International Journal of Biosciences (IJB)
ISSN: 2220-6655 (Print) 2222-5234 (Online)
Vol. 1, No. 6, p. 81-87, 2011
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

Diversity of phytoplankton from three water bodies of Satara district (M.S.) India

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Received: 07 October 2011
Revised: 14 November 2011
Accepted: 15 November 2011

Key words: Physico-chemical parameters, phytoplankton, pollution indicators reservoirs, Satara city.

Abstract

The present study deals with the diversity of phytoplankton and physico-chemical parameters of fresh water bodies from the Satara district. The present work is carried out for 2 Years from June 2008 to May 2010. The algal diversity survey revealed the presence of 53 species, belonging 5 major groups; Chlorophyceae, Bacillariophyceae, Cyanophyceae, Desmidiaceae & Euglenophyceae. Out of which Chlorophyceae was dominant. The group wise population density is as Chlorophyceae > Bacillariophyceae > Cyanophyceae >Desmidiaceae >Euglenophyceae. The 19 species of Chlorophyceae, 15 species of Bacillariophyceae, 9 species of Cyanophyceae, 5 species of Desmidiaceae, 5 species of Euglenophyceae. The investigation shows that these classes of phytoplankton showed considerable fluctuations with water quality parameters.

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Introduction

Plankton is an important component of ecosystem, which responds to ecosystem alterations rather rapidly. It is due to the fact that planktonic organisms play a key role in the turn over of organic matter and energy through the ecosystem. (Telesh, 2004). The phytoplankton is microscopic algae suspended in water whose movements are less dependent on currents. They include micro and macroscopic suspended or free floating non motile or motile unicellular colonial or filamentous algae. They are ecologically significant as they form the basic link in the food chain of all aquatic animals (Misra et al., 2001). Planktonic organisms are known to react to different types of water pollution. This reaction is very rapid because of relatively short lifetime and high reproduction rates of the organisms. Since the phytoplankton plays a key role of primary producer in aquatic environment, it is the first component in the trophic tier affected by pollution. They provide a crucial source of food to aquatic organisms such as fish and crustacean. They are found in all types of water as their presence or absence in water indicates the quality of water. They have played an important role for environmental management as soil conditioners, biofertilizers, bioindicators, biomointers, feed for animal, rehabilitators of degraded ecosystems through bioabsorption of pollutants.

The reservoirs play an important role in maintaince of ecological balance hence they need to be investigated for their biological parameters. The physical and chemical parameters of water are more or less related to different aquatic life. Welch (1948) pointed out that physical and chemical parameters make possible the existence of biotic diversity and various phenomena of biological activity. In recent years reservoirs have received their attention because of environmental crises. Many workers have published their work on aquatic environment and ecology of phytoplankton in fresh water as Singh and Swarup (1979), John Wiley *et al.,* (2000), Hiware & Jadhav (2001) Angadi *et al.,* (2005) and Pawar *et al.,* (2006). Some of the species of phytoplankton are important to access the health of water body. For an instance, more of cyanophyceae members can be taken as indicators of organic pollution of reservoirs. From point of view, enlisting of the species of phytoplankton is interesting. The present study has been planned to understand a relationship between physico-chemical parameter and planktons.

Materials and methods

The selected fresh water bodies receive about 6226 mm rainfall annually. The present investigation reports on physic-chemical parameters (such as PH, E.C., BOD, DO., COD, Hardness, Alkalinity) and biodiversity of phytoplankton of three reservoirs from Satara district. The water from these reservoirs is used for drinking, domestic purpose, irrigation, power generation and aquaculture practices.

The selected reservoirs are located as Kas (N 17°43 05 ° 90; E73 ° 46 42 ° 61), Kanher (N17 ° 44 16 ° 02: E 73 ° 53 43 ° 10), Mahadare reservoir (N17 ° 40 58 ° 43: E 73 ° 58 22 ° 92) reservoir from Satara district. From these reservoirs, water samples are collected for analysis of physic-chemical parameters and diversity of phytoplankton.

Phytoplankton samples were collected with plankton net and preserved by using 0.5 ml of formalin in 50 ml sample collected after filtration of 50 liters of water. The water samples were brought to the laboratory for physic-chemical analysis in separate plastic cans. The phytoplankton was studied under the microscope and micrographs were taken using Nikon L- 20camera. They were identified using standard literature such as Prescott (1982,), APHA (1992), Fritsch (1965), Hutchinson (1957), Biswas (1980), and Edmondson (1963). The physico- chemical parameters were studied by using APHA (1992), Trivedy and Goel (1986).

Result and discussion

Variations in physico-chemical parameters of 3 water bodies were presented in Table 1. Naganandani and Hosmani (1990), Anil Kumar (1998) have stressed the importance of alkalinity, water temperature, dissolved oxygen and biological oxygen demand in the abundance of Euglenophyceae. Zafar (1959) has emphasized the importance of alkalinity and pH favors growth of algae. Zafar (1964) and Singh and Swarup (1979) reported that higher concentration of calcium promote growth of diatoms. Sakhre and Joshi (2002) noted 19 species of phytoplankton in Palas-Nilegaon reservoir. Pulle & Khan (2003) observed 43 species of phytoplankton from Isapur dam. Susheela & Kiran (2006) enumerated 68 algal taxa belonging 45 to Cyanophyceae, 14 to Chlorophyceae and 8 to Bacillariophyceae from Gangtok, Sikkim. Anitha Devi & Singara Charya (2007) recorded 54 species algae in lower Manair dam and Kakatiya canal of Karimngar of A.P. Onyema et al., (2007) recorded 106 phytoplankton taxa in two polluted sites of Lagos lagoon of Nigeria. Hujare (2008) recorded 42 species of phytoplankton in Attigre reservoir of Kolhapur district.

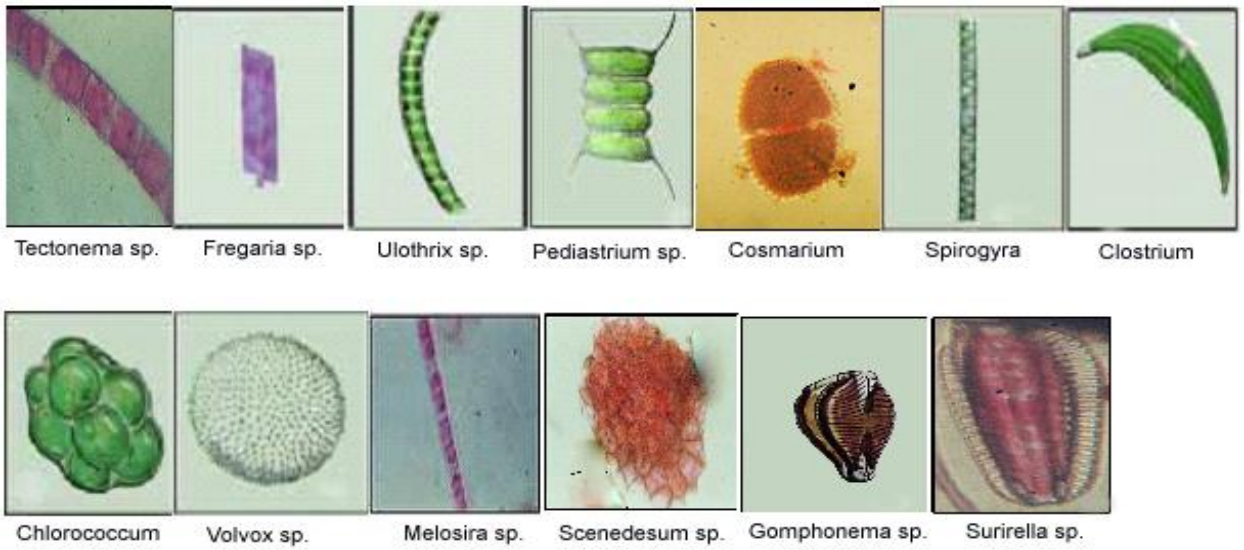

Fig. 1. Photographs of some of the phytoplankton recorded during research work.

Fig. 2. Surface view of reservoirs.

Table 1. Records the physico-chemical parameters of three water bodies. Values are the mean with standard error.

Reservoirs / parameters	Kas reservoir	Kanher dam	Mahadare reservoir
pH	6.02±0.012	6.31±0.03	7.27±0.049
E.C.	0.04±0.001	0.11±0.000	0.28±0.001
DO	4.42±0.240	6.38±0.223	7.65±0.507
Free CO_2	6.17±0.06	7.42±0.148	9.45±0.0.204
Acidity	8.06±0.871	13.11±2.645	40.29±2.950
Alkalinity	23.41±0.05	52.40±11.10	145.67±2.0817
Hardness	54.89±2.87	66.17±3.82	85.63±6.729
Calcium	6.75±0.37	8.82±0.92	22.21±1.394
Magnesium	6.76±1.26	12.40±1.89	9.09±2.127
BOD	6.22±0.223	9.37±0.448	10.23±0.09
COD	5.23±0.061	11.033±0.698	14.89±0.747
Chloride	24.32±1.302	30.46±6.35	43.33±4.015
Hydrogen Sulphide	2.35±0.216	2.95±0.58	3.72±0.251
Sodium	0.94±0.001	7.89±1.692	19.36±0.670
Nitrate	5.96±0.646	10.97±2.13	14.93±0.208
Total dissolved solids	505±6.321	1045±43.472	1512±13.114

All values are expressed in mg/l except pH and E.C.

Table 2. Diversity of phytoplankton in three reservoirs of Satara district.

Sr.no.	Plankton	Kas	Kanher	Mahadare
	A. Class. Chlorophyceae			
1.	Chlorella culgoris	+	+	+
2.	C. valorella	-	+	+
3.	C .conglamerata	-	-	+
4.	Chlorococcum sp.	+	+	+
5.	Chlymadomonas epiphyta	+	-	-
6.	*Closterium moniliforme*	-	-	+
7.	*Hydrodictyon sp.,*	+	+	-
8.	*Oedogonium patulum*	+	-	-
9.	*Pediastrium simplex*	+	+	+
10.	*P. duplex*	+	+	-
11.	*P .tetras*	-	-	+
12.	*Scenedesum dimorphus*	+	+	-
13.	*S. quadricauda*	+	+	+
14.	*Spirogyra negleca*	+	-	-

15.	*Tetraedron trigonum*	-	-	+
16.	*Tribonema bombycium*	+	+	+
17.	*Ulothrix zonta*	+	+	+
18.	*Volvox sp.,*	+	+	+
19.	***Zygnema sp.,***	+	+	+
	B. Class- Bacillariophyceae			
20.	*Cymbella cistula*	+	+	+
21.	*Cocconesis sp.,*	+	-	+
22.	*Diatom species*	+	+	+
23.	*Fragillaria vulgaris*	+	+	-
24.	*Gomphonema constrictum*	+	-	-
25.	*Melosira granulate*	+	+	-
26.	*Navicula cuspidate*	+	-	+
27.	*N. gracilis*	+	-	-
28.	*N. radiosa*	+	-	+
29.	*Pinnularia major*	-	+	-
30.	*Synedra acus*	+	-	-
31.	*S. affinis*	-	+	+
32.	*S. ulna*	+	+	+
33.	*Tabellaria fenestrate*	+	+	-
34	*Tabellaria floculosa*	+	-	+
	C. Class- Cyanophyceae			
35.	*Anabaena constricta*	+	+	+
36.	*Anacystis sp.,*	+	+	+
37.	*Chroococcus species*	+	+	+
38.	*Gomphosphaeria*	+	-	-
39.	*Microcytis aerugenose*	-	-	+
40.	*Nostoc sp.,*	+	+	+
41.	*Oscillatoria chlorine*	+	+	+

42.	*O. limosa*	+	+	-
43.	*Spirulina sp.,*	-	+	-
	D. Class- Desmidiaceae			
44.	*Closterium dinae*	+	+	+
45.	*C. glabulosa*	-	-	+
46.	*C. reniforme*	+	+	-
47.	*C. tenue*	-	+	+
48.	*Cosmarium contractum*	+	+	-
	E. Class- Euglenophyceae			
49.	*Euglena acus*	+	-	+
50.	*E. gracile*	+	+	+
51.	*E. oxyuris*	+	-	-
52.	*E. proxima*	-	+	-
53.	*E. viridis*	+	-	+

The present study shows Cyanophyceae and Chlorophyceae are dominant over other two groups. The result shows the highest pH (7.27), E.C. (0.28 ohms/cm), DO (7.65 mg/l), COD (14.89 mg/l), total hardness (85.63 mg/l), and alkalinity (98 mg/l) is recorded at Mahadare reservoir. The highest BOD (10.23 mg/l) is recorded at Kanher dam. The highest chloride (43.33 mg/l) & TDS (1512 mg/l) were also recorded at Mahadare reservoir. The analysis of water bodies in the present work indicates that water from Mahadare reservoir is hard water as compared to water from Kas and Kanher reservoir because parameters like hardness, alkalinity, COD, BOD chloride & TDS shows comparatively high values than that of Kas & Kanher reservoirs and also high plankton diversity but they are within permissible limit of WHO and ICMR. The investigation shows that these classes of phytoplankton showed considerable fluctuations with water quality parameters. Analysis also shows some pollution tolerant algae like Oscillatoria sp., Pediastrium sp., Closterium sp., Navicula sp., Microcytis sp., and Scenedesum sp. Hence there is need of regular monitoring of water before it is used for drinking and domestic purposes.

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