BioGecko Vol 12 Issue 03 2023

ISSN NO: 2230-5807

Water quality Assessment of a Lentic Ecosystem Valiakulam Pond at Thiruvanathapuram District in Kerala, India

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Abstract
The study on the water quality assessment of surface water from Valiakulam pond, a lenthic ecosystem in Kerala, India was subjected to study for a period of two years. The water samples were collected on a monthly basis from the pond and analysed the physico chemical parameters based on standard laboratory methods and procedures (APHA,2005[1]).The present study aimed to analyse the efficacy of pond water for various domestic purposes. The pond has been functioning as a major water source for drinking, irrigation and agriculture etc for the local people. The parameters of water such as temperature, pH, transparency, turbidity, conductivity, hardness, alkalinity, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and free carbon dioxide (CO_2) were studied from four stations of the pond. Results of the data were subjected for statistical analysis such as correlation and Two way ANOVA with post hoc test.. The results revealed that positive and negative correlation was observed between the physicochemical parameters.The results of ANOVA showed significant difference between the seasons and no significant difference was observed between the study sites($P<0.05$). The results of the study also revealed that the pond water is not polluted, and the parameters studied were within the limits prescribed by the WHO for drinking water.
Keywords: Water quality, Physicochemical, Valiakulam pond, BOD, COD, Alkalinity.Dissolved Oxygen, Conductivity

Introduction

Human beings and many animals utilizes ponds at different times to meet different needs or different purposes. Due to high population and fast urbanization, water resources are reduced day by day and water quality decline at present is a global problem (Mahananda et al., 2010[2]). In determining the trophic status of aquatic habitats, the physico chemical parameters of water have an important role (Sharma et al., 2009[3]). The term water quality includes physical, chemical and biological parameters of water and how they directly or indirectly control the life of organisms present in that habitat. These ecological parameters and seasonal variation affect the population density and distribution of plants and animals and provide sustainability of water for its designated uses and improve existing conditions. The study of physico chemical parameters is most relevant for analysing the metabolic events in an aquatic environment. The parameters influence each other and modulate the distribution and abundance of fauna and flora (Shinde et al.,2011[4]). There were no detailed scientific reports available on physicochemical parameters of water from the present ecosystem, hence the present study was undertaken to assess the physicochemical parameters of surface water from the pond to predict the utility of water for various purposes to satisfy the basic need of local people.

Review of Literature

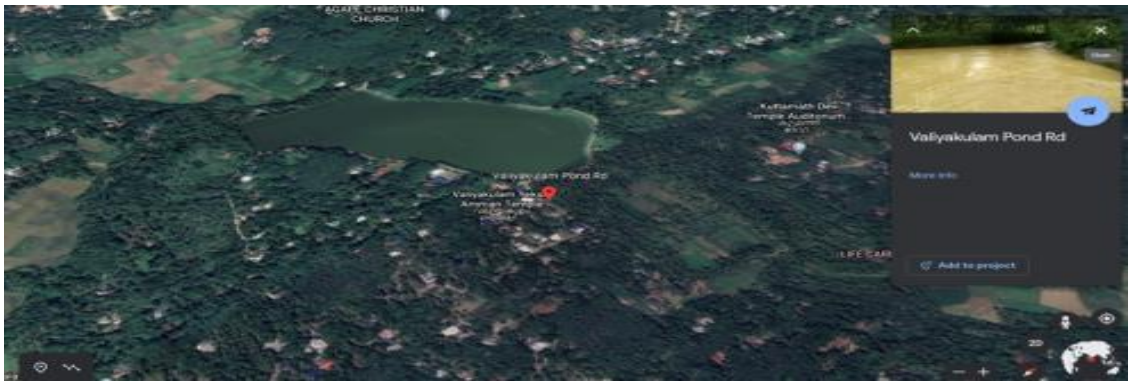
The studies related to lentic and lotic ecosystems are always essential to predict the status report of the environment as well as to include these in the planning strategies of the Government programmes. .Limnological investigations on water bodies based on physicochemical parameters and its various

aspects pertaining to ponds are reviewed from an Indian contest. Number of scientific reports pertaining to physicochemical parameters of water and sediments, seasonal variations, ecological aspects of ponds, plankton and productivity etc. are available. (Munawar, 1970[5]), (Odum,1971[6]) (Sreenivasan ,1974[7]), (Khan et al.,1978[8]),(Shardendu & ambasht,2000[9]) (Vasisht & Sharma1975[10]), (Sharma ,1983[11]) ,(Jindal & vasisht ,1985[12]), (Mahajan &Mandovi ,1993[13])(Singh et al.,2002[14]), (Sandeep arya et al., 2011[15]), (sahni & Yadav, 2012[16]) (Sandya & Benerjee 2016[17]) ,(Meenakshi,2019[18]), (Boyd,1973[19]), (Sreenivasan, 1976[20]),(Mandal,1977[21]). The literature survey revealed a paucity of literature in this area. The pond ecosystems are unique in various aspects of physical and chemical characteristics with respect to the locality and the involvement of human and other living things.

Materials and Methods

Study area

The present study site-Valiyakulam pond which extends to an area of 0.101 sq.km and located at Chenkal village in Thiruvananthapuram District, Kerala.(8º21'31''N latitude and 77º5'58''.E longitude). The state Kerala in the Southern part of India near TamilNadu.The pond is situated 31 km from Trivandrum railway station and 66 km from Kanyakumari, Tamil Nadu. The pond is anthropogenic and its water has been used for domestic purposes and irrigation. Study was undertaken to investigate water quality of Valiakulam pond because of its importance in ground water recharging as well as irrigation, aquaculture and agriculture activities. Four study sites named as site 1,2,3 and 4 were selected for collecting samples. The four sampling sites were selected based on the intensity of anthropogenic disturbances in the pond. The visible physical changes in the pond system were taken as the index in the selection of sampling sites; the pond serves as water reservoirs for agriculture, washing cloths and for drinking and washing domestic animals. This study will be useful in current water resource planning and provide some basic data for the rational exploitation and use of the present water resource in future. The pond is surrounded by semi urban and agricultural area with great potential and scope for agriculture and aquaculture .The mean depth of the pond is 0.765m



Methodology

Collection of samples

The water sample collection for the study was carried out for a period of one year from June 2017 to December 2018.Monthly water samples were obtained from four selected study sites in the ponds.(site 1,2,3 and 4).The samples were collected between 7-8 A.M. in polythene cans and transported the laboratory for analysis. Some physicochemical characteristics of water were recorded at the site, such as temperature, pH, and transparency were determined by thermometer, digital pH meter and Sechis disc respectively. While some parameters like dissolved oxygen, alkalinity ,and hardness were analysed by titrimetric methods in the laboratory. The other parameters like turbidity, conductivity, Biological Oxygen Demand, (BOD),Chemical Oxygen Demand (COD)and free carbon dioxide (CO_2), were analysed as per the standard procedures(APHA, 2005[1]), and (Trivedy & Goel, 1986[22]).

Statistical analysis

The monthly data on physico chemical parameters were pooled and the mean values were calculated for each study site. . Pearson correlation coefficient was applied to measure the statistical relationship between different variables and also to find the magnitude of the correlation between the physico chemical parameters during the period of study(2017-2018).Two way ANOVA was carried out to find out any significant difference between the study sites and seasons.

Results

The results of mean values of the various physicochemical parameters (temperature, pH,transparency,turbidity,conductivity,hardness,alkalinity,dissolved oxygen(DO),Biological oxygen demand (BOD),Chemical oxygen demand (COD) and free carbon dioxide (CO_2) during the study period of two years (January 2018 to December 2019)(Table.1) and the Pearson's correlation matrix were summarised in Tables 2,3, 4 & 5. The results of Two way ANOVA in Table 6.

Table.1.Mean values and Standard Deviations of physicochemical parameters of Valiakulam Pond (June 2017-December 2018).

Parameters		Site 1	Site 2	Site 3	Site 4
Temperature (^{0}c)	A.T	31.875±2.252	31.792±2.340	31.833±2.444	31.667±2.220
	W.T	28.958±2.196	28.917±2.283	28.833±2.297	28.708±2.216
pH		6.99±0.264	6.995±0.259	6.982±0.273	6.997±0.281
Transparency (cm)		35.417±2.653	35.250±2.558	35.375±2.763	35.292±2.38
Turbidity(NTU)		12.458±3.362	12.250±3.300	12.500±3.349	12.042±3.155
Conductivity (µmho/cm)		137±11.665	136.792±12.83	136±11.68	136.67±10.765
Hardness(mg/L)		29.042±7.927	27.958±7.937	29.167±8.6	29.708±8.80
Alkalinity (mg/L)		3.67±1.17	3.754±1.18	4.87±1.34	4.663±1.3
DO(mg/L)		4.892±1.842	4.83±1.885	4.917±1.611	4.554±1.917
BOD (mg/L)		7.863±2.77	7.467±2.84	7.679±2.90	7.633±2.19
COD (mg/L)		30.042±5.704	30±5.690	30.250±5.883	29.875±5.776
CO_2 (mg/L)		5.250±1.92	5.12±1.482	5.246±1.90	5.104±1.508

Table 2: Correlation analysis among various physicochemical parameters of Valiakulam Pond(Site.1)

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
A1		0.896	-0.728	0.752	-0.630	0.771	0.656	0.716	-0.719	0.794	-0.681	0.773
A2			-0.762	0.712	-0.716	0.804	0.743	0.755	-0.787	0.834	-0.766	0.834
A3				-0.562	0.800	-0.703	-0.675	-0.598	0.856	-0.772	0.836	-0.735
A4					-0.578	0.898	0.813	0.909	-0.695	0.873	-0.580	0.908
A5						-0.783	-0.702	-0.730	0.923	-0.847	0.942	-0.825
A6							0.873	0.957	-0.879	0.972	-0.791	0.968
A7								0.819	-0.863	0.922	-0.664	0.880
A8									-0.799	0.918	-0.734	0.942
A9										-0.939	0.909	-0.897
A10											-0.843	0.976
A11												-0.840
A12												

Correlation coefficient values all are significant.(P<0.01)

A1-Atmospheric temperature, A2-Water temperature, A3-pH, A4-Transparency, A5-Turbidity A6-Conductivity, A7-Hardness, A8-Alkalinity, A9-Dissolved Oxygen, A10-Biological Oxygen Demand, A11-Chemical Oxygen Demand,A12-Carbon dioxide.

Table 3: Correlation analysis of various physicochemical parameters of Valiakulam Pond(Site.2)

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
A1		0.868	-0.704	0.677	-0.629	0.712	0.619	0.663	-0.692	0.760	-0.677	0.747
A2			-0.761	0.800	-0.788	0.851	0.791	0.813	-0.854	0.894	-0.820	0.906
A3				-0.567	0.790	-0.715	-0.684	-0.615	0.838	-0.776	0.844	-0.735
A4					-0.667	0.866	0.778	0.841	-0.713	0.868	-0.645	0.887
A5						-0.842	-0.751	-0.779	0.946	-0.892	0.947	-0.870
A6							0.884	0.950	-0.904	0.972	-0.826	0.964
A7								0.804	-0.877	0.928	-0.677	0.873
A8									-0.802	0.911	-0.769	0.942
A9										-0.947	0.921	-0.903
A10											-0.856	0.977
A11												-0.851
A12												

Correlation coefficient values all at significant (p<0.01)

Table 4: Correlation analysis of various physicochemical parameters of Valiakulam Pond(Site.3)

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
A1		0.893	-0.809	0.589	-0.547	0.861	0.700	0.723	-0.744	0.815	-0.623	0.800
A2			-0.813	0.545	-0.537	0.916	0.761	0.786	-0.837	0.858	-0.690	0.837
A3				-0.534	0.727	-0.869	-0.746	-0.667	0.844	-0.833	0.764	-0.781
A4					-0.519	0.665	0.707	0.758	-0.502	0.749	-0.346	0.762
A5						-0.638	-0.568	-0.539	0.720	-0.696	0.771	-0.697
A6							0.825	0.841	-0.878	0.924	-0.749	0.902
A7								0.815	-0.863	0.933	-0.570	0.892
A8									-0.796	0.917	-0.686	0.933
A9										-0.927	0.851	-0.876
A10											-0.738	0.975
A11												-0.741
A12												

Correlation coefficient values significant.(p<0.01)

Table 5: Correlation analysis of various physico chemical parameters of Valiakulam Pond(Site.4)

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
A1		0.846	-0.730	0.684	-0.451	0.699	0.577	0.635	-0.679	0.736	-0.656	0.704
A2			-0.764	0.855	-0.682	0.865	0.791	0.829	-0.853	0.897	-0.694	0.906
A3				-0.634	0.684	-0.750	-0.796	-0.683	0.814	-0.815	0.726	-0.773
A4					-0.573	0.864	0.775	0.881	-0.711	0.869	-0.577	0.900
A5						-0.646	-0.676	-0.666	0.706	-0.708	0.759	-0.732
A6							0.853	0.936	-0.903	0.974	-0.733	0.965
A7								0.796	-0.873	0.917	-0.646	0.887
A8									-0.805	0.907	-0.687	0.939
A9										-0.948	0.781	-0.912
A10											-0.779	0.980
A11												-0.761
A12												

Correlation coefficient values all are significant(p<0.01)

		A1			A2			A3			A4			A5		
Source	df	Mean Sq	F	P	Mean Sq	F	P	Mean Sq	F	P	Mean Sq	F	P	Mean Sq	F	P
Sites	3	0.183	0.052 NOT sig	0.964 p>0.05	0.272	0.089 NOT sig	0.760 p>0.05	0.005	0.171 NOT sig	0.820 p>0.05	0.139	0.033 NOT sig	0.992 p>0.05	.969	0.169 NOT sig	0.917 p>0.05
Seasons	2	98.073	22.309 Sig	0.000 P<0.01	108.135	37.738 Sig	0.000 P<0.01	2.076	69.508 Sig	0.000 P<0.01	152.698 Sig	31.667 Sig	0.000 P<0.01	224.969	35.347 Sig	0.000 P<0.01
Sites & Seasons	6	0.309	0.083 NOT sig	0.798 p>0.05	0.250	0.078 NOT sig	0.897 p>0.05	0.003	0.077 NOT sig	0.993 p>0.05	0.253	0.060 NOT sig	0.899 p>0.05	2.672	0.453 NOT sig	0.841 p>0.05

Table 6 : Two way ANOVA of Physicochemical parameters during 2017- 2018 from Valiakulam Pond

		A6			A7			A8			A9			A10		
Source	df	Mean Sq	F	P	Mean Sq	F	P	Mean Sq	F	P	Mean Sq	F	P	Mean Sq	F	P
Sites	3	4.68	0.075 NOT sig	0.97 p>0.05	0.89	0.018 NOT sig	0.797 p>0.05	0.002	0.002 NOT sig	1.000 p>0.05	0.028	0.015 NOT sig	0.697 p>0.05	0.009	0.003 NOT sig	1.000 p>0.05
Seasons	2	2844.5	36.16 Sig	0.000 P<0.01	1625.09	28.26 Sig	0.000 P<0.01	32.096	40.692 Sig	0.000 P<0.01	72.972	40.457 Sig	0.000 P<0.01	114.940	47.005 Sig	0.000 P<0.01
Sites & Seasons	6	7.39	0.168 NOT sig	0.887 p>0.05	1.566	0.032 NOT sig	1.000 p>0.05	0.029	0.035NOT ig	1.000 p>0.05	0.062	0.034 NOT sig	1.000 p>0.05	0.022	0.008 NOT sig	1.000 p>0.05

		A11			A12		
Source	df	Mean Sq	F	P	Mean Sq	F	P
Sites	3	0.563	0.052 NOT sig	0.974 p>0.05	0.011	0.010 NOT sig	0.879 p>0.05
Seasons	2	587.042	50.218 Sig	0.000 P<0.01	56.011	52.766 Sig	0.000 P<0.01

Sites & Seasons	6	0.817	0.081 NOT sig	0.798 p>0.05	0.015	0.012 NOT sig	1.000 p>0.05

No significant interaction between sites (p>0.05) Significant interaction between seasons (p<0.01)
A1-Atmospheric temperature, A2-Water temperature, A3-pH, A4-Transparency, A5-Turbidity A6-Conductivity, A7-Hardness, A8-Alkalinity, A9-Dissolved Oxygen, A10-Biological Oxygen Demand, A11-Chemical Oxygen Demand,A12-Carbon dioxide.

The highest mean value of atmospheric temperature(in degree celsius) was observed 31.875 and the lowest mean value of water temperature was 31.667.The results of the correlation analysis showed that during the study period of one and a half years from the four sites significant positive correlation with water temperature and atmospheric temperature was noticed (Table 2,3,4&5).pH showed significant negative correlation with atmospheric and water temperature.The highest mean value of transparency was 35.42and the lowest value 35.25. Correlation analysis revealed that in site 1,2,3,4 and transparency showed significant positive correlation with atmospheric temperature and water temperature and significant negative correlation with pH (Table 2,3,4&5).The highest mean value of turbidity was 12.50 and the lowest value was 12.04(Table1).The highest mean value of conductivity was 137 and the lowest value 136.According to the correlation analysis in site 1,2,3 and 4 conductivity showed significant positive correlation with atmospheric temperature, water temperature and transparency and significant negative correlation with pH,and turbidity. Hardness value in site 1,2,3 and 4 was significantly positively correlated with atmosphere temperature, water temperature, transparency and negatively correlated with pH and turbidity.The highest mean value of alkalinity was 4.87 and the lowest 3.67 .The alkalinity value from site 1,2,3 and 4 showed positive correlation with atmosphere temperature, water temperature, transparency, conductivity, hardness and significant negative correlation with pH and turbidity. The highest mean value of DO was 4.91 and the lowest value 4.55.According to correlation analysis DO values at site 1,2,3 and 4 showed positive correlation with pH, turbidity and hardness. The highest mean value of BOD was 7.863 and the lowest 7.4. During the period of study at site 1,2,3 and 4 showed significant positive correlation with atmosphere temperature, water temperature, transparency, conductivity, hardness, alkalinity and significant negative correlation with pH, turbidity and DO.The highest mean value of COD was 30.5 and the lowest value was 29.8.Statistical interpretation showed that in site 1,2,3 and 4 ,COD showed significant positive correlation with pH, turbidity, DO and significant negative correlation with atmosphere temperature.Results of mean values of CO2during the study period . The concentration of carbon dioxide showed the highest mean value of 5.25and the lowest value 5.10.The results of Two way ANOVA revealed that the physicochemical parameters showed no significant difference between the study sites but the values showed significant difference($p < 0.01$) between the seasons (Table 6).

Discussion

The physicochemical parameters of any water body is considered as an essential parameter in predicting the productivity status.The parameters like temperature,p H, Transparency, Turbidity, Conductivity, Hardness ,Alkalinity, DO,BOD,COD and dissolved Carbon dioxide were analyses in the present study.Temperature is a measure of how much heat is present in the environment and it depends on the various factors like season, geographic location,

sampling time etc.(Desai, 1995[23]).Temperature is considered as one of the most important factors in an aquatic ecosystem because water density and oxygen content are directly related to temperature(Welch,1952[24]). The results of the similar studies carried out by many researchers support the above-mentioned opinion and the present study results support the findings of Halyal & Kaliwal,2011[25];Harshey et al., 1987 [26];Kaur et al., 2000[27];Sasikala et al .,2016[28];Sahini & Yadav, 2012[16]). pH is the negative logarithm of hydrogen ion concentration and it indicate the level of acidity or alkalinity of a solution and is an important limiting factor in the aquatic environment(Sharma et al., 2017[29]).The values of p H were found to be near to the neutral condition throughout the study period.pH is reflected as one of the most important operational chemical parameters of water and most of the aquatic organism are adapted to an average pH .In the present study pH was found in the prescribed limit of WHO (6.5-8.5).pH of the water may vary throughout the day mostly as a result of photosynthesis and respiration in the aquatic environment .Das et al., (1997[30]) reported that p H vary with respect to seasons.Transparency is considered an important factor that controls the energy relationship at different trophic levels. The high transparency of water seemed to be related with greater sunshine, better penetration of light ,moderate wind velocity, less proportion of dissolved and suspended matter. According to Kamal et al., 2007[31]; Sahini &Yadav,2012[16]). The highest mean value of turbidity of surface water from Valiyakulam pond was 11.50±3.349. Turbidity ,typically expressed as Nephelometric Turbidity Units (NTU) ,which describes the cloudiness of water caused by suspended particles, chemical precipitation, organic particles and organisms in the ecosystem.(Vasantha Naik,2013[32]).Seasonal fluctuation of turbidity values were reported by many researchers. (Bhavimani & Puttaiah, 2014[33]; Sangeetha & Neha ,2015[34]) .In the present study the highest mean values of turbidity was 11.50±3.349 and the lowest mean value was 11.04±3.155 and the value of turbidity obtained in the present study was within the WHO range and the water is suitable for fish farming. Suspension of solids, mainly soil and microorganism in water intermittent with the passage of light is turbidity.Electrical conductivity measures the capacity of a substance or solution to conduct electric current. Hence the present water body shows high electrical conductivity value during the study period .Conductivity is also a useful tool to evaluate the purity of water(ICMR,1975[35]).It dependent on the ionic concentration and water temperature.A total load of salts in a water body is directly related to its conductivity. It is an indication of freshwater or otherwise of a water body (Acharya et al.,2008[36];Ogbeibu &Vitter ,1995[37]).High value of conductivity is an indication of pollution. Verhuest,(1997[38]) reported that conductivity can be used as an indication of primary productivity and thus favours fish production.Water can be categorized according to degree of hardness as soft (0-75 mg/l), moderately hard (75-150mg/l) and hard (150-300mg/l) and above 300 mg/l as very hard .The hardness of water is mainly due to the presence of various salts of Ca and Mg and it is used to classify water as hard or soft. Hardness of water is the parameter which is used to describe the effect of dissolved minerals.(Ca and Mg),determining suitability for domestic and industrial purposes which is attributed to the presence of bicarbonates, Sulphates, Chlorides and Nitrates (Solomon et al., 2013[39])(Bhatnagar et al., 2004[40]) revealed that higher levels of hardness may be due to low water level and high rate of evaporation.Alkalinity in most natural water is the function of bicarbonates and carbonates. Natural water bodies in the tropics usually show a wide range of fluctuations in their alkalinity value depending upon the geography and season. The value of alkalinity provides an idea of natural salts present in water. Water capacity is a measure of its capacity to neutralise acids and according to Elayaraj et al.,(2016[41]) ,it is a measure of buffering capacity .Bhatnagar & Devi, (2013[42]) opined that optimum alkalinity value of 25 to 100 mg/L is suitable for aquaculture activity .The alkalinity value of Valiyakulam pond indicates water can be safely used for aquaculture activities.DO is defined as the measure of the amount of gaseous oxygen dissolved in an aqueous solution (Tara et al., 2011[43]). DO is considered as an important parameter in water quality assessment and reflects the physical and biological processes of aquatic life. DO is needed for fish and other aquatic organisms and levels of DO vary daily

and seasonally depends on the species of phytoplankton present, light penetration, nutrient availability temperature, salinity, water movement, partial pressure of atmospheric oxygen in contact with the water (Davran et al., 2002[44];Kumar et al .,2017[45]).The results of the present study show the DO values were within the WHO limit so the water would be regarded as safe for drinking and other domestic purposes.Biological Oxygen Demand (BOD) is a parameter to assess the organic load in a water body and it is the measurement of total DO consumed by microorganisms for biodegradation of organic matter(Steven, 2007[46]).It depends on temperature, the extent of biological activity, the concentration of organic matter and microbial population such as bacteria and fungi.(Priyanka et al .,2013[47]).According toStevens, (2007[46]) the BOD values are within an optimum level that would be better for aquaculture ponds and opined that safe for farming activities. The BOD values obtained from the pond showed promising conditions for optimum activity of organisms and hence the ecosystem studied were not polluted and therefore safe for fish farming activities.The Chemical Oxygen Demand(COD) represents the oxygen requirements to oxidise all of the organic matter in a water sample to CO_2 and water. COD is the capacity of water to consume oxygen during the decomposition of organic matter. It helps to indicate the pollution status of water bodies (Kumar et al., 2017[45]). COD is one of the significant physico chemical parameter for establishing the quality of water(Kumar et al., 2017[45]).It determines the amount of oxygen required for chemical oxidation of organic and inorganic matter (Jayaraj et al .,2014 [48]).Organic matter and anthropogenic activities are the major factors which trigger the amounts of COD in water.(Maithy, 2001[49];Jayaraman et al., 2003[50]). According to Kumar et al .,(2017[45]) the high COD values indicate that some degree of non-biodegradable oxygen demanding pollutants were present in the water.According to Sharma et al., (2017[29]) carbon dioxide (CO_2) contributes to the fitness of the natural water body. Usually, the CO_2 in a water body may be derived from atmospheric sources, biotic respiration inflowing of ground water which sweep into the pond. Decomposition of organic matter due to bacteria and also within the water body in a combination of other substances such as Ca, Mg etc. Swan,(1997[51]) recommended that fish can tolerate the CO_2 concentration of 10 ppm. According to Nag et al., (2014[52]) apart from the role in photosynthesis of primary production the CO_2 has an interdependence with pH and bicarbonate carbonate equilibrium. However, if present in higher concentration, it may exert adverse effects on respiration and other physiological functions of aquatic life (Chattopadhyay,1998[53]).The studies on water quality analysis helps to prepare planning and implementation of projects related to aquatic ecosystems, Ponds being frequently disturbed by human being for variety of needs and above a particular level may leads to environmental issues(Sur et al., 2022[54]).

Conclusions

The present study of physico chemical parameters of surface water from the Valiakulam pond during 2018-2019 (two years) revealed that all the parameters analysed were within the permissible range of WHO. In any aquatic ecosystem the physico chemical parameters such as (temperature, pH, transparency, turbidity, conductivity, hardness, alkalinity, DO, BOD, COD and CO_2) have a major role in governing the structural and functional role of the aquatic ecosystem. Moreover, the functional nature of the water bodies greatly influences the existing meteorological conditions. Hydrological conditions of water affect productivity, species composition of aquatic fauna ,eutrophication etc. In addition, the metabolic activities in the pond ecosystem determine the utilisation of water for various domestic, agricultural and aquacultural activities. Though it was a maiden scientific attempt to evaluate the quality of water from Valiakulam pond with a view to explore its utilisation to improve the quality of life of people who are residing in the locality. The productive utilisation of water for domestic, aquaculture, agriculture activities are envisaged in the present study. The results were promising in this regard that the water can be used for any activities. The present study results also support the fact that the parameters studied were within the WHO limits. The study concluded that the

Valiakulam pond water is not polluted during the study period.According to WHO,(2011[55]) access to safe drinking water is essential for health, a basic right and a component of effective policy for health protection. Access to safe drinking water is important as a health and developmental issue at national,regional and local levels. Water quality is considered as an important part of environmental monitoring and which has an integral role in keeping the planet healthy and sustainable. The physico chemical parameters of water samples from the pond and the WHO standard indicate that the parameters fall within the stipulated range of acceptability and hence Valiakulam pond is a healthy aquatic ecosystem. The pond can be effectively utilized for eco-friendly practices for the benefit of local people and thereby improve the quality of life as well as economic prosperity of neighbouring areas.The results of the present study are expected to reveal the purity of water as well as its utility to domestic purposes. Moreover the study may consider to propose decisions regarding the sustainable utilisation of the pond to the local body authorities.

Acknowledgement

The authors are grateful to The Principal, M.G. College Thiruvananthapuram for providing the basic facilities to carry out the present study. The authors extended gratitude to Dr.Balasubramaniam, formerly Professor(Rtd.), Department of Aquatic Biology and Fisheries, University of Kerala for his support and guidance in statistical analysis of the data.

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