Research Article

Hydro Chemical Analysis of Lake Water Quality at Salem District, Tamil Nadu, India

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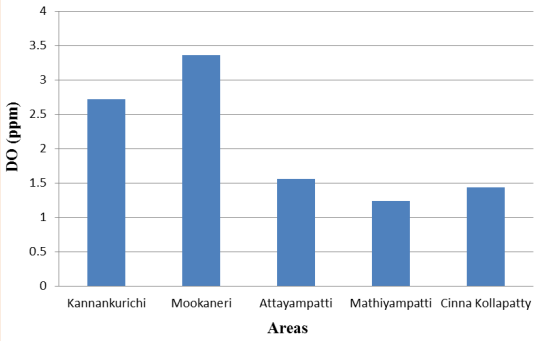
Abstract

The investigation was carried out to analyse the physico-chemical characteristics of lake water of Salem district (Tamil Nadu), India. Water samples were collected from different stations like Kannakurichi, Mookaneri, Attayampatti, Mathiyampatti and Cinna kollapatti in the month of September 2013. In this study, different parameters like pH, Temperature, Total Dissolved Solid, Alkalinity, Hardness, Fe content, Dissolved Oxygen, Chloride, Sulphate, BOD were analysed. The results revealed that parameters such as TDS, hardness and Fe content were in high concentration at most of the lake water samples.



Keywords: Lake water, physico-chemical analysis, water quality, DO, BOD.

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Introduction

The important concern with regards to environmental quality is focused on water because of its importance in maintaining the human health and health of the ecosystem. The chemical composition of water is essential criteria that determine the quality of water. Water quality is very important and often degraded due to agricultural, industrial and human activities. Even though the natural environmental processes provide by means of removing pollutants from water, there are definite limits. Lake water is an important water resource for domestic and agriculture in both rural and urban parts of India. Pollution of lake water comes from many sources. Discharge of waste disposal from agriculture, domestic wastewater, industries and municipalities are main source of lake water pollution [1- 3]. Sometimes surface run-off also brings mud, leaves, and human and animal wastes into surface water bodies. These pollutants may enter directly into the lake water and contaminate it. The quality of water is of vital concern for the mankind since it is directly linked with human welfare. It is a matter of history that facial pollution of drinking water caused water-borne diseases which wiped out entire population of the studied. The present work is an attempt to measure the lake water quality at five different locations in Salem district (Tamil Nadu), India.

Study Area

Salem district in Tamil Nadu is geographically located between the North latitudes 11°14´ to 12°53´ and East longitudes 77 °44´ to 78° 50´ covering an lake about 7905.38 square kilometers. The present study lake is shown in the **Figure 1**. The study lake experiences arid and semi-arid climate with an average annual minimum and maximum

temperature 18.9°C and 37.9°C respectively. The study lake records rain fall in the South-west monsoon and North-east monsoon [4].

Figure 1 Study area for analysis

Experimental

Water samples were collected in polyethylene bottles of two litres with necessary precaution from five different locations in Salem district. They were then carefully sealed, labelled and taken for analysis of physico-chemical parameters such pH, Temperature, Total Dissolved Solid, Alkalinity, Hardness, Fe content, Dissolved Oxygen, Chloride, Sulphate, BOD. The lake water samples were subjected to physico-chemical analysis using standard procedure by APHA [5].

Results and Discussion

Lake water comes into intimate contact with various mineral, which are soluble in water in varying degrees. The dissolved minerals determine the property of the water for various purposes.

pH

pH is used to determine whether a solution is acidic or alkaline. The pH values of all lake water samples are found to be in the range of 6.80 – 8.06 (**Figure 2**). The highest value of 8.06 is observed at Mathiyampatty lake whereas the lowest value of 6.80 is observed at Kannakurichi lake. The permissible limit of pH for drinking water is 6.5 - 8.5 (ISI standards). The lake water sample is found to be within the acceptable limit of ISI standards. There is no abnormal change of pH in the lake water samples. If the pH is found beyond the permissible limit, it affects the mucous membrane of cells [6].

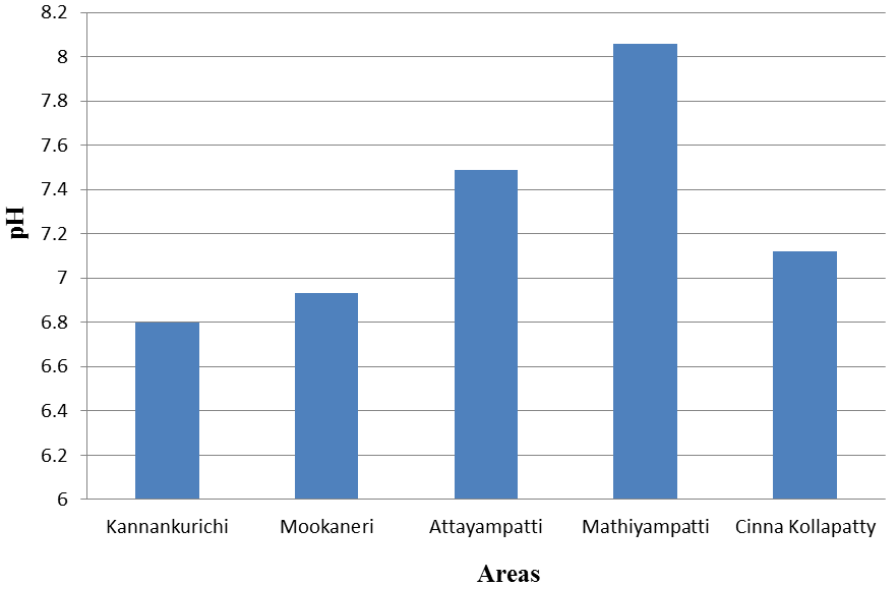

Figure 2 Analysis of pH

Temperature

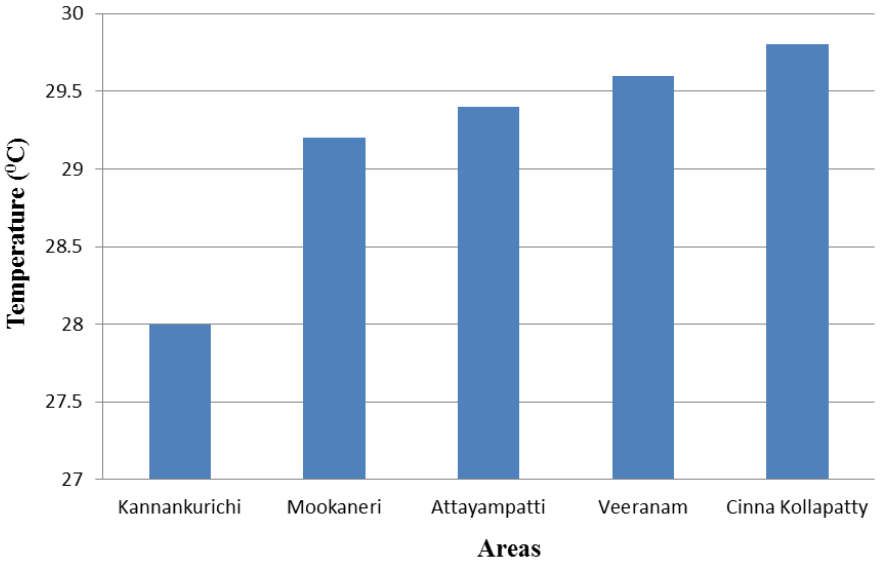

Figure 3 Analysis of Temperature

The temperature values of all lake water samples are found to be in the range of 28.0– 29.8 ^{0}C (**Figure 3**). The highest value of 29.8 ^{0}C is observed at Cinna kollapatty lake whereas the lowest value of 28.0 ^{0}C is observed at Kannakurichi lake. The permissible limit of temperature for drinking water should not exceed 5^{0}C above the receiving water temperature (ISI standards). The lake water sample is found to be within the acceptable limit of ISI standards. Water temperature regulates the metabolism of the aquatic ecosystem. High water temperature stress aquatic ecosystem by reducing the ability of water to hold essential dissolved gases like oxygen.

Total dissolved solids (TDS)

The total dissolved solids in water are due to the presence of sodium, potassium, calcium, magnesium, manganese, carbonates, bicarbonates, chlorides, phosphate, organic matter, and other particles. The values of the total dissolved solids for all the lake water samples vary between 134 and 1340 mg/l (**Figure 4**). The maximum allowable limit of total dissolved solids in drinking water is 500 mg/l (ISI standards). The maximum value (1340 mg/l) is recorded at Attayampatti and minimum value (134 mg/l) is recorded at Kannakurichi lake. Away from this permissible level, palatability decreases and may cause gastro intentional irritation [6].

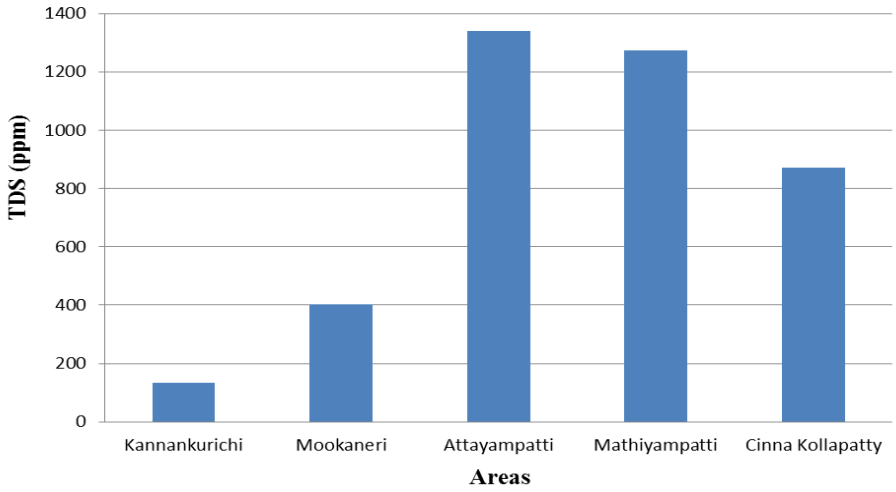

Figure 4 Analysis of TDS

Hardness

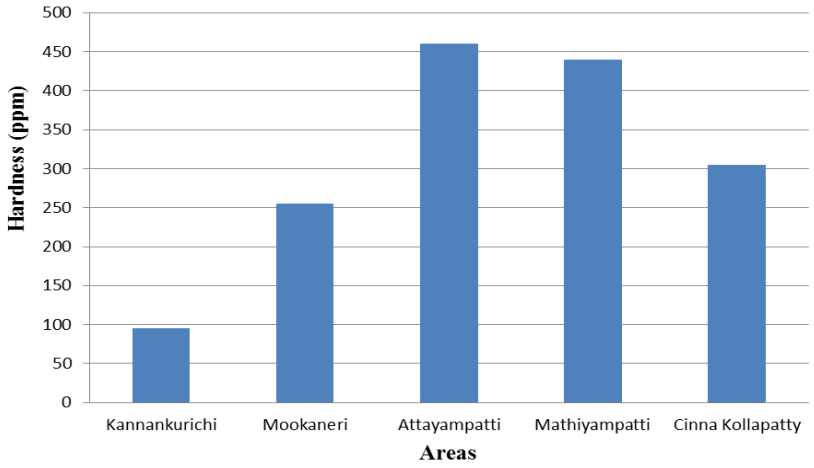

Figure 5 Analysis of Hardness

Hardness of the water is due to presence of Ca and Mg salts. The hardness values of lake water samples were recorded between 95 and 460 mg/l (**Figure 5**). The maximum value (460 mg/l) is observed at Attayampatti lake and minimum value (95 mg/l) recorded at Kannakurichi lake. The permissible level of hardness is 300 mg/l (ISI standards). The most of the lake water samples have crossed this permissible level. Encrustation in water supply structure and adverse effects on domestic use occur beyond this permissible level.

Alkalinity

Alkalinity of the water is due to presence of carbonates, bicarbonates and hydroxide salts. The alkalinity values of lake water samples were recorded between 20 and 62.5 mg/l (**Figure 6**). The maximum value (62.5 mg/l) is observed at Mathiyampatti lake and minimum value (20 mg/l) recorded at Kannankurichi lake. The permissible level of alkalinity is 200 mg/l (ISI standards). All the lake water samples are found to be with in the permissible level. High amount of alkalinity in water is harmful for irrigation which leads to soil damage and reduce crop yields [7].

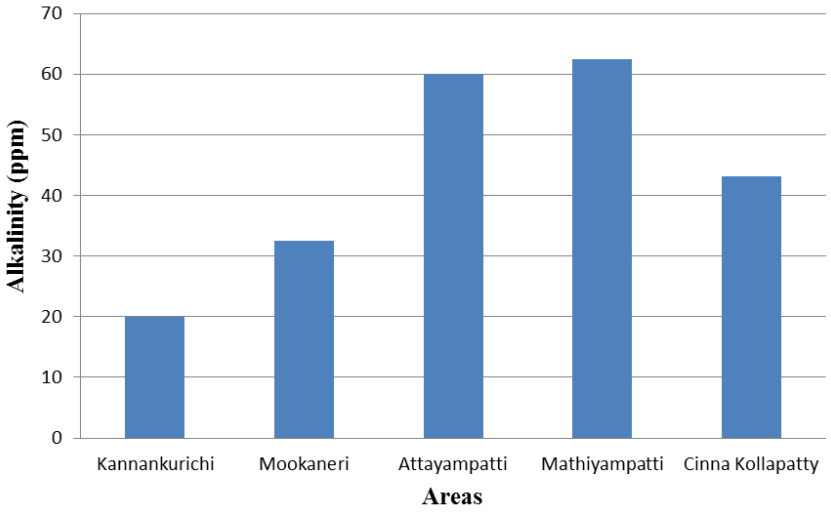

Figure 6 Analysis of Alkalinity

Chloride (Cl)

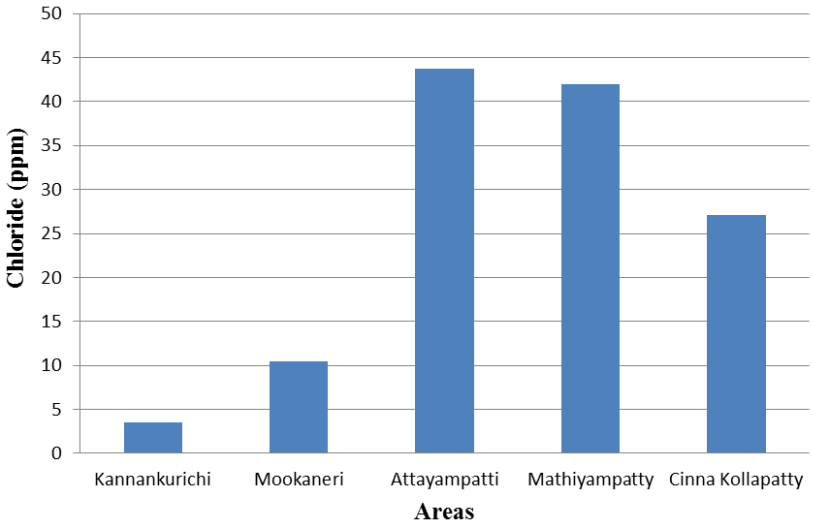

Figure 7 Analysis of Chloride

The value of chloride for all the lake water samples is ranged from 3.5 – 43.78 mg/l (**Figure 7**). All the lake water samples show chloride values within the acceptable limit (250 mg/l) of ISI standards. The highest value of 43.78 mg/l is observed at Attayampatti lake whereas the lowest value of 3.5 mg/l is observed at Kannankurichi lake. Excessive chloride in potable water is particularly not harmful but the criteria set for chloride value is based on its potentially high corrosiveness. Soil porosity and permeability also play an important role in building up the chloride value. Increase of chlorine level in water is injurious to people suffering due to heart and kidney diseases [8].

Sulphate (SO_4)

The sulphate values for the lakewater samples are exhibited between18.3 and 152 mg/l (**Figure 8**). The maximum value (152 mg/l) is noted at Attayampatti lake and minimum value of sulphate (18.3 mg/l) is noted at Kannakurichi lake. The sulphate values for all the lake water samples are well within the permissible limit (200 mg/l) of ISI standards. High concentration of sulphate may cause gastro – intestinal irritation particularly when magnesium and sodium ions are also present in drinking water resources [9].

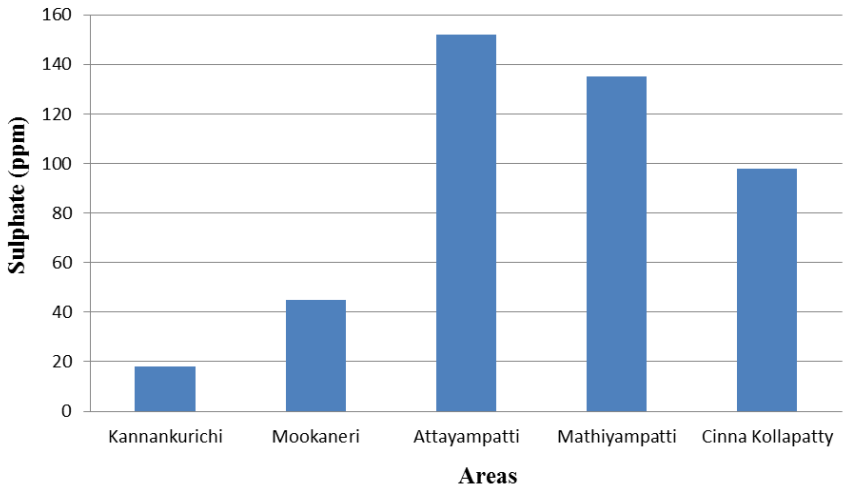

Figure 8 Analysis of Sulphate

Iron (Fe)

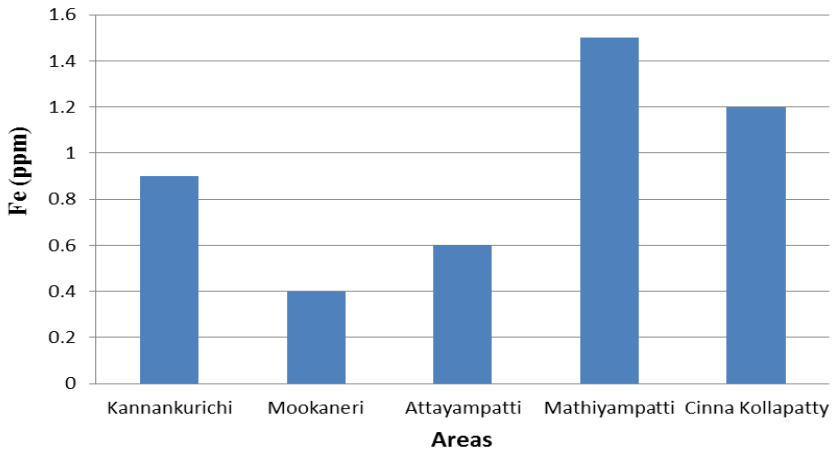

Figure 9 Analysis of Iron (Fe)

The Fe values for the lake water samples are exhibited between 0.4 and 1.5 mg/l (**Figure 9**). The maximum value (1.5 mg/l) is noted at Mathiyampatti lake and minimum value of Fe (0.4 mg/l) is noted at Mookaneri lake. All the lake water samples have crossed the permissible limit (0.3 mg/l) of ISI standards. Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria.

Dissolved oxygen (DO)

The DO values in the lake water samples have observed from 1.24 to 3.36 mg/l (**Figure 10**). The highest value (3.36 mg/l) of DO is recorded at Mookaneri lake whereas the lowest value (1.24mg/l) is recorded at Mathiyampatti lake. The concentration of dissolved oxygen in clean water is 8 – 10 mg/l. In this investigation, the DO is very low in all the lake water samples. It indicates that the deoxygenation is due to biological decomposition of organic matter. The dissolved oxygen is a regulator of metabolic activities of organisms. Oxygen is generally reduced in the water due to respiration of biota, decomposition of organic matter, rise in temperature, oxygen demanding wastes and inorganic reluctant [10].

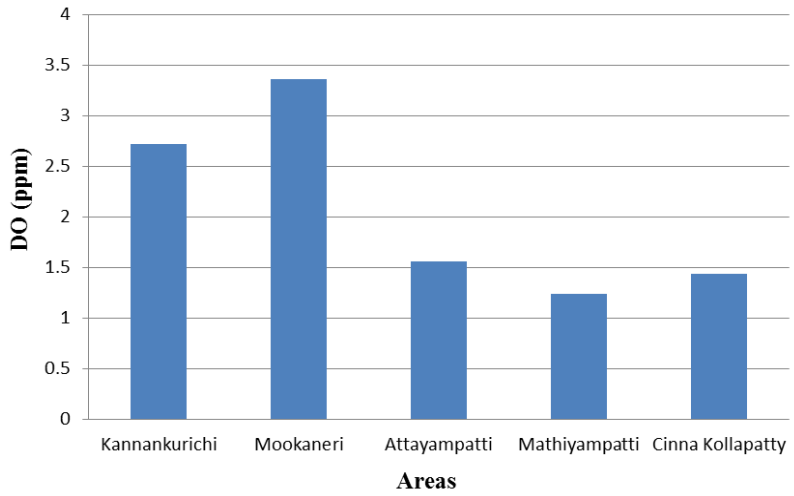

Figure 10 Analysis of Dissolved Oxygen (DO)

Biochemical oxygen demand (BOD)

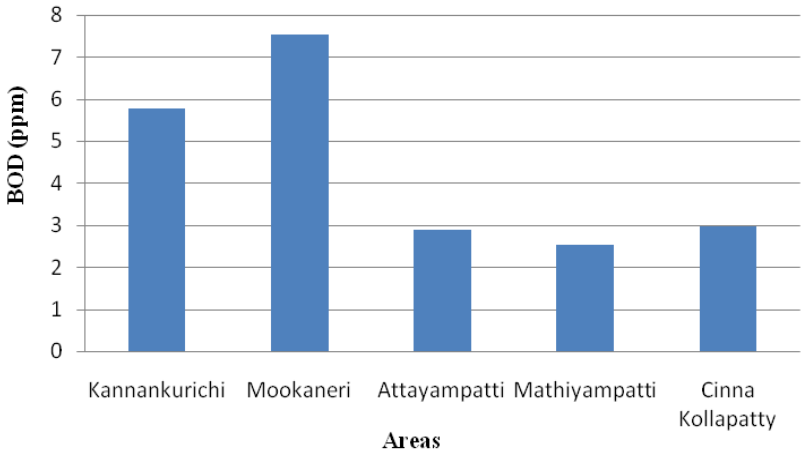

Figure 11 Analysis of BOD

Biochemical oxygen demand is used as an experimental measure of the amount of biochemically degradable organic matter present in a water sample. The BOD value of the lakewater samples are recorded in the range of 2.52 to 7.52 mg/l (**Figure 11**). Kannankurichi and Mookaneri lake water samples are exceeded the permissible limit (5 mg/l) of ISI standards. This indicates that the lake water has suffered degradation due to continuous discharge of domestic, industrial and municipal sewage. The high value of BOD at all sampling stations indicates the pollution by biochemically degradable organic wastes from various sources.

Conclusion

Physico-chemical characterization of lake water samples were taken from Salem district, Tamilnadu. Five water samples were collected from different lakes of Salem district and analyzed for pH, Temperature, Total Dissolved Solid, Alkalinity, Hardness, Fe content, Dissolved Oxygen, Chloride, Sulphate, BOD using standard procedures. The values of all the lake water samples are compared with the standard permissible values. It has been found that lake water samples from Attayampatti and Mathiyampatti lakes are highly contaminated as compared to other lakes water samples. From the obtained results, it is suggested to monitor the lake water quality and assess periodically in this study lake to prevent the further contamination.

Acknowledgement

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