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Physico-chemical analysis of ground water quality from Chhohata Bazar, District-Akola

Harne PV and Mangle VS

Department of Environmental Science, Arts, Science & Commerce College Chikhaldara Dist. Amravati.

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ABSTRACT

Ground water is the main source of drinking, irrigation and for industrial purpose. Bore well water sample were collected from Six sampling points i.e. Takali, Nakhegaon, Karodi, Chohatta, Kinkhed, Mahalakshmigaon. Which was analyzed by standard analytical methods and Physico-chemical analysis was carried out in the laboratory. The physical parameter like Colour, Temperature, Turbidity, Total dissolved solids and Conductivity. Chemical parameter like pH, Dissolved oxygen, Total hardness, Phosphate, Sulphate , Nitrate,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 and ISI standard. After the study it concluded that water is salinity affected i.e. water is not use for drinking purpose.

Keywords: Ground Water Quality, Physico-chemical analysis, Hardness, WHO.

INTRODUCTION

Water plays an essential role in human life. According to statistics of WHO reports, approximately 36% of urban and 65% of rural area of India are without access to safe drinking water1 . Fresh water is one of the most important resources for the survival of all the living beings. It is even more important for the human being as they depend upon it for food production, industrial and waste disposal, as well as cultural requirements. Ground water play a vital role in human life. The consequences of urbanization and industrialization leads to spoiling water for agricultural purposes. Ground water is explored in rural area, especially in those areas, where other sources of water like dam and river or a canal is not available. During last decade, this has been observed that ground water gets polluted drastically because of increased human activities.

Main source of water is rain. After rainy season, the main source of water is ground water, which is available for domestic and agriculture purpose.

The natural quality of ground water tends to be degraded by human activities. Municipal and industrial water entering in to an aquifer is the major source of organic and inorganic pollutants. Due to rapid growth of Akot, much sewage water is disposed off that generates fair chances of ground water pollution, and hence, it is essential to study quality of water.

The Ground Water Survey and Development Agency (GSDA), Government of Maharashtra identified 547 salinity-affected villages (136 in Amravati, 318 in Akola and 93 in Buldhana district) of Vidharbha, covering Purna river valley of 4693 sq km. The ground water in these villagesisseverely affected by salinity and poor quality (Adyalkar 1963, Tambekar et al. 2007). 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.

Arvnabh was studied ground water contains high amount of various ions, salts etc. so if we were using such type of water as potable water then it leads to various water-borne diseases (Mishra et al. 2010).

MATERIAL METHODS

Study area:

Chohtta Bazar is a village in Akot taluka of Akola District, Maharashtra State, India**.** located at 20°54'57.9"N latitude and 77°00'23.3"E longitude with altitude of 267 meter. It belongs to Vidarbha region, Amravati Division. It is located 47 Kms towards North from District headquarters Akola, 576 Kms. from state capital Mumbai.

Sampling sites and sampling:

The ground water was collected from 6 bore well at various location within study area. Water sample were stored in polyethylene five-liter cans without adding any preservative in it. Following table shows village and sampling location.

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, Calcium (Ca) & Magnesium (Mg) Hardness as CaCO3 mg/L was measured by using standard EDTA solution. Nitrate, Sulphate and Phosphate mg/L determined by Colorimetric Method. All the results are compared with standard limits recommended by WHO, WHO standard and ISI standard. All parameters were analyzed by standard procedure mentioned in APHA.

RESULTS & DISCUSSION

The results for bore well water quality of six sampling sites are tabulated in above Table 1. The temperature of six bore well water samples was found between the ranges 20^0C 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 six bore well water samples was found to be clear during the time of sampling period.

Table 1: water samples with its location

Sr.no.	Village	Water sample	Latitude	Longitude
1.	Takali	W1	20^0.55,105'N	76^0.58,264'E
2.	Nakhegaon	W2	20^0.54,696'N	77^0.00,172'E
3.	Karodi	W3	20^0.54,711'N	77^0.00,605'E
4.	Chohatta	W4	20^0.54,163'N	77^0.00,226'E
5.	Kinkhed	W5	20^0.54,672'N	77^0.01,782'E
6.	Mahalakshmigaon	W6	20^0.54,557'N	77^0.02,252'E

Table 2: Physico-chemical parameter of bore well water

Sr. No	Parameters	W1	W2	W3	W4	W5	W6
1	Temperature (^{0}C)	25	25	23	25	21	23
2	Colour	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless
3	TDS (mg/l)	600	524	480	690	423	710
4	pH	8.01	7.94	7.81	8.08	7.81	7.89
5	Electrical Conductivity (ms/cm)	10.01	5.07	5.12	9.03	10.21	10.30
6	DO (mg/l)	6.5	8.1	5.7	6.2	7.9	5.9
7	Total Hardness (mg/l)	718.50	844.45	790.97	918.05	789.90	872.40
8	Sulphate (mg/l)	2.15	1.87	0.8	2.03	3.06	2.53
9	Phosphate (mg/l)	0.99	1.24	0.98	0.79	1.95	1.87
10	Nitrate (mg/l)	5	2	4	4	6	9

Table 3: Drinking water quality standard

Sr.No.	Parameters	WHO Standard	Indian Standard (Permissible limit)
1.	TDS (mg/l)	500 mg/l	500 mg/l
2.	PH	6.5 - 9.0	6.0 - 8.5
3.	DO (mg/l)	--	4 - 6.0 mg/l
4.	Total Hardness (mg/l)	150 - 500 mg/l	300 mg/l
5.	Sulphate (mg/l)		
6.	Phosphate (mg/l)	--	--
7.	Nitrate (mg/l)		45 mg/l

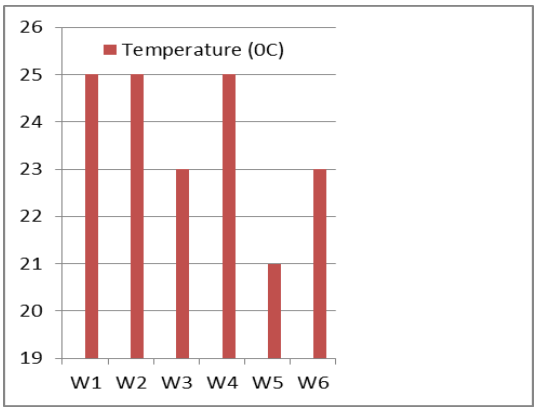

Figure 1: Shows temperature at various site

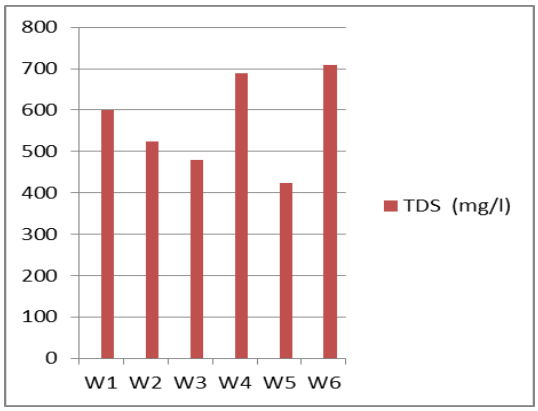

Figure 2: Shows TDS from various site

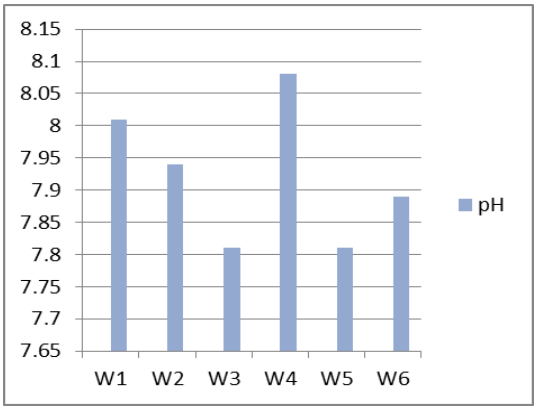

Figure 3: Shows pH from various site

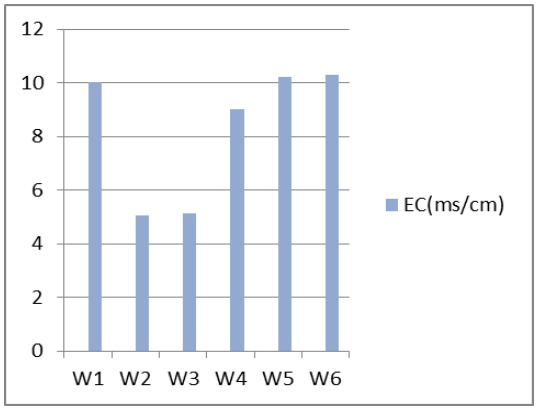

Figure 4: Shows electrical conductivity from various site

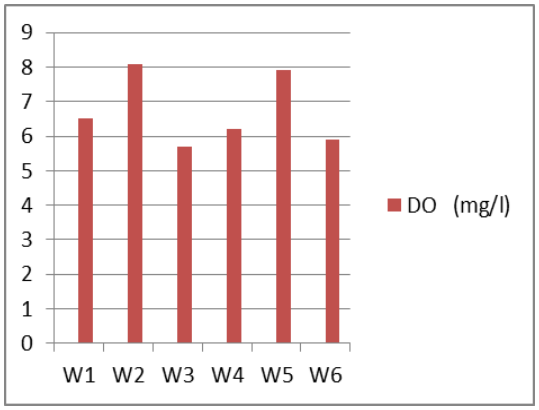

Figure 5: Shows Dissolve oxygen from various site

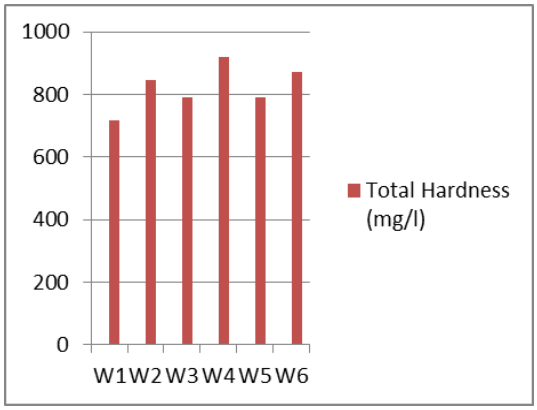

Figure 6: Shows Total hardness from various site

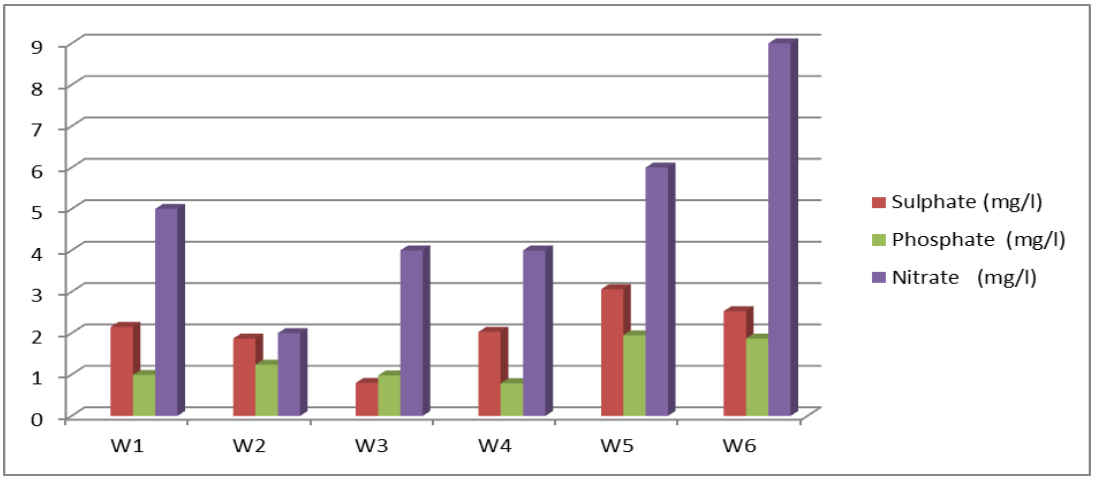

Figure 7: Shows Sulphate , phosphate and nitrate from various site in mg/L

According to WHO the desirable limit of TDS is 500 and all samples were found above 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 500mg/L of TDS is not considered desirable for drinking water.

During analysis pH of Six Samples was found between range 7-8.5 pH. Which is present in permissible limit , the bore well water is slightly alkaline in nature. 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.

EC of samples were found to be 5-11 ms/cm in range. EC is a very important parameter for determining the water quality for drinking and agricultural purposes.

Dissolved oxygen is important parameter in water quality assessment and reflects the physical and biological processes prevailing in the water. The DO values indicate the degree of pollution in water bodies. DO values varied from 8.1 to5.0. The sampling points W2 and W5 showed high DO values.

Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water(Trivedy and Goel 1986).

Hardness of water mainly depends upon the amount of calcium or magnesium salts or both. The hardness values shown range from 500 mg/L to 950 mg/L. The values for

sample from point W4 and W6 were higher than the prescribed limit.

Groundwater contains nitrate due to leaching of nitrate with the percolating water. Groundwater can also be contaminated by sewage and other wastes rich in nitrates. The nitrate content in the study area varied in the range 2 mg/L to 10mg/L and found within the permissible limit.

Sulphate occurs naturally in water as a result of leaching from gypsum and other common minerals. Discharge of industrial wastes, domestic sewage and agriculture waste tends to increase its concentration. The sulphate concentration varied between 0.2 mg/L and 3.6mg/L. and found within the prescribed limit.

Phosphate may occur in groundwater as a result of domestic sewage, detergents, and agricultural effluents with fertilizers. The phosphate content in the study area was found between 0.99 mg/L-1.95 mg/L.

CONCLUSION

The conclusion drawn from the given data is that the concentration of total hardness of site W6,W4,W3 higher than permissible range. TDS of site W3, W1,W6 is high. Water of Nakhegaon, Karodi, Chohatta, Kinkhed, Mahalakshmigaon is hard, it is contaminated with calcium and magnesium hardness. Problem may arise due to this hard water. Therefore, it is essential to improve the water quality. High percentage of TDS may cause gastro intestinal troubles.

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Conflicts of interest: The authors stated that no conflicts of interest.

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