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ANALYSIS OF GROUND WATER OF MUNICIPAL AREA OF BIJAPUR, KARNATAKA

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ABSTRACT

Sixteen water samples from different sources at different locations of Bijapur city were collected during January 2012. Physico-chemical parameters: pH, EC, alkalinity, TDS, turbidity, total hardness and content of fluoride, sulphate and chloride were studied and compared with the standard values prescribed by WHO and APHA. The present investigation revealed that the some of the water samples of source of Bijapur city are not suitable for domestic use and they need the proper treatment before use.

Key words: Bijapur, Ground water, Water quality.

INTRODUCTION

Safe drinking water is a fundamental human need and it is an important factor that determines the physical and social health of the people. Bullard[1] inferred that polluted surface water always results in an unhealthy socio-economic environment. Increase in living standard, growing population, rapid industrialization and wide spread human activities have increased the demand for water[2]. According to World Health Organisation (WHO) about 80% of diseases of human beings are caused by drinking water. Therefore the present investigation aimed to calculate the quality of ground water in Bijapur municipal area.

Talabs (Lakes) and Bowdies (Wells) constructed by Adil Shahi Rulers in 16th and 17th century and now tube well and many open wells are the water resources of Bijapur city. Capacity of these source is determined by rain. Bijapur is situated in semi arid area with average rain fall of 553 mm and suffering critically from shortage of water. In past few decades the municipal authorities trying to solve the water crisis, by using Almatti Reservior

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as a source of water which is about 40 Km away. But still Bijapur is facing water quality problem as well as water shortage specially during summer and large number of people are suffering from health problem due to consumption of contaminated locally available water.

Due to rapid growth of industrialization and urbanization much sewage water is disposed off that generates fair chance of ground water pollution[3] and Bijapur is not an exception for this phenomena. Information on water quality of resources of Bijapur city are scanty. Hence the present work draws the conclusion on the quality of water and provides information about suitability of water for drinking purpose. Comparison of water test results with WHO Guideline[4] values and Indian Standard Institute tolerance limit[5] helps to address the specific problem of water sources and to select the appropriate method of water treatment before use.

Materials and methods

Water samples were collected from 16 spots of Bijapur city during the month of January 2012, in plastic (PVC) containers of 1000 mL. The samples were collected and analysed as per the standard methods prescribed by APHA-AWWA-WEF[6], Goltman et al.,[7] and Trivedi and Goel[8]. In case of tube well, the water was flushed out for 10 minutes to get the fresh water and then the samples were collected. The grab sampling method was followed in case of collection of samples from open wells. In both the cases containers were rinsed several times and filled with samples. The containers were sealed, labeled and the samples were protected from direct sunlight during transportation.

Turbidity (Turb), pH and Electrical Conductance (EC) of the samples were determined on the day of collection to minimize the alteration of original sample condition, using Systronics Digital Turbidity Meter-132, Systronics Digital pH Meter MK-VI and Systronics Digital Conductivity Meter-304, respectively. Total Dissolve Salt (TDS) of the samples were determined gravimetrically by evaporation at 103-105^{o}C. Total hardness (TH) of the samples were determined by complexometric titration with EDTA using Erichrome Black-T as an indicator. Total alkalinity of water samples were determined by titrating against 0.02 N H_2SO_4 using phenolphthalein and methyl orange indicators. The chloride ion (Cl^-) concentration was determined by titrating against standard $AgNO_3$ solution using K_2CrO_4 solution as indicator, at neutral pH adjusted with H_2SO_4. Sulphate ion content in the water samples was determined by titrating against EDTA as prescribed by Jackson. Fluoride (F^-) content of the samples was determined by SPADNS method[9].

Physico-chemical parameters of water sources of municipal area of Bijapur:

Table 1: January 2012

S. No.	Site of the sample	pH	EC mS/m	TDS mg/L	Turbi-dity NTU	Alkali-nity mg/L	Total hardness mg/L	F^- mg/L	Cl^- mg/L	SO_4^- mg/L
S1	Jumma Masjid Road	7.19	1.5	732	0.40	385	234.6	0.8	193.6	235
S2	Jumma Masjid Backside	7.24	2.2	1050	0.11	660	366.6	1.2	238.2	188
S3	Kanaka Das Badavane	7.41	2.1	1030	0.34	275	405.7	0.8	335.0	188
S4	Pulakeshi Nagar	7.37	1.7	830	6.90	275	405.7	1.0	297.8	188
S5	Kirti Nagar Sai Baba Temple	7.50	2.1	1020	0.12	330	264.0	1.1	335.0	188
S6	Jalanagar west	7.34	2.4	1360	0.25	605	215.1	1.1	372.2	235
S7	Ahmad Colny	7.07	3.9	2070	0.12	495	571.9	1.2	580.7	282
S8	Rajendra Colony RTO Behind	7.18	1.9	910	0.12	440	303.1	1.3	275.4	188
S9	Nissar Maddi	7.42	1.7	852	0.55	385	244.4	1.1	238.2	188
S10	Darbar Galli – Sakap Roza	7.16	1.9	915	0.22	440	327.5	1.2	245.7	94
S11	Baraha Kaman	7.39	1.4	670	1.20	385	264.0	0.8	186.1	235
S12	APMC Corner	7.45	1.0	460	0.22	275	127.1	0.5	111.7	141
S13	Sikhar Khana	7.01	1.5	732	0.10	275	332.4	0.6	238.2	141
S14	Rly Station Chougule Ind.	7.24	2.4	2050	8.80	385	488.8	1.6	603.0	282
S15	Shanmukharudh Math	7.47	2.3	1270	0.12	275	435.1	0.8	372.2	188
S16	Rayaramath Divatiger Galli	7.28	1.7	815	0.22	440	278.6	1.0	201.0	235

RESULTS AND DISCUSSION

The results of the analysis water samples are given in the Table 1. Turbidity of the water samples were in the range from 0.1 to 8.2 NTU. Samples No S4 and S14 showed the turbidity above the permissible limit (5 NTU) while rest of the samples showed within the desirable limit. pH of the samples were in the range from 7.01 to 7.50, so that slightly alkaline but within the permissible ISI limit (6.5 to 8.50). Higher pH value impart bitter taste to the water[10]. Electrical conductance of the sample were in the range from 1.0 to 3.9 mS/cm. Sample S7 has highest EC of 3.9 mS/cm while sample S12 has lowest EC of 1.0 mS/cm. There are no prescribed standard suggested by WHO for parameters of EC, no comparison can be made from the observed values. However, the EC indicates the content of soluble and high conducting salts.

Total Dissolved Solids in the water samples were in the range from 460 mg/L to 2070 mg/L. Sample S12 contains the TDS within the desirable limit and Sample S7 and S14 contain above the permissible limit, while rest of the samples have the TDS within the highest permissible limit. The values of total alkalinity for water samples varied from 275 mg/L to 660 mg/L. Except the samples S2 and S6, alkalinity of all the samples were within the WHO permissible limit. Alkalinity in many surface water is due to carbonate, bicarbonate and hydroxide content. The large quantity of alkalinity imparts bitter taste to water[10].

Total hardness is the indicator of hydrogeology and aesthetic values of the water. TH of water samples were in the range from 127.1 mg/L to 571 mg/L. Samples S1, S5, S6, S11, S12, S16 contain TH, within the desirable limit while rest of the samples contain within the highest permissible limit of WHO. It shows the water samples were moderately hard. Total hardness is imparted mainly by calcium and magnesium ions which apart from sulphate, chloride and nitrate are found in combination with carbonates.

Fluoride concentration of water sample are within the permissible limit of WHO. High fluoride concentration causes dental fluorosis[11], while low concentration causes dental caries. Hence it is essential to maintain moderated concentration of fluoride in drinking water.

The chloride content in the water samples varied from 111.7 mg/L to 603 mg/L. Samples S3, S5, S6, S7, S8, S14 and S15 contain chloride within the desirable limit, while rest of the sample contain moderately high. The chloride content indicates pollution status of water body due to contamination of animal and human waste. Chloride is a common constituent of all natural water and is generally not classified as harmful constituent[12].

Concentration of sulphate ion was in the range of minimum 92 mg/L and maximum 284 mg/L Sulphate concentration in Samples S1, S6, S7, S11, S14 and S16 is moderately high while in rest of the samples it is within the desirable limit of WHO guidelines. Higher concentration of sulphate has laxative effect which is enhanced when sulphate is consumed with magnesium.

CONCLUSION

The present study, the analysis of water samples from Bijapur, shows conclusively that except Samples S12, concentrations of one or other investigated parameters are not within the desirable limit and hence they are not suitable for drinking in the accessible state. The effective maintenance of water quality of local resources through appropriate control measures, continuous monitoring of their quality parameters and after suitable treatment, the use of local resources as a supplement to river water, will reduce the water crisis of the city.

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