

Physico-chemical characteristics of underground drinking water From Bhusawal City (M.S.) India

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(Received: March 25, 2006; Accepted: May 21, 2006)

ABSTRACT

Underground water pumped from the borewells is one of the main source fo drinking water in Busawal City. Improper and open drainage system may cause percolation of undesirable materials anc contaminate the underground water. The underground water samples were collected from 12 different location near stagnant sewage water of Bhusawal city and the physico-chemical characteristics such as temperature pH, TDS. Total hardness, Ca⁺⁺, Mg⁺⁺ Chlorides, Conductivity, Do.CO₂ COD of the samples were analysed. The p^H of water at Gajanan nagar, Sahakar Nagar and New RMS Colony was towards higher side but was within the normal limits TDS value of water was highest at Timber Market with high Chlorides and COD. Conductivity of water was maximum at V.M.Ward Calcium value were above ISI levels at Kandari,New RMS colony, Swamisamarth, Anand nagar and Mohi nagar but magnesium levels at all sites were within the normal range.

Key words: Underground water quality,m Bhuswal, Drinking water.

INTRODUCTION

Water is the most essential commodity for the survial of life. Earth is regarded as a water planet having about 71% of its siface area covered by water 97.3 percent of worlds water is found in oceans and is salty that cannot be used for agriculture, domestics and industrial purpose. Out of 2.7% fresh water 2.1 percent freshwater is trapped in the polar ice while in the forms of streams, lakes and underground water it is only 0.6 percent. The ground water which occurs upt the depth of 80 meters below the ground surface is predicted to be $8.5 \times 10^{15} \text{ m}^3$ (Bolenback, 1983; Kataria 1994) According to Shiklomanov (2000) only 0.26 percent of total amount of freshwater on the earth is concentrated in lakes, reservoirs and rivers. In india only 4% of worlds freshwater reserves are available but its population is 16 percent to that of world (Ranjit Kumar *et al.*, 2003).

Bhusawal town is located in *Khandesh* region of Maharashtra having the population about

2.5 lakh and the main source of drinking water is Municipal supply and underground water. As a main Railway junction and improper open drainage system, sewage water accumulates at different areas. As this water can percolate and containinate the underground water, we for the first time have carried out the work to study the potability of underground water from different areas of Bhusawal city.

MATERIAL AND METHODS

File liters each of underground borewell water samples form 12 different sampling stations was collected in polyethylene cans and were analysed for total hardness, chlorides, calcium and magnesium, dissolved CO₂ dissolved O₂ conductivity, TDS contents and COD by the methods as given by APHA (1992). The P^H and temperature ofthe water was measured at the side of collection and at the same time oxygen was fixed in BOD bottles.

Table - 1: Physico-chemical parameters of borewell water from different locations of Bhusawal city

S. No.	Sampling Stations	Temp °C	pH	Total dissolved solids	Total hardness	Calcium	Magnesium	Chlorides	Conductivity μ mho/vm	D.O.	CO ₂	COD
1.	Gajanan nagar	28.1	8.01	1520	108	59.31	12.5	171.82	782	1.2	20.7	6.9
2.	Sahakar nagar	28.3	8.2	1240	186	56.11	17.3	214.82	778	1.7	27.94	5.3
3.	Kandari	26.3	7.8	970	162	88.97	21.4	220.1	874	0.8	28.82	4.1
4.	New RMS colony	27.3	8.1	1090	152	90.58	10.8	144.02	776	1.8	11.9	18.5
5.	Timber market	23.4	7.7	2000	192	58.51	35.2	237.24	862	2.5	25.96	20.4
6.	Swami samratha	27.4	7.8	1600	190	84.16	49	234.3	779	4.8	24.86	12.1
7.	Anand nagar	27.6	7.6	1450	144	91.38	21	174.66	768	3.2	23.1	5.2
8.	Kazi plot	26.9	7.9	1270	132	48.89	45	284	971	2.8	27.06	4.8
9.	V.M. ward	26.1	7.5	560	176	63.32	31.2	120.7	1071	2.2	20.46	3.3
10.	Mohit nagar	26.3	7.98	1020	106	89.77	9.8	146.26	774	2.4	16.94	7.2
11.	WHO Standards		7.5			75	50	250	600			
12.	Indian Standards		7-8.5	500	300	75	50	250	750			6

Except pH, temperature and conductivity all the parameters are expressed in mg/lit

RESULTS AND DISCUSSION

The values of different parameters with respect to sampling stations are given in Table -1. The temperature of water was between 23.4 °C to 28.3 °C. The WHO (1992) did not recommend any definite temperature for drinking water. P^H value varied between 7.5 to 8.2 as compared to the values of ISI standard. At all sampling stations P^H was alkaline while at Sahakar nagar and New RMS colony it was near the highest level. Except V.M. Ward. P^H values at all other stations were above WHO (1992) standards and thus water is slightly alkaline.

The total dissolved solids were within the range of 560 to 2000mg/lit. Except the TDS at V.M. Ward (560), in all samples TDS values were high which is an indication of leaching of soluble solids from soil and weathering of rocks (Jhingran, 1988) or due to percolation of water having dissolved solid contents.

The total hardness of water at different sampling stations was within the range of 106 to 192 mg/lit. The levels of hardness are much below the levels (300mg/lit) as laid down by Indian standards and thus the water is soft. The hardness is mainly due to dissolved salts of calcium and magnesium. The comparative values of calcium were between 48.89 mg/lit to 91.38 mg/lit which were slightly higher than the standard values laid down to WHO (1992) and Indian standards. While the magnesium values ranged between 9.8 to 45mg/lit and at most places values are much lower than the WHO and Indian standards. This range of hardness normally does not have an adverse effect on human health. The hardness values above 200mg/lit may cause scale deposition in the water distribution system, more soap consumption (Trivedi and Goel, 1986). The present results are comparable to those of Balkrishan and Karuppusmu (2005).

The chloride contents of water were beyond the ISI limit at Kazi plot but at all other places are within the prescribed limit (250mg/lit). However, at many places, the chloride contents were near the higher limit. The findings are comparable to the results of Satyanarayan (1992) and Subhadra *et al.*, (2003).

The conductivity of water at various sampling stations ranged between 600 to 1071 μ mho/cm and all the stations it was higher than the prescribed limit of WHO (600 μ mho/cm) and ISI (750 μ mho/cm). It indicates the higher amount of ions in the water that can be due to percolation of sewage water (Thomas *et al.*, 2000) or solubility of salts from rocks.

The DO values of water varied between 0.8 to 4.8 mg/lit. The values were quite low which indicates the possibility of presence of microorganisms in the water. In contrast CO₂ values which lie between 11.9 to 28.82 mg/lit are very high. Both aspects indicate that the organisms in water are more. The DO and CO₂ values may not play an important role in drinking water however, higher CO₂ levels make the water acidic (Jha and Verma 2000). However, though the CO₂ levels are high, the P^H of water was alkaline. The COD values of water were in the range of 3.3 to 20.4 at different locations. The values of COD were very high at New RMS colony and Timber market, indicating the percolation of sewage water in the underground water.

ACKNOWLEDGEMENTS

Authors are thankful to Dr. S.P. Zambare, Reader, Department of Zoology, Dr. Babasaheb Ambedkar, Marathwada University, Aurangabad for kind cooperation and valuable guidance during investigation of water analysis.

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