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Water quality assessment of resources of Bijapur, Karnataka

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ABSTRACT

The evaluation of physico chemical parameters of ground water of Bijapur city was carried out seasonally to study the quality of water and suitability for domestic purpose. Talabs (Lakes), Bowdis (Wells) (constructed by Adil Shahi Sultans in 16th &17th century) and bore wells are water resources of the city. Ten samples were collected from different sources at different locations during summer, rainy season and winter season of 2009. The parameters studied were pH, EC, TDS, Turbidity, Fluoride, Sulphate, Chloride, Nitrate and Total hardness. The present investigation revealed that the quality of water varies from season to season. Some of the samples are unfit for drinking and utility purpose and requires the proper treatment before use.

Key words: Bijapur, Ground water quality, Talabs, Adil shahi, Sultans, seasonal variations

INTRODUCTION

The ever growing demands for water resources coupled with the rate at which much of the earths fresh waters are being adversely affected by human activities, demonstrate a developing crisis in the not too distinct future if environmental water resources are not appropriately managed[1]. Bijapur is not an exception to this future crisis. Indeed, Bijapur with an average rain fall of 553 mm with 37.2 rainy days, is a city located in an area that suffers critically from a shortage of water resources. So the conservation of improvised water resources is indispensable for the sustainability of our economic development. For this reason, in the past few decades more attention has been given to the water quality of Bijapur. Actually many Talabs (lakes) and Bowdies (wells) constructed by Adil Shahi Sultans in 16th and 17th century and now many tube wells (B.W) are water resources in the city. Bijapur is facing water quality problems as well as drinking water shortage, specially during summer season. Adults and children of this city are suffering from health problems due to consumption of contaminated water.

For effective maintenance of water quality through appropriate control measures, continuous monitoring of large number of quality parameters is essential. However, it is very difficult and laborious task for regular monitoring of all the parameters even if adequate manpower and laboratory facilities are available.

Information on water quality of Bijapur is scanty. Hence the present work, seasonally determining its suitability for drinking purposes, assesses the ground water quality of Bijapur city.

MATERIAL AND METHODS

Ground water samples were collected for physico-chemical analysis from 10 sites during summer, rainy and winter seasons. While sampling for ground water, samples were collected in sterilized plastic containers (PVC 1000ml) after flushing out the tube wells (minimum 10 minutes) to get the fresh ground water and grab sampling method was followed in case Talabs and Bowdies. The containers were sealed and the samples were protected from direct sunlight during transportation.

The water pH, electrical conductivity(E.C), Total Dissolved Solids(TDS), Turbidity(TUR), Fluoride (F^-), Sulphate (SO_4^-), Chloride (Cl^-), Nitrate (NO_3^-) and Total Hardness (TH) were estimated. Standard methods as prescribed by Goltman *et al.,*[2] (1978), Trivedi and Geol (19840 and APHA (1998) were followed for examination of various physical and chemical parameters of the water.

RESULTS AND DISCUSSION

The seasonal variations of physico-chemical characteristics are given in the Table-1. Climatic factors such as rainfall, temperature, pressure and humidity etc play an important role in the geology as well as terrestrial environment. A sound knowledge of these factors help in

Table 1: Physico Chemical Parameters of water sources of Bijapur

Sample No.	pH	EC mS/m	TDS mg/L	Turbidity NTU	Total Hardness	F^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	NO_3^- mg/L
In Winter									
S1	8.82	480	330	0.05	100	4.0	42	120	3.3
S2	7.10	5112	3560	1.00	1640	0.3	865	748	4.0
S3	7.00	3670	2500	0.10	930	0.5	420	720	30.1
S4	7.32	4900	3185	0.02	895	0.85	590	850	33.0
S5	7.50	4502	2850	0.00	835	0.95	352	905	22.5
S6	7.22	1800	1220	1.00	375	0.40	186	120	0.7
S7	9.05	550	345	0.10	125	2.18	105	58	12.4
S8	7.18	2600	1750	0.10	650	0.65	480	280	13.5
S9	7.40	2200	1600	0.00	580	0.75	350	298	10.0
S10	7.22	2800	2000	0.02	850	0.60	450	375	6.5
In summer									
S1	8.9	500	380	0.06	200	5.0	62	160	3.1
S2	7.0	5220	3480	1.02	1840	0.4	955	848	4.5
S3	7.2	3570	2600	0.15	980	0.5	520	760	31.5
S4	7.4	5005	3284	.03	995	0.95	790	890	33.0
S5	7.6	4500	3145	0.02	1035	1.05	452	905	24.5
S6	7.3	1850	1310	1.03	575	0.60	196	140	1.7
S7	8.9	600	380	0.20	225	2.38	155	88	14.4
S8	7.5	2700	2100	0.12	650	0.65	550	330	16.8
S9	7.8	2180	1690	0.02	590	0.95	450	365	12.0
S10	7.5	2900	2150	0.05	880	0.80	690	485	7.5
In Rainy Season									
S1	8.5	490	295	0.08	100	3.5	41	120	3.0
S2	7.2	4525	3250	0.05	1240	0.3	665	648	3.5
S3	7.3	3550	2580	1.02	730	0.5	320	630	25.1
S4	7.2	5000	3100	0.14	885	0.75	510	650	28.5
S5	7.5	4550	3080	0.03	735	0.85	250	705	18.5
S6	7.2	1790	1340	0.00	305	0.40	176	110	0.7
S7	8.4	590	280	1.02	125	2.00	105	58	11.4
S8	7.4	2660	1650	0.20	610	0.60	425	220	9.5
S9	7.6	2200	1550	0.04	505	0.55	240	238	8.5
S10	7.4	2890	1890	0.05	750	0.55	320	315	6.1

understanding the complex processes of interaction between the climate and biological processes in water bodies. pH is the scale of intensity of acidity and alkalinity of water and measures the concentration of hydrogen ions. 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]. In the present study, the mean values of pH ranged between 7.0-9.0. The least value was recorded to be 7.00 in the month of December while maximum was recorded to be 9.0 in the winter season. pH was found to be alkaline in nature at all the sites6. The pH was observed to decline during winter and increases during the summer as is evident from the mean values7. The lower value of pH during rainy season may be due to dilution of alkaline substance or atmospheric CO_2.

The electrical conductivity was recorde highest in summer season and lowest in winter and rainy season. The electrical conductivity ranges from 480 – 5220 mS/m and there are no prescribed standards suggested by WHO for parameters electrical conductivity for drinking purpose. So no comparison can be made from observed values. Total dissolved salt was ranged from 295-3250mg/ litre (in rainy season) and 380-3480 mg/litre (Summer season). TDS is the term used to describe the inorganic salts and small amount of organic matter present in solution of water. TDS values of water samples are within the highest desirable or maximum permissible limit set by WHO[8]. The turbidity (0-1.0 NTU) was within permissible limit. The variations in trend of turbidity and total solids is approximately is similar in different seasons and the average these parameters is higher in summer compared to rainy and winter season. It is evident that the discharge variations are commensurate with weather conditions and seasons variations. The average discharge is higher in rainy season in contrast with winter and summer.

Fluoride concentration of water sample was minimum for winter and maximum for summer season. In sample S1, the fluoride was observed 4.0 ppm which is above the permissible limit of WHO. High fluoride concentration causes dental fluorosis[9,10,11,] while low concentration causes dental caries. Hence it is essential to maintain moderated concentration of fluoride in drinking water.

Concentration of sulphate ion was minimum in rainy and winter season (120mg/litre) and maximum (905mg/litre) in summer which is above the permissible limit. High concentration of sulphate has laxative effect[12] which is enhanced when sulphate is consumed with magnesium. Water containing magnesium sulphate (1000mg/litre) acts as purgative in human adults. Sulphate anions can be removed by ion exchange resin methods[13]. Chloride is the indicator of contamination with animal and human waste. The chloride contents varied from 105 to 865 mg/litre which indicates pollution status of water body. Maximum value was recorded in summer while minimum value recorded in rainy season. Excessive concentration of nitrate in drinking water is considered hazardous for infants causing methamoglobinaemie[14]. Total hardness is the indicator of hydrogeology and aesthetic quality of water. The hardness was ranged from 1640 mg/ litre (maximum in summer) to 100mg/litre (minimum in winter). In most of the fresh water total hardness is imparted mainly by the calcium and magnesium ions, which apart from sulphate, chloride and nitrates are found in combination with carbonates and bicarbonates. These findings suggests that the water body is moderately hard and high medium productive during present stage. Similar findings were also observed by Sehgal[15] and Das[16] in their studies.

CONCLUSION

Analysis of Bijapur water resources in three seasons rainy, winter and summer during 2009 revealed that some of water resources of Bijapur are not suitable for drinking purpose.

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