RESEARCH ARTICLE

Physico-Chemical Analysis of Ground Water Sample from Kamal Colony, Amravati.

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ABSTRACT

The quality of ground water depends on various constituents and their concentration. Ground water is the only source of potable water for majority of people in the urban & rural area.Dug well water samples were collected from five sampling of the Kamal colony, Amravati. which is analyzed by standard analytical methods. Water sample is collected by grab sampling method and stored in clean polyethylene five-liter cans. Physico-chemical analysis is carried out in the laboratory. The physical parameter like Colour, Temperature, Turbidity, Total suspended solids, Total dissolved solids and Conductivity. Chemical parameter like Alkalinity, Hardness, Acidity, p^H, Dissolved oxygen, Chloride, Total hardness, Phosphate, etc. were analyzed. Each parameter was compared with the standard desirable limit of that parameter in drinking water as prescribed by different agencies such as WHO standard, ISI standard and USPH Standard.

Key Words-Ground Water Quality, Physico-chemical analysis, Awareness.

INTRODUCTION

Water is nature's most wonderful, abundant & one of the most essential need for the human and other living organisms, but is also important for the sustenance of biodiversity, ecology and overall health of the planet Earth. Water is extremely essential for survival of lives–ecological resources for the flora and fauna of our earth. The quality of water is vital concern for mankind since it is directly linked with human welfare. The quality of ground water depends on various chemical constituents and their concentration, which is derived from the geological data of the particular region. Ground water occurs in weathered portion, joints and fractures of the rocks (Gupta *et al*., 2009). Most groundwater is clean, but groundwater can become polluted or contaminated due to various anthropogenic activities.

It can become polluted from leaky underground tanks that store gasoline, leaky landfill, or when people apply too much fertilizer, herbicides or pesticides on their fields or lawns. When pollutants leak, spread or are carelessly dumped on the ground they can move through the soil. Some sources are contaminated to groundwater as well, such as industries would dump toxic wastes into ponds, river or swampy area, which is not realizing that the waste could get into someone's drinking water. Some agricultural areas have trouble with fertilizer, pesticides and herbicides from farm runoff that contaminated seeps into the drinking water. Even sewage from houses,

toilets or livestock can contaminate water with dangerous bacteria. According to WHO survey has studied that 1.2 billion people all over the world do not use pure and safe drinking water and biological contamination of water is responsible for 80% of all human illness in the developing world (Wright *et al*., 2004).

Quality of ground water is an important factor in development and use of ground water as drinking resource. The potable water should be free from pathogenic agents and chemical constituents, pleasant to taste and usable for domestic purposes and healthy to human. The ground water is characterized by various quality problems (Gupta *et al*., 2004).

A various pathogenic microorganisms can be transmitted to humans via contaminated water with fecal material. Bacteriological quality of drinking water is primarily determined by using "indicator organisms" whose presence indicates fecal contamination (Duling, 2008). The physical, chemical and bacterial characteristics of ground water determine its use fullness for municipal, commercial, industrial, agricultural, and domestic water supplies (Walton, (1970). Various workers in our country have carried out an extensive work on water quality for various purposes. Subramani had studied groundwater quality and its suitability for drinking and agricultural use in Chithar River Basin (Subramani, 2005). Charu had studied the drinking water quality status in Bhopal and concluded that the water quality is good and within permissible range of drinking water standard values given by various agencies

MATERIALS AND METHODS

Study area: Kamal colony comes within the jurisdiction of Amravati municipal corporation (AMC). Kamal colony situated towards western part of the city. It is about two kilometers away from the main city. This colony was brought into existence in 1983. At the distance of 5 km. MIDC area is situated. Area covered by this colony is 19,6020sqft. and there are 58 plots of 2000sqft. There are 12 wells in the colony from those one wells are dumped by garbage or other waste.

***Sampling sites and sampling*:** The ground water is carried out from five (5) well at various locations within study area. Water sample is collected by grab sampling method and stored in clean polyethylene five-liter cans. Sampling has been carried out without adding any preservatives in well-rinsed bottles.

***Methodology*:** The collected samples were analyzed for different physico-chemical parameters. Some physical parameters like temperature & pH were determined at the site with the help of digital water analyzer kit. Electrical conductivity determined by conductivity meter. Total dissolved Solids (TDS) was estimated by evaporation method. Dissolved Oxygen (DO) mg/L Winkler method, Alkalinity as analyzed by titration method, Calcium (Ca) & Magnesium (Mg) Hardness as CaCO3 mg/L was measured by using standard EDTA solution. Chloride was determined by argentometric titration method using standard AgNO3 solution. Phosphate mg/L determined by Colorimetric Method. All the results are compared with standard limits recommended by WHO, WHO standard, ISI standard and USPH Standard & all parameters were analyzed by standard procedure mentioned in APHA.

RESULTS AND DISCUSSION

The results for dug well water quality of Kamal colony Amravati are tabulated in above Table 1. The temperature of five well water samples was found between the ranges 25^0C to 25.3^0C which is below the desirable limit. Higher ground water temperature decrease dissolved oxygen and also due to increased microbial activity (Kataria, 1996). The colour of the five well water samples was found to be clear during investigation period.

The turbidity of well water samples was found between the ranges 0.9 to1.7 NTU. In most water, turbidity is due to colloidal and extremely fine dispersions. The turbidity of five well water samples was found to be within permissible limits.

Total dissolved solids (TDS) value of five well water sample ranged from 19 to 81mg/lit. The total suspended solids and total solids, in five well water samples were found within the range of permissible limit. According to WHO the desirable limit of TDS is 500 and all samples were below the standard permissible limit. A high value of TDS reduces water quality for drinking, irrigation and agriculture purposes (WHO, 1996). Increase in TDS is mainly due to sea water intrusion and increase in salts (carbonates, bicarbonates, sulphate, calcium, sodium, potassium and other ions) Mittal *et al*. (1994). Dissolved solids tend to increase with increasing pollution of water. Water containing more than 500

mg/L of TDS is not considered desirable for drinking water.

Electrical conductivity of five well water samples was found between the range 0.738 m mho/cm to 1.110 m mho/cm value indicating that conducting materials are not present in large amount. It is a very important parameter for determining the water quality for drinking and agricultural purposes.

pH of five well water samples was found between the range 7.4 to 7.7. This value shows that the groundwater of the study area is slightly alkaline in nature and all the samples were within the permissible limit prescribed by WHO. pH is an important parameter in water body since most of the aquatic organisms are adapted to an average pH and do not withstand abrupt changes. pH is most important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water (Gupta *et al*., 2009).

Dissolved oxygen values of well water sample are varied between 4 mg/lit to 4.8 mg/lit. Dissolved Oxygen is one of the important parameters that measure the extent of organic as well as biological pollution load to a water body. All the samples were within the permissible limit. The low DO values indicating contamination by organic matter, which indicates some pollution load in the water.

Table 1: Physico-Chemical Parameters of well water

Sr. No.	Parameters	Sampling Station-1	Sampling Station-2	Sampling Station-3	Sampling Station-4	Sampling Station-5
1	Temperature	25^{0}C	25.2^{0}C	25.2^{0}C	25.3^{0}C	25.1^{0}C
2	Colour	Transparent	Transparent	Transparent	Transparent	Transparent
3	Turbidity	1.7 NTU	0.9 NTU	1.7 NTU	0.9 NTU	1.7 NTU
4	Total Solids	340 mg/lit	362 mg/lit	329 mg/lit	441 mg/lit	287 mg/lit
5	TSS	320 mg/lit	343 mg/lit	289 mg/lit	360 mg/lit	248 mg/lit
6	TDS	20 mg/lit	19 mg/lit	40 mg/lit	81 mg/lit	39mg/lit
7	Electrical Conductivity	0.751m mho/cm	0.753mmho/cm	0.738m mho/cm	1.110m mho/cm	0.776m mho/cm
8	pH	7.6	7.6	7.4	7.5	7.7
9	DO	4.4 mg/lit	5.1mg/lit	4.4 mg/lit	5.1mg/lit	4.4 mg/lit
10	Total Alkalinity	328 mg/lit	319 mg/lit	314 mg/lit	331 mg/lit	308 mg/lit
11	Total Hardness	320 mg/lit	316 mg/lit	300 mg/lit	324 mg/lit	292 mg/lit
12	Calcium Hardness	196mg/lit	244 mg/lit	172 mg/lit	188 mg/lit	180 mg/lit
13	Magnesium Hardness	124 mg/lit	72 mg/lit	128 mg/lit	136 mg/lit	112 mg/lit
14	Chloride	53.88 mg/lit	58.21 mg/lit	65.22 mg/lit	70.90 mg/lit	51.48mg/lit
15	Phosphate	0.10 mg/lit	0.7 mg/lit	0.8mg/lit	0.11 mg/lit	0.6 mg/lit

Table -2: Drinking Water Standards

Sr. No.	Parameter	WHO Standard	ISI Standard (Permissible limit)	USPHS Standard
1	Temperature	--	--	--
2	pH	6.5-9.0	6.0 – 8.5	6.0 – 8.5
3	Conductivity	--	--	300 μ mho cm^{-1}
4	Turbidity	5 NTU	5NTU	5NTU
5	Total Solids	500-1500 mg/lit	500-2000 mg/lit	--
6	Total dissolved solid	500mg/lit	500 mg/lit	500 mg/lit
7	Total suspended solid	-	100 mg/lit	120-
8	Alkalinity		200-600 mg/lit	120
9	D.O.	--	4 to 6.0 mg/lit	4.0 – 6.0 mg/lit
10	Total Hardness	150-500 mg/lit	300mg/lit	--
11	Calcium Hardness	100-200 mg/lit	75-200 mg/lit	--
12	Magnesium Hardness	150mg/lit		
13	Chloride	250mg/lit	250 mg/lit	250 mg/lit
14	Phosphate	--	--	0.1 mg/lit

The total Alkalinity in five well water samples was found between the range 308 mg/lit to 328 mg/lit. The main sources of natural alkalinity are rocks containing carbonate, bicarbonate and hydroxide compounds that are present in region (Agarwala *et al*., 2012). The value of alkalinity in water provides an idea of natural salts present in water.

The total hardness of five well water samples was found between the range 292 mg/lit to 324 mg/lit. The calcium hardness of five well water samples was found between the range 172 mg/lit to 244 mg/lit. The magnesium hardness of five well water samples was found between the range 72 mg/lit to 136 mg/lit. Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water. Hardness of water mainly depends upon the amount of calcium or magnesium salts or both. The total hardness in five well water samples was found to be within permissible limit. Excess of calcium and magnesium shows the hardness in water and is not good for potable.

The chlorides of five well water samples was found between the ranges 51.48 to 70.9 mg/lit. Chlorides are important in detecting the contamination of ground water by waste water. The permissible limit of chloride in drinking water is 250 mg/L. The values of chloride observed in five well water samples were very low i.e. within the permissible limit. The concentration of chloride caused a salty taste to water. These people who are not accustomed to high chloride content, it may cause a laxative effect (Agarwala *et al*., 2012).

The phosphate of five well water samples was found between the ranges 0.6mg/lit to 0.11 mg/lit. The higher phosphate was found to be 0.11mg/lit. Phosphate may occur in groundwater as a result of seepage of domestic sewage, detergents, agricultural effluents with fertilizers and industrial waste water. The phosphate content in the study area was found to be above the permissible limit. The excess amount of phosphate may cause serious health hazard (Rao *et al*., 2012).

CONCLUSION

The study area is analyzed for 15 parameters which are essential for deciding the water Portability. The quality of ground water with respect to name as per to various collection stations is within permissible limit. The par parameter phosphate is showing high level which cause adverse health effect. The purpose of project is to create awareness in people so that they can accept and implement the precaution while handling and using the ground water for drinking purpose

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