Phytoplankton biodiversity of Ottakkal reservoir, Kerala.

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ABSTRACT

The Ottakkal reservoir is located between latitude 8^0 49' and longitude $77^0$16' and $76^0$24' E . The physico-chemical parameters showed only slight variations. Out of 35 species of phytoplankton recorded , 10 belonged to Bacillariophyceae, 15 Chlorophyceae, 9 Cyanophyceae and 1 Desmidaceae. The Chlorophyceae represented the maximum density throughout the period of the study. It was maximum during November to April and minimum during June to September. The Cyanophyceae was noticed only during March and April. The observations showed the maximum density of phytoplankton in winter and the minimum density during rainy periods . The low temperature and velocity coupled with good transparency of water may be considered as the factors that favoured optimum growth of the phytoplankton of the Ottakkal reservoir during winter.

Key words: Ottakkal reservoir, Phytoplankton, Organic matter, Physico-chemical parameters.

INTRODUCTION

A large number of impoundments have been created in the country since independence to harness river waters for the purpose of irrigation, power generation, flood control and navigation. Construction of a dam and the resultant creation of a new artificial impoundment result in altered hydrology both up and downstream. As the reservoir exhibits wide degree of variations on their shape, runoff, soil type, climatic factors and human interference, the problems related to fishery management and their solutions are location specific. The Parappar reservoir was created by constructing a dam across Kallada river at Thenmala with a gravity masonry dam, aligned perpendicular to the centre line of the Kallada river. The watershed upstream of the dam is covered mainly by forests and plantations. Three rivers namely, the Kalthuruthy, Shendurni and Kulathupuzha rivers flow through this water shed and falls into the reservoir. For any scientific utilization of water resources, the study of phytoplankton and physico-chemical characteristics of water are of primary interest . Phytoplankton groups such as Cyanophyceae, Bacillariophyceae, Chlorophyceae and Desmidiaceae are seldom distributed completely at random due to variations in reproductive patterns, microhabitat preferences or grazing. Most have an uneven distribution despite the fact that they are constantly mixed by water movement. Almost all phytoplankton are dependent upon a single season growth or a physical redistribution of resting stages to their annual maximum (Lund 1965). Virtually all dynamic features of rivers and reservoirs such as colour, clarity, trophic state, water taste or zooplankton and fish production depend to a large degree on the phytoplankton (Boney 1975). This paper reports the physico-chemical parameters and phytoplankton of the Ottakkal reservoir.

MATERIALS AND METHODS

Regular monthly collections were undertaken from three different sites of the reservoir during June 2017 to May 2018. Samples from surface and bottom layers were taken with the help of a Nansen bottle. The physico-chemical parameters were analysed using methods described by Welch (1948) and APHA (1976). The pH was determined using an electronic pH meter, turbidity with turbidity meter, transparency with a Secchi disc and velocity by a current meter. Collection of plankton was made by filtering 50 litres of water through bolting silknet No. 20 mesh. The plankton counts in terms of a single cell, a colony or a filament were made by drop method.

RESULTS AND METHODS

The physico-chemical parameters in the Parappar reservoir showed only a marginal variation (Table 1). Out of 35 species of phytoplankton recorded (Table 2), population of Chlorophyceae represented the bulk of the phytoplankton throughout the period of the study, it was maximum during November to April and minimum during June to September. The Bacillariophyceae followed the same trend of seasonal abundance. The velocity and water level affected the phytoplankton population. Desmidiaceae was noticed only during March and April. The observation showed the abundance of phytoplankton in winter and the rains bring down their number. The situation in the Parappar reservoir appears to be in sharp contrast to that found in Amaravathy reservoir and Neyyar reservoir (Sreenivasan 1965 ; Nair & Prabhoo 1977), where maximum phytoplankton was recorded in winter months. This study support the observations of Holden and Green (1960) and Bhatt and Negi (1984) in that temperature when combined to some other physico-chemical factors, has less significant effect on the abundance of phytoplankton. The low temperature and velocity coupled with good transparency of water may be considered as the factors that favoured optimum growth of the phytoplankton of the Parappar reservoir during winter.

A close relationship between turbidity and velocity and planktonic biomass was observed. A rise in turbidity from May onwards was related to higher velocity of water resulting from greater rainfall leading to silting, disturbances in normal Oxygen- Carbondioxide exchange, consequently an inhibition of photosynthesis of the phytoplamkton. The adverse effects of turbidity on phytoplankton was probably due to the “blanketing effect” of suspended materials which interfere with photosynthetic activity (Welch 1952). A low transparency during rainy season may be ascribed to the increase in the non-algal suspended soils. The data on total solids were in coincidence with turbidity and rain. During winter the dissolved Oxygen reached the peak and free Carbondioxide remained less while a reverse situation occurred in the rainy season. The results indicate that the fall in dissolved Oxygen and the rise in CO_2 during rainy season should be ascribed to retarded photosynthetic activity of the phytoplankton or to decreased concentration of Oxygen being consumed by the organic matter in turbid state of water during low phytoplankton density.

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Table 1. Monthly variations in physico-chemical parameters of the Ottakkal reservoir

Month	Turbidity (mg/l)	Velocity (m/sec)	Transparancy (%)	Total solods (mg/l)	Total hardness (mg/l)
June 1987	42	2.651	37.6	415	59
July	39	2.614	26.0	435	48
Aug.	49	2.413	24.8	489	75
Sept.	21	2.118	55.4	398	69
Oct.	15	2.115	70.9	287	91
Nov.	10	1.264	98.6	164	86
Dec.	09	0.795	97.6	161	83
Jan. 1988	06	0.715	Total	136	121

Feb.	09	0.876	70.7	190	132
Mar.	26	0.997	40.7	236	145
Apr.	27	0.987	89.7	243	143
May	35	2.543	65.7	289	140

Table 2. Monthly abundance of phytoplankton of the Ottakkal reservoir during June 2017 to May 2018

Taxa	Jun.	Jul.	Aug	Sept	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
BACILLARIOPHYCEAE *Rhizobium, Tabellaria, Fragillaria, Synedra, Achanthes, Navicula, Stauroneis, Pleurosigma, Nitzschia, Surirella*	• •	•	•	• •	• •	• • •	• • •	• • •	• • •	• • •	• • •	• •
CHLOROPHYCEAE *Tetraspora, Ulothrix, Microspora, Pediastrum, Kirchnerilla, Treubaria, Scenedesmus, Mougeotia, Spirogyra, Netrium, Cosmarium, Micrasterias, Euastrum, Staurastrum, Hyalotheca*	•	•	•	•	•	• • •	• • •	• • •	• • •	• • •	• • •	• •
CYANOPHYCEAE *Aphanocapsa, Coelospharrium, Policystis, Oscillatoria, Phormidium. Homeothrix, Anabaena, Nodularia, Clathrocystis*	_	_	_	_	_	_	_	_	_	• •	• •	_
DESMIDIACEAE *Closterium*	_	_	_	_	_	_	_	_	_	• •	• •	_

(- = Absent , • = 5.2 % coverage, • • = 25.5 % coverage, • • • = 50 % coverage)