

TESTING OF GROUND WATER QUALITY FOR DRINKING PURPOSE IN TIRUPATI, CHITTOOR DISTRICT, A.P, INDIA

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Abstract

Testing of groundwater quality is very important before using it for drinking purpose. In the present study ten samples at various locations of Tirupati were collected and the values of various chemical parameters like total dissolved solids (TDS), pH, chlorides, hardness, sulphates and fluorides were determined. These values were compared with Drinking water standards of IS:10500-1991 to assess the suitability for drinking purpose. It has been concluded that nine samples are suitable for drinking where as one sample at one location requires treatment to reduce the hardness value for its suitability for drinking.

Keywords

Chlorides, fluorides, hardness, pH, sulphates and Total dissolved solids (TDS).

1. Introduction

In general water will be pure in its evaporation state. When the water comes in contact with earth some impurities will be added. Human activities in the form of industrial effluents and agricultural chemicals are also responsible for impurities. These impurities not only affect the taste and odour of water but also cause water borne diseases like cholera, jaundice etc., The various chemical parameters considered in the study are total dissolved solids, pH, chlorides, hardness, sulphates and fluorides. Dilli Rani G., et.al., concluded that ground water of some of the areas in and around Mangalam near Tirupati was polluted and not suitable for drinking purpose. It requires purification before drinking. Physico-chemical status of ground water for different samples was assessed in Akot City which is situated in Akola district, Maharashtra. During last decades it is observed that the ground water get polluted drastically because of increased human activities. Chidambaram et al., have studied the groundwater quality for sustainable use in Erode district of Tamilnadu, India. They have characterized the groundwater of the study area based on electric conductivity and total dissolved solids for general purpose, and also they have considered fluoride ion concentration in the study area to suggest the suitability of groundwater for drinking purpose. Chourasia has used Scholler diagram to compare the chemical constituents in groundwater. In his study he found the suitability of groundwater for domestic as well as irrigation purposes in the catchment area of Rajghat dam project, India.

2. Study area

Ten locations at random in Tirupati town were selected. Tirupati is one of the most important pilgrimage centers in South India. It is located in Chittoor district of Andhra Pradesh, India. Samples of

groundwater at these locations were collected and the values of considered chemical parameters were determined. The details of ten locations are shown in table 1. Aerial view of Tirupati showing locations of collected samples is given in figure 1.

Table 1. Details of locations in Tirupati

Sample number	Location of collected water sample in Tirupati
1	Sri Venkateswara University College of Engineering
2	Govindaraja Swamy Temple
3	Triveni children Hospital, Reddy&Reddy Colony
4	Tirumala Tirupathi Devasthanam Administrative building
5	Sri Venkateswara Polytechnic College
6	Rashtriya Sanskrit Vidyapeeth
7	Sree Venkateswara Ram Ruia Government hospital
8	Sri Padmavathi Mahila Vishwa Vidyalayam
9	Bus Stand area
10	M/s Sri Chennakesava Enterprises, Sanjay Gandhi Colony



Figure 1. Aerial view of Tirupati showing locations of collected samples

3. Methodology

Ten samples were collected in polythene containers from bore wells and analyses were carried out according to the methods for testing of water prescribed in “Chemical analysis of Water and Soil”, a Laboratory manual by K.V.S.G. Muralikrishna. The values of various water quality parameters are shown in table 2.

Table 2 .Values of water quality parameters in Tirupati

Sample number	TDS (ppm)	pH	Chlorides (ppm)	Hardness (ppm)	Sulphates (ppm)	Flourides (ppm)
1	800	6.57	45.99	344	29.83	0.8
2	800	6.82	92.58	278	65.54	0.6
3	1200	7.42	89.99	362	46.65	0.6
4	800	6.66	131.99	330	74.35	0.6
5	800	6.54	141.99	366	85.84	0.2
6	300	6.94	16.99	82	15.19	0.3
7	400	6.50	68.99	16	45.71	0.5
8	300	6.89	49.99	48	9.51	0.3
9	1400	7.20	344.52	662	78.54	1.0
10	1500	7.39	190.81	586	240	1.0

Drinking water standards of IS:10500-1991 are shown in table 3.

Table 3.Drinking water standards as per IS:10500-1991

Parameter	Permissible limit in ppm	Permissible Limit in the absence of alternate source in ppm
TDS	500	2000
pH	6.5-8.5	No relaxation
Chlorides	250	1000
Hardness	300	600
Sulphates	200	400
Flourides	1.0	1.5

4. Results and Discussions

Based on table 2 the values of TDS, pH, chlorides, hardness, sulphates and fluorides are graphically represented in figures 2, 3, 4, 5, 6 and 7 respectively.

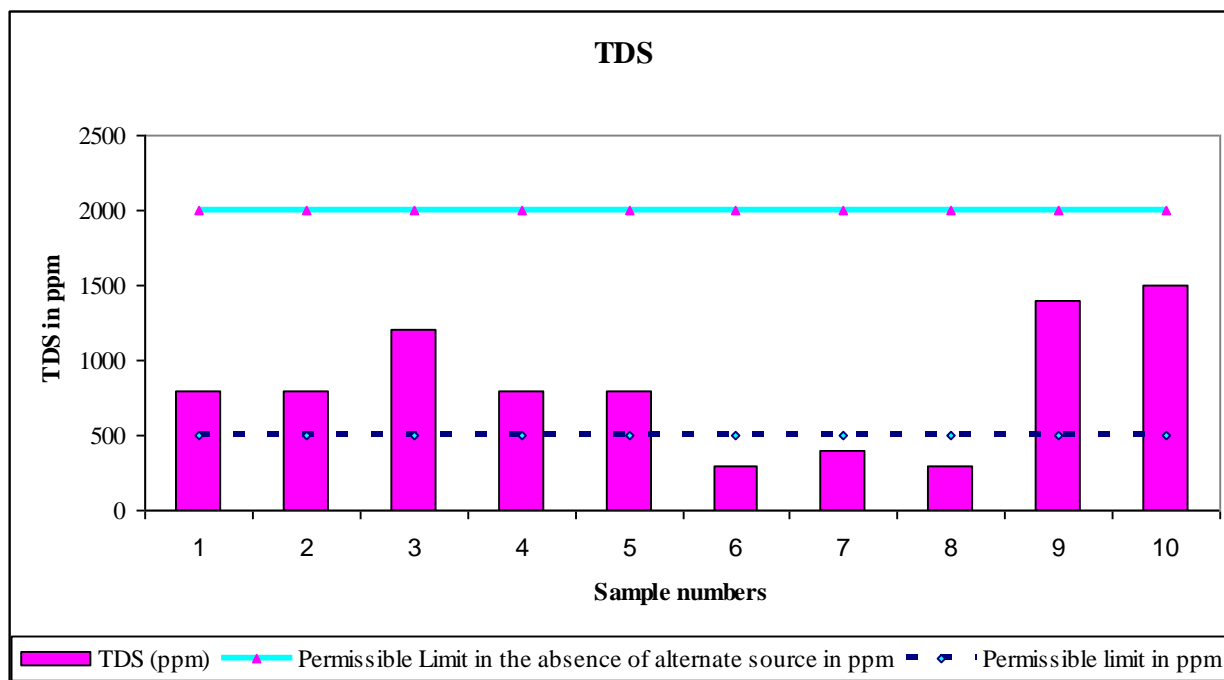


Figure 2. TDS in considered samples

The total amount of organic and inorganic substances that are present in water are known as total dissolved solids. At locations 6, 7 and 8 the value of total dissolved solids is less than 500 ppm which is a permissible limit. At the remaining seven locations the value is more than the permissible value but less than the permissible limit in the absence of other alternate source. So the water can be considered as suitable for drinking with respect to TDS at ten considered locations.

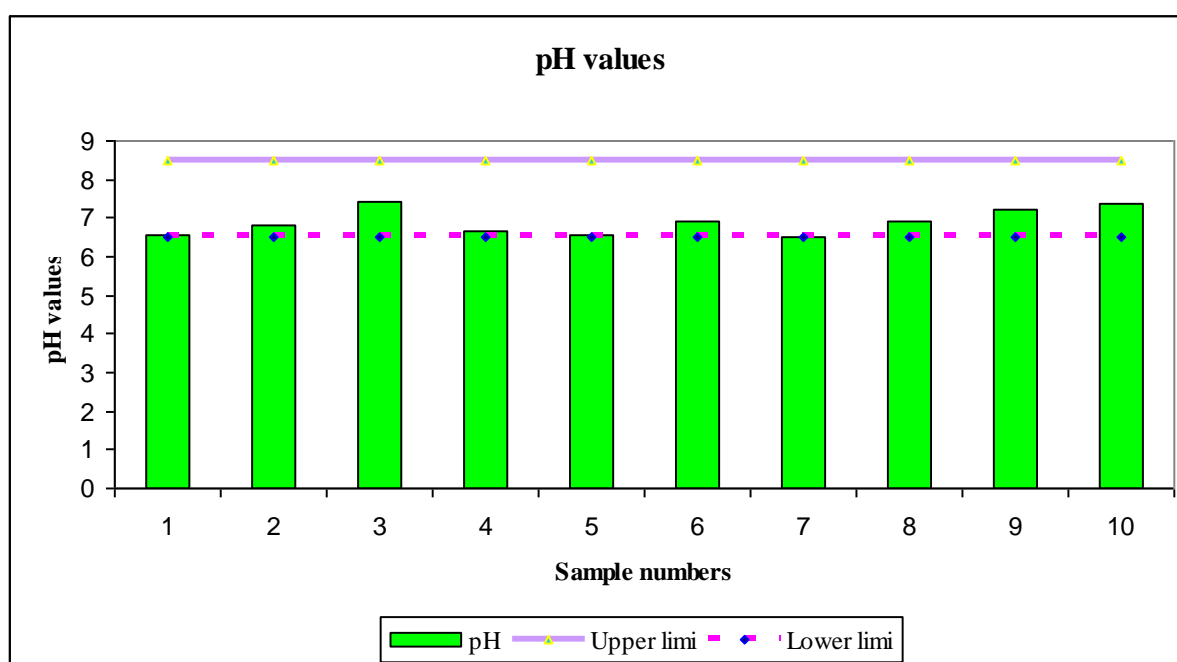


Figure 3. pH values of considered samples

pH is the negative logarithm of hydrogen ion concentration. The value of pH for all considered ten locations is within the permissible range, indicating that the water is suitable for drinking with respect to pH.

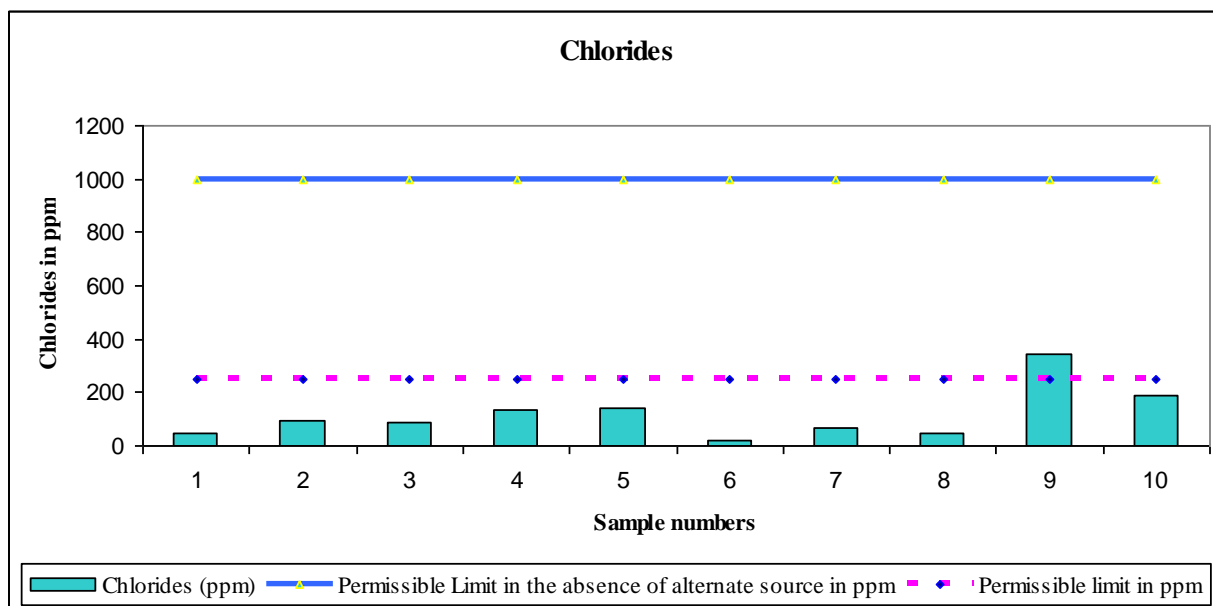


Figure 4.Chlorides in considered samples

At all locations except 9th location the value of chlorides is within the permissible limit. For 9th location also even if the value is more than the permissible value but less than the permissible limit in the absence of other alternate source. And hence all the samples can be considered as suitable for drinking with respect to chlorides.

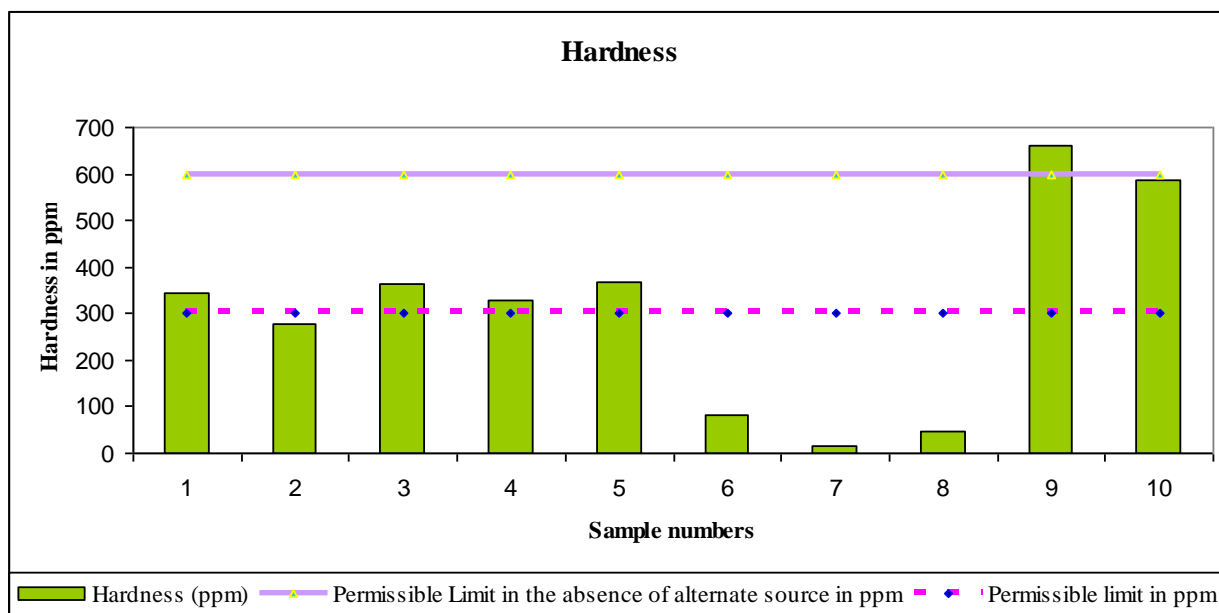


Figure 5.Hardness of considered samples

Hard water is water that has high mineral content. Calcium and magnesium are the two most common minerals that are responsible for hardness of water. Samples with numbers 2, 6, 7 and 8 have the hardness value within

the permissible limit. And samples with numbers 1, 3, 4, 5 and 10 have the value in between the permissible limit and permissible limit in the absence of other alternate source. So these samples may be considered as suitable for drinking with respect to hardness where as the remaining sample at location 9 requires treatment.

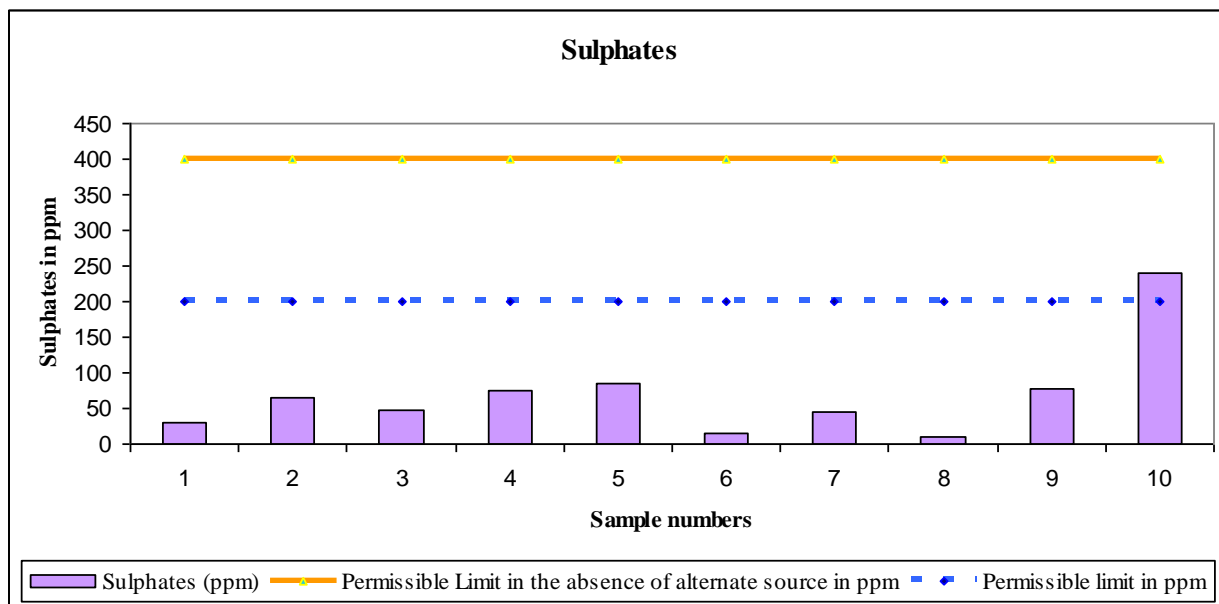


Figure 6.Sulphates in considered samples

With respect to sulphates, all the samples can be considered as suitable for drinking since, all the samples except the sample at location 10 have the values within the permissible limit. Sample with number 10 also has the value within the permissible limit in the absence of other alternate source due to which it also can be considered as suitable for drinking.

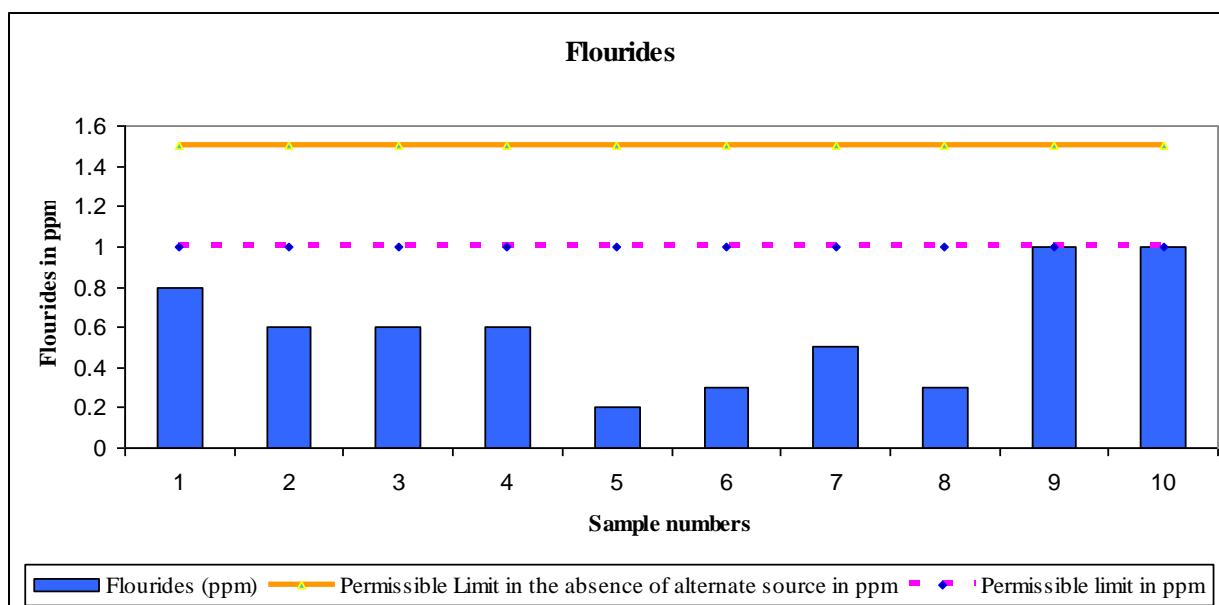


Figure 7.Fluoride in considered samples

With respect to fluorides all the samples can be considered as suitable for drinking since, all of them have the values within the permissible limit.

5. Conclusions

Since the samples at all locations except at location 9 (Bus Stand area) have the values within the permissible limits and limits in the absence of other alternate source, all of them can be considered as suitable for drinking with respect to considered chemical parameters total dissolved solids, pH, chlorides, hardness, sulphates and fluorides. Sample at location 9 (Bus Stand area) requires treatment to reduce the hardness so that it can also be used for drinking.

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