

Chemical analysis of ground water collected from different areas of Antiri and some nearby villages, Gwalior (M.P.)

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ABSTRACT

Water is most essential to life next to air only. Ground water is most important for water supply for irrigation, industries and drinking purpose. Safe drinking water is primary needs of every person. Most of person mainly depends upon ground water sources. Some of these have problems such as excess hardness, sodium, fluoride etc. The natural quality of ground water tends to be degraded by human activities and geo environmental changes. Physico-chemical analysis of bore wells & hand pumps, drinking water has been done in winter season. Different parameters of water has been analyzed and assessed the suitability of drinking water in public hygiene scenario. Some parameters are prescribed by ISI and WHO while other are beyond the limits.

Key words: pH, Total alkalinity, total hardness, Mg^{2+} , Ca^{2+} , Na^+ , K^+ Cl^- , NO_3^- , F^- , E.C., T.D.S.

INTRODUCTION

Now a days ground water is primary sources of drinking water. The quality of ground water depends on the ion, which are dissolved in ground water. The major ions which are responsible to maintain the quality of ground water are carbonate, bicarbonate, chloride, sulphate, nitrate, and fluoride. These ions are present in anionic form. The cation and anions must be equal to maintain the quality of water. Cation such as calcium ion, Magnesium ion Na^+ , K^+ etc. are also present in ground water in form of hardness and salinity. The natural quality of groundwater tends to be degraded by human activities. Municipal and industrial water entering in to an aquifer are the major source of organic and inorganic pollutants. A network of tubewells & handpumps has been spread in most of the cities of M.P. and their number is much more higher in northern part of Madhya Pradesh. The water level of under ground water has been full down to 30 to 40 meters in most of areas. Five (05) ground water samples collected from Antiri Municipal areas were analysed for (12) parameter such as pH, Total

alkalinity, Total hardness, calcium ion, Magnesium ion Na^+ , K^+ Cl^- , NO_3^- , F^- , Electrical conductivity, T.D.S..

MATERIAL AND METHODS

The samples were collected during the month January 2007. Samples for analysis were collected in sterilized bottles (plastic with acid washed)., pH-systronic pH meter Type 361 Total Alkalinity of the ground water samples were determined by titrating With N/50 H_2SO_4 using phenolphthalein and methyl orange as an indicator. The total hardness of the water samples were determined by complexometric titration with EDTA using eriochrome black-T as an indicator. Calcium-EDTA titrimetric, Magnesium-Calculation from total hardness and calcium method Chloride-Argentometric titration, Sodium and potassium - flame photometer (128) technique. NO_3^- - UV-visible spectrophotometer. , EC - systronic EC meter, T.D.S.- Gravimetric Fluoride-Spads spectro-photometrically method, UV-visible spectro-photometer(128)

Table - 1

S.No.	Parameter	S(1)	S(2)	S(3)	S(4)	S(5)
1	pH	8.1	8.0	7.8	7.9	7.8
2	T.A.	260	265	145	155	180
3	T.H.	320	295	135	170	200
4	Mg ⁺⁺	36	24	7.2	42	56
5	Ca ⁺⁺	68	78	42	26.7	14.5
6	Na ⁺	94.3	188.6	65.8	90.1	63.0
7	K ⁺	3.1	2.2	20.8	0.2	0.4
8	Cl ⁻	138.4	294.6	99.4	131.3	88.7
9	NO ₃ ⁻	12.41	1.9	6.6	5.3	9.9
10	F ⁻	0.25	0.27	0.39	0.15	0.49
11	E.C.	1050	1410	609	731	673
12	T.D.S.	672	902.4	389.7	467.8	430.7

RESULTS AND DISCUSSION

The pH of the water body indicates the degree of deterioration of water quality³. The desirable pH range necessary for drinking water is from 7.0 to 8.5. The pH value of water sample in the study area ranged from 7.8 to 8.1. The desirable limit for total alkalinity is 200mg/L. The value of ground water samples were varied from 145 mg/L to 265 mg/L. The desirable limit for Total hardness in drinking water according to I.S.I. is 300mg/L. Its values in Ground-water samples varied from 135 mg/L to 320 mg/L. The drinking water containing high magnesium contents may be cathartic and diuretic^{4,5}. Magnesium values varied between 7.2 mg/L to 56 mg/L. WHO permissible limit of calcium in the ground water is 100 ppm². In the present investigation calcium content ranged from 14.5 mg/L to 78 mg/L. Ground water pollution by sodium salt is an unavoidable phenomenon caused from the return flow of irrigation and disposal of industrial and urban wastes. In large concentration it may affect a person with cardiac deficiencies⁷. Sodium values in ground water samples varied from 63.0 mg/L to 188.6 mg/L. Potassium is an essential nutrient for plants. Potassium values in ground water samples varied from 0.2 mg/L to 20.8 mg/L. The salty taste produced by chloride concentrations is variable and dependent on the chemical

composition of water. Water containing 250mg chloride per liter may have a detectable salty taste. The values of chloride in ground water samples were varied from 88.7 mg/L to 294.6 mg/L. The chloride is troublesome in irrigation water and harmful for aquatic life. Excessive concentrations of nitrate in drinking water may cause blue baby syndrome in small children. Nitrate is good for plant nutrient. Its values in ground water samples varied from 1.9 mg/L to 12.4 mg/L. The fluoride is essential for human life and the excess may cause some health problems. The concentration of fluoride exceeds 1.5mg/L. It may cause teeth mottling and still higher concentration may lead to skeletal fluorosis. Fluoride in ground water samples were varied from 0.15 mg/L to 0.49 mg/L. E.C. values are responsible to make the criteria of ground water. The Electrical conductivity values of water sample in the study area ranged from 609 to 1410 micromhos/cm at 25°C. Total dissolved solids are an important parameter for drinking water and water to use for other purposes. The permissible limit of TDS suitable for drinking is 500 mg/L (W.H.O.) the total dissolved solids values of water sample in the study area ranged from 430.7 mg/L to 902.4 mg/L. All the values are expressed in mg/L except pH, electrical conductivity. Electrical conductivity is expressed in micromhos/cm at 25°C, T.A. = total alkalinity, T.H. = total hardness,

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