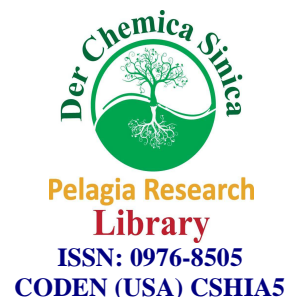




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Studies of physicochemical parameters of underground water samples

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ABSTRACT

Underground water samples were collected from different location in and around Bhusawal, Maharashtra (India). Water is a wander of the nature. “No life without water” is a common saying depending upon the fact that water is the one of the naturally occurring essential need of all human life. Physicochemical parameters of water samples collected from various sites in and around Bhusawal city was carried out in April. All the samples were collected from the different places. People used water for drinking and irrigation purpose these water samples from six different places of Bhusawal, were analyzed for their physicochemical characteristics. Laboratory tests were performed for analysis as physical and chemical parameters of ground water like, Temperature (T), pH, electrical conductivity (EC), total dissolved solids (TDS), turbidity, dissolved oxygen (DO), total alkalinity (TA), total hardness (TH), calcium (Ca^{2+}) magnesium (Mg^{2+}), sodium(Na^{+}), potassium (K^{+}), chloride (Cl^{-}), fluoride (F^{-}), nitrates(NO_3^{-}) sulphate (SO_4^{2-}) and phosphate (PO_4^{3-}) was determined. The analyzed data were compared with standard values recommended by WHO. The usefulness of these parameters in predicting ground water quality characteristics were discussed.

Key words: Physicochemical, Conductivity, Hardness

INTRODUCTION

Underground water samples from six different areas, located in and around Bhusawal city were collected in two liter plastic sampling bottles with necessary precautions. Water is essential natural occurring resources for human life and environment, which we have always thought to be available in abundance and free god gift of nature[1-2].The water for the consumption of human beings comes in different forms and from different sources. There were two main sources of drinking water; one is a surface water resources river, lakes. Under ground water mainly from the seepage of surface water and is held in the subsoil and in previous rock. About 94% of total available water all over world is in the form of ground water. In villages the main source of drinking water is under ground water available from wells, bore wells or hand pumps [3-6].

MATERIALS AND METHODS

All the water samples were collected in the month of April. Samples were collected in plastic sampling bottles with necessary precautions. Sampling bottles were of two liter capacity, the places form Bhusawal, S₁ Sahakarnagar, S₂People bank colony, S₃Mahesh Nagar, S₄Khadaka,S₅Thokenagar, S₆Gopal nagar, samples were collected using the standard method for collection of samples. This water which was being used mainly for the purpose of drinking, cooking and irrigation the villages form Bhusawal taluka, Standard procedure was used for determination of

physicochemical parameters. The chemicals used for analysis and determination of certain parameters they were from S. d. Fine chemicals Ltd., and Loba Chmie Pvt. Ltd., Mumbai. All reagents were of analytical grade and were used as received and preparation of solutions and reagents in double distilled water. The collected samples were analyzed for different physicochemical parameters such as temperature, pH, Electrical conductivity (EC), total dissolved solids (TDS), total hardness (TH), Ca^{2+} , Mg^{2+} , SO_4^{2-} and Chloride, Sulphate, nitrate, COD was determined by standard procedure. Total hardness and calcium were measured by EDTA titration method respectively. Chloride was determined by Volhard's method using ferric alum indicator.

RESULTS AND DISCUSSION

Table 1 shows physicochemical parameters of bore wells underground water samples from six sampling places in and around Bhusawal. The temperature, pH, conductivity and dissolved solids of the water samples were determined by using a thermometer; pH meter, Electrical conductivity was measured using a conductivity meter. The chloride, calcium, magnesium and total hardness were estimated by the standard methods of water. The samples were analyzed using various analytical methods; Total hardness and calcium were measured by EDTA titration method [7-9].

In the present analysis, chloride concentration was found in the range of 196.00 mg/L to 265 mg/L. Chloride was determined by Volhard's method using ferric alum indicator. The data revealed that there were minor variations in the examined samples from different sources with respect to their chemical characteristics. The results indicate that the quality of water considerably varies from location to location as well as depth of samples. [10-13].

Table 1 shows physicochemical parameters of underground water samples from six places of Bhusawal (Jalgaon District)

Sr. No	Parameter	unit	S1	S2	S3	S4	S5	S6
1	Temperature T	$^{\circ}\text{C}$	31 $^{\circ}\text{C}$	30 $^{\circ}\text{C}$	32 $^{\circ}\text{C}$	33 $^{\circ}\text{C}$	31 $^{\circ}\text{C}$	32 $^{\circ}\text{C}$
2	pH		7.3	7.5	7.2	7.5	7.7	8.1
3	TDS	mg/L	470	539	618	569	718	599
4	Ca hardness	mg/L	140	160	145	148	139	158
5	Mg hardness	mg/L	85	110	115	112	114	110
6	Total hardness TH	mg/L	225	270	260	260	283	268
7	Chlorides Cl^{-}	mg/L	205	225	198	196	274	265
8	Sulphates SO_4^{2-}	mg/L	53.6	49.8	57.6	63.7	55.8	62.8
9	Nitrate NO_3^{-}	mg/L	9.5	10.4	12.7	16.2	18.9	17.6
10	Phosphate PO_4	mg/L	0.41	0.39	0.51	0.53	0.87	1.17
11	DO	mg/L	7.7	6.9	5.6	6.9	7.1	7.5
12	COD	mg/L	10.4	11.3	12.5	12.8	13.5	11.7
13	EC	mho/cm	936	1065	1120	1075	1260	1190

In the present study physical properties color and temperature is an important biologically significant factor, which plays an important role in the metabolic activities of the microorganism. The temperature was ranging from 30 $^{\circ}\text{C}$ to 33 $^{\circ}\text{C}$ during the study period. Lowest water temperature was observed in the sites S2 was 30.0 $^{\circ}\text{C}$ and highest temperature 33 $^{\circ}\text{C}$ was observed at S₄. Temperature ranges from 30 $^{\circ}\text{C}$ to 33 $^{\circ}\text{C}$ from color and appearance of water shows it is suitable for drinking purpose, the taste of water samples was as usual, and the pH is a term used universally to express the intensity of the acid or alkaline condition of a solution. Most of the water samples are slightly alkaline due to presence of carbonates and bicarbonates. The pH values of water samples varied in the range 7.2 to 8.1 and were found above the limit prescribed by WHO. The pH has showed significant positive relation with electrical conductivity and alkalinity. The variation of pH values are shown in table. Electrical conductivity (EC) is a measure of water capacity to convey electric current. In the present study the EC values were found higher at S₆ village (1190 mhos/cm) and very low conductivity was found at S₁ village (936 mhos/cm). EC values can be used to estimate the dissolved solids concentration which may affect the taste of water and suitability for various uses. Higher the conductivity values indicate higher the dissolved solids concentration in water. Higher the concentration of base and salts in water, more will be the conductivity. [14-19]. The BOD indicates the consumption of oxygen by the micro-organism in aerobic degradation of the dissolved organic matter in water. The values observed for BOD of all the samples from all the different sources were all within the permissible range (Table 1). Total dissolved solids indicate the salinity behavior of groundwater. Water containing more than 500 mg/L of TDS is not considered desirable for drinking water supplies, but in unavoidable cases 1500 mg/L is also allowed [20]. A TDS value varies from 470 mg/L to 817 mg/L. COD is the measure of oxygen consumed during the oxidation of oxidizable organic

matter present in the water by strong oxidizing agent. The values of COD were comparatively less indicating that the water was not suitable for the growth of micro-organisms. A number of bases like carbonate, phosphate, hydroxide contributes to the alkalinity. It was clear from results basicity of water for all the sources due to contamination of alkaline earth ion. Hardness is the measure of the capacity of water to produce lather with soap or detergent. Hardness is one of the very important properties of ground water from utility point of view for different purposes. Total hardness is varies from 225mg/L to 283mg/L. Calcium and magnesium are directly related to hardness and hence they are discussed in combined. The acceptable limits for calcium and magnesium for domestic use are 75 mg/L and 30 mg/L, respectively in ground water. [21-27].

CONCLUSION

All the physicochemical parameters of underground water samples which were studied have shown positive and negative correlation between each other. However water from Bhusawal is suitable for drinking purpose after proper treatment. The study of various physicochemical parameters such as hydrogen ion concentration (pH), electrical Conductivity, total alkalinity, dissolved Oxygen, chloride, total hardness, magnesium, calcium, total dissolved solid, chemical oxygen demand (hereafter COD), was carried out by using various standard methods reported in the literature. Specific representative six sampling places in and around Bhusawal city was selected. From the study it was clear that the water of all these sources is suitable for drinking purpose after proper treatment,

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