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Water Quality Assessment in Kannur District

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Abstract: ***A survey of the quality of surface and ground water in Kannur District, Kerala was made as a part of my minor research project which was funded by UGC. A small part of the work was presenting here. In my work, I have selected four surface water samples from different parts of Kannur District and its quality was tested based on different parameters such as BOD, COD presence of various ions etc. From the analysis it was clear that our water sources are not perfect and we have to take immediate action to protect our water system.***
Keyword: water quality parameters, DO, BOD, COD, dissolved ions.

I. INTRODUCTION

Pure water for drinking is one of the most basic needs of all the living beings. But unfortunately it is just a dream for many. According to WHO, about five crores of peoples all over the world die every year from consumption of polluted water. Due to various human activities, the available water resources become more and more polluted. Moreover, the water scarcity all over the world also increasing at an alarming rate. In this context it is very important to analyse water samples from our location to find out whether they are fit to use or not. Kannur is a fast developing and thickly populated Area. So pollution due to improper disposal of waste is one of our major problem. In my project, quality of the surface and ground water in and around Kannur District was checked and a small portion of the work was presenting here by selecting four surface water samples from different parts of Kannur District.

Water quality analysis in general can be planned at 3 levels as given below

1) Compulsory water quality parameters, like pH, Electrical Conductivity, Hardness, Turbidity and presence of coliform bacteria in the water sample.
2) Optional water quality parameters like presence of ions such as Fluoride, Nitrate and Iron, Dissolved oxygen, Biological and chemical oxygen demand of the water sample.
3) Water quality parameters which are to be analysed in referred labs such as presence of Heavy metals and Pesticide.

Some water quality parameters in first and second level was analysed from department of Chemistry, PRNSS College, Mattanur and was given below.

II. EXPERIMENTAL

Compulsory water quality parameters, like pH, TDS, Salinity, Electrical Conductivity and temperature can be measured directly by using water analysis kit. Samples used by the public from various parts of Kannur district are collected for analysis. Optional water quality parameters COD BOD and DO can be measured by redox titration[1],[2],[3]. I have selected 4 samples (surface water) from various parts of Kannur district in my analysis.

A. Chemical Oxygen Demand (COD)

It is a measure of water and waste water quality. It is based on the fact that a strong oxidizing agent, under acidic condition, can fully oxidize almost any organic compounds to carbon dioxide. COD is the amount of oxygen consumed to chemically oxidize organic water contaminants to inorganic end products. For all organic matter to be completely oxidized, an excess amount of potassium dichromate (or any oxidizing agent) must be present. Once oxidation is complete, the amount of excess potassium dichromate can be measured by back titration with ferrous ammonium sulphate (FAS) using ferroin as the indicator. Once all the excess dichromate has been reduced, the ferroin indicator changes from blue-green to a reddish brown. The amount of ferrous ammonium sulphate added is equivalent to the amount of excess potassium dichromate added to the original sample.

Procedure

50ml of water sample was taken in an RB flask along with some porcelain pieces. 30ml of 0.01N $KMnO_4$ solution was added followed by 20mL of 50% H_2SO_4. Connected the reflex condenser and heated in a water bath for 2hrs. Solution was cooled and titrated against 0.0409N FAS in presence of ferroin indicator to measure the volume of unreacted $KMnO_4$ (s). Titration of blank solution was conducted by taking distilled water

in place of sample water (b). COD can be calculated using the formula,

COD in mg/L = (b-s) n X 8X1000/Vol. of sample used

where b is the volume of FAS used in the blank sample, s is the volume of FAS used in the original sample, and n is the normality of FAS.

B. Biological Oxygen Demand (BOD)

It is the amount of dissolved oxygen used up by suitable aquatic microorganisms for the oxidation of organic matter present in a well aerated sample of water incubated for a period of 5 days at 20^0C. It is the difference in dissolved oxygen for a fresh sample and that after incubated for a period of 5 days at 20^0C. DO is measured by Azide-Winkler method.

C. Dissolved Oxygen (DO)

The Winkler Method uses titration to determine dissolved oxygen in the water sample. A sample bottle is filled completely with water (no air is left to skew the results). The dissolved oxygen in the sample is then "fixed" by adding a series of reagents that form an acid compound that is then titrated with a neutralizing compound (sodium thiosulfate), that results in color change. The point of color change is called the "endpoint," which coincides with the dissolved oxygen concentration in the sample. Dissolved oxygen analysis is best done in the field, as the sample will be less altered by atmospheric equilibration.

DO in mg/L = Normality of thio X Vol. of thio X 8000/ Vol. of sample.

Procedure:

Water sample was collected in a 300ml stoppered glass bottle. By using a pipette, 2ml of manganese sulphate was added, mixed, and then 2 mL of alkali-iodide-azide reagent was also added in the same manner. Stopper the bottle with care to be sure no air is introduced. 2 mL of concentrated sulfuric acid was added. 300 mL of the sample was titrated against 0.1N sodium thiosulfate solution to a pale straw color. 2 mL of starch solution was added to get a blue color. Titration continues until the discharge of blue color. Procedure was given in fig.1. The concentration of dissolved oxygen in the sample is equivalent to the number of milliliters of titrant used. Each mL of sodium thiosulfate added corresponds to 1 mg/L dissolved oxygen.

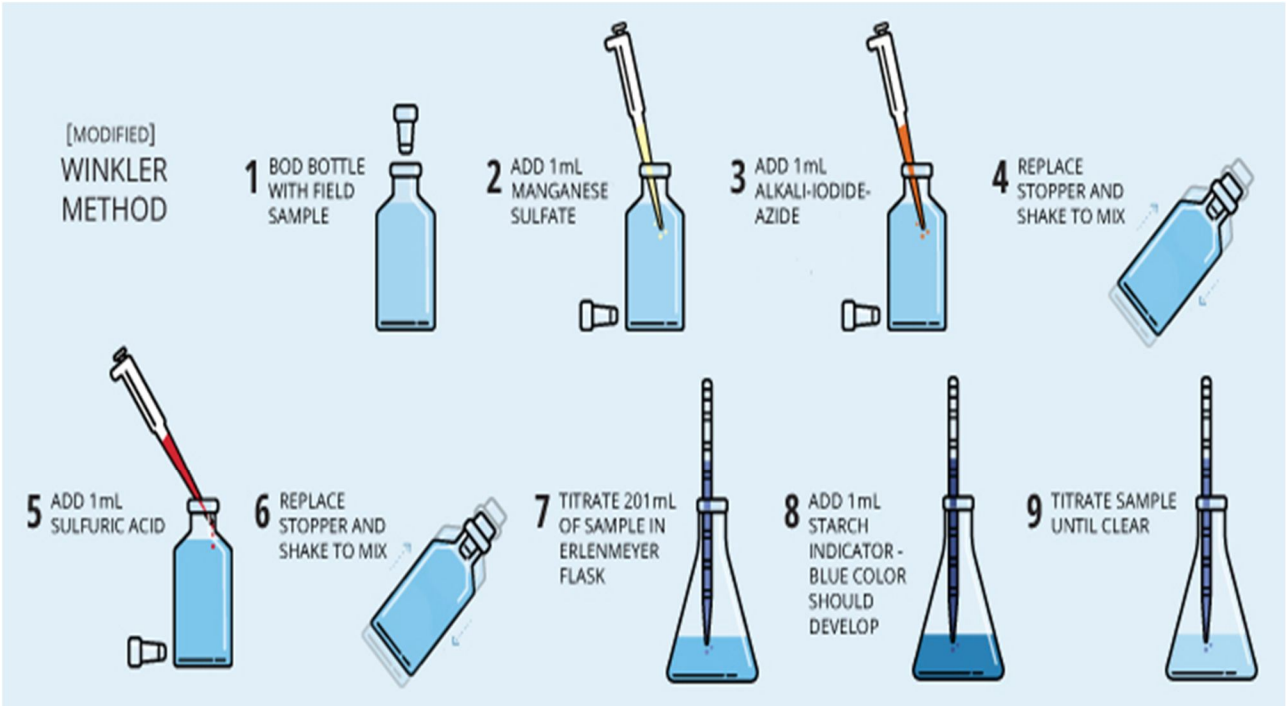

Fig 1. winkler method for calculate DO.

III. RESULTS AND DISCUSSION

Compulsory water quality parameters, like pH, TDS, Salinity, Electrical Conductivity and temperature can be measured directly by using water analysis kit and the results are given in table.1. Value of TDS, Salinity, Electrical Conductivity all represents amount of dissolved ions present in the samples. All were within acceptable limit according to ISI & BIS standards. Similarly, pH 6.5 to 8.5 is acceptable, so the value is low in our 3 samples.

Table.1. Compulsory water quality parameters

Sample No.	pH	TDS ppm	Salinity ppm	Electrical Conductivity micro Siemens per cm	Temperature ^{0}C
1	5.49	166	136	234	28.5
2	5.73	12.7	19.8	18.4	30.3
3	5.76	15.4	21.1	21.7	28.9
4	6.69	34.6	33.8	43	28.5

COD was detected volumetrically and the results are given in table.2. As per ISI & BIS standards, COD value for water system should be less than 250, but its value was found to be slightly higher in 2 cases.

Table.2.COD of water samples

Sample No.	required ml of FAS for sample	COD in mg/L = (b-s)n X 8 X1000/50
1	29.2	208.1
2	17.1	287.3
3	20.3	266.3
4	24.0	242.1

(Required ml of FAS for blank = 61ml; normality of FAS 0.0409N)

DO and BOD was detected volumetrically and the results are given in table.3 and 4. From ISI & BIS standards, value for DO in the water system should be 4-6mg/L. but its value was found to be less (3.47mg/L) in the second sample. If DO is below 4 most of the fishes began to get severely stressed and the moment DO reaches zero, massive killing of fishes occur. Water may be considered fairy pure if the BOD is only 1-3mg/L. Higher BOD indicate pollution. All the four samples, BOD value lies within acceptable limit.

Table.3. Dissolved Oxygen (DO) of water samples

Sample No.	ml of sodium thiosulphate required for sample	DO in mg/L = Normality of thio X Vol. of thio X 8000/ Vol. of sample.
1	2.2	5.87
2	1.3	3.47
3	1.5	4.0
4	2.1	5.6

(Normality of thiosulphate = 0.1N)

Table.4. Biological oxygen demand(BOD) of water samples

Sample No.	ml of sodium thiosulphate required for sample	DO in mg/L after 5 days	BOD in mg/L = DO initially- DO after 5 days
1	1.5	4.0	1.87
2	0.8	2.13	1.34
3	1.0	2.67	1.33
4	1.5	4.0	1.6

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IV. CONCLUSION

So from various analysis, it was concluded that the samples are not perfect, but acceptable. So we must take care to improve the quality of our water system. Proper waste management should be promoted to avoid dumping of waste in rivers, ponds and other water system.

V. ACKNOWLEDGMENT

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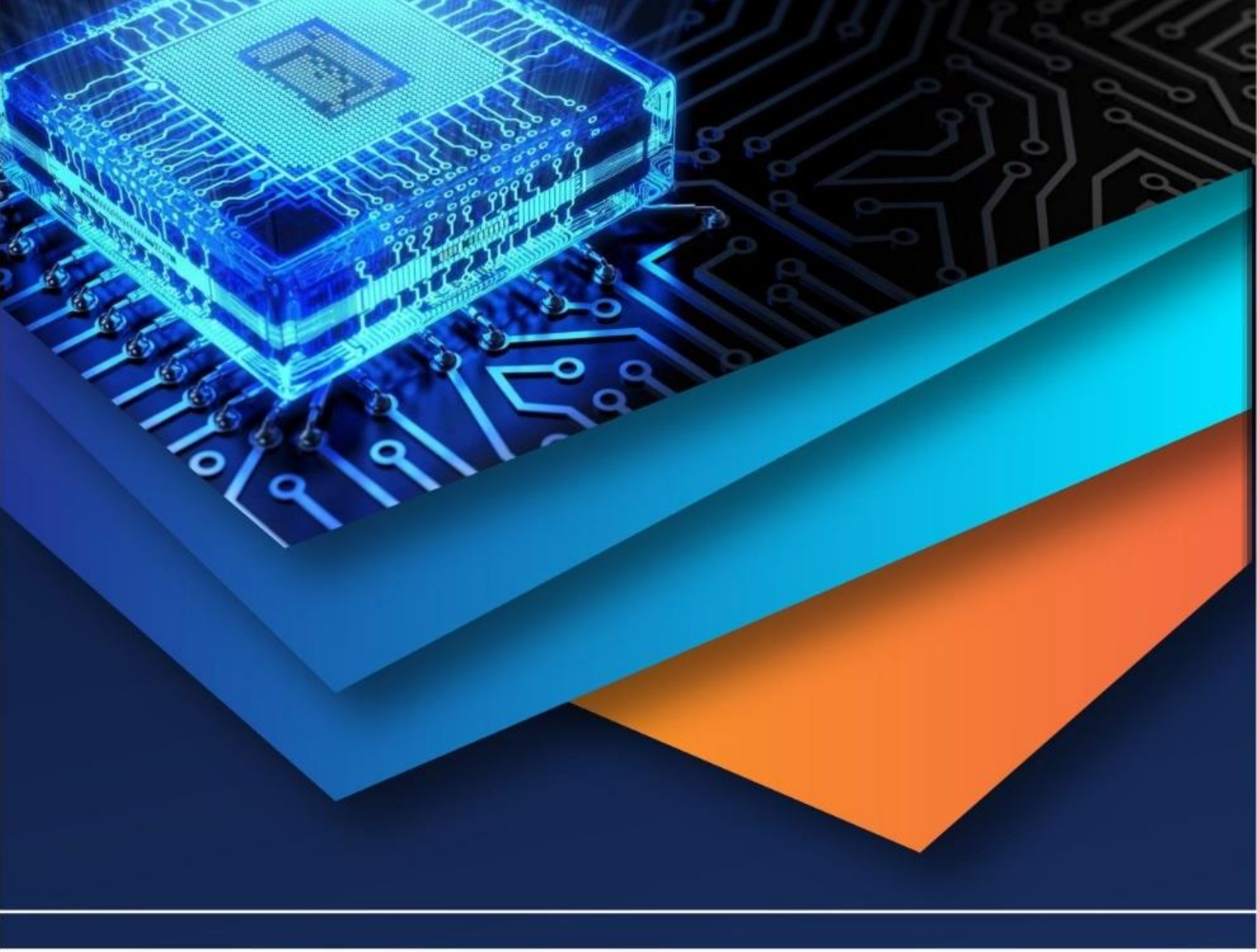

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