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PHYSICOCHEMICAL CHARACTERISTICS OF GROUND WATER OF DEOLALI PRAVARA AREA, DISTRICT AHMEDNAGAR, MAHARASHTRA

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ABSTRACT:- In the present investigation attempts has been made to study physicochemical characteristics of ground water of Deolali Pravara area. Ground water is no more considered to be non-polluted. The investigation was highlighted and to assess the suitability of water for drinking. The water samples were collected from three wells. The samples were analyzed for pH, temperature (^{0}C), electrical conductance (EC), total alkalinity (TA), total hardness(TH), calcium(Ca^{++}), magnesium(Mg^+), chloride (Cl^-), sodium (Na^+), potassium (K^+), sulphide (So_4^-) and nitrates (No_3^-)etc. The average value of pH was ranged 6.0 to 7.0, Temperature 15.33 to 16.30, electrical conductivity (EC) 650.00 to 855.32 µmho/cm, total alkalinity (TA) 49.10 to 55.13 mg/L, total hardness (TH) 23.5 to 23.33, calcium(Ca^{++}) 8.2 to 16.5 mg/L, magnesium (Mg^+) 4.99 to 8.16 mg/L, chloride (Cl^-) 106 to 232 mg/L, Sodium (Na^+) 2.9 to 4.63, potassium (K^+) 4.46 to 4.76, sulphide (SO_4^-) 2.43 to 3.00 and nitrates (NO_3^-) 1.55 to 1.66 etc. They were compared with standard value of APHA and WHO and classified according to Durfer and Beker's method. The results show that, water of Deolali Pravara area is within permissible limit according to observations.

Key words : Physicochemical, characteristics, potable water, ground water.

INTRODUCTION

Water is elixir of life and most important natural resources on earth planet. The consumptive water source available from surface water and ground water is about 0.6 %. Ground water is about 20% of the world resource of fresh water and widely used in industry, irrigation and domestic purposes. Fresh water comes from small percentage of rain that falls, infiltrates the ground, traveling downward and fills the available pore spaces within rock, sand, gravel and clay. It forms a large subsurface storage area of water that interacts with various rocks, minerals, microorganism and man made or natural materials that seep from the surface. Most of the peoples are completely depends on ground water for domestic, agricultural and drinking purpose; hence quality of ground water is very important. Generally ground water is polluted by acid rain, use of fertilizers, industrial waste, domestic waste and garbage (Kaushik and Kaushik, 2006). Any substance that comes in contact with the ground water can affect water quality. However, 80% water bodies are polluted.

Ground water accumulates salts during its passages through various litho-units of earth. Therefore, the study of physico-chemical behavior of ground water reflects the water sources, surface, subsurface geology as well as environment. The occurrence of water bodies in ground has been attributed to its hydrochemistry, surface geology, (Stallard and Edmord, 1983) and climatic differences and flow of water direction (Lyons *et al*, 1992). Deoalali Pravara in Ahmednagar district is located in between 19^0 30' N latitude and 74^0 25' E longitude, as the area falls in semi-arid zone. Ground water is highly useful and often abundant resources, however over use or overdraft can cause major problems to the people and to the environment. In present investigation, an attempt has been made to study physico-chemical parameter of ground water and to assess it's potability for drinking in the study area.

MATERIALS AND METHODS

Ground water samples were collected from three localities of Deolali Pravara in Ahmednagar district. The sampling stations were fixed viz., Station I, Station II and Station III respectively and distance was 2 km from each station. Monthly samples were collected for a period of three months during January 2009 to March 2009 from three wells of the study area. Water samples were collected in well-sterilized plastic container which having 2 lit capacity and sample were storage. The container was thoroughly cleaned, washed and raised before every collection and separate container were used and brought to laboratory early in the morning (9.00 am). The samples were analyzed as per the standard methods of APHA (1995); Trivedi and Goel (1986). The parameters such as electrical conductivity (EC), pH, total hardness (TH),

Table 1 : Showing average physico–chemical characters of well water during month of January, February and March, 2009.

Sr.No.	Station	pH	Temp.	EC	TA	TH	Ca	Mg	Cl	Na^+	k^+	SO_4^-	NO_3^-
1.	I	7	16.30	855.32	49.10	23.5	15.1	8.7	106	4.63	4.76	3.00	1.66
2.	II	6	16.33	650.00	54.33	23.33	8.2	4.99	232	2.9	4.63	3.00	1.60
3.	III	7	15.33	788.89	55.13	23.16	16.5	8.16	111.86	3.60	4.46	2.43	1.55

All parameters are expressed in Mg/l except pH and temperature.

total alkalinity (TA), Major cations (Calcium and Magnesium) and anions (Chloride), sodium (Na^+), potassium (K^+) and sulphide (SO_4^-) and nitrates (NO_3^-) etc were analyzed in laboratory. Temperature, electrical conductivity and pH were measured using digital conductometer (Quadra model DCM 85) and pH (PHSENSOR 01) meter respectively at the field level.

RESULTS AND DISCUSSION

It is observed that, the finding of the samples was analyzed and results were reported in table 1. The pH values of samples are minimum was 6.00 recorded all four months and maximum pH value was 7.00 recorded in all stations January, February and March months. Generally, pH value shows slightly acidic to alkaline in nature. The values are within the maximum permissible limit 6.5-8.5 prescribed by WHO and ICMR. The finding of sample, temperature (T^0c) of well water shows minimum 14^0 c the in the month of January and maximum 19^0c in March was recorded this follow the general trend of air, temperature which increases in summer month.

Electrical conductivity (EC) was ranged from 650.00 to 855.32 mhu/cm. station I and III showed maximum value of EC. Some samples from other zones also showed maximum EC. Higher concentration of acid, base and salt in water is responsible for high EC. (Katuria *et al*, 1995). High amount of solids in water samples could be attributed to processes like soaking, liming, debarring, deflating and declaiming (Manivasakam, 1984).

The total alkalinity of water found in between 48 mg/l to 59 mg/l. the values of alkalinity were ranged maximum in sample 'C' while minimum in sample 'A' in the month February and March . The total hardness (TH) of water samples ranged from 16.5 to 50 mg/L. The prescribed value of hardness is 300 mg/L as $CaCO_3$ accordingly by WHO and ICMR. As per Durfer and Baker's classification. Hardness may cause scale deposition and result in excessive soap consumption followed by subsequent scam formation in pipes, sinks and path tubes. During present work calcium was detected in water samples were ranged from 13.7 to 15.8 mg/L. The Indian standard for hardness is 300 mg/L and all the values are in the limits. The range of calcium content varied from 14-17 mg/l. the maximum calcium content was recorded in sample 'C'. Minimum calcium content was recorded in sample in March 2009 Calcium (Ca^+) is responsible for hardness of water (Mishra and Saxena, 1989). Hardness has no known adverse effect on health; however evidence has indicated its role in heart disease (Sastry and Rathee, 1998). Calcium remains present in rocks and leaches from there to water and subsequently followed into water.

Magnesium (Mg^+) are released, when water react with naturally occurring gypsum (Joseph *et al*, 2004). It is responsible for hardness of water. Magnesium (Mg^+) detected in all samples ranged from 4.5 to 9.0 mg/L. It is variable in all zones as compare to standard values of WHO and ICMR. However, high concentrations of Mg^+ have a laxative effect specifically on new users of a supply. It may act like "Milk Magnesia" and water becomes unpalatable before toxic concentrations of Mg are reached. Taking this fact in to consideration limits of Ca and Mg have been fixed at 75 mg/L respectively. The greater hardness of potable water protects consumers' incidence of cardiovascular problems (NRS, 1977).

The chlorides (Cl^-) found in all samples were ranged from 106 to 248 mg/L. that were not above from the permissible limits with respect to ICMR and WHO. Chloride unto 250 mg/L is not harmful. It was also found that chloride ion concentration bear a conjugational relationship with mineral content of respective water samples as chloride contents increases with increasing minerals content. Sodium (Na^+) was present the in the range 2.4 ppm to 6.00 ppm. The Potassium (K^+) content of well water ranges from 6 ppm to 3.6 ppm. The maximum K^+ is 6 ppm recorded in sample 'A' in January 2009 and 3.7ppm is minimum record in sample 'C' in March 2009. The Sulphate (So_4^-) content of well water ranges from 3.1 ppm to 1.8 ppm. High concentration of chlorine in water is often in conjunction with Na^+ concentration. Besides the salty taste of water due to high Cl^- deleterious effects on metallic pipes and structures, as well as agricultural plants are also reported (Dhembare and Pondhe, 2008).

Table 2 : Coefficient of correlation between physico-chemical parameters of well water during month of January, February and March, 2009.

	pH	Temp.	EC	TA	TH	Ca	Mg^+	Cl	Na^+	k^+	SO_4^-	NO_3^-
pH	1	-0.52266	0.948416	-0.39048	-0.62	0.987513	0.990886	-0.99915	0.806087	-0.07675	-0.5	0.052414
Temp		1	-0.22542	-0.58077	0.852540689	-0.65044	-0.40305	0.487092	0.083222	0.890142	0.999652	0.823974
EC			1	-0.6622	0.317029792	0.886628	0.982477	-0.96067	0.952123	0.243301	-0.19965	0.366304
TA				1	-0.920610329	-0.24057	-0.51094	0.428081	-0.85958	-0.88792	-0.60203	-0.93981
TH					1	-0.15754	0.134707	-0.0412	0.591798	0.99705	0.866025	0.998625
Ca						1	0.957291	-0.98018	0.70279	-0.23287	-0.63019	-0.10556
Mg							1	-0.99559	0.878459	0.058256	-0.37878	0.186458
Cl								1	-0.82978	0.035608	0.463894	-0.09351
Na^+									1	0.528182	0.109469	0.633235
k^+										1	0.901847	0.991657
SO_4^-											1	0.838628
NO_3^-												1

All parameters are expressed in mg/l except pH, Temp. and EC (mhos).
Range- 0 to 0.20= low degree positive, 0.21 to 0.60=moderate positive, 0.61 to 0.80= high degree positive, 0.81 to 1= highly positive.
Range- -0.20 to – 0 = low degree negative, -0.60 to – 0.21= moderate negative, - 0.80 to – 0.61= high degree negative, - 1 to – 0.81 = highly negative.

Correlation coefficients

Study existence and the magnitude and the direction of the relation in between two or more variable are called correlation. This correlation helps to determine the degree of relationship between two or more variables (Survey *et al*, 2005; Kalleshappa *et al*, 2008). Determination of dependability of water quality parameters on each other in the samples of ground water collected from Deolali Pravara area and the values are presented in table 2.

In the present investigation on the well water of all physico chemical parameter were fluctuated. For the result of average table graph showing heist and lowest physico chemical parameter like temperature pH, Chloride (Cl^-), Total Alkalinity (TA), Total Hardness (TH), Calcium (Ca^+), Magnesium (Mg^+), Sodium (Na^+), Potassium (K^+), Sulphate (So_4^-) are in mg/l and ppm except temperature and pH. Therefore according to the literature (APHA) (1995) and different investigator like Chaudhary *et al* (2005), Delphin Rose *et al* (2007) and Wagh *et al* (2009) well water have get affected by physico-chemical parameter. But sampling sites water are below permissible limit. Well water can be used for drinking and agricultural purpose. But, there is of needs continuous monitoring for giving proper treatment to well water.

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