Current World Environment Vol. **6**(1), 71-76 (2011)

Impact of Physico-Chemical Parameters on Microbial Diversity: Seasonal Study

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(Received: February 07, 2011; Accepted: March 15, 2011)

ABSTRACT

Water is the most precious resource on earth. It plays a predominant role in distribution of organisms. Fresh water contains various micro-organisms[6]. The quality of water[1,5] through parameters (Physico-Chemical) affects the species composition, their abundance and productivity of water. Some organisms can survive in a wide range of conditions and some are more tolerant to pollution while others are very sensitive to changes in conditions and intolerant to pollution.

These fresh water bodies namely Ravishankar, Murrum-silly and Sondhur reservoir, which serve as drinking, irrigation and major Sources of fish culture were studied with relation in between physico-chemical condition and diatoms flora. Samples were collected on the monthly basis from three selected sites of water bodies for a period of one year.

Author carried out the 28 species of diatoms have been recorded minimum species were recorded in Sondhur reservoir and maximum species are recorded in Ravishankar reservoir. The number of species diatoms were directly affected to physico-chemical condition of concern water bodies. In this study, reported, diatoms species grow better during January to April and November to December and pH range of 7.8 to 8.6. Similarly high nitrate and phosphate content and dissolved oxygen favour more growth of all the species.

The role of physico-chemical parameters in productivity of diatoms has been discussed in this research.

Key words: Physico-chemical parameters, Indicator, microbial diversity, seasonal changes.

INTRODUCTION

Fresh water contains various micro-organism. The quality (physico-chemical) of water affects to species composition, abundance and productivity of water. Physical and chemical parameters are directly related to micro-organisms and productivity of water bodies. Some organism can survive in a wide range of condition and some are more tolerant to pollution and other are very sensitive to change in conditions and are intolerant to pollution. Generally a large number of flora (algae) are natural food source of economically importance, fauna like fishes and their presence, play a significant role in the productivity of water bodies.

Authors selected three fresh water bodies namely Murum-silly, Ravishanker, Sondhur reservoir, which is major source of drinking, irrigation and fish culture were studied with relation in between physico-chemical parameters and diatom flora.

MATERIAL AND METHODS

These water bodies are situated in the Dhamtari (C.G.) region, which is situated in mid and mid-eastern part of India. (longitude=8.1E and latitude=22.9 N.). These water bodies are situated approximately from Dhamtari Distt.

1. Murum-silly about 29 Km away
2. Ravishanker about 11 Km away
3. Sondhur Reservoir about 70 Km away

Sample were collected on the monthly basis from three selected site of water bodies for a

period of one year. Dhamtari region is tropical area. There is rainy season from 15 June to 15 October, Winter season from Nov. to Feb and Summer season from March to June. The maximum temperature is between 34 - 44 ± 2°C and minimum 6-12 ± 2°C.

Collection of sample

Site I This site is surrounded by agricultural fields.

Site II This site is an entry point of human and animals inhabitants.

Site III In this site not any activity of animal and human being, is found.

For investigation, algae, water and mud sample were collected from selected site in sterilized sampling bottles. Sample were preserved in 5% formalin for identification of algae using keys provided by Gonazalves and Joshi, 1946 Prescott 1957, Tiffany and Britton 1952, and Desikachary[4] 1959, Jenson 1985, Kobayasi 1968 and Sarode and Kamat 1984.

Sample for diatoms and algae were collected from these water bodies by scrubbing the surface of the submerged substratum rocks etc.

For estimation of dissolved oxygen, water was collected in B.O.D bottles and fixed at the sampling spot. Water sample were collected at 6:30 to 9:00 a.m.

The Diatoms were processed according to "Burn's Method" by treating them with hydrochloric acid, for 24 hours followed by treatment with sulphuric acid to which a few crystals of potassium dichromate were added.

Samples for physico-chemical analysis of water was carried out regularly in the first week of every month. In this study, four physical and seven chemical parameters were taken. The water analysis was carried out by the APHA (standard method for the examination of waste water 18th edition.) 1989 and 1992.

RESULTS AND DISCUSSION

Authors reported diatoms species (Table-3) grow better during January to April and November to December and high pH 7.8 to 8.6 value are favourable. Some nutrients like nitrate and organo-phosphate are also helps in growth and development of flora and diatoms species. Physical parameters (Table-1) and chemical parameters (Table-2) and their values play a significant role for the productivity of water bodies for their betterment (economically important).

Table 1: Physical parameters of Murum silly, Ravishankar and Sondhur Reservoir

Particular	Season	Water bodies		
		Murum silly	Ravishankar	Sondhur
Colour	Summer	Green	Green	Green
	Rainy	Grey brown	Grey brown	Brown grey
	Winter	Green	Green	Green
Odour	Summer	Faint	Faint	Faint
	Rainy	Fishy	Fishy/feacal	Fishy
	Winter	Faint	Faint	Faint
Total Solid	Summer	650.00	700.00	670.00
dissolved	Rainy	1200.00	1500.00	1700.00
	Winter	500.00	650.00	600.00
Temperature	Summer	28.00	30.0	29.0
(^{0}C)	Rainy	26(±5)	24(±5)	24.0
	Winter	17(±5)	15(±5)	16.0

In this research, selected three reservoirs whose sampling were done in three sites and Grab method helped in diatoms and algae were collected. Sampling is done on monthly basis.

In this research 28 species of diatoms have been recorded. The no. of diatoms species are found in Ravishankar reservoir 37 was more compared to Murum silly reservoir 46 and Sondhur reservoir 26. Diatoms were directly affected by physico-chemical conditions of concerned water bodies.

Diatoms and flora are also affected by high temperature. Diatoms species grow better during moderate temperature of water, presence of nutrients (nitrate and organo phosphate), dissolved oxygen concentration and colder months are also favourable for multiplication of diatoms species. Diatoms species and flora are more effected from organic matter of water.

Table 2: Chemical parameters of water bodies named Murrum silly, Ravishankar and Sondhur

S. No	Particular	Season	Water bodies		
			Murrum silly	Ravishankar	Sondhur
1.	pH	Summer	8.2 mg/lit.	8.3 mg/lit.	8.4 mg/lit.
		Rain	7.5 mg/lit.	7.4 mg/lit.	7.1 mg/lit.
		Winter	8.4 mg/lit.	8.3 mg/lit.	7.2 mg/lit.
2.	DO	Summer	21.9 mg/lit.	23.9 mg/lit.	24.8 mg/lit.
		Rain	14.0 mg/lit.	11.4 mg/lit.	12.2 mg/lit.
		Winter	18.4 mg/lit.	18.4 mg/lit.	19.1 mg/lit.
3.	Sulphate	Summer	399 mg/lit.	398 mg/lit.	401 mg/lit.
		Rain	400 mg/lit.	410 mg/lit.	412 mg/lit.
		Winter	393 mg/lit.	399 mg/lit.	410 mg/lit.
4.	Calcium	Summer	57.0 mg/lit.	59.0 mg/lit.	46.0 mg/lit.
		Rain	47.0 mg/lit.	51.0 mg/lit.	34.0 mg/lit.
		Winter	65.0 mg/lit.	71.0 mg/lit.	49.0 mg/lit.
5.	Alkalinity	Summer	106.0 mg/lit.	104.0 mg/lit.	106.0 mg/lit.
		Rain	74.0 mg/lit.	76.0 mg/lit.	74.0 mg/lit.
		Winter	98.0 mg/lit.	96.0 mg/lit.	92.0 mg/lit.
6.	Chlorides	Summer	23.8 mg/lit.	21.9 mg/lit.	22.8 mg/lit.
		Rain	12.9 mg/lit.	13.8 mg/lit.	13.5 mg/lit.
		Winter	22.8 mg/lit.	20.7 mg/lit.	22.5 mg/lit.
7.	Phosphates	Summer	0.81 mg/lit.	0.90 mg/lit.	0.71 mg/lit.
		Rain	0.13 mg/lit.	0.19. mg/lit.	0.22. mg/lit.
		Winter	0.78 mg/lit.	0.77 mg/lit.	0.71 mg/lit.
8.	Nitrates	Summer	0.24 mg/lit.	0.29 mg/lit.	0.20 mg/lit.
		Rain	0.17 mg/lit.	0.18 mg/lit.	0.16 mg/lit.
		Winter	0.23 mg/lit.	0.25 mg/lit.	0.23 mg/lit.
9.	Free CO2	Summer	32.6 mg/lit.	31.6 mg/lit.	31.2 mg/lit.
		Rain	41.0 mg/lit.	39.0 mg/lit.	41.1 mg/lit.
		Winter	19.0 mg/lit.	49.5 mg/lit.	48.1 mg/lit.
10.	Ammonical Nitrogen	Summer	1.5 mg/lit.	1.6 mg/lit.	1.3 mg/lit.
		Rain	2.2 mg/lit.	1.8 mg/lit.	2.1 mg/lit.
		Winter	1.14 mg/lit.	0.9 mg/lit.	0.8 mg/lit.

Table 3: Physico-chemical variations (Seasonal variation in some flora)

S. No.	Species	Water bodies								
		Ravishankar			Murrumsilly			Sondhur		
1	*Achnathus gibbberual*	-	-	-	+	-	+	+	_	+
2	*Fragillarias intermedia Grun*	-	-	-	-	-	-	+	-	+
3	*Synedra affilnis*	-	-	+	+	+	+	-	-	-
4	*Synedra ulna*	+	+	+	+	+	+	+	+	-
5	*Navicula anceps*	+	+	+	-	+	+	+	+	-
6	*N.cryptocephala*	-	-	-	-	+	+	-	-	-
7	*N.major*	-	-	+	-	-	-	+	-	+
8	*N.grevillei*	-	-	+	+	-	+	-	-	-
9	*N.lanceolata*	+	+	+	+	+	+	+	+	-
10	*Cyelotellakuetzinghiana*	-	-	-	+	-	+	-	-	-
11	*C.Operculata*	+	+	+	+	-	+	-	-	-
12	*C.Meneghiana*	-	-	+	+	+	+	-	-	-
13	*Cymbella offilnis*	+	+	+	-	+	+	-	-	-
14	*C.cisull(Hemp)*	-	+	+	+	-	+	-	-	-
15	*C.reilnharbtill(Grun)*	+	-	+	-	+	+	-	-	-
16	*C.tumida(Breb)*	+	+	+	+	+	-	-	-	-
17	*Gomphonema acquatoriale*	-	+	-	+	-	+	+	-	+
18	*G.parvulaum Kutz.*	+	+	+	+	-	+	+	+	+
19	*G.lanceolatum*	-	+	-	-	-	-	+	-	-
20	*Nitzschia amphibian Grun*	-	-	-	-	-	-	-	-	+
21	*N.angurtata*	+	-	+	-	-	-	+	-	-
22	*N. dilssipata*	-	-	-	-	-	+	-	-	+
23	*N.vitrea Norman*	+	-	-	+	-	-	+	-	-
24	*Surilrella splendlida kutz*	-	-	+	+	-	+	-	-	-
25	*Stairpmesos araceps*	-	-	-	+	-	-	+	-	-
26	*Rhopaldia gibba*	-	-	+	+	+	-	+	-	-
27	*Pinnularia microstaurom*	+	-	-	-	-	-	-	-	-
28	*Melosira granulata*	-	-	-	+	-	+	+	-	-
	Nos of species observed different physico-chemical condition	11	10	16	18	10	18	14	4	8
	Total		**37**			**46**			**26**	

CONCLUSION

This research, concluded that water play a significant role for living organism. It is observed that, a minute variation in water quality some diatoms can tolerate and other perishes (died).

Presence of nutrients, in water like nitrate and organo-phosphate help in growth and development and also helps in multiplication of productivity.

In this study samples were collected samples from three different sources. These sources (reservoir) are situated in Dhamtari dist. of Raipur we analyze four physical and seven chemical parameters by APHA (Standard Method for the examination of water and waste water 18th edition) Diatoms and flora are collected by Grab method.

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