

PHYSICO-CHEMICAL ANALYSIS OF KARANJI LAKE WATER MYSORE, KARNATAKA, INDIA

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Abstract: The physico – chemical parameters like hardness, concentration of Mg²⁺ and Ca²⁺ ions, pH, alkalinity, TDS etc of Karanji lake water were studied. The results obtained by the analysis were compared with WHO and ISI standards. These results suggest the deteriorating status of the lake water. To keep it alive and usable a routine analysis of lake water is suggested by the authors at least once in a month. This will be helpful for the lake authorities to safe guard the lake water and keep its impurities levels under check. This study will also bring awareness among the people to maintain a healthy and green environment. These water bodies are very precious and there water should be saved from pollution.

Keywords: Alkalinity, pH, Total dissolved solids, awareness, environment.

I. INTRODUCTION

Water is the most important vital force for all life activities. Lakes act as storage resources of water from ancient times. Their commercial importance is no less than industries, as it facilitates fishing, irrigation, laundry and municipal supply of drinking water. Studies on lake water parameters have been performed by many authors [2-10], to emphasise the importance of conservation of water resources. In the present study authors have tried to analyse the water quality of Karanji Lake, located in the heart of the Mysore city in the state of Karnataka, India. It was constructed by Maharaja of Mysore. It is one of the biggest lakes in Karnataka and spreads over an area of 90 acres with a water spread area of about 55 hectares [1]. This lake is the site for largest walk through aviary in India. It is an abode for more than 90 species of native and migratory birds, butterflies and mammals. The lake is surrounded by a beautiful nature park (Butterfly Park). Regional museum of natural history is also located on the banks of the lake. Being a percolation lake, it started getting polluted when sewage water made its way into the lake. This if not controlled and checked properly will lead to the destruction of a wonderful tourist attraction and nature's gift to the mankind.

II. MATERIALS AND METHODS

Water samples from the Karanji Lake were collected as per standard procedures. The various Physico - chemical parameters were studied using standard methods [11]. The results obtained were analyzed and compared with the WHO and ISI standards [12] listed in table 1. Temperature of the water samples was recorded at the sampling point. AR grade chemicals and glass distilled water was used for the preparation of the reagents. Electrical Conductivity and pH was determined using Systronics - Conductometer and Digital Systronics pH – meter respectively. The water quality parameters like Alkalinity, Total dissolved solids, Calcium and Magnesium ions, pH, Electrical Conductivity, Total, Temporary and Permanent hardness, etc. were studied and listed in Table 2.

III. RESULTS AND DISCUSSION

A. Temperature

Temperature plays a significant role in all physical and biological activities. Rise in temperature of the water enhances the solubility rate of the minerals, but decreases the Solubility of oxygen and other gases. Hence it is an important parameter. Temperature of the water samples was recorded at the sampling point .It was found to be 22⁰C.

B. pH

pH is defined as negative logarithm of the hydrogen ion concentration. The pH of natural water is generally between 6 and 8. It varies due to the dissolved gases, hydrolysis of salts of strong bases and weak acids or vice versa. It affects the solubility of many heavy metals as well as toxic chemicals in water. The pH of the water was found to be 8.0 and 8.2 for samples S₁ and S₂ respectively, which is on the higher side of the tolerance limit as stated by WHO and ISI standards. Table 2, Fig 1.

C. Alkalinity

Alkalinity of water is the quantitative capacity of water to buffer or neutralize an acid. It is due to the presence of carbonates, bicarbonates and hydroxides anions, which decreases H⁺ ions and increases the pH of water. Irrigation of land with highly alkaline water may lead to the reduction in the yields of the crops by altering the pH of the soil. Alkalinity of the water samples was found to be 340 mg/L for S₁ and 345 mg/L for S₂ samples respectively, which is very high as compared to the said standards. Table 2, Fig 1.

D. Electrical Conductivity (EC)

Electrical Conductivity is an estimate of the total amount of dissolved ions in water. It is a measure of electrical flow and depends upon the concentration, temperature and mobility of

the ions present in the water. Inorganic materials like alkalis, nitrate, sulphate, chloride, phosphate, carbonates etc of sodium, magnesium, calcium, iron and aluminium attributes towards conductivity. The Electrical Conductivity was found to be 580 $\mu\text{s}/\text{cm}$ and 600 $\mu\text{s}/\text{cm}$ respectively for S_1 and S_2 . Table 2, Fig 1.

E. Hardness

Hardness is caused due to the presence of dissolved salts of calcium and magnesium. It is expressed in the terms of calcium carbonate equivalent (ppm or mg/L). The total hardness in the water was found to be 179 mg/L for S_1 and 185 mg/L for S_2 sample respectively which is quite alarming. The nature of the hardness in the water was further studied as temporary and of permanent type. Bicarbonates of calcium and magnesium that leads to temporary hardness in the water was found to be 139 mg /L for S_1 and 145 mg/L for S_2 sample whereas, the chlorides and sulphates of calcium and magnesium that causes permanent hardness in the water was found to be 40 mg/L for both the samples S_1 and S_2 respectively. Table 2, Fig 1.

F. Ca^{2+} and Mg^{2+} ions

The total hardness in water is due to the presence of Calcium and Magnesium ions. Hardness in water is extremely disadvantageous for both industrial and domestic uses. sugar, paper, pharmaceutical, cement etc industries all suffer if water is hard. Potable water is also suggested to have low concentration of these ions as their deposition in the soft tissues of the living bodies may lead to various kinds of illnesses like stone formation and even cancer. The presence of Ca^{2+} ions was found to be 91 mg/L for S_1 and 96 mg/L for S_2 sample which is beyond the tolerance limits, whereas Mg^{2+} ions was found to be 88 mg/L for S_1 and 89 mg/L for S_2 sample even this was higher when compared to ISI standards. Table 2, Fig 1.

G. Total Dissolved Solids (TDS)

The total dissolved solids is the sum of all the ions like iron, calcium, magnesium, sodium, carbonates, bicarbonates, sulphates, chlorides, nitrates, phosphates, etc present in the water. Total dissolved solids are due to the dissolution of soil, rocks, gypsum etc. The amount of TDS was found to be 332 mg/L for both S_1 and S_2 samples. Table 2, Fig 1.

Table 1: Water Quality Parameters and Their WHO & ISI Standards

| Sl.No | Parameters | Method | WHO Standards | ISI Standards |
|-------|-------------------------|-------------------|---------------|---------------|
| 1 | Temp. | Thermometric | ----- | ----- |
| 2 | pH | pH metery | 7.0 – 8.0 | 6.5 – 8.5 |
| 3 | Electrical Conductivity | Conductometry | 1400 | ----- |
| 4 | Total Dissolved Solid | Filtration Method | 1000 | 500 |
| 5 | Total Hardness | EDTA titration | 100 | 300 |
| 6 | Temporary hardness | EDTA titration | ----- | ----- |
| 7 | Permanent hardness | EDTA titration | ----- | ----- |
| 8 | Calcium | EDTA titration | 75 | 75 |
| 9 | Magnesium | EDTA titration | 150 | 30 |
| 10 | TA | Titration Method | 120 | 200 |

Table 2: Parameters and Methods studied for Karanji Lake water

| Sl.No | Parameters | Method | S ₁ | S ₂ |
|-------|--------------------------------------|-------------------|-------------------|-------------------|
| 1 | Colour | ----- | Colourless | Colourless |
| 2 | Temp. | Thermometric | 22 ⁰ C | 22 ⁰ C |
| 3 | pH | pH metery | 8.0 | 8.2 |
| 4 | Electrical Conductivity(μ s/cm) | Conductometry | 580 | 600 |
| 5 | Total Dissolved Solid(mg/L) | Filtration Method | 332 | 332 |
| 6 | Total Hardness (mg/L) | EDTA titration | 179 | 185 |
| 7 | Temporary hardness(mg/L) | EDTA titration | 139 | 145 |
| 8 | Permanent hardness(mg/L) | EDTA titration | 40 | 40 |
| 9 | Calcium(mg/L) | EDTA titration | 91 | 96 |
| 10 | Magnesium(mg/L) | EDTA titration | 88 | 89 |
| 11 | Alkalinity (mg/L) | Titration Method | 340 | 345 |

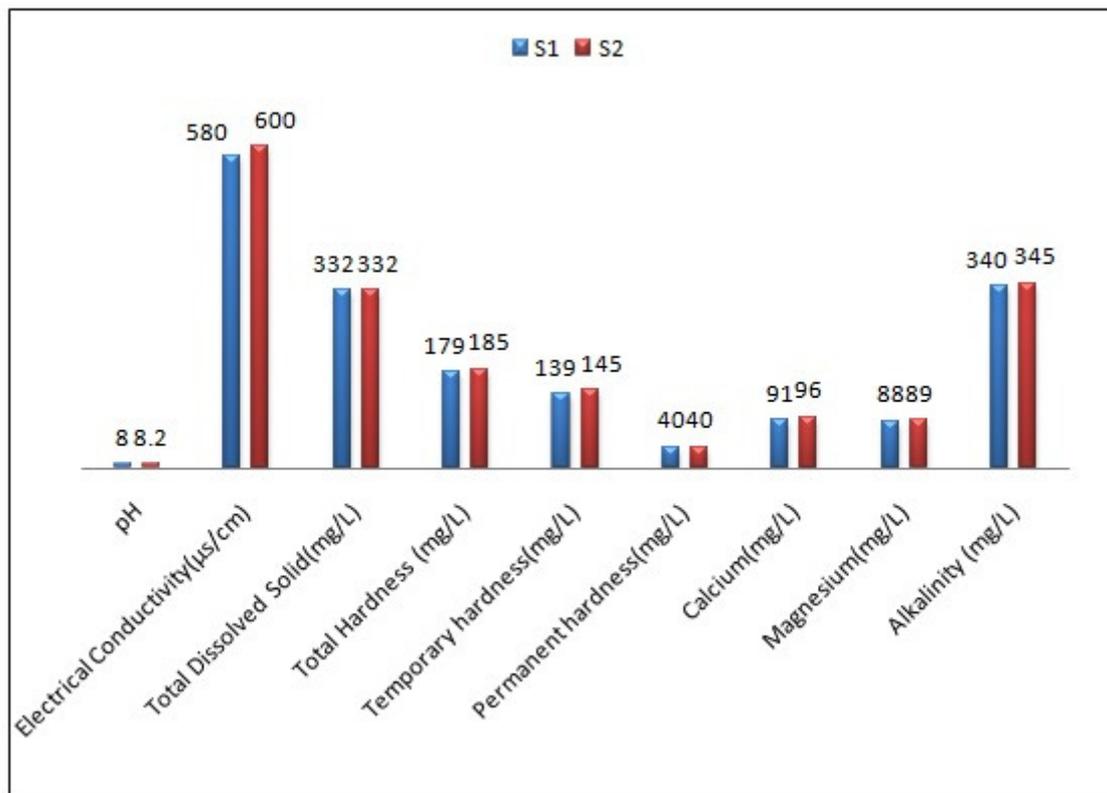


Fig 1: Graphical Representation of parameters of Karanji Lake water

V. CONCLUSION

Karanji Lake is a percolation lake. It is a great tourist attraction from India and abroad. It is an abode for many animals. It supplies water to many industries, to the city for urban use and for irrigation. The results obtained from the present study are not very enthusiastic. High pH and alkalinity of the water as well as high amount of total hardness in the lake water makes the water highly prohibited for drinking and irrigation purposes. It is even not recommended for industries due to excessive hardness. The main reasons for its deterioration may be improper town planning and development, dumping of garbage and sewage in the soil of the catchment area of the lake and improper or leaky underground drainage system. Unplanned tourism activities and cultural misuse is yet another big threat to the lake. Hence the authors suggest having a well managed and well built shoreline. This will prevent illegal trespassing and misuse of the lake water. Visitors entering into the park and museum should be educated properly, through hoardings and documentaries about the prestigious ancestral heritage of the lake so that they should not spoil the sanctity and serenity of the lake. Frequent cleaning of the surrounding areas of the lake is also important and should not be overlooked.

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