`Physico-Chemical Analysis of Kaveri River Water in the Pre-monsoon Season in Karnataka,India

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***Abstract*—The present study was carried out to analyze the quality of water of Kaveririver before the commencement of Rains. Kaveri is considered as lifeline of Southern India and carry the same sentiments and importance as the holy river Ganga.It originates from the hills of Talakaveri in Coorga in Karnataka and flows through the two Indian states of Karnataka and Tamilnadu before merging with the Bay of Bengal. Both states share the water for farming and irrigation of their lands. Krishnarajasagara is a massive dam built across Kaveri near Mysore. Many historic, religious and tourist places have developed on the banks of the river. Thousands of tourist and pilgrims visit these places every year. This made the authors curious to study the quality of the water of river Kaveri. To begin with this the water samples from the riverwere collected at two different sites. Sample S-1was collected near the Coorg city and sample S-2 was collected from a tourist spotnear the Mysore city. The various Physico-Chemical parameters studied were temperature,pH, Conductivity, TDS, Turbidity, Hardness, Alkalinity, Concentration of Ca^{2+},$Mg^{2+}$and Cl^{-} ions etc. All these parameters were then compared with the WHO and ISI standardsto draw the final conclusion on the quality of water of the river.**

Key Words: Kaveri River, Talkaveri, Coorg, Physico-Chemical analysis, tourism

I. INTRODUCTION

River Kaveri rises from the Western Ghats range in Karnataka. It is one among the sacred rivers in India and is a lifeline of South India. Its water is shared by two Indian states Karnataka and Tamilnadu for Farming and Irrigation. River Kaveri has a wonderful history beginning from prehistoric ages. On its banks beautiful picnic spots and religious places are situated.This attracts thousands of national and international touristsin the state throughout the year. Kaveri has many tributaries namely Hemavathi, Honnuhole, Arkavathy, Kapila, lakshmanaTheerth, Kabini, Lokapavani, Bhavani, Noyil and Amaravathi. It covers a distance of about 765 km before mergining into the Bay of Bengal [1].Mushrooming hotels due to increased tourism, use of excessiveinsecticides, Pesticides and urbanization, have contributed to pollute the river water and affect the quality of the river water. This study was aimed at assessing the changes in water quality as it flows from its place of origin in Coorg to Mysore. An extensive literature survey revealed that several workers have so far studied the water qualityof different rivers[2]-[11],still the study and analysis of the Kaveri river in Karnatakadid not attain much attention even after the huge momentum gained in the past two decades in the tourism industry in the state .So the authors have made an effort in this direction to study the various parameters of the water of River Kaveri before the onset of the Monsoon that could help in maintaining the quality of river water for the users.The study aimed at the determination of various physico-chemical parameters such as temperature, pH, Conductivity,TDS, Turbidity, Hardness, Alkalinity, Concentration of Ca^{2+},$Mg^{2+}$and Cl^{-}ions etc and compares these parameters with Indian and International standards to ensure the quality of Kaveriwaters.

II. MATERIALS AND METHODS

Samples were collected from two different places as per standard procedures. Sample-1(S_1) from near the Mysore city and Sample-2 (S_2) from near theCoorg city .The various Physical and Chemical parameters were studied and the resultsobtained were compared with theWHO and ISI standards. Chemicals used for analysis were of AR grade. For thepreparation of the reagents glass distilled water was used. The glassware's used were made up of Borosil. Electrical Conductivity, pH, and Turbidity were determined using Systronics-Conductometer,Digital Systronics pH –meter and Turbidity –meter, respectively. The major water quality parameters studied are pH, Conductivity,Turbidity, Total hardness, Temporary hardness, Permanent hardness, Alkalinity, Total dissolved solids, Calcium ions,Magnesium ions, Chloride ions etc.Temperature of the samples was noted at their sampling points. Standards methods were employed for determination of various parameters [12].The WHO and ISI standards are listed in Table 1.

III. DETERMINATION OF WATER QUALITY PARAMETERS

The parameters studied in the present study are compared with WHO and ISI standards [13],[14]. The conclusion is drawn after making a thorough comparison of the present data with the standard values. For the determination of Total hardness, Temporary hardness, Permanent hardness, Alkalinity, Total dissolved solids, Calcium, Magnesium and Chloride ions Standard methods were employed.

IV. RESULTS AND DISCUSSION

The water quality was analyzed by collecting samples at two different places. Sample-1 (S_1) and Sample-2 (S_2) near the Mysore city and the Coorg city respectively. Results obtained in the study are tabulated in the Table 2.

A. pH

pH was found to be 7.5 and 7.1 for$S_1$and S_2respectively. S_2 is well within the range of WHO and ISI standards but S_1 is

towards the upper limit though within the range of the said standards. Table 2, Fig1 .

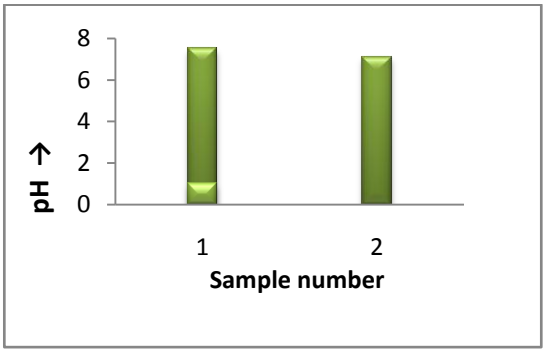

Fig 1 Graphical representation of pH

B. Total Dissolved Solids (TDS)

TDS found in the analysis was 116 mg/L and 138 mg/L for sample S_1 and S_2 respectively which is also within the standard limits.Table 2, Fig 2.

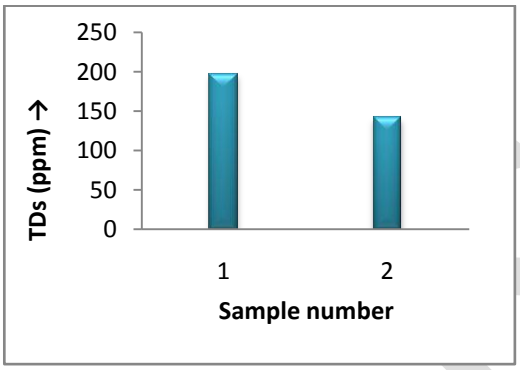

Fig 2 Graphical representation of TDs

C.Total Hardness

S_1 and S_2 sample gave 116 mg/L and 138 mg/L of total Hardness which according to WHO standard is exceeding the limit of total hardness but is within the range of ISI standards. Table 2,Fig 3.

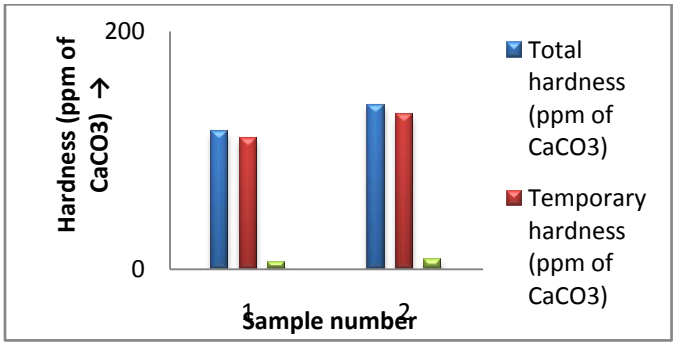

Fig 3 Graphical representation of Total, Temporary and Permanent hardness

D. Permanent Hardness

Permanent hardness is due to chlorides and sulphates of Calcium and Magnesium. It was found to be as little as 06 mg/Land 08mg/L for samples S_1 and S_2respectively. Table2, Fig 3.

E. Temporary Hardness

Bicarbonates of Calcium and Magnesium dissolved in water produces temporary hardness in water. It was found to be 110 mg/Land 130 mg/L in S_1 and S_2respectively. Table2, Fig 3.

F. Concentration of Calcium, Magnesium and Chloride ions in sample water

Concentration of Ca^{2+} was found to be 80 mg/L and 92 mg/L samples for S_1 and S_2 respectively which is slightly exceeding the permissible limits, while Mg^{2+} was found to be 36 mg/L and 46 mg/L for S_1 and S_2 samples which also is higher compared to ISI standards but are within the WHO standards.Concentration ofCl^- ions was found to be 25.56mg/L and 25 mg/L in sample S_1 and S_2respectively.Table2, Fig 4.

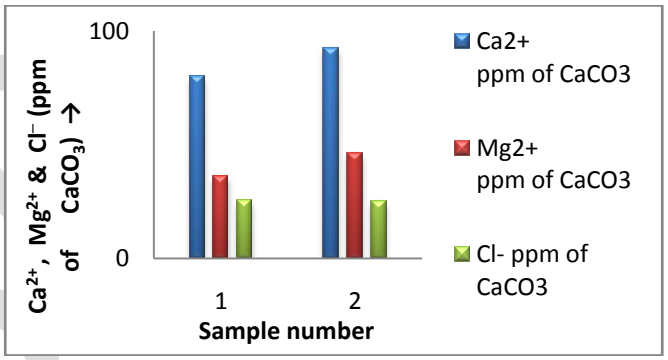

Fig 4 Graphical representation of Calcium, Magnesium & Chloride ions

G. Turbidity

The turbidity in the two samples S_1 and $S_2$was reported to be 16 NTU and 12 NTU respectively.Table2,Fig 5.

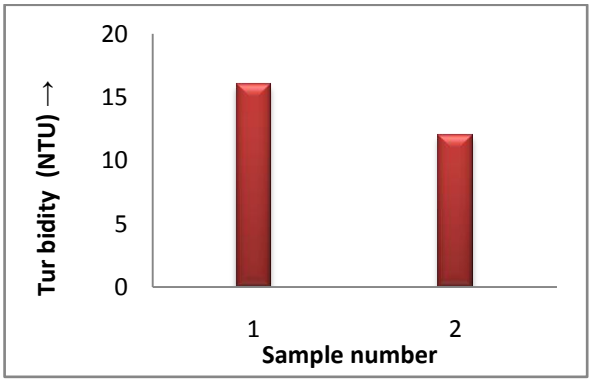

Fig 5 Graphical representation of Turbidity

H. Alkalinity

The acid neutralizing capacity of water is called alkalinity and is due to the presence of OH^-,$CO_3^{2-}$and HCO_3^- ions in water. The alkalinity of the samples S_1 and S_2 was found to be 172 mg/L and 189mg/L respectively.This also is very

high according to WHO standards but is within the ISI standards.Table 2,Fig 6.

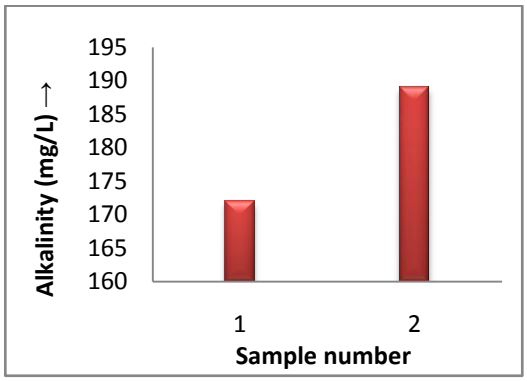

Fig 6 Graphical representation of Alkalinity

I. Electrical Conductivity(EC)

Electrical Conductivity was found to be within the limits of both the national and international standards, 290 μs/cm for S_1 and 320 μs/cm for S_2.Table 2, Fig 7

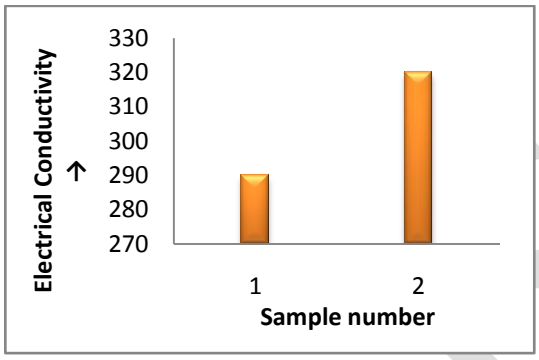

Fig 7 Graphical representation of Electrical Conductivity

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
WATER QUALITY PARAMETERS KAVERI RIVER WATER

SL. No	Parameters	Method	S_1	S_2
1	Temp.	Thermometric	25^0C	23^0C
2	pH	pH metery	7.5	7.1
3	Electrical Conductivity(μ s/cm)	Conductometry	290	320
4	Total Dissolved Solid(mg/L)	Filtration Method	198	142
5	Total Hardness (mg/L)	EDTA titration	116	138
6	Temporary hardness(mg/L)	EDTA titration	110	130
7	Permanent hardness(mg/L)	EDTA titration	6	8
8	Calcium(mg/L)	EDTA titration	80	92
9	Magnesium(mg/L)	EDTA titration	36	46
10	Turbidity (NTU)	Turbidity meter	16	12
11	Chloride(mg/L)	Argentometric Titration	25.56	25
12	Alkalinity (mg/L)	Titration Method	172	189

CONCLUSION

The above study suggests that both the samples collected from river Kaveri at two different places were mostly in accordance with the WHO and ISI Standards except for pH of the water, Concentration of Calcium and Magnesium ions and Alkalinity which was found to be a little high reaching the upper limit or even exceeding it. This may be due to the weathering of rocks that could lead to higher Concentration of Calcium and Magnesium ions in water and may resultinto an increased pH and thus the alkalinity. The disposal of wastes made by tourists may lead to the slight change in these parameters. Theextensive use of fertilizers and insecticides to increase the yields crops may also alter the physico-chemical parameters .Hotel industry in these two cities is another major source of water pollution that could also be a contributing factor in determining the water quality.The other parameters were found in the safe limit that suggests that the water of the river Kaverias a whole is acceptable for drinking and other purposes,but it also suggests that a proper awareness to the natives and tourists by the authorities can slow down and minimize the rate of pollution thereby improving the quality of water.

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