

Study on the Physicochemical of Vembakottai Dam and Pilavakkal Dam of Virudhunagar District, Tamilnadu, Sivakasi

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Abstract: Water, the most vital source for all kinds of life on this planet is also the resources, adversely affected both qualitatively and by all kinds of human activities. Aquatic ecosystems are polluted by various sources such as industries, agricultural, anthropogenic activities etc. water is the major criteria which requires immediate attention because life is dependent on water that adversely affected the water quality and organism associate with aquatic ecosystem. Water pollution is the greatest environment evils. Water we drink has not only life supporting but also life damaging properties due to presence of pollutants has a qualitative balance but when the water components is distributed, in other words, polluted it may affect human health. The constituents monitored included turbidity, EC, total dissolved solid, electrical conductivity, pH, dissolved oxygen, chloride, total alkalinity, hardness. The observed values of various physicochemical parameters of water samples were compared with standard values recommended by WHO. The correlation coefficient was determined with various physicochemical parameters of Dam water. The water resources data base which could have validated the observed values is scarce.

Key words: Physicochemical Parameters • Chemical Composition

INTRODUCTION

Water is one of the most important resources bestowed by God Almighty for all humans, so it is assumed that this vital resource must have great interest and appreciation of humans should seek to maintain and preserve its purity [1]. Water is said as liquid of life and it is the essence of all living processes. Water is a universal solvent as it dissolves more substances than any other liquid without undergoing any chemical change. Thus water, the unique component of nature, has played an important role in the life from molecules to man, hence since the time unmemorable the great human civilization has originated, evolved and flourished around water resources [2]. Water is one of the abundantly available substances in nature and also called the “Elixir of life”. The quality of water is being deteriorable due to higher degree of minerals present in soil.

Water is a transparent fluid which forms the world's streams, lakes, oceans and rain and is the major constituent of the fluids of living things. Water covers 71% of the Earth's surface. It is vital for all known forms of life. However, some observers have estimated that by

2025 more than half of the world population will be facing water-based vulnerability. Water plays an important role in the world economy, as it functions as a solvent for a wide variety of chemical substances and facilitates industrial cooling and transportation.

Worldwide, the consumption of water is doubling every 20 years-more than twice the rate of increase in population. A large amount of water is wasted in agriculture, industry and urban areas. It has been estimated that with available technologies and better operational practices, agricultural water demand could be cut by about 50% and that in urban areas by about 33% without affecting the quality or economics of life. Due to the increase in population there has been a rise in the demand for food, space for housing, consumer products, etc., which has in turn resulted in increased industrialization, urbanization and demands in agriculture thereby leading to both river and groundwater contamination.

In the recent years environmental monitoring through regular assessment of water quality has become a crucial factor in the exploitation of conservation of aquatic resources water quality regulates biotic diversity and

biomass, energy, material cycles, tropic levels and rare of succession. This, in turn helps in planning exploitation antipollution or conservation strategies. The environmental monitoring through water quality assessment should be continuous process and regularly undertaken for a variety of purpose like testing, suitability of water for agricultural, industrial, aquaculture, recreational and domestic purposes. Therefore, various water quality parameters of Vembakottai and Pilavakkal reservoir have been analyzed to assess the nature of water for drinking agriculture, aquaculture purposes.

Methods

Collection and Preparation the Sample: The study was carried out from September 2014 to April 2015. water samples were collected periodically in first week of every month, in the early hours of the day. The water sample from the Dams were collected and analyzed for 9 physicochemical parameters by following the established procedures. Treatment and storage of water samples were done according to IAAB [3]. The samples were collected in plastic, cane of five liters capacity without any air bubbles.. The temperatures of the samples were measured in the field itself at the time of sample collection.

Physicochemical Analysis: Analysis was carried out for 9 water quality parameters such as included turbidity, EC, total dissolved solid, electrical conductivity, pH, dissolved oxygen, chloride, total alkalinity, hardness, sodium, potassium, calcium, magnesium manganese, iron, nitrate, nitrite, ammonia and sulfate by using standard method. All the used reagents for the analysis were AR grade and double distilled water was used for preparation of solutions. Details of the analysis methods are summarized as followed.

RESULT AND DISCUSSION

In an aquatic ecosystem physicochemical environment has performed influence on its biotic components. It controls biodiversity, biomass and distribution of biotic communities. The physical and chemical parameters exert their influence both individually and collectively their interaction produces abiotic environment which ultimately condition the origin, development and finally succession of biotic communities [4]. The metrological factors, such as ambient temperature, sunshine, rainfall and wind, exert a considerable influence on the physicochemical dynamics of water body.

Colour: The apparent colour of the selected dam water was noted and found to be mostly colorless. The same result was reported by Bustamante *et al.* [5] in the quality assessment of waters in Velachery, Chennai Tamilnadu.

Odour: The odour of water is usually due to the gases to the produced by decomposition of organic matter. In the present study, no obnoxious odour was sensed in the selected Dam water. Similar results were observed by Kaur *et al.* [6] during his study in Physicochemical characteristics of underground water in rural areas of Tosham subdivisions, Bhiwani district, Haryana.

Temperature: The lowest temperature (22°C) was recorded in Vembakottai Dam month of September 2014 and highest water temperature (27°C) in the month of March 2015. In Pilavakkal Dam the lowest water temperature of 22°C was recorded in the month of October 2014 and highest water temperature (26°C) in the month of March 2015 (Table 2 and 3). The water temperature depends upon the water depth besides solar radiation, climate and topography. Similar results were observed by Baruah [7] Water quality assessment using phytoplankton in a historical pond of Upper Assam.

pH: The pH is determined by the amount of dissolved carbon dioxide CO₂, which forms carbonic acid in water. According to the pH of ground water can also be lowered by organic acids from decaying vegetation, or the dissolution of sulfide minerals [8]. pH is a term used

Table 1: Parameters and Methods Employed in the Physicochemical Examination of Water Samples

S.No.	Parameters of water analysis	Method employed
1.	Turbidity (NTU)	Nephelometric
2.	TDS (mg/l)	Gravimetric
3.	EC (is/cm)	Potentiometric
4.	pH	Potentiometric
5.	DO	Titrimetric
6.	Tot. Alkalinity	Titrimetric
7.	Tot. Hardness	Titrimetric
8.	Ca	Titrimetric
9.	Mg	Titrimetric
10.	Fe	Titrimetric
11.	Mn	Titrimetric
12.	NH ₃	Titrimetric
13.	NO ₂	Titrimetric
14.	NO ₃	Titrimetric
15.	Cl	Titrimetric
16.	F	Titrimetric
17.	SO ₄	Spectrophotometric
18.	PO ₄	Titrimetric

universally to express the intensity of the acid or alkaline condition of a solution. The selected study sites ranged from 6.3 to 7.6 (Tables 2 and 3) show that the present water samples are slightly alkaline. Changes in pH can be indicative of an industrial pollutant, photosynthesis or the respiration of algae that is feeding on a contaminant. This alkaline pH value was also witnessed due to presence of alkaline earth metals interact with soluble CO forming carbonates and bicarbonate which results in shifting the pH up over 7. Similar results have been reported by in the studies on interaction between, surface and ground waters at Guwahati, Assam, India, by Bhattacharyya *et al.* [9].

Dissolved Oxygen: In the present study, the dissolved oxygen level is slightly lower than the minimum range of dissolved oxygen level. This may be due to the stagnation of water for long time and also the dumping of human and animal wastes continuously. During the present study the dissolved oxygen value is maximum (8.2 mg/l) (Table 2 and 3) in both the Dams during the study period.) The quality of the water in terms of DO content is always of primary importance, because at the waste discharge points in Dam, the DO is required for aerobic oxidation of the wastes. A good level of DO in sampling sites of the

Dam indicated a high re-aeration rate and rapid aerobic oxidation of biological substances. Which indicate anthropogenic activities within the study area [10] reported similar results in Uyyakondan channel water of river Cauvery.

Alkalinity: The alkalinity is a measure of buffering capacity of water usually imparted by the presence of bicarbonates, carbonate and hydroxides [11]. In the present investigation the total alkalinity in the surface ranged from 52.8 mg/l to 70.1 mg/l. Maximum alkalinity (70.1 mg/l) was recorded in the 70.1 mg/l in Vembakottai Dam in the month of November 2014 (Table 2 and 3). It is also another physiographic factor that influence greatly the water quality. High value of alkalinity is due to evaporation and entry of more domestic and rain water. Similar results were observed by IAAB [3] on water quality of Manjara project reservoir in. Beed district, Maharashtra.

Hardness: Hardness of a water sample depends on a complex mixture of cations and anions is predominant contributed by of calcium and magnesium. Has suggested that the total hardness ranged from 60.1 mg/l to 74.1 mg/l in Vembakottai Dam and 60.1 mg/l to 73.8 mg/l in

Table 2: Physical and Chemical Parameters of the Vembakottai Dam from September 2014 to April 2015

S.No	Parameters	September 2014	October 2014	November 2014	December 2014	January 2015	February 2015	March 2015	April 2015
1	Turbidity NT Units	138	129	159	141	133	137	129	120
2	TDS (mg/l)	107	189	163	282	197	186	176	180
3	EC	61.6	43.8	55.0	50.33	49.78	46.87	46.34	45.78
4	pH	6.8	7.0	7.6	7.2	6.9	7.3	7.2	7.3
5	DO	6.5	6.2	7.1	7.9	8.0	8.2	8.1	8.3
6	Tot. Alkalinity	52.8	62.0	70.1	65.6	69.3	65.9	65.3	52.8
7	Total Hardness	60.1	68.4	71.3	74.1	73.5	72.2	73.8	60.7
8	Sulphate	30.5	31.7	32.0	32.9	31.3	31.0	29.7	30.2
9	Phosphate	0.75	0.84	0.45	0.46	0.39	0.28	0.32	0.45

Table 3: Physical and Chemical Parameters of the Pilavakkal Dam from September 2014 to April 2015

S.No	Parameters	September 2014	October 2014	November 2014	December 2014	January 2015	February 2015	March 2015	April 2015
1	Turbidity NT Units	128	126	149	153	143	137	139	132
2	TDS (mg/l)	101	159	149	202	197	194	176	164
3	EC	60.6	42.5	50.0	50.23	49.78	48.87	47.34	47.65
4	pH	6.8	6.7	7.3	7.2	6.9	7.2	7.0	7.1
5	DO	7.5	7.6	7.9	8.0	7.7	8.1	8.0	7.9
6	Tot. Alkalinity	67.5	64.0	57.0	66.5	68.3	65.9	67.3	67.5
7	Total Hardness	60.1	65.4	70.3	72.1	73.2	72.2	73.8	70.1
8	Sulphate	31.5	32.7	35.9	36.9	31.3	31.0	29.7	30.5
9	Phosphate	0.85	0.64	1.1	1.5	0.69	0.58	0.42	0.65

Pilavakkal Dam during the study period. The lowest 60.1 mg/l was recorded in Vembakottai Dam month of September 2014 and highest hardness 74.1 mg/l in the month of December 2014. In Pilavakkal Dam the lowest of 60.1 was recorded in the month of September 2014 and highest 73.8 mg/l in the month of March 2015 (Table 2 and 3). It has found that the hardness and alkalinity are slightly related to each other [12]. Studied on water quality of Warparakalpa reservoir, Nagpur, near Parli Vajinath, Beed, District Maharashtra region and reported the same results.

Manganese: The Manganese was found from 0.3 mg/l to 1.1 mg/l in Vembakottai Dam and 0.2 mg/l to 1.0 mg/l in Pilavakkal Dam during the study period. The lowest 0.3 mg/l was recorded in Vembakottai Dam month of September 2014 and highest 1.1 mg/l in the month of November 2014. In Pilavakkal Dam the lowest of 0.2 mg/l was recorded in the month of September 2014 and highest 1.0 in the month of March 2015 (Tables 2 and 3). This may be due to leaching of organic substances present in the water. Similar results were observed by Benarjee and Ramulu [13] on the physicochemical factors influenced plankton biodiversity and fish abundance- A case study of Andhra Pradesh.

Nitrate: The Nitrate was ranged from 0.31 to 0.71 in Vembakottai Dam and 0.32mg/l to 0.75 mg/l in Pilavakkal Dam during the study period. The lowest 0.31 mg/l was recorded in Vembakottai Dam month of March 2015 and highest water temperature 0.71 mg/l in the month of October 2014. In Pilavakkal Dam the lowest of 0.32 mg/l was recorded in the month of April 2015 and highest 0.75 mg/l in the month of October 2014 (Table 2 and 3). Due to leaching of nitrate with the percolating water. It can also be contaminated by sewage and other wastes rich in nitrates. Similar results were reported by Lekhak and Jha [14] reported. Biodiversity and seasonal abundance of Zooplankton and its relation to Physico Chemical Parameters of Jamunabundh, Bishnupur, India.

Phosphate: Phosphate is another important element present in the water and plays a vital role in the metabolism, Malik [15]. In the present study the lowest Phosphate 29.7 mg/l was recorded in Vembakottai Dam month of March 2015 and highest 32.9 mg/l in the month of December 2014. In Pilavakkal Dam the lowest of 29.7 mg/l was recorded in the month of March 2015 and highest water temperature 36.9 mg/l in the month of December 2014 (Table 2). Phosphate occurs naturally in

water as a result of leaching from gypsum and other common minerals which increase its concentration. Similar results were observed by Hiware *et al.* [12] in this studies on water quality of Warparakalpa reservoir, Nagpur, near Parli Vajinath, Beed District, Maharashtra.

CONCLUSION

The present study reveals that the physicochemical and biological nature of Dam water bodies is closely linked to their hydrology, the surrounding terrestrial surfaces, as well as the anthropogenic activities in and around the dams. The physicochemical parameters of the selected two dam water is below the permissible limit of WHO, therefore the dam waters may be used for drinking, agricultural aquaculture etc.

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