Experimental Study of Surface Water of Kodli Lake

Manish Srivastava[1] Revansiddaya[2] Prashant[3] Akshata Pawar[4] Aishwaraya Rani[5]
[1,2,3,4,5]Department of Civil Engineering
[1,2,3,4,5]GuruNanak Dev Engineering College, Bidar, India

Abstract— Freshwater is required for sustenance of life on Earth. Freshwater can be found in surface water bodies such as lakes, rivers, ponds and canals. Potable or drinking water is defined as having a satisfactory quality in terms of its physical, chemical and bacteriological parameters so that it can be securely used for drinking and cooking. The most common and widespread health risks associated with drinking water in developing countries are of biological origin. The WHO Guidelines for Drinking-Water Quality recommend that Faecal Indicator Bacteria (FIB), preferably E. coli or alternatively Thermo-Tolerant Coliform (TTC), should not be detectable in any 100 ml drinking water sample. Water is essential to life on Planet Earth. Humans generally consume from 2 to 4 L water/day. The composition of drinking water has positive and negative effects on human health because it may contain microbiological, chemical, and radiological contaminants. When contaminated with human and animal wastes, water contributes to Waterborne diseases such infections with microbial pathogens which result in gastrointestinal problems e.g., Diarrhoea or in systemic illnesses e.g., hepatitis); kidney failure.Water-washed diseases linked to poor hygiene resulting from poor access to safe water. Water-based diseases such as schistosomiasis caused by parasitic worms that live inside snails, the parasite causes damages in several organs such as the intestines, skin, liver, and the brain. Water-related diseases caused by insect vectors that breed in water.

Keywords: Surface Water, Kodli Lake, Faecal Indicator Bacteria (FIB), Thermo-Tolerant Coliform (TTC)

I. Study Area

Kodli Lake is located in Kalburgi district, Karnataka. Which are 615km from Bangalore and 201km from Hyderabad, Latitude and Longitude of lake is N17.422443870106875N and E77.2162685775601E respectively.

The main reason to choose this location is that even in the presence of lake wateras a resource people leaving nearby villages prefer to consume water through other resource, so we decided to know the reason behind it and started doing research on it.

II. Literature Survey:

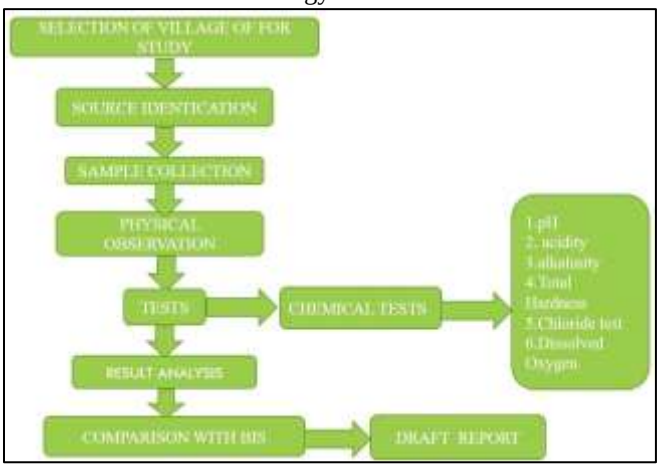
1) KHUSHBU K. BIRAWAT, MATHUVANTHI C. NACHIYAR AND MAYAJA. N. (2021) "Impact of urbanisation on lakes—a study of Bengaluru lakes through water quality index (WQI) and overall index of pollution (OIP)" Lakes are important in a city like Bengaluru which does not have a perennial river, thus is dependent on many lakes for both water supply and recreation. In this study, ten lakes of three different subwater sheds-rural, semi-urban and urban were studied. Physicochemical analysis of the lakes was carried out. It was found that all the lakes, except for Mogi Kere, had BOD content exceeding 3 mg/L, which is an indication of high organic pollution. The water quality index was then computed using the weighted arithmetic method and overall index of pollution method. From the current study, it was found that in the city of Bengaluru, urban sub watersheds host lakes of very poor water quality and need immediate attention. Also, the lakes in semi-urban watersheds have to be protected to avoid further deterioration and protection of water bodies.
2) H.S. ANANTNARAYAN, TINA BERETTO, ANUPAMA DESAI AND GAJANANHEGDE (2018): "Water quality assessment of Kotithirta a holy temple lake of Gokarna, Karnataka" The main aim of current study was to assess water quality of kotiteertha lake, Gokarna a holy place situated in Karnataka. Water samples were collected in winter season of Costal Karnataka. Due to increased population and manmade activities and performing rituals, water is being highly polluted with different types of contaminates1. The

water samples were collected at five different selected sampling sites. The assessment of physio chemical parameters of Kotiteertha lake water was done during January 2018.It is very necessary to know details about different parameters like pH, temperature, turbidity, alkalinity, hardness, conductivity, sulphate, TS, TDS, TSS, DO, BOD etc. The above analysis results of Physio chemical parameters reveal that majority of lake water is contaminated due to several man-made activities and performing rituals in the lake water. The high value of turbidity and Total solids confirms that the lake water is unsafe for drinking purpose as per the guidelines given by IS 10500:2012. However, after filtration or necessary treatment like Ultra filtration, Reverse osmosis, etc the water can be used for drinking purpose. The low value of D.O and high value of BOD at some sampling points concludes that the water is going to be dangerous for aquatic life. Further studies are required to estimate the Heavy metals and microbial analysis for reporting the complete assessment of water quality.

3) T.M SANTHOSH KUMAR and K.L. PRAKASH (2020):
"Surface Water Quality in the forest catchment – A case study of Tunga and Bhadra River stretches, Karnataka" A need of water quality assessment of the rivers before enters into the human induced habitations play a vital role in maintenance of ecological balance. The surface water samples were randomly collected from the Tunga and Bhadra reservoirs situated in the downstream catchments of Western Ghats with semi-evergreen and mixed deciduous forests during January 2018 to December 2019. The samples were analysed as per the Standard Methods prescribed for drinking water analysis. It is very necessary to know details about different parameters like pH, temperature, turbidity, alkalinity, hardness, conductivity, sulphate, TS, TDS, TSS, DO, BOD etc. The water quality in Tunga and Bhadra reservoir meets the acceptable criteria for sustenance of aquatic life in the absence of specific standards in India. Forest plays crucial role in purifying the water naturally.22 Iron ore mining activities carried out in the past in the river catchments of Bhadra river has no relationship with river water quality now. Similarly, there was no significant changes in water quality were observed during peak floods of monsoon season in 2019. Weathering of rocks, geological formations in the catchment also contributes in maintaining the water quality.

III. METHODOLOGY AND METHODS FOR ANALYSIS

Methodology Flow Chart



A. Collection of Sample

Sampling techniques used in raw water supply must assure that representative samples are obtained because the date of analysis of Samples will ultimately serve as a basis for designing of treatment facilities. The objective of the samples is to collect portion of the materials mall Enough in volume to the transported to end handled in the laboratory while still accurately representing the material.

1) TYPES OF SAMPLING PROCEDURES:

a) Grab sampling
b) Composing sampling.
c) Integrated sampling.

a) Grab Sampling

A sample collected at a particular time and place can represent only the composition of the source at the same time and place.

b) Composite sampling: -

The term composite to mixture of sample taken at the same sampling point at different time. Sometimes the term "composite time" is used when its necessary. Composite samples and be used to determine components or characteristics subject to significant unavoidable changes on storage.

c) Integrated Sampling:

Mixture of samples collected from different point simultaneously or as nearly as possible integrated samples, such samples are for river or streams that is called occurrence its width and depth By adopting the integrated sampling the raw water was collected The influent in 11 to 11 in an interval of 2 in order to 8 in the past. Was seen to the site itself.

These collected samples were listed physical and chemical characteristics. The sample was analyzed in laboratory to study its characteristics of physical and chemical parameters like temp, color, pH, DO, Alkalinity, Hardness and Chloride. The work was started on 12-03-2022 and it has been closed on 05-06-2022 during these period 10 samples were analyzed in thermo laboratory.

B. EXPERIMENTAL PROCEDURES

1) Alkalinity Test

Aim: - To determine the various forms of alkalinity in given sample

Apparatus: -

- Conical flask
- Burette, pipette
- Beaker, etc.

Reagents: -

- 0.002N H2SO4,
- Phenolphthalein indicator,
- Methyl orange indicator.

Procedure: -

1) Take 25 or 50ml sample into a conical flask and add 2-3 drops of phenolphthalein indicator.
2) If pink color develops titrate it with 0.02N H2SO4 so till disappear or P is 8.3. Note the volume of H2SO4 require.
3) Add 2-3 drops methyl orange to the same flask, and continue titration till P comes down to 4.5 or yellow color changes to orange. Note down the vol. of H2SO4 added.
4) In case pink color doesn't appear after addition of phenolphthalein continue as in 3 above.

Calculation: -

- Total phenolphthalein (P) and methyl orange alkalinity as follow and express in mg/l as CACO3.
- P-Alkalinity, mg/litre as caco3=A X 1000/ ml of sample. A-Alkalinity, mg/litre as caco3=B X 1000/ ml of sample.

2) Acidity Test

Aim: - To determine the acidity of given sample.

Apparatus: -

- Standard 0.02n NAOH
- Methyl orange indicator
- Phenolphthalein indicator

Procedure: -

1) Measure suitable volume of sample (50 or 100 ml) in 250 ml conical flask beaker depending upon the method to be followed.
2) Add 2 drops methyl orange and titrate with std.0.02N NOAH till color changes to faint orange colored pH 4.4-4.3.
3) Note down the volume of NAOH required A
4) Take another 50ml of sample in a fresh conical flask.
5) Add 1 to 2 drops of Phenolphthalein indicator and titrate with 0.02N NAOH purple color appears.
6) Note down the volume of titrant required B

Calculation: -

a) Each ml of 0.02N NAOH IS = 1mg caco3. Therefore, acidity (mineral or due to co2) as mg/l caco3 = ml 0.02N NAOH required x 1000/ ml of sample as follows:
b) In case if normality of NAOH is other than 0.02N calculate as follows:
c) Acidity minerals or due CO2 as mg/l, CACO3 = A/b X N X 5000/ ml of sample.

Where:

A= ml of NAOH required for sample to raise pH up to 4.4-4.3 B = ml of NAOH required for sample to raise pH up to 4.4-8.3. N= Normality of NAOH used.

3) pH VALUE TEST

Aim: - to determine the pH of given samples using digital pH meter.

Apparatus: -

- pH meter with electrodes
- Beaker
- Thermometer

Reagents: -

- Buffer solution.
- pH paper.
- Using pH Meter.

Procedure: -

1) Follow the manufactures operating instruction.
2) Dip the electrodes in the buffer solution non pH.
3) Switch on the power supply and take the reading. Standardized the instrument using the calibrating knob.
4) After cleaning, again dip the electrodes in the buffer solution of pH 7. Note the reading. If it is 7, the instrument is calibirty. If not, correct the value and is manipulated so that the reading in the dial comes to 7.0.
5) A solution whose pH is to be form is taken in beaker and temperature knob is adjusted such that temperature of solution is same as that in dial.
6) The electrodes is washed with distill water and reused with the solution and then it is dipped in the solution.
7) The reading on the dial indicates the pH of the solution.

4) Determination of Total Hardness

Aim: - To determine total hardness, temporary hardness of a given sample using titrimetric method.

Reagents: -

- Hardness buffer solution
- Eriochrome black T indicator
- Standard EDTA solution 0.01M

Apparatus: -

- Burette
- Pipette
- Conical flask

Procedure: -

1) Take 25 ml sample in a conical flask.
2) Add 1 ml of hardness buffer solution.
3) Add 2-3 drops of eriochrome black T indicator. Wine red color is observed.
4) Titrate with standard EDTA solution till wine red color change to blue.
5) Note down the volume of EDTA consumed (A).

Calcium Hardness Procedure: -

1) Take 25 ml of sample in a conical flask.
2) Add 1 ml of NAOH solution.
3) Add a pinch of murexide indicator.
4) Titrate with a standard EDTA solution till pink color changes to purple.
5) Note down the volume of EDTA consume (A).

Calculation: -

a) Total hardness as CaCO3 in mg/l = V1 x 1000/ ml of sample used.
b) Calcium Hardness as vCaCO3 in mg/l = V2 x 1000 ml of sample used.
c) Magnesium Hardness as Caco3 in mg/l = (Total hardness as CaCO3- Calcium Hardness as CaCO3).

5) Ditermination of Dissolved Oxygen (DO)

Aim: - To determine the quality of dissolved oxygen present in the given sample by using Winkler's (Azide modification) method.

Apparatus: -

- BOD Bottle- 300 ml capacity
- Conical flask
- Burette
- Measuring jars

Reagents: -

- Manganous Sulphate
- Alkali Iodide-Azide Solution
- Starch Indicator
- Standard Sodium Thiosulphate 90.025 no
- Concentrate sulphuric acid

Procedure: -

1) Take the BOD bottle and fill it completely with the given the sample of water.
2) Add 2 ml of manganous sulphate and 2 ml of Alkali-iodide- Azide solution to the BOD bottle. (The tip of the pipette should be below the liquid level while adding these agents)
3) Stopper with care to exclude air bubbles and mis by repeatedly inverting the bottle 15 times.
4) After shaking and allowing sufficient time for all oxygen to react, the chemical precipitates are allowed to settle leaving at least 100 ml of clear solution.
5) Add 2 ml of concentrate Sulphuric acid by allowing the acid to run down the neck of the bottle.
6) Stopper and mix by gentle inversion until the suspension is completely dissolved and yellow color is uniform throughout the bottle.
7) Measure out 203 ml of the solution from the bottle to an Erlenmeyer flask. As 2 ml each of manganese sulphate and azido reagent have been added, the proportionate quantity of yellow solution corresponds to 200 ml of sample is = (200 x 300/ (300-4) = 203 ml.
8) Titrate it against sodium thiosulphate solution until dark yellow changes to pale yellow.
9) Add 1-2 ml starch solution and continue the titration to the first disappearance of the blue color and note down the volume of sodium thiosulphate solution added (V), which gives directly the D.O. in mg/l.

IV. Result and Analysis

CONSTITUENT	PERMISSIBLE STANDARDS	UNITS
pH range	6.5-8.5	-
Acidity	6.5-8.5	-
Alkalinity	200 to 600 mg/l	mg/l
Chloride concentration	<250 mg/l	mg/l
Dissolved oxygen	>5mg/l	mg/l
Hardness test	<200 mg/l	mg/l

Table 5.1.1: Water quality limits as per BIS

CONSTITUENT	PERMISSIBLE STANDARDS	RESULT OBTAINED
pH range	6.5-8.5	7.13
Acidity	6.5-8.5	7.13
Alkalinity	200 to 600 mg/l	230 mg/l
Chloride concentration	<250 mg/l	98mg/l
Dissolved oxygen	>5mg/l	8.42mg/l
Hardness test	<200 mg/l	156mg/l

Table 5.1.2: Results for sample collected in winter season

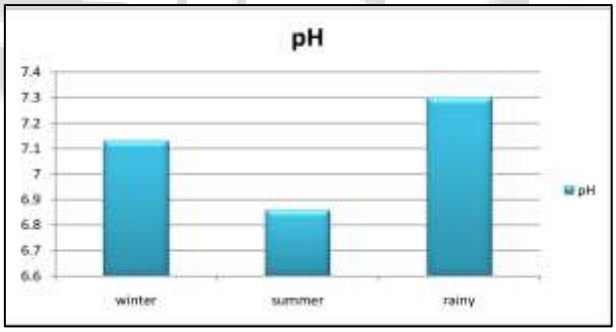
CONSTITUENT	PERMISSIBLE STANDARDS	RESULT OBTAINED
pH range	6.5-8.5	6.86
Acidity	6.5-8.5	6.86
Alkalinity	200 to 600 mg/l	340 mg/l
Chloride concentration	<250 mg/l	78mg/l
Dissolved oxygen	>5mg/l	7.92mg/l
Hardness test	<200 mg/l	186mg/l

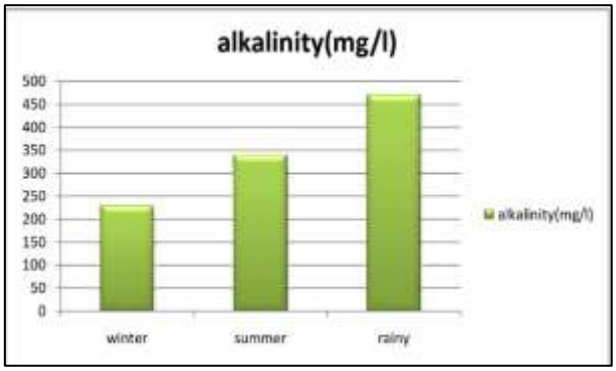
Table 5.1.3: Results for sample collected in summer season

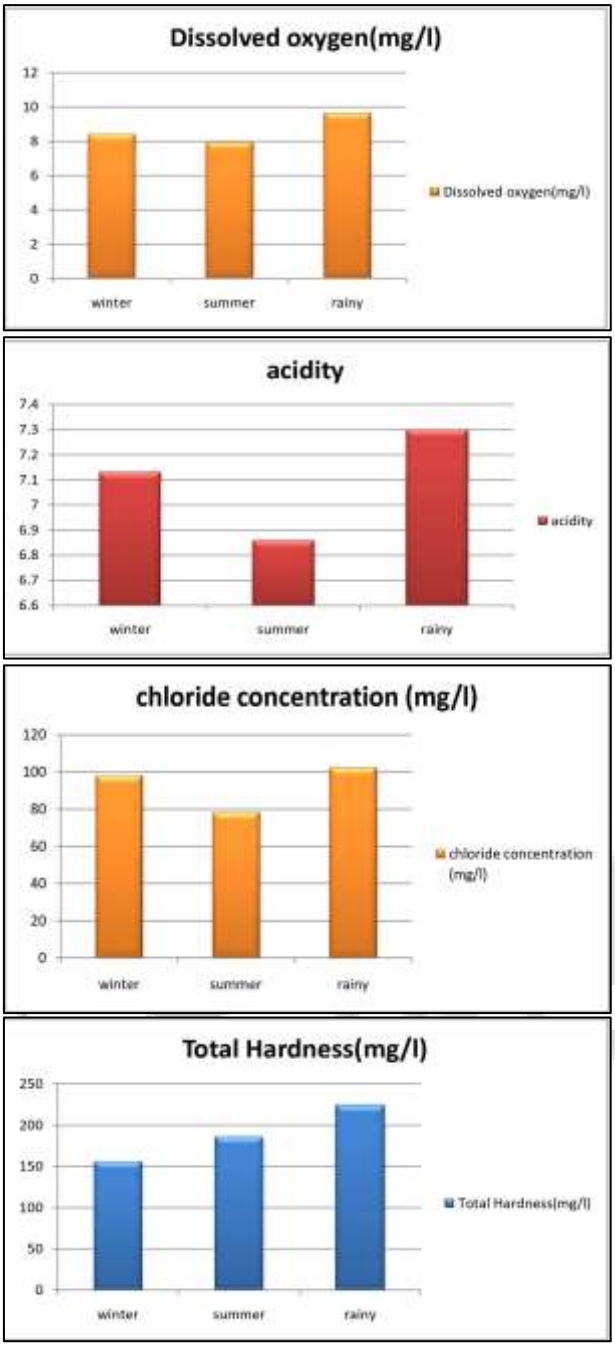
CONSTITUENT	PERMISSIBLE STANDARDS	RESULT OBTAINED
pH range	6.5-8.5	7.3
Acidity	6.5-8.5	7.3
Alkalinity	200 to 600 mg/l	470 mg/l
Chloride concentration	<250 mg/l	102mg/l
Dissolved oxygen	>5mg/l	9.64mg/l
Hardness test	<200 mg/l	224mg/l

Table 5.1.4: Results for sample collected in rainy season.

V. Graphical Representation







VI. CONCLUSION

Since all samples collected in winter, summer and rainy is are analysed that pH value lies between the range of 6.86 to7.3, acidity value is lies between the range of 6.86 to 7.3, alkalinity is varies from 230mg/l to 470mg/l, chloride content is lies between 78mg/l to 102mg/l, Dissolved oxyegen is varies from 8.42mg/l to 9.74mg/l and Total hardness is varies from 156mg/l to 224mg/l

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