Physico-Chemical Analysis of Ground Water Sample from Dattawadi, Amravati, Maharashtra

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ABSTRACT

Ground water is the only source of potable water for majority of people in the urban and rural area. The quality of ground water depends on various constituents and their concentration. Bore well water samples were collected from five sampling spots of Dattawadi area, Amravati. This was analyzed by standard analytical methods. Water sample is collected by grab sampling method and stored in clean polyethylene five-liter cans. Physico-chemical analysis was carried out in the laboratory. The physical parameter like Temperature, Colour, Turbidity, Total Solids, Total suspended solids, Total dissolved solids, Conductivity and Chemical parameter like Alkalinity, Hardness, Acidity, pH, Dissolved oxygen, Chloride, Total hardness, Phosphate, etc. were analyzed to observe the current status of the groundwater quality. All parameters were compared with the standard desirable limit of drinking water standards as prescribed by different agencies such as WHO standard, ISI standard and USPH Standard.

Key Words- *Ground water, Bore well water, Physico-chemical analysis, Awareness*

INTRODUCTION:

Water is nature's most wonderful, abundant and 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. Water resources have played critical and vital role throughout history in the growth and continue to be a factor of importance in the economic growth of all the contemporary societies. In societies like our India with developing economics, the optimum development, efficient utilization and effective management of their water resources should be the dominant strategy for economic growth. But in recent years, unscientific management and use of these resources for various purpose has created undesirable problems in water logging and salinity in the case of agriculture use and environment pollution of various limits as a result of mining, industries and municipal use (Kumar and Kumar, 2013).

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
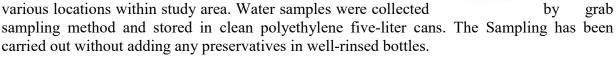
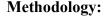drinking water. Even sewage from houses, toilets or livestock can contaminate water with dangerous bacteria.

According to WHO survey 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). Groundwater pollution has become a major subject of public concern the world over. There are several ways as groundwater is contaminated in urban and rural areas such as municipal sewage disposal to nearby water bodies, disposal or seepage of effluent from industries and use of inorganic fertilizers in agricultural farming. Most of the industries discharge the effluent without proper treatment into nearby open land or pass them through unlined channels, resulting in a deterioration of the groundwater resources. The groundwater pollution is highest in urban areas than rural areas where large volumes of waste concentrated and discharged near to the urban lakes. The increasing demand of water from fast growth of industries has put pressure on limited water resources (Ramesh and Soorya, 2012). 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.

MATERIALS AND METHODS

Study area:

Dattwadi (Near Deshmukh Lawn) comes within the jurisdiction of Amravati Municipal Corporation (AMC) in Maharashtra State. It is about two kilometers away from the main city. This area belongs mostly to agriculture land. There are more than 11 bore wells in the Dattwadi area and bore well water is mostly used for domestic purpose. The collection of bore well water samples was carried out from five sampling sites of various locations within study area. Water samples were collected by grab sampling method and stored in clean polyethylene five-liter cans. The 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 and P^H were determined at the site with the help of digital water analyzer kit. Electrical conductivity determined by conductivity meter. Total Solids (TS) Total dissolved Solids (TDS) were estimated by evaporation method. Dissolved Oxygen (DO) by Winkler method, Alkalinity by titration method, Calcium and Magnesium Hardness as $CaCO_3$ were measured by using standard EDTA solution. The Chloride proportion was determined by titration method using standard $AgNO_3$ solution. Phosphate was determined by Colorimetric Method.

All the results are compared with standard limits recommended by WHO standard, ISI standard and USPH Standard & all parameters were analyzed by standard procedure mentioned in book edited by Trivedy and Goel (1986).

Results and discussion

The results for bore well water quality of Dattwadi, Amravati are tabulated in Table 1.

Table 1: Physico-Chemical Parameters of bore well water
(Sampling Location: Dattwadi, Near Deshmukh Lawn, Amravati**)**

Sr. No.	Parameters	Sampling Station-1	Sampling Station-2	Sampling Station-3	Sampling Station-4	Sampling Station-5
1	Temperature	25.1^{0}C	25.0^{0}C	25.2^{0}C	25.3^{0}C	25.1^{0}C
2	Colour	Transparent	Transparent	Transparent	Transparent	Transparent
3	Turbidity	1.3 NTU	1.0 NTU	1.4 NTU	1.2 NTU	1.1 NTU
4	Total Solids	482 mg/lit	367 mg/lit	552 mg/lit	417 mg/lit	436 mg/lit
5	TDS	367 mg/lit	284 mg/lit	427 mg/lit	321 mg/lit	341 mg/lit
6	TSS	124 mg/lit	89 mg/lit	127 mg/lit	117 mg/lit	107 mg/lit
7	pH	8.07	7.88	8.37	7.82	8.10
8	Electrical Conductivity	821µ mho/cm	623µ mho/cm	894µ mho/cm	691µ mho/cm	698µ mho/cm
9	Total Alkalinity	382 mg/lit	339 mg/lit	412 mg/lit	321 mg/lit	317 mg/lit
10	Total Hardness	328 mg/lit	297 mg/lit	485 mg/lit	313 mg/lit	307 mg/lit
11	Calcium Hardness	202 mg/lit	153 mg/lit	265 mg/lit	213 mg/lit	221 mg/lit
12	Magnesium Hardness	127 mg/lit	143 mg/lit	227 mg/lit	107 mg/lit	112 mg/lit
13	DO	4.46 mg/lit	4.76 mg/lit	3.72 mg/lit	3.85 mg/lit	3.30 mg/lit
14	Chloride	131.22 mg/lit	116.31 mg/lit	142.41 mg/lit	121.10 mg/lit	125.26 mg/lit
15	Phosphate	0.21 mg/lit	0.27 mg/lit	0.94 mg/lit	0.98 mg/lit	0.25 mg/lit

Table -2: Drinking Water Standards

Sr.No.	Parameters	WHO Standard	ISI Standard	USPHS Standard
1	Temperature	----	----	----
2	pH	6.5 – 9.2	6.0 - 8.5	6.0 - 8.5
3	Electrical Conductivity	---	----	300 µ mho cm-1
4	Turbidity	5 NTU	5 NTU	5 NTU
5	Total Solids	500-1500 mg/lit	500-2000 mg/lit	----
6	Total Dissolved Solids	500 mg/lit	500 mg/lit	500 mg/lit
7	Total Suspended Solids	---	100 mg/lit	120 mg/lit
8	Total Alkalinity	---	200-600 mg/lit	---
9	DO		4 to 6.0 mg/lit	4 to 6.0 mg/lit
10	Total Hardness	150-500 mg/lit	300 mg/lit	-----
11	Calcium Hardness	100-200 mg/lit	75-200 mg/lit	----
12	Magnesium Hardness	50-150 mg/lit	---	---
13	Chloride	250 mg/lit	250 mg/lit	250 mg/lit
14	Phosphate	----	-----	0.1 mg/lit

The temperature of five well water samples was found between the ranges 25.0^0C to 25.3^0C which is below the desirable limit. The colour of the five well water samples was found to be transparent during investigation period. The turbidity of well water samples was found between 1.0 to 1.4 NTU. In most water samples turbidity is due to colloidal and extremely fine dispersions. The turbidity of five well water samples was found to be within permissible limits.

Total solids of well water sample ranged between 367 to 552 mg/l. Total dissolved solids (TDS) value of five well water sample ranged from 284 to 427 mg/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 mg/l for drinking water 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). High level of TDS in water used for drinking purposes leads to many diseases which are not water-borne but due to excess salts (Sabata and Nayar, 1995; Parihar *et al.,* 2012). Dissolved solids tend to increase with increasing pollution of water. Electrical conductivity of five well water samples was found between the range 623 µmho/cm to 894 µmho/cm. 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 7.82 to 8.37. 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 samples varied between 3.30 mg/lit to 4.76 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.

The total Alkalinity in all well water samples was found between the range 317 mg/lit to 412 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 297 mg/lit to 485 mg/lit. The calcium hardness of five well water samples was found between the range 153 mg/lit to 265 mg/lit. The magnesium hardness of five well water samples was found between the range 107 mg/lit to 227 mg/lit. Hardness is the property of water which prevents the lather formation with soap and increases the boiling point 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 drinking purpose. The chlorides of five well water samples was found between the range 116.31 to 142.41 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. The 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 0.21 mg/lit to 0.98 mg/lit. The higher phosphate was found to be 0.98 mg/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

Ground water quality of Dattwadi, (Vishwa Vihar, Near Deshmukh Lawn) Amravati has been analyzed in the present work. All water parameters were compared with drinking water standards of WHO and ISI. It is concluded that all the water parameters are within the permissible limit of drinking water standards except phosphate which shows higher concentration than standard. So, water can be used for domestic purpose.

The analysis of water samples revels that diversity of the area is reliant on - the quality of edaphic factor & water reservoirs of the adjoining region. Hence, these sites should be conserved for future maintenance as these stands are showing sufficient supplements for growth and development of vegetation.

REFERENCES

Agarwala B R, Mundhe b V, Hussainc S and Pradhand V (2012) : Assessment of bore well water quality in and around Badnapur Dist. Jalna. *Journal of Chemical and Pharmaceutical Research,* 4(8):4025-4027.

APHA (1998) : Standard Methods for the Examination of Water and Waste Water. 20th edition, American Public Health Association Washington D.C.: APHA-AWWA-WEF.

Gupta DP, Sunita and Saharana JP (2009) : Physiochemical analysis of ground water of selected area of Kaithal City (Haryana) India, Researcher, 1(2): 1-5.

Gupta S, Kumar, Ojha CK and Singh G (2004) : Assessment of Water Quality Index for the Groundwater in Tumkur Taluk, Karnataka State, India. *J Environmental Science and Engineering*, 46(1): 74-78.

Indian standard drinking water Specification (1991): (First Revision), ISSN-10500: BIS, New Delhi, India.

Kasturi H, Kakaraddi, Kugali NM and Yadawe M (2014) : Bacteriological and Physico-Chemical analysis of drinking water samples S2. International *Journal of Pharmaceutical and Medical Research,* Vol – 2 (1):13-15.

Kumar M and Kumar R (2013) : Assessment of Physico-Chemical Properties of Ground Water in Granite Mining Areas in Goramachia, Jhansi, UP, India. *International Research Journal of Environment Sciences*. 2(1): 19-24.

Mittal SK, Rao AL, Singh and Kumar R (1994) : Ground water quality of some areas in Patiala city. *Indian J Environ Health,* 36:51-53.

NEERI (1981) : A Course Manual Water and Waste Analysis. National Environmental Engineering Research Institute, Nagpur.

Parihar S S, Kumar A, Gupta RN, Pathak M, Shrivastav A and Pandey A C (2012) : Physico-Chemical and Microbiological Analysis of Underground Water in and Around Gwalior City, MP, India. Research Journal of Recent Sciences. 1(6): 62-65.

Ramesh K and Soorya V (2012) : Hydrochemical Analysis and Evaluation of Groundwater Quality in and around Hosur, Krishnagiri District, Tamil Nadu, India*. International Journal of Research in Chemistry and Environment.* 2(3): 113-122

Rao VS, Prasanthi S, Jagarlapudi VSK and Kottapalli RSP (2012) : Physico-chemical analysis of water samples of Nujendla area in Guntur District, Andhra Pradesh, *India. Int. J. ChemTech Res*, 4(2): 691-699.

Sabata B C and Nayar M P (1995) River pollution in India: A case study of Ganga river, 33.

Trivedy RK and Goel PK (1986) : Chemical and biological methods for water pollution studies. Environmental Publication, Karad

World Health Organization (1993) : Guidelines for drinking water quality, vol 1, 2nd ed. Recommendations, Geneva 830.