



## Physico-chemical parameter analysis of water in Musiri Taluk, Tamil Nadu, India

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### ABSTRACT

An analysis of the physico-chemical parameters of ground and surface waters of Musiri Taluk (Tamil Nadu, India) were carried out to study the quality of water and suitability for domestic purpose. Cauvery water, well water and bore wells are the water resources of the study area. The parameters included pH, EC, TDS, Turbidity, Total hardness and content of Fluoride, Sulphate and Chloride were also assessed and compared with the standard values prescribed by BIS. The present investigation revealed that the quality of water of Cauvery water is suitable for drinking purposes, but the well water and bore well water samples are unfit for drinking and utility purpose.

**Keywords:** Musiri, Water quality, Physico-chemical parameters, Turbidity, Total hardness

### 1. INTRODUCTION

Water is one of the most important compounds to the ecosystem. Better quality of water is described by its physical, chemical and biological characteristics. But some correlation was possible among these parameters and the significant one would be useful to indicate quality of water. The physico-chemical parameters of water and the dependence of all life process of these factors make it desirable to take as an environment. In India still now several researchers have been doing studies on physico-chemical and biological characteristics of standing and running water resources [1-3].

## 2. MATERIALS AND METHODS

The drinking water for physico-chemical analysis was collected from different drinking channels at Musiri Taluk. The samples were collected with the intervals of two hours in a larger container. The container was washed thoroughly with distilled water and dried. The samples after collection were transported on the sample date to the laboratory for the analysis. The water samples were immediately brought into laboratory for the estimation of various physico-chemical parameters like water temperature; transparency and pH were recorded at the time of sample collection by using thermometer and pocket digital pH Meter. Transparency was measured with the help of Secchi Disc. The other parameters, such as TDS, Hardness, chlorides, alkalinity, nitrate, sodium, potassium, etc., were estimated in the laboratory by using standard methods as prescribed by APHA, AWWA, Trivedy and Goel [2], and Kodarkar [3].

## 3. RESULTS AND DISCUSSION

The physico-chemical parameters of waters are given in **Table 1** and **Figure 1**. The physico-chemical parameters are discussed, as given below, and compared with BIS standard values in **Table 2** [4].

**Table 1.** Physico-Chemical Parameter Analysis of Water Samples in Musiri Taluk, Tamil Nadu, India

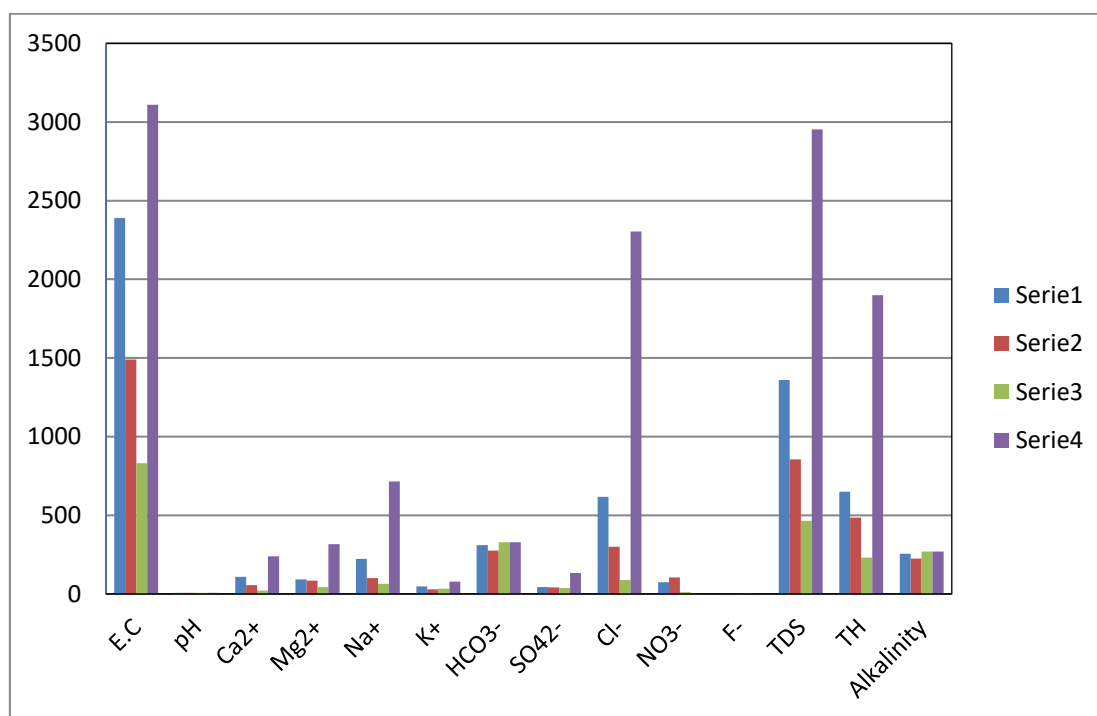
S. No.	Parameters	Obtained Value (Sample I)	Obtained Value (Sample II)	Obtained Value (Sample III)	Obtained Value (Sample IV)
1.	Electrical conductivity (E.C.)	2390	1490	830	3110
2.	pH	6.9	6.8	7.1	6.8
3.	Calcium (Ca <sup>2+</sup> )	108	56	22	240
4.	Magnesium (Mg <sup>2+</sup> )	92	84	43	316
5.	Sodium (Na <sup>+</sup> )	223	101	64	715
6.	Potassium (K <sup>+</sup> )	47	30	33	78
7.	Bicarbonate (HCO <sub>3</sub> <sup>-</sup> )	311	275	329	329
8.	Carbonate (CO <sub>3</sub> <sup>2-</sup> )	0	0	0	0
9.	Sulphate (SO <sub>4</sub> <sup>2-</sup> )	43	41	38	134
10.	Chloride (Cl <sup>-</sup> )	617	301	89	2304

11.	Nitrate ( $\text{NO}_3^-$ )	74	105	11	1
12.	Fluoride ( $\text{F}^-$ )	0.35	0.28	0.58	0.63
13.	Total dissolved solids (TDS)	1360	856	465	2953
14.	Total hardness as $\text{CaCO}_3$ (TH)	650	485	230	1900
15.	Alkalinity as $\text{CaCO}_3$	255	225	270	270
16.	Colour	Colourless	Colourless	Colourless	Colourless
17.	Odour	Odourless	Odourless	Odourless	Odourless
18.	Temperature, $^\circ\text{C}$	29.4	29.4	29.4	29.4
19.	Turbidity	Nil	Nil	Nil	Nil
20.	Suspended Solids	Nil	Nil	Nil	Nil

**Table 2.** Standard Values of Drinking Water (BIS: 10500-1991).

S. No.	Parameters	Minimum Value	Maximum Value
1.	Electrical conductivity (E.C.)	---	---
2.	pH	6.5-8.5	No relaxation
3.	Calcium ( $\text{Ca}^{2+}$ )	75	200
4.	Magnesium ( $\text{Mg}^{2+}$ )	50	150
5.	Sodium ( $\text{Na}^+$ )	-	-
6.	Potassium ( $\text{K}^+$ )	-	-
7.	Bicarbonate ( $\text{HCO}_3^-$ )	200	600
8.	Carbonate ( $\text{CO}_3^{2-}$ )	-	-
9.	Sulphate ( $\text{SO}_4^{2-}$ )	200	400
10.	Chloride ( $\text{Cl}^-$ )	250	1000
11.	Nitrate ( $\text{NO}_3^-$ )	50	No relaxation

12.	Fluoride (F <sup>-</sup> )	1.0	1.5
13.	Total dissolved solids (TDS)	500	2000
14.	Total hardness as CaCO <sub>3</sub> (TH)	300	600
15.	Alkalinity as CaCO <sub>3</sub>	200	600
16.	Colour	5	25
17.	Odour	Unobjectionable	No relaxation
18.	Temperature, °C	-	-
19.	Turbidity	5	10
20.	Suspended Solids	-	-



**Figure 1.** Physico-Chemical Parameters

***Electrical Conductance***

The water sample III contains lower conductance than that of the other samples. Therefore, this water sample contained minimum amount of charged particles.

### ***pH***

Most of the biological processes and biochemical reactions are pH dependant. pH is considered as an indicator of overall productivity that causes habitat diversity [5]. pH was found to be alkaline in nature at all the sites [6]. The pH was observed to decline during winter and to increase during the summer as is evident from the mean values [7]. The lower value of pH during rainy season compared to summer, may be due to dilution of alkaline substance. All the four samples of pH value are around 7.0. This value indicates that there is no acidic or basic in nature of water sample.

### ***Calcium***

The water sample IV contains higher amount of calcium than the other samples. But the water sample III has contained only 22 ppm. This value is lower than the desirable limit of BIS standard. This sample is also suitable for drinking purpose.

### ***Magnesium***

The water sample IV contains higher amount of magnesium than the other samples. But the water sample III has contained only 43 ppm. This value is lower than the desirable limit of BIS standard. This sample is also suitable for drinking purpose.

### ***Sodium***

The water sample IV contains higher amount of sodium than the other samples. But the water sample III has contained only 64 ppm. This value is lower than the desirable limit of BIS standard. This sample is also suitable for drinking purpose.

### ***Potassium***

The content of potassium in the form phosphate may be varied due to rain, surface water runoff, agriculture run off; washer man activity could have also contributed to the inorganic phosphate content [8]. The water samples II and III have contained 8 ppm, which is greater the drinking water sample of BIS standard.

### ***Bicarbonate***

All the four samples have contained the bicarbonate within the limit of BIS standard. It is acceptable for drinking purpose.

### ***Sulphates***

All the four samples have contained lower value of sulphates for the desirable limit of BIS standard. But, the sample IV content is higher than the other samples.

### ***Chlorides***

Chloride is the indicator of contamination with animal and human waste. Chloride is a common constituent of all natural waters and is generally not classified as harmful constituent [9]. The water sample III has shown the chloride is low and the water samples I and II are having the amount of chlorides within the range of BIS standard. But, the sample IV content is too high when compared to the maximum limit.

### ***Nitrates***

The water sample IV is almost absent of nitrates but samples I and II contained 74 ppm, and 105 ppm, respectively. Here, the sample III contains only 11 ppm which is suitable for drinking purpose.

### ***Fluoride***

The entire four water samples are with lower value of the desirable limit. High fluoride concentration causes dental fluorosis [10, 11], while low permissible limit is found in the seasons. Concentration of sulphate has laxative effect [12] which is enhanced when sulphate is consumed with magnesium.

### ***Total Dissolved Solids***

The water sample III contains only 465 ppm which is suitable for drinking purpose and no need to carry out further purification of TDS. But, the sample IV is too high and out of TDS, which is superior value of maximum limit.

### ***Total Hardness***

Hujare [13] reported the total hardness was higher during summer than in monsoon and winter season. High value of hardness during summer can be attributed to a decrease in water volume and increase of rate of evaporation of water. The water sample III contains only 230 ppm which is suitable for drinking purpose and no need to carry out further purification of TDS. But the sample IV is too high and out of TDS, which is superior value of maximum limit.

### ***Alkalinity***

The entire four water samples contain the alkalinity within the limit of BIS standard.

### ***Colour***

Khan and Chowdhury [14] reported that higher transparency occurred during winter and summer due to the absence of rain, runoff and flood water, as well as gradual settling of suspended particles. Kadam *et al.* [15], also reported similar observation from Masoli reservoir of Parbhani district, Maharashtra. The colour of the water samples was pure and colourless.

### ***Odour***

All the four water samples are odourless.

### ***Temperature***

Water temperature plays an important role which influences the chemical, bio-chemical and biological characteristics of water body. The four water samples are almost near to the room temperature.

### ***Turbidity***

The turbidity may be varied from place to place. Due to human activities, the decrease in water level and presence of suspended particulate matter occur. All the four water samples are absent of turbidity.

### **Suspended Solids**

The entire four water samples are absent of suspended solids.

## **4. CONCLUSION**

Analysis of different physico-chemical parameters of river, well and bore well waters from the different areas of Musiri Taluk was done. In this analysis, bore well water (sample I, IV) from Musiri and Thathampatty, well water (sample II) from Thathampatty, and river water (sample III) from Nachiyapudur, were studied. All the samples containing minerals are almost in the range of BIS standard. From the physico-chemical parameter analysis one may conclude that the river water from Nachiyapudur is directly taken for the drinking purpose. But, this sample area of bore well water is not suitable for drinking purpose. Therefore, the three water samples should undergo the domestic water treatment before taking them for the drinking purpose.

## **References**

- [1] Pandey, A.K., Siddiqi S.Z. and Rama Rao, Physico-chemical and Biological Characteristics of Husain Sagar, an Industrially Polluted Lake, Hyderabad. *Proc. Acad. Environ. Biol.* 2(2) (1993) 161-167.
- [2] Trivedy, R.K. and Goel P.K., Chemical and Biological Methods for Water Pollution Studies, Environmental Publication, Karad, (1986), Maharashtra.
- [3] Kodarkar M.S., Methodology for Water Analysis, Physico-chemical, Biological and Microbiological. Indian Association of Aquatic Biologists, Hyderabad, 2nd Edition, (1992), pp. 50.
- [4] Marisol Vega, Rafael Pardo, Enrique Barrado, Luis Debán. Assessment of seasonal and polluting effects on the quality of river water by exploratory data analysis. *Water Research*, Volume 32, Issue 12, December 1998, Pages 3581-3592
- [5] Minns C.K., Factors Affecting Fish Species Richness in Onleria Lake. *Trans. of Am. Fish Soc.* 118 (1989) 533-454.
- [6] Praparna N. and Shashikant K., Pollution Level in Hussain Sagar Lake of Hyderabad - A case study. *Poll. Res.* 21 (2002) 187-190.
- [7] Hulchinson G.E., A Treatise on Limnology. Vol. I, Part-2, Chemistry of Lakes, (1957), John Wiley & Sons, New York.
- [8] Arvindkumar, Some Immunological Aspects of the Fresh water Tropical Wetland of Santhal. Pargana (Bihar) India. *J. Envi. Poll.* 2(3) (1995) 137-141.
- [9] Jayanta Chutia and Siba Prasad Sarma. Relative Content of Chloride and Sulphate in Drinking Water Samples in Different Localities of Dhakuakhana Sub-division of Lakhimpur District of Assam. *Int. J. Chem. Sci.* 7(3) (2009) 2087-2095.

- [10] Meenakshi, Garg V.K., Kavita R. and Mallik A., Ground Water Quality in Some Villages of Haryana, India, Focus on Fluoride and Fluorosis. *J. Han Mater*, 106 (2004) 85-97.
- [11] Yadawe M.S., Hiremath D.M. and Patil S.A., Assessment of Fluoride Content in Ground and Surface Water and its Environmental Impacts at Basavan, Bagewade and Muddebihal Taluk of Bijapur District. *E- Journal of Chem.* 7 (2010) 109-113.
- [12] Lorraine C.B., Assessing the Acute Gastro Intestinal Effects of Ingesting Naturally Occurring High Levels of Sulphate in Drinking Water. *Crit. Rev. Clin. Lab. Sci.* 37 (2000) 389-400.
- [13] Hujare, M.S., Seasonal Variation of Physico-chemical Parameters in the Perennial Tank of Talsande, Maharashtra. *Ecotoxicol. Environ. Monit.* 18(3) (2008) 233-242.
- [14] Khan, M.A.G. and Choudhary S.H., Physical and Chemical Limnology of Lake Kaptai, Bangladesh. *Trop. Eco.* 35(1) (1994) 35-51.
- [15] Kadam, M.S. Pampatwar D.V. and Mali R.P., Seasonal Variations in Different Physico-chemical Characteristics in Masoli Reservoir of Parbhani District, Maharashtra. *J. Aq. Bio.* 22(1) (2007) 110-112.

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