals with the phytoplankton abundance with respect to Physico-chemical properties of Tapi during March-2015 to August-2015. For the given purpose Galteshwar, a riverine zone of Tapi was selected. The water samples and plankton samples were collected, preserved and analysed in laboratory as per method described in APHA (2005). Monthly variation of water quality parameters like Temperature, pH, Chloride, Dissolved Oxygen, Biological Oxygen Demand and Chemical Oxygen Demand were investigated. The investigation shows the organisms of family Bacillariophyceae (Diatoms) were dominating on Chlorophyceae followed by Cyanophyceae. The range of phytoplankton between 282-564unit/L was noted. Statistical correlation coefficient analyses were used to interrelate to the Physico-chemical parameters with phytoplankton density.**

Keywords:-**Phytoplankton,Physico-chemicalproperties, Galteshwar, Tapi River**

I. INTRODUCTION

Plankton, The tiny and drifting organisms found in all types of water bodies. They are mainly represented as Phytoplankton and zooplankton. Mathivanan and Jaykumar (1995) stated that Plankton are very sensitive to the environmentalchanges. Tolerance, abundance, diversity and dominance in the habitat can be seen particular by Plankton..Therefore plankton population observation may be used as a reliable tool for bio monitoring studies to assess the population status of aquatic bodies. Phytoplanktons are primary producers. The Quality and Quantity of phytoplankton are good indicator of water quality.(Muhammed Ali *et al.*,2005). Phytoplankton productivity is often the primary source of all the organic matter in an ecosystem. Being an index of trophic status phytoplankton reflect the overall environmental condition of the system and its potentiality. Their density has been reported to be affected by the quality of water.(Trivedy, 2000).

The Tapi River is one of the major west flowing rivers in the western part of India. Tapi originated from Satpura Mountain in Betul district of Madhya Pradesh at an elevation of 752 m above sea level. Tapi runs 724 km from its origin though three states (Madhya Pradesh, Maharashtra, and Gujarat) before it join the Arabian sea near Dumas Surat.

II. MATERIALS AND METHODS

As Study site Galteshwar was selected this is located near the kamrej. Galteshwar is located at Kamrej near the bank of Tapi River. (Lat. 21° 16' 51.1572" N and Long. 73° 5' 0.4776" E). It is freshwater zone of Tapi where inlet of agricultural waste, Sand mining, and waste from temple are found.

The surface Water samples were collected on monthly basis at selected site. The Phytoplankton samples were collected by filtering 50L of water through plankton net of having 20µ mesh size. The samples were concentrated up to 100ml and preserved with 4% formalin and Lugol's iodine solution. The quantitative estimation of Phytoplanktonwas carried out by Lackey's drop method.(APHA, 2005). Qualitative estimation also done by using standard literature.(Sarode and Kamat and APHA).

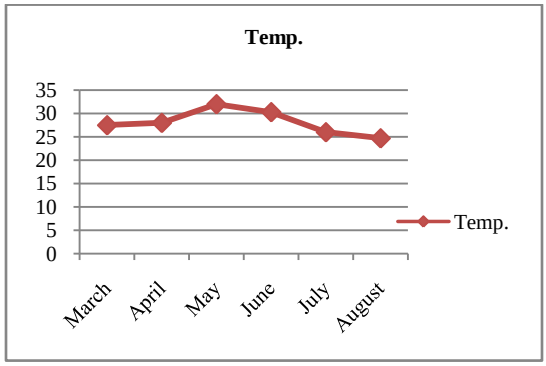
III. RESULT AND DISCUSSION

The Physico-chemical properties of Tapi river water given in Table-1

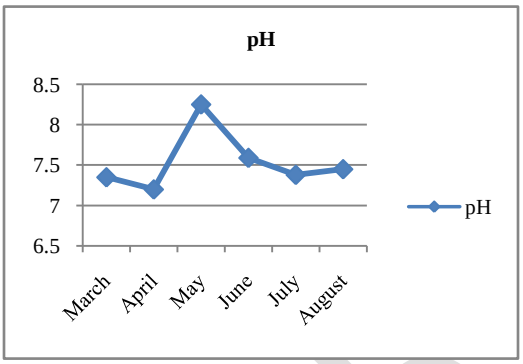
Table-1

The Physico-chemical properties of Tapi River water and Phytoplankton density (unit/L)

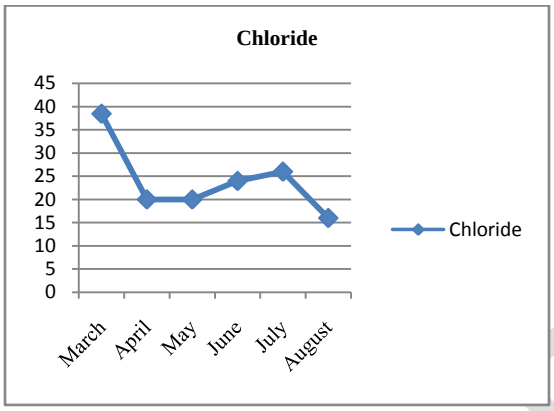
Month	Temp.	pH	Chloride	DO	BOD	COD	Phytoplankton density (unit/L)			Total
							Bacillariophyceae	Chlorophyceae	Cyanophyceae	
March	27.5	7.35	38.48	9.122	4.054	120	492	54	18	564
April	28	7.2	20	9.324	5.27	117.6	310	62	12	384
May	32	8.25	19.99	10.135	2.235	30.768	224	50	8	282
June	30.3	7.59	23.99	9.52	3.04	124.99	320	44	32	396
July	26	7.38	26	6.283	2.837	43.776	400	60	14	474
August	24.7	7.45	16	12.36	7.095	247.43	330	44	20	394
%							83.23%	12.59%	4.17%	--



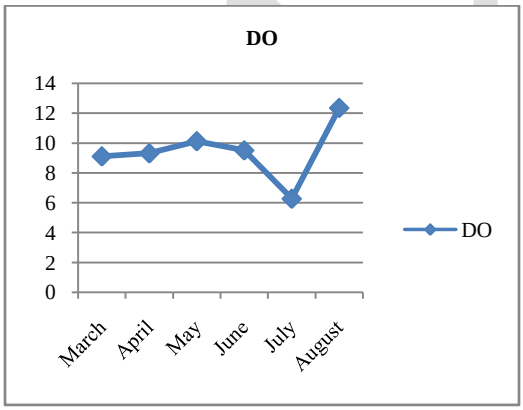
[Figure-1(a)]



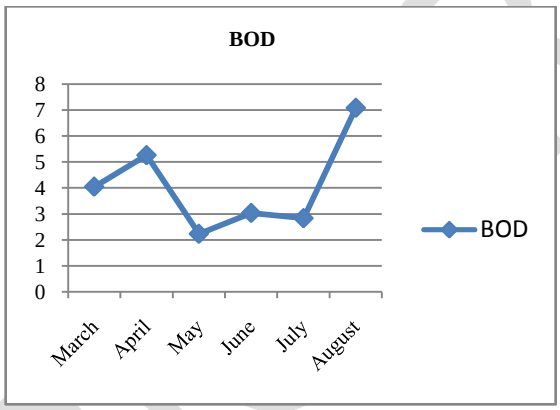
[Figure-1(b)]



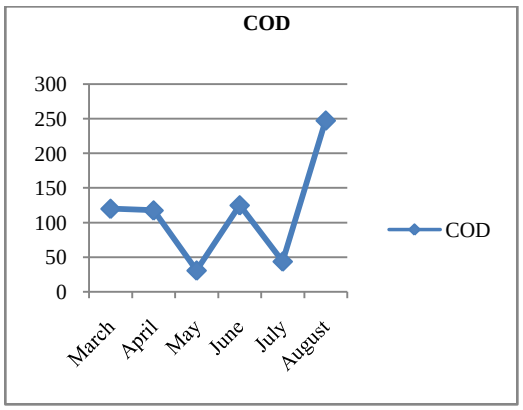
[Figure-1(c)]



[Figure-1(d)]



[Figure-1(e)]



[Figure-1(f)]

Temprature is one of the most important parameter which play crucial role in the metabolic activites of organisms so it considered as abiologically significant factor.(Varunprasath*et al.*, 2010). During the study period temperature varied between 32-24.7 ºc [Figure-1(a)].The maximum temperature was found in May where phytoplankton abundance is very less. While minimum was found in April. The pH of Tap river water varied between 8.25-7.20.The variation shown in [Figure-1(b)]. The maximum pH found in May.While minimum in April. In the current investigation, pH was found in the neutral range (7.0-8.25) supports the good population of diatoms.(Nirmalkumar, 2011) Chloride concentration remains usally low in natural waters(Smitha*et al.*2013).In Tapi River water chloride concentration varied between 8.48-16mg/L [Figure-1(c)]. Dissolved Oxygen is an important parameter for aquatic organisms for aerobic metabolic activities.(Wetzel, 1975). The DO concentration lied between 12.36-6.283 mg/L

The maximum DO found in August due to rain fall. While minimum in July [Figure-1(d)]. The raised values of dissolved oxygen may be due to high photosynthetic rate by phytoplankton during which more carbon dioxide is utilized

and oxygen is released.(George and Koshy, 2008).The BOD values lied between 7.095-2.235mg/L[Figure-1(e)].Maximum BOD value found in August and minimum in May.COD value varied between 247.43-30.768mg/L[Figure-1(f)].Maximum value found in August and minimum in May. The higher values of BOD and COD observed in water indicate high degree of organic pollution. High amount of BOD was noticed might be due to the influx of untreated domestic wastes (Iyer, 1997).

Monthly variation in phytoplankton density shown in (Table-1). During the study period ,The range of phytoplankton between 564-282unit/L. Minimum phytoplankton was found in May. While maximum phytoplankton were found in March.The phytoplanktons were represented by mainly three families: Bacillariophyceae (diatoms)were dominated on Chlorophyceae (Green algae) and Cyanophyceae (Blue-green algae).

The investigation shows the Bacillariophyceae –diatoms (83.23%) were dominated on Chlorophyceae (12.59%) and Cyanophyceae(4.17%) members of organisms[Figure-2].Similar studies was done by (Khanna *et al.*, (2012). Zafar (1967) has emphasized the importanceof temperature in the distribution of diatoms. Temperature influences the production of diatoms as theyseem to grow and colonise during the warmer periodsand will have lean population in winter. Chlorophyceae are free living and planktonic, mostlyconfined to shallow waters and are attached to thesubmerged plants or found on moist soil. Studies havebeen made by many workers on the distribution andthe abundance of the Chlorophyceae(IslamAzizul*et al*.2001)

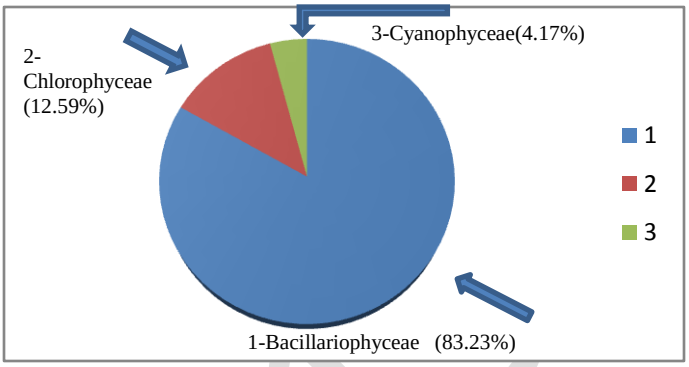


Figure-2 Percentage Composition of various family of phytoplankton

FouziaIshaq, *et, al;* (2013) statedthat Physicochemical factors within all the natural biological systems interact among themselves and with the biotic factors resulting in the formation of a complex relationship which is usually called as the environmental complex. Analysis of environmental factors individually is insufficient to trace the exact role of each factor affecting the existence of species population or communities. In such circumstances correlation analysis would be much more fruitful. Correlation analysis between Physico-chemical environmental factors and with community characteristics is important to identify certain key relationships crucial to the sustainable management of natural ecosystems.

Table-2Correlation coefficient analysis of water

	Temp.	pH	Chloride	DO	BOD	COD	Bacillariophyceae	Chlorophyceae	Cyanophyceae
Temp.	1								
pH	0.73113	1							
Chloride	-0.00886	-0.26213	1						
DO	-0.00788	0.23108	-0.47606	1					
BOD	-0.70225	-0.54214	-0.34007	0.63205	1				
COD	-0.58602	-0.4293	-0.26378	0.73137	0.90525	1			
Bacillariophyceae	-0.55113	-0.65403	0.833771	-0.38977	0.109003	0.13348	1		
Chlorophyceae	-0.16448	-0.42756	0.25258	-0.6491	-0.1453	-0.50292	0.2683	1	
Cyanophyceae	-0.0538	-0.25171	0.122417	0.164108	0.102438	0.45859	0.2168	-0.614366	1

The correlation analysis of water parameters with phytoplankton abundance showed positive correlation of chloride with Bacillariophyceae (0.833),Chlorophyceae (0.25) and Cyanophyceae (0.12). DO with Cyanophyceae (0.16). Further, BOD and COD also showed correlated positively with Bacillariophyceae (0.10) and Cyanophyceae (0.45).

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IV. CONCLUSION

The present study concluded that there was a monthly variation in physico-chemical properties and Phytoplankton abundance. In which, Bacillariophyceae (diatoms) were dominating on Chlorophyceae followed by Cyanophyceae. The high value of diatoms shown the water quality of Tapi River at Galteshwar site is good for the growth of the diatoms.

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