

A Study on the Water Quality Parameters of Kukkarahalli Lake Water Mysore, Karnataka, India

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Abstract: The physico-chemical parameters like pH, alkalinity, TDS, hardness, Mg^{2+} , Ca^{2+} etc of Kukkarahalli lake water were studied and the results obtained by the analysis were compared with WHO and ISI standards. The results of the present study are not very encouraging and reflect the deteriorating status of the lake. It emphasises for a quick action to be taken for its restoration. This requires a careful monitoring of lake water by conducting its analysis on a routine basis. This study may be very helpful for the authorities to protect the lake water resources and keep their impurity level under check so that it can be used during the crisis. The study will also help in bringing awareness among the people living near the lakes to keep their environment clean and green.

Key Words: Kukkarahalli Lake, pH, Total hardness, Impurities, Awareness

I. INTRODUCTION

Lakes are valuable resources for the people. Farmers use lake water for irrigation, if maintained properly and beautified lakes become popular picnic spots. Healthy lakes and their shores provide us with a number of environmental benefits and also improve the quality of our life by strengthening our economy through the lake resources. Kukkarahalli Lake sets a good example for the above stated things. It is located in the heart of the Mysore city and was created in the year 1864 by Mummadi Krishnaraja Wodeyar (1794 – 1808) a visionary and king of the Mysore dynasty [1]. This lake has seen the rise of great poets, writers and musicians doing their finest work on its shores [2]. It was also used to be a big attraction to bird watchers. The increased sewage dumping and excessive land encroachments have resulted into the blockage of the flow of the water leading to the eutrophication of lake. This had an adverse effect on the number of birds visiting the lake, and their number is greatly reduced. Many authors have studied various physico-chemical parameters of different lakes of the country to assess their water quality [3]-[8]. The authors of the

present study found this lake amusing because of its historical and cultural importance, hence tried to do a small effort in this direction.

II. MATERIALS AND METHODS

Samples were collected from the Kukkarahalli Lake as per standard procedures. The various Physico - chemical parameters were studied and analyzed. The results were compared with the WHO and ISI standards [9]. AR grade chemicals were used for the preparation of reagents and glass distilled water was used for the analysis. Electrical Conductivity and pH were determined using Systronics-Conductometer and Digital Systronics pH – meter respectively. The water quality parameters like pH, Conductivity, Alkalinity, Total dissolved solids, Calcium and Magnesium ions, Total hardness, Temporary and Permanent hardness, etc. were studied. Temperature of the sample was noted at the sampling point. Various parameters were studied using standard methods [10]. The WHO and ISI standards are listed in Table 1.

III. DETERMINATION OF WATER QUALITY PARAMETERS

The parameters like Total hardness, Temporary hardness, Permanent hardness, Alkalinity, Total dissolved solids, Calcium, and Magnesium ions were determined using standard methods as listed in Table 2 and the results obtained were compared with WHO and ISI standards listed in Table 1

IV. RESULTS AND DISCUSSION

A. Temperature

Temperature influences the rate of chemical and biochemical reactions in water hence it is very important. Rise in temperature of water decreases the solubility of gases and amplifies the tastes and odour. The temperature of the water samples noted was 22^oC.

B. pH

pH is the negative logarithm of the hydrogen ion activity. The pH of natural water is generally between 6 and 8. pH of water varies due to the hydrolysis of salts of strong bases and weak acids or vice versa. Dissolved gases like carbon dioxide, Hydrogen sulphide, ammonia etc also affect the pH of the

water. The pH of water was found to be 8.6 and 8.4 for samples S1 and S2 respectively. The pH was found to be on the higher side when compared with the standards both WHO and ISI. Table 3, Fig 1.

C. Alkalinity

Alkalinity of water is its capacity to neutralize an acid. The presence of carbonates, bicarbonates and hydroxides, decreases H⁺ ions and increase the pH of the solution/water. Increase in Alkalinity affects the irrigation and alters the pH of the soil thus reducing the crops yield. Alkalinity of the water samples was found to be 450 mg/L. This was found to be very high when compared to the WHO and ISI standards. Table 3, Fig 1.

D. Electrical Conductivity (EC)

Conductivity of water is the ability of water to conduct electrical current. Conductivity in water is due to the presence of inorganic dissolved compounds like nitrate, sulphate, chloride, phosphate, sodium, magnesium, calcium, iron and aluminium ions. Conductivity of water also depends upon temperature, concentration and mobility of the ions. The Electrical Conductivity was found to be 660 and 690 μs/cm respectively for S₁ and S₂, which is well within the permissible range of the standards. Table 3, Fig 1.

E. Total hardness (TA)

The hardness is caused due to the presence of multivalent cations mainly calcium and magnesium. The bicarbonates, chlorides and sulphates of calcium and magnesium impart hardness to the water. Hardness is expressed in terms of calcium carbonate equivalent (ppm or mg/L). It was found to be almost same in both the samples that are 219 and 220 mg/L which is very high compared to WHO standards but is well within the limits of ISI standards. Temporary and permanent hardness of the lake water was also determined. Temporary hardness in the water was found to be 181 mg/L and 185 mg/L and permanent hardness was found to be 38 mg/L and 35 mg/L for S₁ and S₂ samples respectively. Table 3, Fig 1.

F. Ca²⁺ and Mg²⁺ ions

Calcium and Magnesium ions are responsible for the hardness in the water. Their excess in boiler feed water leads to the formation of scales and sludge. Potable water is 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 Ca²⁺ ions was found to be very high in both the samples when compared to the WHO and ISI standards. Mg²⁺ ions according to the ISI standards was very high in the water but was quite reasonable in comparison to WHO standard. Table 3, Fig 1.

G. Total Dissolved Solids (TDS)

The total dissolved solids is the sum of all the chemical ions dissolved in the water i.e iron, calcium, magnesium, sodium, carbonates, bicarbonates, sulphates, chlorides, nitrates, phosphates, etc. Dissolution of rocks, soil, gypsum etc is responsible for the total dissolved solids. The amount of TDS was within the safe limits of WHO and ISI standards. Table 3, 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

Methods Employed for Various Water Quality Parameters

SL.No	Parameters	Method
1	Colour	-
2	Temp.	Thermometric
3	pH	pH metery
4	Electrical Conductivity(μ s/cm)	Conductometry
5	Total Dissolved Solid(mg/L)	Filtration Method
6	Total Hardness (mg/L)	EDTA titration
7	Temporary hardness(mg/L)	EDTA titration
8	Permanent hardness(mg/L)	EDTA titration
9	Calcium(mg/L)	EDTA titration
10	Magnesium(mg/L)	EDTA titration
11	Alkalinity (mg/L)	Titration Method

TABLE 3

Water Quality Parameters of Kukkarahalli Lake

SL.No	Parameters	S ₁	S ₂
1	Colour	Colourless	Colourless
2	Temp.	22 ^o C	22 ^o C
3	pH	8.6	8.4
4	Electrical Conductivity(μ s/cm)	66	69
5	Total Dissolved Solid(mg/L)	426	430
6	Total Hardness (mg/L)	219	220
7	Temporary hardness(mg/L)	181	185
8	Permanent hardness(mg/L)	38	35
9	Calcium(mg/L)	115	115
10	Magnesium(mg/L)	104	105
11	Alkalinity (mg/L)	450	450

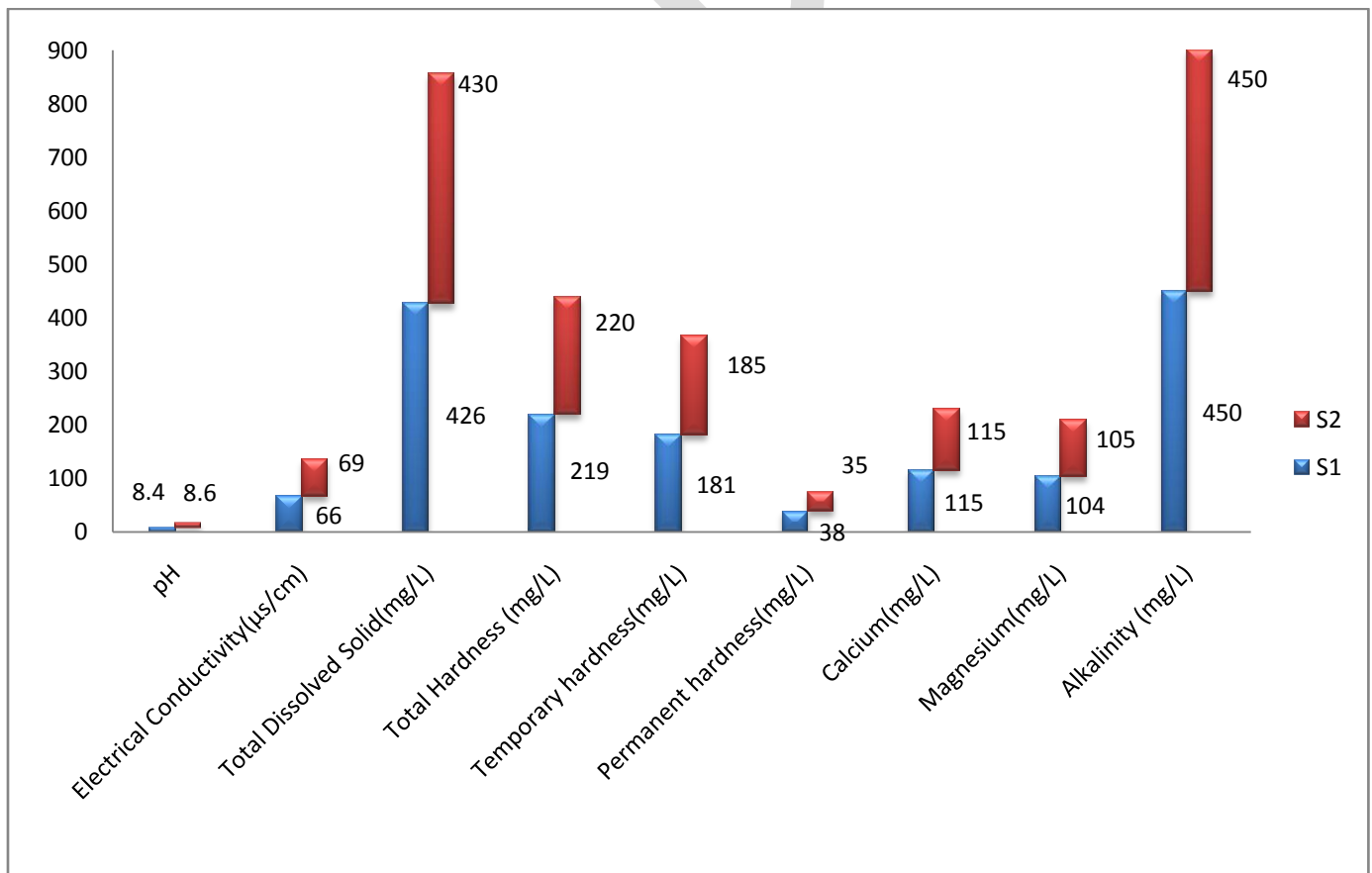


Fig 1 Graphical Representation of parameters of Kukkarahalli Lake water

V. CONCLUSION

The present study reveals a very high concentration of calcium and magnesium ions in the lake water. It also shows a very high pH, Alkalinity and Total hardness that makes the water unfit for both drinking and irrigation purposes. The reason for this may be the inflow and mixing of the sewage water into the lake water which makes the lake water highly contaminated for use. Authors suggest taking strict measures to improve the quality of the lake water before it becomes too late to act. Also, the consumption of its water for any kind of use should be immediately prohibited. Barricades and filters should be fitted throughout the circumference of the lake to stop the inflow and mixing of the dirty water in the lake water. The fencing surrounding the lake should be maintained properly to retain its green flora and fauna from the surrounding and rapidly growing urban habitat.

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