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SEASONAL VARIATIONS IN PHYSICO-CHEMICAL PARAMETERS OF PUTHUKULAM POND, PUDUKKOTTAI, TAMILNADU

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ABSTRACT: The water samples were collected from freshwater aquaculture pond in Puthukulam at Pudukkottai town, Tamilnadu. Pond water was monitored at monthly intervals from November 2015 to October 2016. The data measured from different seasons showed seasonal variations with respect to temperature (21-33^{o}C), turbidity (35-51cm), pH (7.2-8.2), dissolved oxygen (7.3-2 ml/lit), Chemical Oxygen Demand (20.2-52.0 ml/lit) total hardness (110 - 170 ml/Lit), Potassium (2.7- 3.5), Phosphate (0.02-0.50 mg/lit), Alkalinity (122-165), sulphate (25.2-43.0) and nitrate (0.15-0.40). Temperature, pH, Dissolved Oxygen, Total hardness, sulphate and nitrate were found to maximum in the period of summer. Turbidity, Alkalinity, Potassium and Sulphate were recorded maximum during monsoon.

KEYWORDS: Water quality, Pond, Variation, Seasons.

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1. INTRODUCTION

In fresh water aquaculture the quality of water is one of the most important factors. The study of these parameters helps to develop strategies to monitor water quality parameters and to implement schemes to maintain water quality. Water management aims to provide water suitable for the cultured organisms and to minimize water fluctuations. A sufficient supply of good quality water is essential to any aquaculture operation. The seasonal and diurnal variations in physico-chemical and biological parameters of perennial fresh water ponds have been reported [1]. Ponds are found inside the temples or outside the temples. Temple management imposes restrictions over misuse of these holy ponds;

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therefore they remain comparatively clean [2]. Water is one of the most common and the most precious resources on earth, without which there would be no life on earth. Pollution is a serious problem as 70% of India's surface water resources and ground water reserves have been contaminated by organic, inorganic and biological pollution [3-6]. Water quality is important in pond aquaculture because water quality imbalances can cause stress, poor growth, and mortality of culture species .Water quality is strongly influenced by feed inputs, and ponds with high feeding rates frequently have more severe problems with low dissolved oxygen concentrations and excessive concentrations of ammonia and nitrite than ponds with low or moderate feeding rates [7]. It is a common freshwater fish which is abundantly found in ponds, lakes and canals of India. In fisheries ground water is widely used in various stages as in hatchery operation and in aquaculture [8]. The physic-chemical parameters such as air temperature, water temperature, pH, total hardness, alkalinity, potassium, nitrate, sulphate, phosphate, dissolved oxygen, biological oxygen demand and chemical oxygen demand are some of the chemical factors usually measured in hydro-biological study. About 97.2% of water on earth is salty and only 2.8% is present as fresh water among which about 20% occurs as ground water. Ground water is highly valued because of certain properties not possessed by surface water [9]. Physico-chemical parameters of wads Aggai waters have been reported [10, 11]. Observed variability of physic-chemical and biological parameters between replicated out-doors fresh water lentic mesocosms. Singh and Sharma [12] observed hydrological parameters and primary production in a fish pond manured with different organic manures. Many workers [13-20] reported the seasonal variations of physic-chemical parameters of fresh water bodies. The present paper reports the seasonal variation in physico-chemical parameters of fresh water pond, Puthukulam at Pudukkottai.

2. MATERIALS AND METHODS

The water samples were collected from fresh water pond, Puthukulam, Pudukkottai located at Tamilnadu, India. Station I and II samples of water were collected monthly intervals for a period ranging from November 2015 to October 2016. Pond water samples were collected in sterilized bottles of 500 ml capacity at a depth of about 30 cm. The sample is fixed soon after collection and taken to the laboratory for analysis. The water samples were analysed by using standard methods [21]. The Temperature and pH were recorded on the site immediately after the collection of the sample mercury thermometer was used to measure temperature, Sacchi disc and pH meter were used to measure turbidity and pH respectively. Other physico-chemical parameters were determined by different method [7, 22.].

3. RESULTS AND DISCUSSION

The range of physico-chemical parameters are presented table 1 and 2. The temperature of pond water ranged between 20-33^{o}C having maximum temperature in the month of July 2016 (summer) and minimum during January 2016 (winter). Turbidity of the pond water varied from 35-55 cm,

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having maximum during May 2016 (summer) and minimum in October 2016 and November 2015 (monsoon). The pH of the water showed alkaline range throughout the study period. It varied from 7.2-8.2, having maximum in May 2016 (summer) and minimum in September 2016 (monsoon). Dissolved oxygen varied from 7.3-8.3 mg / lit having maximum in July 2016 and minimum January 2016. Many workers [14-21] found similar results as observed in the present study. The present study focused the monthly variations of physic-chemical parameters to monitor the pond ecosystem. Highest level potassium present in the 3.1 point August 2016 at the same month BOD 3.6 highest level was noted. Table 1 dissolve oxygen three period same levels increased because animal phytoplankton and zooplankton consumption work was high noted in at the same. Table 2 Air temperature and water temperature gradually increased compared than others may month 2016. The potassium level march and October month gradually increased compared than other month variation. In the present study potassium low level noted at 2016 January to reflex aquatic micro organism less amount accumulated in the particular periods. The pH is an important factor that determines the suitability of water for various purposes. The pH of the pond depends on water flow and nutrient strategy. Thus present study highest dissolve oxygen level was noted December 2016 makeable levels present at the experimental periods. Similar findings were reported by many workers [23-31]. The value of pH and their influence on organism were reported by many workers [1, 3, 32]. The fluctuation in water temperature usually depends on the season, geographic location, sampling time and temperature of effluents entering the stream. Temperature showed significant positive correlation with BOD and COD and had a negative correlation with pH. The present study agrees with earlier observations [1, 10, 33]. Potassium showed summer maximum and minimum July station - II. Correlation analysis indicates potassium has significant a negative correlation with sulphate, BOD and COD reported by earlier workers [34]. Nitrate is another important element which influences the productivity water and showed significant positive correlation with BOD and COD, and negative with DO. Similar finding was reported by earlier worker [35]. The results indicated that analyzed parameters were normal range and the pond water is relatively less contaminated.

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Table 1: Monthly variations of major physico-chemical parameters of the fresh water pond in Station I, Puthukulam, Pudukkottai.

Parameter	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	June 2016	July 2016	Aug 2016	Sep 2016	Oct 2016
Air temperature (°C)	29	23	21	25	28	31	32	34	35	32	31	30
Water temperature (°C)	27	22	20	24	27	30	31	32	33	30	30	28
pH	7.3	7.5	8.2	8.0	7.6	7.8	8.2	7.5	8.0	7.6	7.2	7.4
Alkalinity (mg/l)	138	130	122	145	148	150	160	146	127	165	150	125
Turbidity	35	45	50	51	40	45	55	52	48	45	40	35
Total hardness (mg/l)	155	125	135	110	115	170	160	140	150	140	120	110
Potassium (mg/l)	2.7	2.8	3.5	4.2	4.5	4.2	4.2	2.7	2.8	3.1	2.9	2.8
Nitrate (mg/l)	0.18	0.16	0.22	0.24	0.20	0.40	0.18	0.16	0.20	0.15	0.18	0.20
Sulphate (mg/l)	25.2	28.2	30.1	26.8	40.0	43.0	38.6	26.8	32.0	42.0	40.0	38.4
Phosphate (mg/l)	0.02	0.22	0.30	0.16	0.09	0.15	0.12	0.16	0.30	0.20	0.50	0.03
Dissolved oxygen (cc/l)	8.0	7.5	7.3	7.4	7.6	8.2	7.6	8.0	8.3	7.8	8.0	7.6
BOD	1.7	3.2	3.2	4.2	2.7	3.6	2.2	2.0	2.2	3.6	1.8	2.0
COD	23.6	30.0	34.0	52.0	26.6	20.2	25.0	28.6	20.4	21.3	22.6	22.4

Table 2: Monthly variations of major physico-chemical parameters of the fresh water pond in Station II, Puthukulam, Pudukkottai. 2016.

Parameter	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	June 2016	July 2016	Aug 2016	Sep 2016	Oct 2016
Air temperature (°C)	28	29	28	27	30	31	35	34	30	28	27	26
Water Temperature (°C)	27	25	27	25	28	29	32	30	30	28	25	26
pH	7.8	7.6	7.5	8.0	8.2	8.4	8.0	8.0	7.8	7.5	7.2	7.4
Alkalinity (mg/l)	122	190	120	130	150	180	170	150	130	120	130	170
Turbidity	34	43	48	49	38	43	54	51	49	43	39	33
Total hardness (mg/l)	140	120	130	140	120	110	130	110	130	120	130	110
Potassium (mg/l)	2.8	3.2	3.0	2.7	3.8	3.4	3.6	3.0	2.6	3.0	3.6	3.8
Nitrate (mg/l)	0.26	0.28	0.20	0.26	0.20	0.18	0.28	0.30	0.18	0.40	0.32	0.30
Sulphate (mg/l)	40.7	29.8	29.5	21.5	29.5	26.8	26.6	27.2	36.2	36.2	35.8	36.6
Phosphate (mg/l)	0.28	0.21	0.19	0.33	0.29	0.46	0.37	0.29	0.25	0.37	0.23	0.33
Dissolved oxygen (cc/l)	8.1	9.1	9.3	8.0	8.1	7.8	8.3	7.9	7.7	8.1	8.6	8.4
BOD	3.6	4.0	4.2	4.0	2.2	2.6	2.7	3.2	2.7	4.2	3.7	3.8
COD	20.2	18.8	19.6	20.2	18.8	26.7	20.2	22.6	30.2	29.2	18.6	17.8

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4. CONCLUSION

The present study carried out in the fresh water pond indicates that the water quality parameters were within the normal range. The fluctuation of phosphate, potassium, nitrate and sulphur were due to inflow of urban runoff water with wastages. The pond water can be used for domestic works and pisiculture.

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CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

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