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Physicochemical studies of bore wells underground water samples

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ABSTRACT

Physicochemical analysis of bore wells underground water samples were collected from different places of Bhusawal (India). These six samples of water samples from different places were analyzed for their physicochemical characteristics. Water is an important part of human life, Physicochemical analysis of underground water was carried out during April 2014. 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 Temperature Calcium, Magnesium, hardness, total hardness; pH, Chloride, Alkalinity, TDS, Conductivity, sulphate, phosphate, nitrate & COD were studied. The usefulness of these parameters in predicting ground water quality characteristics were discussed. Thus an attempt has been made to find the quality of ground water in and around Bhusawal suitable for drinking purposes after proper purification.

Key words: Physiochemical parameters, Drinking water, Hardness

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INTRODUCTION

Under ground and surface water are essential natural resources for sustaining life and environment that we have always thought to be available in abundance and free gift of nature. 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 [1-6].Bore wells underground water samples from six different areas located in and around Bhusawal, were collected in brown plastic sampling bottles with necessary precautions. People's lives and live hood depend on water; demand for cleans water increases continuously as the growth in world population. People in many areas of the world lack the fresh, drinkable water essential to their survival if they are proper; more secure water supplies are needed.

MATERIALS AND METHODS

Ground water samples were collected from different villages of Bhusawal (India).All the water samples were collected in the month of April 2014.Samples were collected in brown plastic sampling bottles with necessary precautions. Sampling bottles were of one liter capacity, the places form Bhusawal, S_1 Duskada, S_2 Kathore, S_3 Fakari, S_4 Shakari, S_5 Ompark, S6 Khadaka, 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 irrigationthe villages form Bhusawal, Standard procedure was used for determination of physiochemical parameters. Most of the chemicals were procured from Loba Chime Pvt. Ltd., Mumbai and rests were purchased from S.d. Fine Chemicals

Ltd., All reagents were of analytical grade and were used as received without further purification. Metal ion (1 mg/ml) solutions were prepared by dissolving analytical-grade salts in double-distilled water (DDW) with the addition of hydrochloric acid and further diluted daily prior to use. All solutions were prepared from double distilled water. Standard lab ware and glassware were acid-washed and rinsed with Double distill water. The collected samples were analyzed for different physicochemical parameters such as temperature, pH, Electrical conductivity (EC), total dissolved solids (TDS), total hardness (TH), Ca2+, Mg2+,$SO_4$2-and Chloride, sulphate, nitrate , COD was determined by standard procedure. Total hardness and calcium were measured by EDTA titrimetric 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 of Bhusawal, Jalgaon District. 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].

The EC values were found higher at S_3 Fakari village (1240 µmhos/cm) and very low conductivity was found at S_1 Duskada. (930 µmhos/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. As the concentration of acid, base and salts in water increases there will be increase in the conductivity of water. The variation of pH values are shown in table. TDS is commonly found as carbonates, bicarbonates, chlorides, sulphates and nitrates of calcium, magnesium, mineral containing rocks. The high content of dissolved solids increases the density of water and influences osmo regulation of fresh water organisms.

Table 1 shows physicochemical parameters of bore wells water samples from six places of Bhusawal, Jalgaon District

Sr No	Parameter	unit	WHO	ISI	S1	S2	S3	S4	S5	S6
1	Temperature	^{0}C	-	-	31^{0}c	32^{0}c	32^{0}c	33^{0}c	31^{0}c	32^{0}c
2	pH		7.5-8.5	6.5-8.5	7.5	7.2	7.6	7.7	7.8	8.3
3	TDS	mg/L	1000	500	485	536	615	565	710	590
4	Ca hardness	mg/L	100	75	135	155	145	138	149	168
5	Mg hardness	mg/L	150	300	75	105	110	112	125	95
6	Total hardness	mg/L	500	300	210	260	255	250	274	263
7	Chlorides	mg/L	250	250	200	215	195	185	285	245
8	Sulphates	mg/L	250	200	54.5	48.5	55.8	60.5	53.8	63.8
9	Nitrate	mg/L	5	45	8.5	10.6	11.2	17.2	17.9	18.6
10	Phosphate	mg/L	0.2	0.2	0.32	0.38	0.52	0.59	0.92	1.25
11	DO	mg/L	2- 5	5	7.4	6.8	5.9	6.5	7.3	7.9
12	COD	mg/L	-	9	11.8	11.5	12.8	13.2	12.6	12.3
13	EC	mho/cm	1400	-	930	950	1240	1050	1150	1160

The 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. [10-12].

In the present study physical properties color, temperature ranges from 31^{0}C to 33^{0}C, from color and appearance of water shows it is suitable for drinking purpose, the taste of water samples was as usual, The pH value of water samples varied in a narrow range from7.2 to 8.3which is within the permissible limits in all sources. The pH has showed significant positive relation with electrical conductivity and alkalinity. The variation of pH values are shown in table. In the present study the EC values were found higher atS_5 village (1250 µmhos/cm) and very low conductivity was found at S_2 village.(930µmhos/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. [13-17]. The 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. 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. [18-23].

CONCLUSION

All the physicochemical parameters of samples which were studied have shown positive and negative correlation between each other. However water from Bhusawal is suitable for drinking purpose after some purification. The study of various physico-chemical parameters such as color, taste, odor, 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 of Bhusawal, Taluka selected. From the study it was clear that the water of all these sources is suitable for drinking purpose after little treatment with respect to the studied,

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