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ORIGINAL CONTRIBUTION

Physical and Chemical Analysis of the Ground Water at the Town of Achhnera, Agra

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ABSTRACT

Ground water samples were collected in polythene bottles from six different sites namely site I station bazaar, site II Railway loco colony, site III- Rathiya mohalla, site IV- Jatwan mohalla, site V- Shekhan mohalla and site VI- Bajahera mohalla in Achhnera, Agra for their physico-chemical studies. Laboratory test were performed for analysis of sample for total dissolved solids, Electrical conductivity and major ions eg., Calcium, Magnesium, Nitrite, Fluoride, Sodium and Potassium. This paper highlights the analytical results for main ions contributing towards total dissolved solids. On comparing the results against drinking water quality standard laid by Indian Council of Medical Research (I.C.M.R.), it is found that most of the water samples are not suitable for human beings due to high concentration of one parameter or the other. Most of the samples have total dissolved solids values much higher than the maximum permissible level stipulated by ICMR. The high values of these parameters may have health implications and therefore they need attention.

Key words: Samples, Electrical Conductivity and Major ions

1. INTRODUCTION

According to W.H.O., about 80% of all the diseases of human beings are caused by water. Since these diseases are directly related with human health, it is necessary to bring awareness among the present and future generation about the consequences of water pollution. Pollution can be defined as “The addition of something to water which changes its natural quality”. Pollution can also be defined as “pollution is a modification of the physical, chemical and biological properties of water, restricting or preventing its use in the various applications where it normally plays a part.

With rapid growing population and improved living standard, the pressure on water resource is increase [1-2]. Rapid industrialization and urbanization have led to discharge of industrial effluent which turn pollutes the ecosystem. The disposal of effluent has become a serious techno-

economic problem particularly due to rising cost of disposal and growing awareness of pollution hazard. Ground water is an important source of drinking water for much of the world's population and its quality of purity has no direct effect on human health. Ground water is generally a very good source of drinking water because of the purification properties of the soil. It is also used for irrigation and spraying and where surface water is scarce for industrial purpose. Water is a universal solvent [3] and it dissolves minerals from the rocks in which it is stored and thus physical and chemical attribute of ground water depend on geology of particular area. The quality of ground water is the resultant of all the processes and reaction that act on the water from the moment, it condense in the atmosphere to the time it is discharged by a well [4].The socio-economic growth of a region is

severely constrained by non availability of safe drinking water [5]. Ground water meets domestic needs of more than 80% rural and 50% urban population besides fulfilling irrigation need of around 50% irrigation agriculture. Around two fifth of India's agriculture output is contributed from area irrigated by ground water. Contribution from ground water to India's Gross domestic product has been estimated to be 9% a reported [6].

The main objectives of the hydro chemical studies to know the distribution of solute in ground water, and the suitability of the ground water for domestic and agriculture purpose. Bacterial contamination and total dissolved are two main criteria for judging the quality of water for drinking purpose. U.P. State is characterized by high evaporation and extreme variation in temperature and Irregular rainfall [7]. In continuation of the work earlier done, related to ground water analysis and the results of ground water analysis presented in this paper Achhnera, Distt. Agra, ground water mainly contains no suspended particles and practically no bacteria. The suitability of ground water for domestic uses has been based on chemical composition of dissolved solids [8]. The I.C.M.R (1975) has recommended highest desirable limit of 500mg/l and maximum permissible limit of 1500mg/l for total dissolved solids [9].

1. MATERIAL AND METHOD

Sample were collected in polythene bottles from six different sites namely site I station bazaar, site II Railway loco colony , site III- Rathiya mohalla, site IV- Jatwan mohalla, site V- Shekhan mohalla and site VI- Bajahera mohalla from the depth of 35' and 75'ft. utmost care was taken during sampling to avoid any kind of contamination. Temperature and pH were measured at the time of collection itself. Physical attributes like Total suspended solids was evaluated by microprocessor. The conductivity was measured by conductivity meter. Major ions like Calcium, magnesium, and chloride were analysed using the standard titrimetric method. Sulphate ion estimation was done Spectrophotometrically. Sodium and potassium

ions analyses were done using Systronic Flame Photometers.

2. RESULT AND DISCUSSION

The results of the analyses are reported in table 1 and graph. In the present studies, the pH values in all the samples ranges from 7.60-7.78, which are well in the highest permissible level (6.5-9.2). The lower value of pH may cause tuberculation and corrosion while the higher value may produce incrustation, sediment deposit, and difficulties in chlorination for disinfection of water. EC of the ground water in all sites was under the permissible limit stipulated by ICMR. Conductivity is measurement of the dissolved solids in ms/cm. Conductivity varied from 650.00 – 663.00 ms/cm. Chloride ions was found from the range 350 to 390 mg/l Chloride ions concentrations in most of the samples were found higher than the desirable limit (i.e. 200ppm) but under the permissible limit (i.e. 1000ppm) for drinking water at all site. High chloride concentration indicated organic pollution. Sodium was found from the range 346 to 385 mg/l. Sulphate in most of the sample found from the range 162.00 to 185.00 mg/l. It was found within the permissible limit (400 mg/l, ISI. 1991. Calcium is also essential for healthy growth of bones and play important roles in biological system.

Table 1: Analytical and Physico-Chemical Parameter of Ground water

Sl No	Location	Temp.	pH	Electrical Conductivity	Turbidity	Chloride Ions	Bicarbonate Ions	Ca ²⁺	Mg ²⁺	SO ₄ ²⁻	Nitrate	Fluoride	Na ⁺	K ⁺	Total Solid
1	Station Bazar	18.80 ± 0.10	7.75 ± 0.30	655.00 ± 1.12	6.50 ± 1.52	360.00 ± 0.27	588.00 ± 1.26	92.80 ± 0.65	64.00 ± 0.35	165.00 ± 0.54	14.40 ± 0.10	Ab.	380 ± 0.66	7.80 ± 0.16	658 ± 1.28
2	Railway Loco Colony	19.30 ± 0.01	7.60 ± 0.11	650.00 ± 0.64	5.50 ± 1.27	350.00 ± 0.44	582.00 ± 0.36	88.80 ± 0.39	60.28 ± 0.32	162.00 ± 0.62	1.65 ± 0.06	Ab.	344 ± 0.13	7.10 ± 0.04	653 ± 1.52
3	Rathiya Mohalla	19.00 ± 0.03	7.78 ± 0.45	668.00 ± 0.45	14.80 ± 0.99	390.00 ± 0.76	640.00 ± 0.62	97.18 ± 0.29	70.58 ± 0.13	185.00 ± 0.12	4.84 ± 0.12	Ab.	384 ± 0.08	10.4 ± 0.24	708 ± 1.20
4	Jatwan Mohalla	19.50 ± 0.03	7.64 ± 0.60	659.00 ± 0.35	8.34 ± 0.67	362.00 ± 0.02	590.00 ± 0.34	91.90 ± 0.11	66.00 ± 0.11	168.00 ± 0.32	2.24 ± 0.06	Ab.	355 ± 0.04	8.00 ± 0.54	680 ± 0.90
5	Shekhan Mohalla	19.88 ± 0.02	7.76 ± 0.22	662.00 ± 0.26	9.95 ± 0.32	365.00 ± 0.12	617.00 ± 0.32	95.50 ± 0.17	70.50 ± 0.03	174.00 ± 0.94	4.38 ± 0.08	Ab.	360 ± 0.04	9.56 ± 0.06	700 ± 0.48
6	Bajahera Mohalla	20.30 ± 0.21	7.62 ± 0.09	661.00 ± 0.12	9.90 ± 1.11	364.00 ± 0.34	615.00 ± 1.52	93.49 ± 0.23	69.38 ± 0.09	172.00 ± 0.74	3.23 ± 0.06	Ab.	356 ± 0.12	9.20 ± 0.96	685 ± 1.20

Calcium varied from 88.80-97.18. Calcium was found in the entire sample higher than the highest desirable limit (75ppm) but under the permissible limit of ICMR i.e. 200ppm. Magnesium is a beneficial metal but toxic at higher concentration. Magnesium ranged from (60.28-70.58) mg/lit (highest desirable limit for magnesium by ICMR is 105 ppm). It can be concluded from the results that the ground water in Achhnera town possess high desirable value of total dissolved solids,

Chloride, Sodium and Magnesium ion conc. etc. Though none of these factors pose any serious health hazards yet these degrade quality of drinking water and therefore required to be treated.

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