Research Article

Water Quality Evaluation of River Kaveri at Salem Division, Tamil Nadu, India

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Abstract

The aim of this study to assess the physico-chemical characteristics of Kaveri river water in Salem district(Tamil Nadu), India. Water samples were collected from five different stations like Mettur, Navapatti, Karungalpalayam, Bhavani and Kaveri karai 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.

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Introduction

River water resource is becoming day by day at the foster rate of deterioration of the water quality is now a global problem. Discharge of toxic chemicals, over pumping of qualifier and contamination of water bodies with substance that promote algae growth are some of the today's major cause for water quality degradation. Organic manure, municipal waste and some fungicides often contain fairly high concentration of heavy metals. The chemical composition of water is very important 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.

Kavery river water is the major water resource for domestic and agriculture in both rural and urban parts of Tamilnadu. Pollution of river water comes from many sources. Discharge of waste disposal from agriculture, domestic wastewater, industries and municipalities are main source of station 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 station 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 quality of Kaveri river water at different stations 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 station about 7905.38 square kilometers. The present study station is shown in the **Figure 1**. The study station experiences arid and semi-arid climate with an average annual minimum and maximum temperature 18.9°C and 37.9°C respectively. The study station records rain fall in the South-west monsoon and North- east monsoon [4].

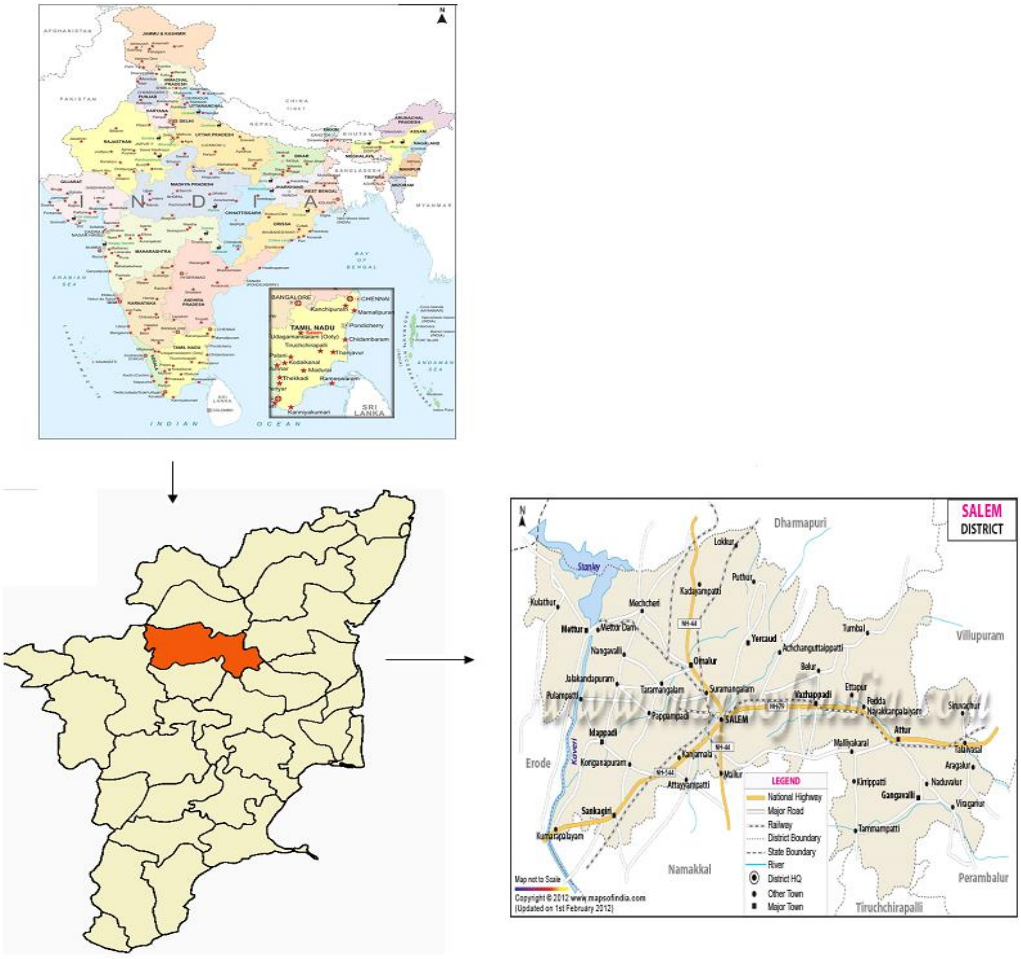

Figure 1 Study area for analysis

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 water samples were subjected to physico-chemical analysis using standard procedure by APHA [5].

Results and Discussion

River water comes into intimate contact with various sources such as industrial wastewater, domestic wastes, etc, 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 station water samples are found to be in the range of 6.1 – 7.07 (**Figure 2**). The highest value of 7.07 is observed at Bhavani station whereas the lowest value of 6.1 is observed at Mettur station. The permissible limit of pH for drinking water is 6.5 - 8.5 (ISI

standards). The all stations water samples are found to be within the acceptable limit of ISI standards. There is no abnormal change of pH in the station water samples. If the pH is found beyond the permissible limit, it affects the mucous membrane of cells [6].

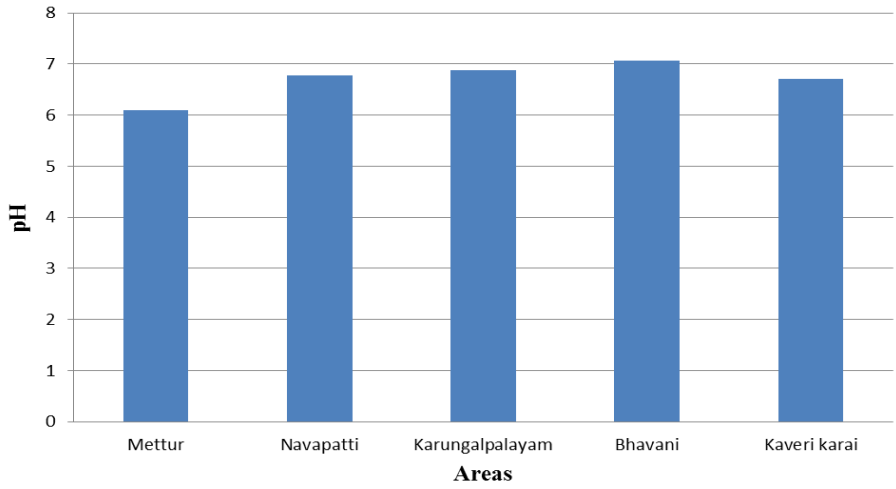

Figure 2 Analysis of pH

Temperature

The temperature values of water samples are found to be in the range of 28.0– 29.4 ^{0}C (**Figure 3**). The highest value of 29.4 ^{0}C is observed at Bhavani station whereas the lowest value of 28.0 ^{0}C is observed at Kaveri karai station. The permissible limit of temperature for drinking water should not exceed 5^{0}C above the receiving water temperature (ISI standards). All water samples are 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.

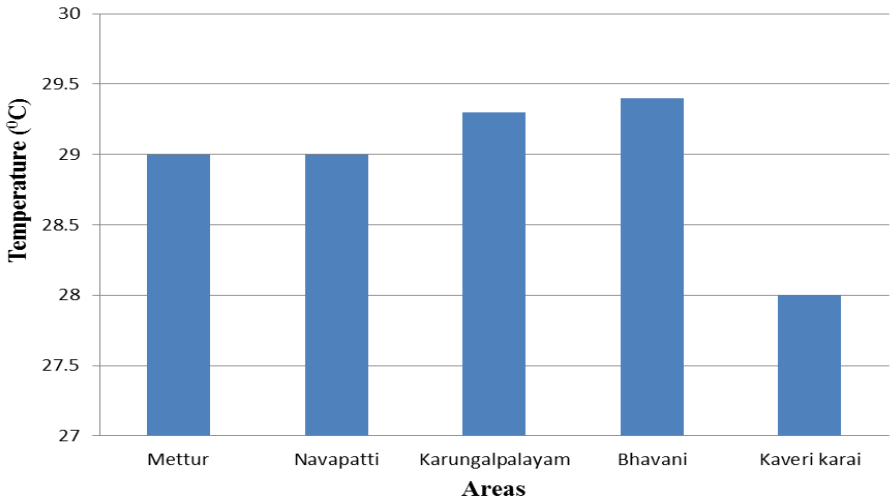

Figure 3 Analysis of Temperature

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 water samples vary between 134 and 201 mg/l (**Figure 4**). The maximum allowable limit of total dissolved

solids in drinking water is 500 mg/l (ISI standards). The maximum value (201 mg/l) is recorded at Kaveri karai station and minimum value (134 mg/l) is recorded at Navapatti station. All water samples are found to be within permissible level. Away from this permissible level, palatability decreases and may cause gastro intentional irritation [6].

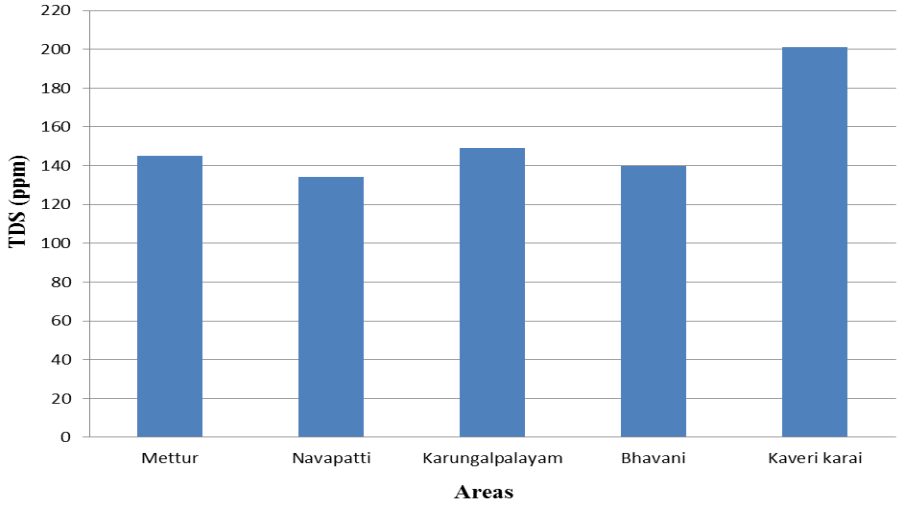

Figure 4 Analysis of TDS

Hardness

Hardness of the water is due to presence of Ca and Mg salts. The hardness values of water samples were recorded between 112 and 155 mg/l (**Figure 5**). The maximum value (155 mg/l) is observed at Kaveri karai station and minimum value (112 mg/l) recorded at Mettur station. The permissible level of hardness is 300 mg/l (ISI standards). All the water samples are found to be within this permissible level. Encrustation in water supply structure and adverse effects on domestic use occur beyond this permissible level.

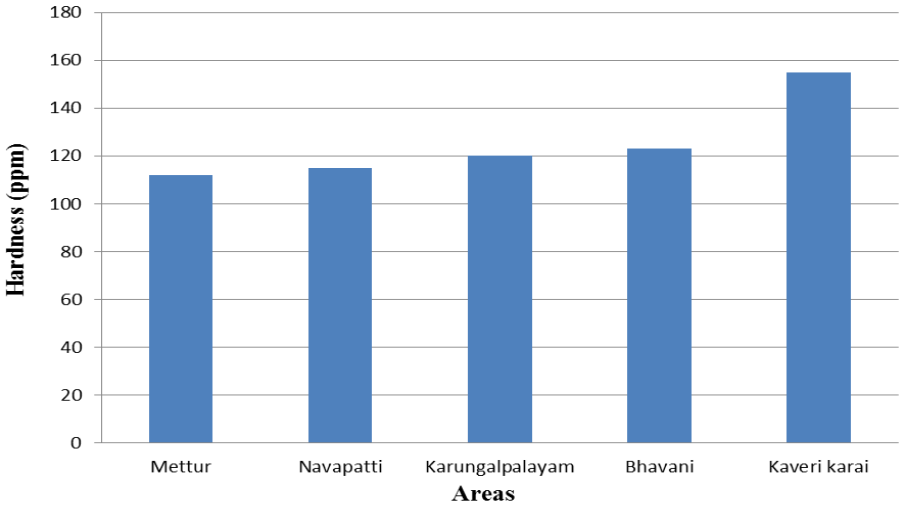

Figure 5 Analysis of Hardness

Alkalinity

Alkalinity of the water is due to presence of carbonates, bicarbonates and hydroxide salts. The alkalinity values of water samples were recorded between 12.5 and 30.0 mg/l (**Figure 6**). The maximum value (30.0 mg/l) is observed at

Mettur station and minimum value (12.5 mg/l) recorded at Navapatti station. The permissible level of alkalinity is 200 mg/l (ISI standards). All stations 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].

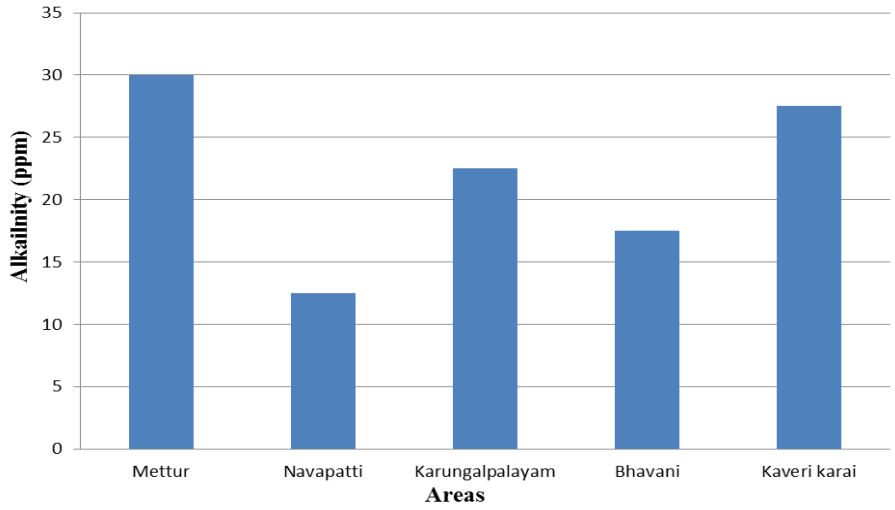

Figure 6 Analysis of Alkalinity

Chloride (Cl)

The value of chloride for all the station water samples is ranged from 2.1 – 4.6 mg/l (**Figure 7**). All station water samples show chloride values within the acceptable limit (250 mg/l) of ISI standards. The highest value of 4.6 mg/l is observed at Kaveri karai station whereas the lowest value of 2.1 mg/l is observed at Mettur station. 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].

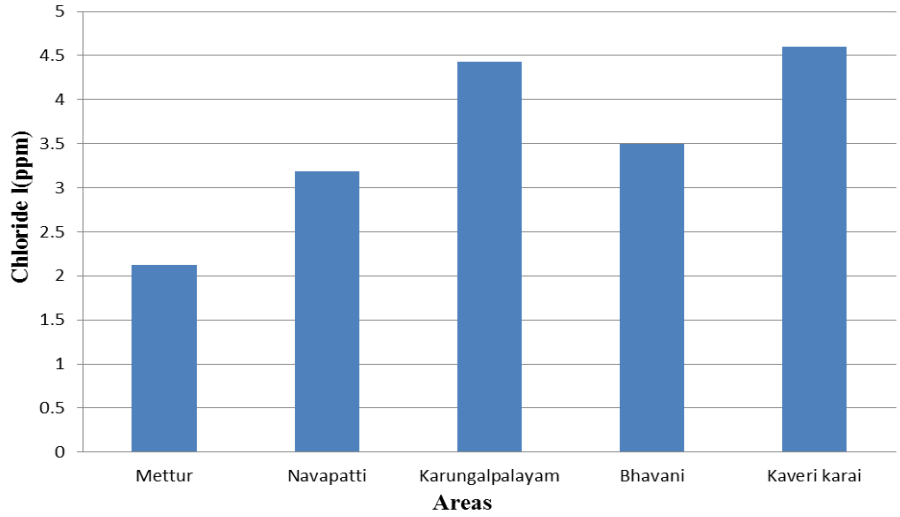

Figure 7 Analysis of Chloride

Sulphate (SO_4)

The sulphate values for the water samples are exhibited between 18.2 and 11.5 mg/l (**Figure 8**). The maximum value (18.2 mg/l) is noted at Kaveri karai station and minimum value of sulphate (11.5 mg/l) is noted at Navapatti station.

The sulphate values for all the station 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].

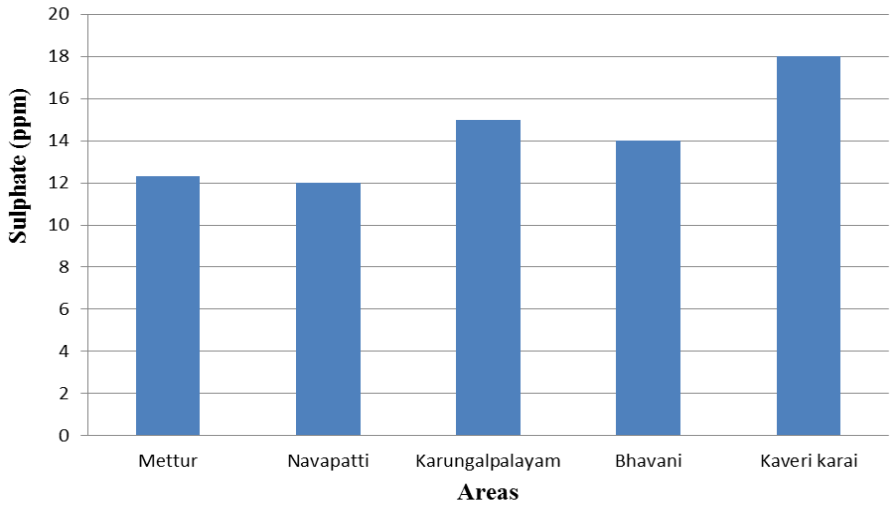

Figure 8 Analysis of Sulphate

Iron (Fe)

The Fe values for the station water samples are exhibited between 0.1 and 0.2 mg/l (**Figure 9**). All the station water samples are found to be within 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.

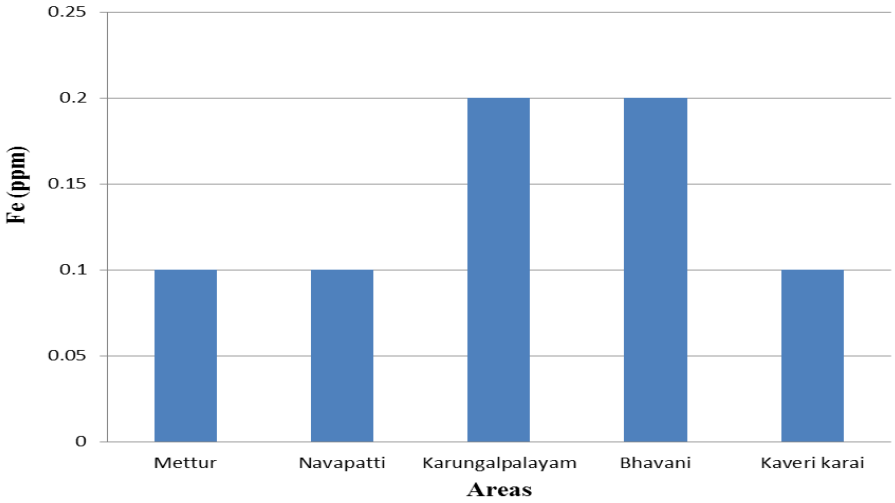

Figure 9 Analysis of Iron (Fe)

Dissolved oxygen (DO)

The DO values in the station water samples have observed from 3.2 to 4.0 mg/l (**Figure 10**). The highest value (4.0 mg/l) of DO is recorded at Mettur station whereas the lowest value (3.2 mg/l) is recorded at Bhavani station. The concentration of dissolved oxygen in clean water is 8 – 10 mg/l. In this investigation, the DO is very low in all the station 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].

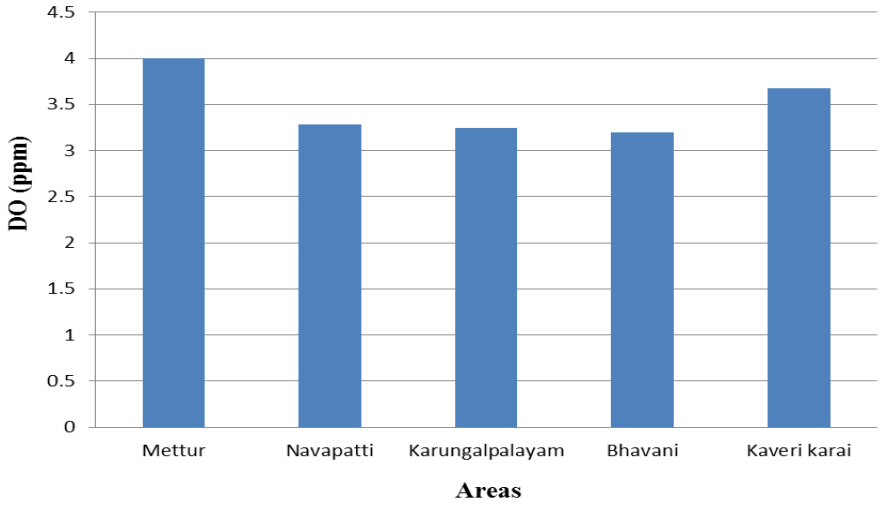

Figure 10 Analysis of Dissolved Oxygen (DO)

Biochemical oxygen demand (BOD)

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 water samples are recorded in the range of 5.40 to 7.92 mg/l (**Figure 11**). All the station water samples are exceeded the permissible limit (5 mg/l) of ISI standards. This indicates that the river water at all stations have 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.

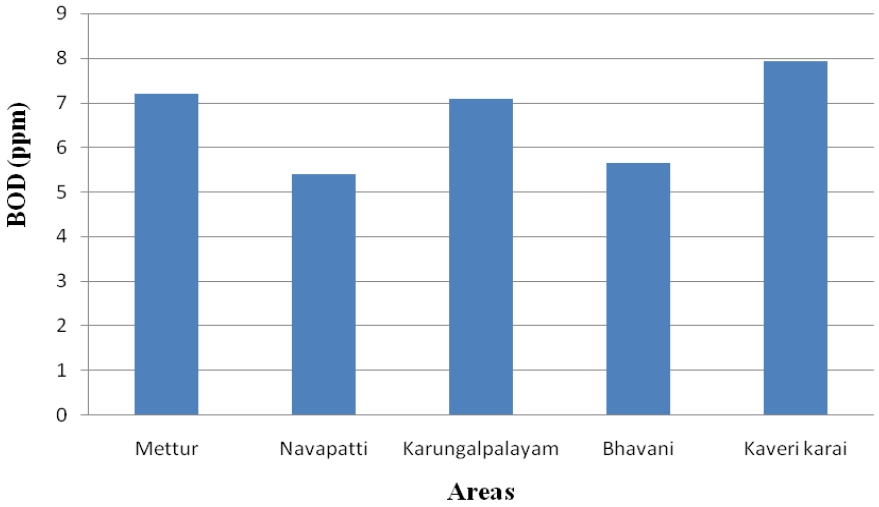

Figure 11 Analysis of BOD

Conclusion

Physico-chemical characterization of Kaveri river water samples at different stations are taken from Salem district, Tamilnadu. Five water samples were collected 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 station water samples are compared with the standard permissible values. It has been found that maximum parameters of water samples from all different stations are at permissible level as per ISI standards. However, it is suggested to monitor the station water quality and assess periodically in this study station to prevent the contamination from dye industries, municipal wastewater and other sources.

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References

[1] M.M. Hanipha, A.Z. Hussain, *Int. Res. J. Environment Sci.*, **2013**, 2, 68.
[2] V. Tharanitharan, K. Srinivasan, *Indian J. Chem. Technol.*, **2009,** 16, 245.
[3] V. Tharanitharan, K. Srinivasan, *Indian J. Chem. Technol.*, **2009,** 16, 417.
[4] P.F. Lilly, A. Paulraj, T. Ramachandramoorthy, *Int. J. Res. Chem. Environ.*, **2012,** 4, 323.
[5] APHA, American Public Health Association, Standard Methods for Estimation of water and Wastewater, AWWA, *Water Pollution Control Federation*, 1995, New York.
[6] K. Nishtha, R.S. Lokhande and J.K. Dhar, *I.Res. J. Environment Sci*., **2012,** 1, 1.
[7] L. Sundar, Saseetharan, *Journal of Environmental Science and Engineering.*, **200**8, 50, 187.
[8] C.K. Jain, K.K. Bhatio, S.R. Kumar, *InternationalJournal of Environmental Protection.*, **2005**, 23, 321.
[9] I. Gupta., A. Salunkhe, N. Rohra, R. Kumar, *Journal of Environmental Science and Engineering.*, **2011**, 43, 453.
[10] B.K. Sahu, R.J. Rao, S.K. Behara, R.K. Pandit, *ABD publication*., **2000**, 168.

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