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PHYSICOCHEMICAL CHARACTERISTICS AND PLANKTON ASSEMBLAGES OF SATHIYAR RIVER IN MADURAI DISTRICT

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Introduction

River water is not only an indispensable source for irrigation but also plays a vital role for drinking water supply for most of the urban municipalities. Water from rivers is pumped at specific sites and after treatment at municipal water treatment plants supplied as domestic potable water supply (Shah and Singh 2016**).** Water pollution is an acute problem in all the major rivers and dams. Water is known to contain a large numbers of chemical element, and the interactions of both the physical and chemical properties of water play a major role in composition, distribution and abundance of aquatic organisms. Water is extensively used for irrigation, industrial development, hydro electrical generations, fisheries, human life survival and for domesticated animals. Hence physico-chemical analysis is of prime importance to assess the quality of water for its best usage and also to know the pollution load on receiving water bodies. The maintenance of healthy aquatic ecosystem is dependent on the physicochemical properties and biological diversity. Among these, plankton constitute the foundation of the food web in aquatic ecosystems and represent one of the most direct and

profound responses to pollution entering river. Phytoplanktons are also the indicators of water pollution. Several researchers informed on a number of algal species as water quality indicator (Naik et al., 2005; Nandan and Aher, 2005; Zargar and Ghosh, 2006). In a study on Kadra reserviour of Karnataka in 2006, Zargar and Ghosh reported on several algal forms belonging to Chlorophyceae, Cyanophyceae, and Bacillariophyceae as water pollution indicators. Nandan and Aher (2005) concluded that the algal genera, Oscillatoria, Scenedesmus and Navicula are the species found in organically polluted waters. Hence, the present study has been designed to evaluate the water quality and related plankton assemblage in Sathiyar River

Materials and method

The water samples for hydrobiological studies, phytoplankton and zooplankton were collected at six selected sampling sites of the Sathiyar River. The distance between two adjacent sites is approximately 2kms. Sampling was carried out weekly random water sampling method. The samples were taken at the same time each day in the upper reach of the river in downstream direction. Sampling was carried out for three months of monsoon period from June to August 2015. In each sampling sites, the sample water was collected with a 100 ml plastic bottle. The water samples for phytoplankton were preserved with 1% Lugol's iodine solution. Qualitative and quantitative analyses were carried out in the laboratory using the U termol method under an inverted microscope (Utermohl, 1958). The phytoplankton composition was based on the identification of the specific and infra-specific taxa. Zooplankton sampling at each station was collected with standard plankton net of 1 m length, 30 cm mouth diameter, and mesh size of lm fitted with a flow meter. Samples were preserved in a 4% buffered formalin/river water solution. Zooplankton species were identified to the lowest taxonomic unit possible, and taxon abundance (per cubic meter) was counted under a microscope (1 ml sub sample). These samples were taken with a Stempel-pipette from the entire sample (250 ml).

The water samples from the six selected sites (collected sites are sathiyar dam, Erampatti, Kovilpatti, Ayyur, Kuravankulam and Vandiyur respectively) were periodically collected and the physico-chemical parameters such as Turbidity, TDS, EC, pH, Total hardness Ca, Mg, Fe, and Nitrites, Nitrates, Fluorides and Chlorides were estimated (APHA, 1995). Simultaneously the phytoplankton and zooplankton were also estimated. The estimated values were statistically analyzed.

Results and Discussion

Safe water supply is recognized at the highest priority task in environmental protection throughout the globe (Adewuyi et al., 2014). For the present study, the water samples of all six selected sites (collected sites are sathiyar dam, Erampatti, Kovilpatti, Ayyur, Kuravankulam and Vandiyur respectively) were periodically collected and the physico-chemical parameters such as Turbidity, TDS, EC, pH, Total hardness as $CaCO_3$, Ca, Mg, Fe, and Nitrite as NO_2, Nitrate as NO_3, Fluoride and chlorides were estimated. Simultaneously the phytoplankton and zooplankton were also estimated. The estimated values were statistically analyzed and tabulated in Table-1 and 2. According to the table values, all the physico-chemical parameters observed for sites I, II, III and IV were more or less similar when compared to the sites V and VI. In the present study, the mean values of pH of Sathiyar river varied between 7.4 to 8.3. These values indicated that pH of drinking water source was slightly alkaline in nature. In the current study, slight alkaline nature of Sathiyar river is in accordance with the previous reports of (Mullai et al., 2013) while evaluating pH of Uppanar river of Tamilnadu. In sites V and VI, the physico-chemical parameters such as Turbidity, TDS, EC, Total hardness as $CaCO_3$, Ca, Mg and chlorides were one fold elevated than that of the other sites. The other parameters such as nitrites and nitrates were meagerly increased in the sites V and VI when compared to other sample sites of the river. Even though considerable increase occurred in both sites V and VI, the values of physico-chemical parameters observed in all samples sites as shown in table 1, were occurred within the acceptable and the permissible limits. The elevation of parameters Turbidity, TDS, EC, Total hardness as $CaCO_3$, Ca, Mg and chlorides in the sites V and VI may be due to the mixing of non-point source of sewage and polluted water into these two regions of Sathiyar River. This finding has some coincidence with the TDS, TH, turbidity and Cl values found in Gudbahri river and important indicators of pollution (Weldemariam 2013).

The results for plankton numbers were inversely proportionate to the results of physico-chemical parameters. The fluctuations in the total number of plankton as shown in table 2 suggests that sample sites for I, II, III and IV were low when compared to the sites V and VI. The sites V and VI showed the decreasing trends in the number of plankton and also disappearance of plankton communities such as *Cladophora*, *Coelosphaerium*, *Calanoids nauplii* and *Brachionus*. This may be due to discharge of pollutants in these sites. The decomposition of the organic materials by micro-organisms in the aquatic ecosystem leads to the lowering of the level of dissolved oxygen, which in turn inhibits the growth or cause the

death of the aquatic habitats and the planktonic population depends on hydrological situation as well as water quality parameters. Water quality in an aquatic ecosystem is determined by many physical and chemical factors (Sargaonkar & Deshpande 2003). The poor diversity of plankton may be caused by poor light penetration. Algal analysis thus showed that water quality of the pond has reached at threshold level and therefore, it needs some corrective measures to maintain the water chemistry of the river (Nair et al., 2015). Basic water management principles have to be designed to maintain good water quality and reduce incidence of diseases. It is important to develop a plan of action to be taken when water quality parameters are outside the desirable range and in stressful concentrations. Hence monitoring regularly and recording data is important as it will aid in anticipation of needed action.

Sampling sites	Physico-chemical paramteres											
	Turbidity NTU	TDS mg/l	EC µS/cm	pH	Total hardness mg/l	Ca mg/l	Mg mg/l	Fe mg/l	Nitrites mg/l	Nitrates mg/l	Fluorides mg/l	Chlorides mg/l
I	05±1	242±10	352±17	7.50±1	121±6	20±1	8±1	0	0.3±0.01	3±0.5	0.6±0.04	18±0.9
II	05±1	241±8	354±16	7.4±1	125±5	21±2	8±1	0	0.2±0.01	4±0.5	0.7±0.03	18±0.7
III	06±1	250±12	366±15	7.52±1	127±7	22±3	9±1	0	0.3±0.01	5±0.2	0.6±0.04	16±0.6
IV	12±2	275±10	550±22	7.54±1	150±5	29±2	12±2	0	0.3±0.01	6±0.3	0.6±0.03	22±2
V	22±2	459±9	725±18	7.68±1	245±8	46±5	18±2	0	0.4±0.01	8±0.2	0.7±0.04	42±4
VI	29±1	477±6	703±17	8.3±1	270±6	59±2	26±1	0	0.5±0.01	8±0.2	0.6±0.03	60±4

Table 1 shows the Physicochemical parameters observed in different sample sites.

Table 2 shows Plankton species assemblage in different sample sites.

Sampling sites	Plankton species assemblage %										Number of plankton /L
	Volvox sps	*Cladophora sps*	*Oscillatoria sps*	*Coelosphaerium sps*	*Nostoc sps*	*Cyclops sps*	*Keratella sps*	*Calanoid naupli i*	*Brachionus sps*	*Trichocerca sps*	
I	01	05	14	07	11	09	14	11	05	13	28896±1400
II	12	02	19	05	13	08	17	11	03	10	30124±1506
III	10	04	14	09	09	12	13	15	05	08	31675±1812
IV	13	01	20	04	12	07	15	10	07	11	29942±1345
V	28	0	26	0	32	12	02	0	0	0	11459±982
VI	20	0	24	0	35	13	02	01	03	02	16723±1024

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