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Research Article

STUDIES ON PHYSICO-CHEMICAL PARAMETERS AND PRIMARY PRODUCTIVITY OF KALLAYI RIVER, CALICUT, KERALA, INDIA

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ABSTRACT

The analysis of physico-chemical parameters were carried out during June 2015 to May 2016 from Kallayi River, Kerala, India. The maximum water and air temperature were observed in summer season (May). The water is more transparent during summer season (May). The maximum pH value is observed in summer season (May). The water showing more dissolved oxygen during the rainy season (November). The maximum carbon dioxide content of the river was reported in the rainy season (June). The alkalinity is observed maximum during summer season (April). The maximum electrical conductivity in water was observed in the winter season (December). The maximum total dissolved solids were reported in summer season (May). The total suspended solids reported maximum during summer season (May). Dissolved nutrients like nitrate, phosphate and silicate were reported accordingly. Nitrate maximum during in rainy season (September), phosphate maximum in summer season (May) and the silicate maximum in the rainy season (June). The maximum gross primary productivity reported during summer season (May).The maximum net primary productivity and gross primary productivity was observed in the rainy season (May) and the maximum community respiration was reported during summer season (April).

Keywords: Physico-chemical parameters, Primary productivity, Kallayi river, Kerala.

INTRODUCTION

The water quality is mean by its physical, chemical and microbial characteristics. The proper maintenance of oceans, rivers, lakes, ponds and canals is depended on the physico-chemical properties and biological diversity of the river. The disturbance of any of these water properties effects the growth and reproduction of aquaculture species. The change in the quality of water directly or indirectly affects the human, other water and land organisms. The discharges of domestic sewage from a population are one of the main causes of water pollution and that make the change in the water quality by WHO (1985). There are about two million people phase numerous water-borne diseases such as cholera, typhoid, etc.

The regular checking of aquatic ecosystem required on large number of parameters that ensure not only to prevent the exposure of diseases but also the formation of wastes from various sources. The regular monitoring of water also helps the aquatic ecosystem from further deterioration by Kutty (1987). The studies on physico-chemical characteristics of river water of Ganga in middle Ganga plains have been reported by (Leena Singh and Choudhary, 2013).

Water pollution has however threatened to reduce the quantity in ponds, lakes and rivers and reservoirs due to disposal of sewage, industrial water and due to other human activities, Trivedi and Chandrasekhar (1999). Sinha *et al.* (1990) carried out the assessment of drinking water quality of Santhal Pargana Bihar. The water quality of reservoirs and temple tanks at Tirupati and Tirumala was studied by (Naidu *et al.*, 1990). The children is inhabit nearby a polluted water bodies can leads dangerous malignant diseases such as cancer, other chronic diseases, etc. The proper maintenance of the water quality helps eradicate all water born disease that directly or indirectly affect human as well as other land and water organisms by Nautiyal (1986).

The good water quality will reduce environmental consequence and increase the rate reproduction in the aquatic ecosystems. The variation in the river water quality

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and quantity is widely studied in the case of several world rivers. The present investigation is to analyze the seasonal variation of water quality and the phytoplankton productivity of Kallayi River, Kerala.

MATERIALS AND METHODS

The seasonal variation of water quality and phytoplankton productivity of Kallayi River, Kerala, and the experiment is started from 15th June 2015 to 15 May of 2016. The water samples were taken every month for the study and it continued up to 12 months. During the time of sampling, the air temperature and water temperature was noted with the help of mercury filled Celsius thermometer as the minimum the thermometer should have a scale marked for 1 degree with marking edged on the capillary glass. The transparency was recorded with the help of Seechi's disc, Meter scale with the pen. The pH of the pond water was measured with the help of Ph digital pen (Elico model). The dissolved oxygen content of the pond water was estimated by Winkler's method. The carbon dioxide content of the pond water sample was estimated by Titrimetric method. The alkalinity was determined by titrating known volume of the water sample with 0.02 MHCl. The total dissolved solid (TDS) was determined by gravimetrically by evaporating a known volume of water to dryness in a pre-weighed crucible on a steam bath. The primary production was estimated by observing the post-incubation changes in dissolved oxygen concentrations in the water collected from the sampling site in light and dark bottles following the method of Gaarder and Gran (1927). The mean result of all experimental result is reported. A 500 ml beaker was taken then weighed and labelled as A. 500 ml of water sample was taken in the same beaker and evaporated till dryness over a heater. Now the beaker weighed and cooled then labelled as B. (B-A) × 2 gives the total solids present in the water sample in mg/l. Take 500 ml of another beaker and filtered through a pre-weighed filter paper. The two filter paper difference gives the total suspended solids (TSS). The filtrate was taken in a pre-weighed beaker and evaporated till dryness. The beaker cooled and weighed. The two weights of beaker difference give the total dissolved (TDS) solids present in the water.

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RESULTS

The water temperature ranges from 24°C to 33°C. The water temperature is least in June. The air temperature is varied from 26°C to 35°C. The air temperature is least in the month of June. The water is more transparent in the month of May (16.5 inches). So the light penetration is more in this month. The monthly pH variation is ranged between 7.12 and 8.12. The minimum value of pH was reported the month of June. The dissolved oxygen range varied from 0.46 to 4.21. The minimum dissolved oxygen in April. The maximum dissolved oxygen in November. The free carbon dioxide ranges from 3.2 and 3.96. The maximum carbon dioxide was observed in June. The minimum level of dissolved carbon dioxide was observed in December. The alkalinity is varied from 86.02 to 116.4. The level of alkalinity maximum in April and the minimum was observed in December. The total dissolved solids were varied from 2.23 to 4.26. The high total dissolved solid content was in May. The minimum total dissolved solids content was reported in July. The total suspended solids were varied from 2.05 to 4.04. The high total suspended solids content was in May. The minimum total dissolved suspended solids content was reported in July. The electrical conductivity ranged from 4.21 to 5.06. The minimum level of electrical conductivity was reported in May and maximum was in December. The level of nitrate ranged from 0.50 to 1.56. The minimum level of nitrate was reported in February and maximum is in September. The phosphate level ranges from BDL (Below detection limit) to 0.20. BDL is in June and September and the maximum is in May. The Silicate is ranged from 0.74 to 6.78. The minimum level of silicate was reported in April and maximum level was reported in June (Table 1). The gross primary productivity of the pond is varied from 0.86 to 2.62. The maximum gross primary productivity was reported in May. The minimum gross productivity was reported in December. The net primary productivity of is varied from 0.51 to 1.96. The minimum net primary productivity was reported in February. The maximum net primary productivity was reported in May. The community respiration ranged from 0.30 to 0.78 (Table 2). The minimum community respiration was observed in September and maximum community respiration was reported in April.

Table 1. Monthly variation ofphysico-chemical characteristics.

Parameters	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Water temperature (^{0}C)	24	26	28	29	27	27	26	27	30	31	32	33
Air temperature (^{0}C)	26	27	29	31	30	31	29	29	31	33	34	35
Transparency (Inches)	4.5	5.6	6.4	6.6	6.9	7.2	7.5	8.8	8.9	11.5	14.4	16.5
pH	7.12	7.14	7.29	7.32	7.44	7.46	7.45	7.52	7.55	8.10	8.16	8.22
Dissolved oxygen (mg/l)	1.56	2.46	1.60	2.26	2.31	4.21	3.30	2.32	3.66	0.78	0.46	0.64
Free CO_2 (mg/l)	3.96	3.72	3.11	3.68	3.92	3.16	3.02	3.68	3.54	3.45	3.84	3.64
Total alkalinity (mg/l)	89.03	86.02	112.23	108.65	106.63	105.61	102.35	98.89	115.40	111.20	116.40	108.64
Total dissolved solids	3.26	2.23	3.32	2.95	3.65	3.78	3.94	3.98	4.04	4.06	4.12	4.26
Total suspended solids	3.65	2.28	2.96	2.05	2.63	3.42	3.18	3.22	3.64	3.94	3.82	4.04
Electrical conductivity (EC)	4.44	4.54	4.48	4.58	4.36	4.58	5.06	4.58	4.52	4.56	4.65	4.21
Nitrate (mg/l)	1.24	1.05	1.19	1.56	1.46	0.98	0.64	0.68	0.50	0.52	0.54	0.59
Phosphate (mg/l)	BDL	0.08	0.14	BDL	0.11	0.10	0.12	0.13	0.15	0.13	0.19	0.20
Silicate (mg/l)	6.78	6.20	6.14	5.83	4.41	3.98	5.12	3.24	3.85	1.92	0.74	0.86

Table 2. Monthly variations in Gross primary productivity (G.P.P), Net primary productivity (N.P.P) and Community respirations (C.R).

Primary productivity parameters	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Gross primary productivity (G.S.S)	1.21	1.20	1.26	1.12	1.02	1.12	0.86	0.96	1.01	1.68	2.60	2.62
Net primary productivity (N.P.P)	0.82	0.86	0.84	0.82	0.64	0.78	0.53	0.52	0.51	0.98	1.82	1.96
Community respiration (C.R)	0.39	0.34	0.42	0.30	0.38	0.34	0.33	0.44	0.50	0.70	0.78	0.66

DISCUSSION

The physico-chemical parameters and productivity of phytoplankton of Kallayi river, Kerala were studied. The maximum pollution reported in throughout the year of 2015 to 2016. The river showing the much pollution because of dumping the large number of woods, industrial effluents and hospital, plastic equipment directly or indirectly into the water bodies. The bathing of people results in direct mixing of soaps and other chemicals into the water bodies. The bubble from soaps and oils cover water surface and reduce the oxygen catchment of pond water. The other hospital utensils also adversely affect the water organisms.

The dumping of wastes into water body results from the variation phytoplankton productivity (Ormerod *et al.*, 1997). When the more wastes dumped in that time the river water showing more changes in the physical and chemical water quality and results increase in the production of phyto-zooplankton community.

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