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Research Article

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Comparative study of water quality parameters of lake water (Chinna Eri) with surrounding bore well water samples, Thuraiyur (Tk), Tiruchirappalli (Dt), Tamil Nadu.

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Abstract

This paper deals with an assessment of water quality parameters of Chinna Eri lake and their surrounding bore wells, Thuraiyur (tk), Tiruchirappalli (dt). Results were compared with ICMR, BIS and WHO drinking water standards. The lake water produces effects of eutrophication due to the elevated total dissolved solids, dissolved carbon dioxide, hydrogen sulphide and phosphate and stumpy of dissolved oxygen. The bore well water samples also polluted by elevated dissolved carbon dioxide, hydrogen sulphide and phosphate. Both the water samples are slightly acidic. The findings of the analysis would prove the quite information regarding the water quality of Chinna Eri lake.

Keywords: water quality, Chinna Eri lake, ICMR, BIS and WHO.

Introduction

Water plays essential role in all forms of life and it is the fundamental requirement for people. Water is not only used for drinking or cleaning but for recreation people seek water's edge, such as a solvent, cleanser, coolant, a compound from which every organism is created. So water pollution has become global concern. Extraordinary urbanization terrified up water pollution.

At present people deduce rivers as a carriage (Kavitha, 2013). Ground water is valuable for both domestic and industries. In word wife report almost one fifth of water was obtained from ground (Muthu kumar *et al*., 2011). The quality of ground water is directed by human activities (Bhatt and Salakani, 1996; Karanth, 1997; Jain *et al*., 2005). Due to scarcity of surface water nowadays the usage of ground water is increases, so we have to analyses the quality of ground water. Water quality may determined by chemical composition of water. If the chemical composition is in permissible limits it is safe to use. Generally the natural quality of ground water is good but the recharged water carried pollutants and this pollution is dissolved in ground water and pollutes (Subba Rao, 2014).

Pollution in ground water affects its usage (Brindha and Elango, 2012). In developing countries about 80% of diseases and one-third of death caused by drinking of polluted water (Olanjire and Imeokparia, 2001 and WHO, 2004). In continuation of earlier study on bore well water (Sudha, 2016); here we have investigated the water quality parameters of lake (Chinna Eri) with surrounding bore- well water samples.

Study area:

Thuraiyur Municipality (study area) is located in the Tiruchirappalli district. It is located about 43 Kms northern side via Mannachanallur from Tiruchirappalli,

38 Kms from Perambalur in National Highways 58 Kms form Attur (Salem district). Chinna eri Lake and the surrounding sampling station are located near the bus stand of Thuraiyur taluk.

Features Of Cinna Eri:

Thuraiyur Chinna eri is a P.W.D. tank. It receives supply from the left surplus of Thuraiyur big tank in addition to its free basin 2.273 Sq.Km. and its latitude is $11^0$9' and longitude is $78^0$36'. The surplus from the tank falls immediately over porampoke lands and flows a distance of 1,500 m and falls into Madurapuri tank.

Materials and Methods

Ground water samples were collected from 5 stations from the surrounding of lake and one sample from lake on January 2017. One liter water samples were collected from each station by pre-cleaned polythene container for analysis of chemical character. The collected water samples were immediately brought to the laboratory for estimation of water quality parameters. The water quality parameters were analyzed according to the methods mentioned in APHA (1995) and the results were compared with standard of water quality WHO, ICMR and BIS. The analysis focused on the determination of eleven specific water quality parameters. They were pH, Total Hardness, Calcium, Chloride, Dissolved Oxygen, Dissolved Carbon dioxide, Hydrogen sulphide, Total Dissolved Solids (TDS), Silicate, Phosphate and Temperature.

Results and Discussion

Determination of water quality parameters of ground water is essential for the sustainable of drinking water.

pH of water increased with increased metabolic activities of autographs (Kaul *et al.,* 1980). In this study the pH of both the lake and sampling stations were not neutral and were recorded from 5.3 to 5.9. The pH values are found to be below the permissible limit of WHO (6.5–8.5) (Mohamed Sihabudeen *et al.,* 2015) in all the sampling stations.

Hardness value below 300 mg/l is considered drinkable (ICMR, 1975). The hardness in water may deliver from dissolved CO2, release by bacteria found in water. In the present study, the total hardness values were observed in the range of 122–910 ppm and 610 ppm for bore well and lake water samples respectively. The mean value of total hardness value exceeded the desirable limit of WHO (300 ppm) in all the stations for both lake and bore well water samples. The high concentration of total hardness may cause heart disease and kidney problem (Jain *et al.,* 1997).

The value of calcium for all the bore well water samples is ranged from 37.6-56 mg/l. Calcium may dissolve from calamite rocks and limestone or to be leached from soils. In the present study, the calcium values were found below the maximum permissible limit of BIS (1991) (75-200 mg/l) in both lake and sampling stations water samples.

Chlorides are practically found in all natural water. This is the most common inorganic anion present in water. In the present study, the chloride values were found above the desirable limit of BIS (1991) (250 mg/l) in both lake and sampling stations water samples.

Nutrient content of water depend on the availability of O_2 in water (Wetzel, 1983), when the amount of DO2 decreased which causes eutrophication. Oxygen content of water is important for living organisms. Low oxygen content signs the water pollution (Bhatt *et al*., 1999). In this study, the mean value of dissolved oxygen content of sampling stations (5.04 mg/l) was found within permissible limit of ICMR (1975) (5-6 mg/l) but in lake water it was found below the permissible limit. While the dissolved carbon dioxide content of both lake and sampling stations samples were above the permissible limit of WHO (1993). Depletion of DO2 and restoration of DCO2 in lake water produces effects of eutrophication.

The parameter of H2S is also very important because it causes serious health problems (Department of Health and Human Services, 2014). WHO (1996) reported that the taste and smell of H2S are found to be between 0.05 and 0.1 ppm. In this study, the level of H2S of sampling station and lake water sample was found to be 20.08 ppm and 16 ppm respectively.

Highly mineralized water unflavored for human (Bhanja *et al*., 2014) and also for most of the industries (APHA, 1992). The elevation of TDS reduces the solubility of O_2, hence enhances the eutrophication (Mathur *et al*., 2008). The TDS of sampling stations and lake water samples were above the desirable limit of 500mg/l (BIS, 1991).

Chemical weathering of silicate minerals of rock and sediments results in high concentration of dissolved silicate in water. But in this study the level of silicate in both lake water and ground water samples were below the permissible limit of WHO (1993).

The value of phosphate in the bore well water samples lies between 1.3 – 3.4 ppm. The Highest value is recorded in lake water sample (6.6 ppm). In the present study, the phosphate values are found above the permissible limit of (0.1 ppm) of WHO (Mohamed Hanipha and Zahir Hussain, 2013)

Atmospheric temperature influences on water temperature (Kaul *et al.*, 1980). Aquatic organisms are depending on optimum temperature for their favorable growth (APHA, 1992). In this present study the temperature of lake and mean value of sampling stations were 29ºC and 32.40. WHO (1993) did not

recommended definite value for temperature, however BIS (1991) recommended 40ºC is the permissible limit for drinking water. So the temperature of all water samples was within the permissible limit.

Table 1 showed the mean±standard deviation of water quality parameters of sampling stations and table 2 showed the water quality parameters of Lake and mean value of sampling stations with drinking water standard of ICMR (1975), BIS (1991), WHO (1993) and WHO (1996).

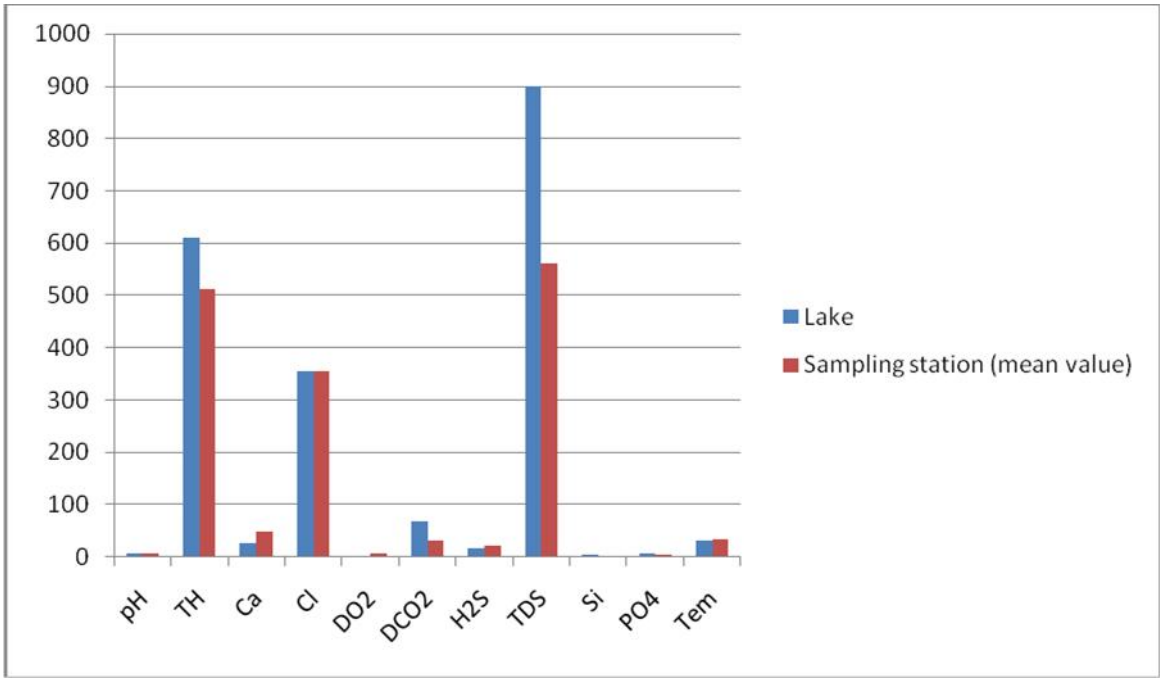
Table 1: Water quality parameters of sampling stations.

Parameters	S1	S2	S3	S4	S5	Mean± Std. Deviation
pH	5.6	5.8	5.7	5.9	5.7	5.74±.11
Hardness (mg/l)	300	910	610	122	610	510.40±306.04
Calcium (mg/l)	48	44	56	54.5	37.6	48.02±7.59
Chloride (mg/l)	319	354	389	354	354	354.00±24.75
DO2 (mg/l)	8.5	1	5.6	4.5	5.6	5.04±2.70
DCO2 (mg/l)	60	12	36	12	28	29.60±19.92
H_2S (ppm)	20	21	21	21	21	20.80±0.45
TDS (mg/l)	500	600	700	700	300	560.00±167.33
Silicate (mg/l)	0.4	0.25	0.5	0.35	0.3	0.36±0.10
Phosphate (ppm)	2	1.5	1.6	3.4	1.3	1.96±0.84
Temperature (℃)	35	30	32	33	32	32.40±1.82

Table 2: Comparison of water quality parameters of Lake and sampling stations with drinking water standard of ICMR (1975), BIS (1991), WHO (1993) and WHO (1996).

Parameters	Lake	Sampling station (mean value)	Desirable limits	Permissible limits
pH	5.3	5.74	6.5	8.5
Hardness (mg/l)	610	510.40	300	600
Calcium (mg/l)	24	48.02	75	200
Chloride (mg/l)	354	354.00	250	1000
DO2 (mg/l)	0.5	5.04	5	6
DCO2 (mg/l)	68	29.60	-	6
H_2S (ppm)	16	20.80	-	1
TDS (mg/l)	900	560.00	50	2000
Silicate (mg/l)	2	0.36	5	25
Phosphate (ppm)	6.6	1.96	-	0.1
Temperature (℃)	29	32.40	-	40

Chart 1: Comparison of water quality parameters of Lake and mean value of sampling stations.



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