Quality Analysis of Drinking water samples in Tirupati

Jonnalagadda.Tulasi, tulasi.24neelima@gmail.com

Abstract: As water is the most essential component of life unsafe drinking water is the major concern for life as water borne diseases are increasing day by day. The present study is focused mainly on the qualitative analysis of Water in and around different areas of Tirupati which includes the physiochemical and microbiological analysis of water. The water samples chosen for quality analysis includes Bore-Well water and Dam water & Bottled water as they are the major sources and supply of drinking in different areas in and around Tirupati. The results revealed that the water samples collected from different places of Tirupati area which are supplied from the main sources like Kalyani Dam, Telugu Ganga, Bore –well and Bottled water were within the ISI permissible limits. But when the selected water samples were compared with Bottled water which is taken as a control they were not significant for some of the physico-chemical parameters, Hence it is suggested that the water must undergo more purification process before supply and drinking and it is suggested   not to store water for longer duration, it is also suggested that in future the water may become hazardous for drinking.

Key words: water, Quality, Purification, Physico-chemical Parameters, Hazardous, Qualitative analysis, ISI permissible limits

I.   INTRODUCTION

Water is the most essential component of life .It is a unique liquid in the sense that without it life is impossible on a global scale, there is abundance of water .The main problem is the availability of water .The right place at the right time and in the right form .The survival of mankind has always depended on water it is riverbeds were responsible for wiping out the populations due to floods. Well known that in earlier times, civilization flourished on riverbeds also. Water quality refers to the chemical, physical and biological and radiological characteristics of water, it is measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. Water pollution is the most serious environmental quality issues in India. It is caused by the disposal of solid and liquid wastes on land and surface water. The most significant waste is sewage, industrial effluent, agricultural residues and chemicals Water analysis may be defined as the chemical analysis of dissolved materials and determination of the amount of suspended solids and pH values.

II.   METHODOLOGY

The study area is situated in different places of Tirupati where the water is of less quality and not cleans.

Selection of Sampling Areas:-

The samples collected should be small in volume, enough to accurately represent the whole water body. Thus basing on their criteria water samples are collected from various places of Tirupati which are located at different locations,

they are Leela Mahal centre and Balaji Colony, Tirumala hills, and bottled water were collected.

Selection of Water Samples:-

Water samples were selected based on the presence of turbidity in the water. The selected samples were mainly in and around Tirupati where it is feasible to analyze the samples in the laboratory. Grab sampling was done at the inlet and this is to assess their physical and chemical qualities. The water samples were collected from different places of Tirupati in a plastic bottle of volume (1000ml) by employing a purposive sampling method for analysis, water samples were collected in a clean plastic bottles free from microbial contamination and chemical contamination as the analysis has to be carried out within 3-4 hrs.

Analysis of Water Samples for Physical, Chemical, and Microbiological Parameters:-

The selected water samples were tested for physical, chemical, microbiological parameters which were analyzed as per standard methods by CFTRI and FSSAI. To assess the potability of water for drinking. All chemicals used were of analytical grade. At each sample site an aliquot of 1000ml of water was collected in a clean and sterilized bottle for the determination of physiochemical and microbiological parameters. The physical parameters like Colour, Odour, Taste, PH, Turbidity and Chemical parameters like alkalinity, total hardness, chloride, fluoride, calcium, magnesium, sulphates and microbiological parameters like COD, BOD,

MPN, were done for E-coli and fecal contaminants were analyzed.

Procedures for Physico Chemical analysis of water

 pH by Electrode Method

Apparatus:-

Glass electrode, Calomel electrode filled with saturated KCl solution, Buffer solution of ph 4.0, 7.0, and 9.0, PH electrometer

Procedures:-

Standardize the PH meter by using buffer solution of PH approaching that of the sample and adjust the temperature control. Rinse both the electrodes in the sample water taken in a beaker and read the PH directly on the dial.

Turbidity of Water by nephelometric method:-

Procedure:-

Switch on the nephelometric turbid meter and wait for few minutes till it warms up. Set the instrument at 100 on the scale with a 40 NTU standard suspension in this case every division on the scale will be equal to 0.4 NTU turbidity. Shake thoroughly the sample and keep it for some time to eliminate the air bubbles. Take sample in nephelometer sample tube and put the sample in sample chamber and find out the value on the scale Dilute the sample with the turbidity free water and again read the turbidity value.

Procedures for Chemical Analysis of Water

Alkalinity:-.

Take 50ml of sample in an 250ml Erlenmeyer flask and add two drops of phenolphthalein indicator and titrate over a white surface with 0.02N H_2SO_4 until the pink colour disappears. Record the volume of standard sulphuric acid solution used. Add 2 to 3 drops of mixed indicator to the solution in which the phenolphthalein alkalinity has been determined. Titrate with the standard acid to light pink color (equivalence of pH 3.7). Record the volume of standard acid used after phenolphthalein alkalinity

Calculation:-

Phenolphthalein indicator as mg/lit of $CaCo_3$ = ml of 0.02N $H_2SO_4 \times 1000$ is divided by ml of sample

Table no.1 DIFFERENT PARAMTERS OF DRINKING WATER

S.NO	PHYSICAL ANALYSIS	CHEMICAL ANALYSIS	MICROBIAL ANALYSIS
1	Colour	Alkalinity	BOD
2	Odour	Chlorides	COD
3	PH	Fluorides	MPN
4	Taste	Calcium	-
5	Turbidity	Sulphates	-
6	-	Total hardness	-

STATISTICAL ANALYSIS:-

The statistical analysis was done by using the annova method to identify the difference in between the samples. And this was done using the version 16.0 in the excel sheet in the computer.

III.   RESULTS

 The results for the present study were discussed in this under the following headings:

Colour , Odour , pH , Taste, Turbidity, Chemical characteristics of water :Alkalinity, Chlorides, Fluorides, Calcium, Magnesium, Sulphates, Microbiological Characteristics: BOD, COD, MPN, Comparison of the physiochemical and microbiological characteristic with standards, The various water samples collected for the physiochemical and microbiological analysis of water. The Telugu Ganga Water, Kalyani Dam Water and Bore well Water are the major sources and supply of water for drinking to different areas in and around Tirupati hence these four samples are collected to check for their quality.

Table no:2 Code and place and name of the water sample

S. No	Name of the Water Sample	Code	Place
1.	Dam Water (Telugu Ganga water)	DW_1 DW_2 DW_3	Near Leela Mahal Centre
2.	Bore Well Water (SPMVV Hostel)	GW_1 GW_2 GW3	SPMVV Hostel
3.	Dam Water (Kalyani Dam Water)	DW_1 DW_2 DW_3	Tirumala Hills
4.	Bore Well Water (Underground Water)	GW_1 GW_2 GW_3	Balaji Colony, Tirupati
5.	Bottled Water	BW_1 BW_2	Tirupati

NOTE:-

*= significant at 0.05 level, ** = significant at 0.01 level, @ / NS = not significant

 The desirable limit and the selected samples were significantly different at 0.01 level. The standard value is 250mg/L. The f- value of the selected samples was 106.496 and the p- value is 0.000 After comparing the values obtained between the bottled water and the Dam Water. The results showed significantly different at 0.01 level for Turbidity, hardness, COD, Calcium, chlorides and not significant for pH, alkalinity, fluorides BOD, MPN. Hence the dam water must undergo even more purification and reduce of the addition of chemicals for water for drinking purpose. After comparing the Bore-well (BW_1) water samples with the Bottled water some of the Physico-chemical parameters like pH, fluorides, magnesium and MPN are not significant, and the other

parameters like turbidity, alkalinity hardness, chlorides, calcium, BOD, COD are significant and the t-value of turbidity (12.728), alkalinity (16.450), hardness (57.166), chlorides (9.439), fluorides (2.000), calcium (9.371), magnesium (1.160), BOD (10.277), COD (22.264), MPN (2.242). The p-values of turbidity, alkalinity and hardness is (0.000) and chlorides (0.001), fluorides (0.116), calcium (0.001), magnesium (0.311), BOD (0.001), COD (0.000), MPN (0.088). Hence the water must be more purified and supplied for drinking. After comparing the values obtained between the bottled water and the kalian dam water many parameters were significant at 0.01 level and they are colour, turbidity, alkalinity, hardness, chlorides, calcium, BOD, COD, were obtained significant and fluorides, magnesium and MPN were not significant. The t-values of this comparison were as follows: - turbidity (12.728), alkalinity (16.450), hardness (57.166), chlorides (9.439), fluorides (2.000), calcium (9.371), magnesium (1.160), BOD (10.277), COD (22.264), MPN (2.242) and the p-values were (0.0000) for turbidity, alkalinity, hardness and COD. (0.001) for chlorides and calcium (0.016) for fluorides, (0.311) for magnesium and (0.088) for MPN. Hence there are some of the non-significant water must be re-purified and drinked. After the comparison of the bottled water with Borewell water (GW_2) the results showed that there is significant for colour, turbidity, hardness, chlorides, calcium, BOD, COD, MPN and there is no significance in Alkalinity, fluorides, magnesium. The t-values of this comparison were turbidity (22.274), alkalinity (1.625), hardness (43.975), chlorides (37.5), fluorides (1.809), calcium (8.148), magnesium (1.740), BOD (11.714), COD (4.025), MPN (14.402). The p-values were (0.0000) for colour, turbidity, hardness, chlorides, BOD, MPN and alkalinity (0.179), total hardness (0.000), fluorides (0.145), calcium (0.001), magnesium (0.157), COD (0.016). It is advisable to take the purification steps for water.

The results obtained when they were compared with the ISI standard values were within the permissible limits and are safe for drinking of water. As they are safe but when compared to the bottled water they are not significant and it is advisable to take a slight purification process if possible and supply.

IV. DISCUSSION AND CONCLUSION

Different water samples were collected for the identification of physico chemical and microbiological parameters to assess their quality. Tirupati is being a pilgrim centre it is necessary to assess the quality of the drinking water. It is concluded that the selected water samples from the different places of Tirupati area which are supplied from the main sources like Kalyani Dam, Telugu Ganga, Bore-well and Bottled water were within the ISI permissible limits. The physical parameter PH of all the water samples selected were analyzed and the results were in between the ranges of 7-7.2 and among all

the samples the Bore-well water was having the highest PH it may be due to the dissolution of salts. The colour of all the samples were within the normal range and the water is acceptable for the purpose of drinking. The odour of the samples was acceptable that is there was no bad odour of the water among all the selected water samples. The turbidity of the water samples selected is in between the normal ranges (5 NTU) among the selected water samples the turbidity is in between 0.133-2.233 NTU among all the selected water samples the Bore well water was having high turbidity and the Bottled water has low turbidity value. But when the selected water samples were compared with the bottled water which is taken as a control they were not significant for some of the physico-chemical parameters, Hence it is suggested that the water must undergo more purification process before supply and drinking and it is suggested not to store water for longer duration, it is also suggested that in future the water may become hazardous for drinking.

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