Analysis of Physico-Chemical Parameters and Ground Water Quality of Some Villages in Lonar Taluka of Buldana District, Maharashtra, India

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ABSTRACT

The ground water quality and some of its physico-chemical parameters were analyzed of different localities in some Village of Lonar Taluka, district Buldana, Maharashtra. The water samples analysis involved pH, TDS, temperature, Alkalinity, nitrate, total hardness. The water samples were collected from different localities of the village and analyzed for the suitability of drinking purposes. It was found that the water samples were found not suitable for drinking and domestic purposes directly without prior treatment.

Keywords: Ground water quality, physico-chemical parameters, etc.

I. INTRODUCTION

Healthy environment is fundamental right of every human being. But recently, it is observed that human activities affect the environment, due to which it is mostly affected. It may due to some deforestation for civilization or by means of water pollution [1]. In contrary, different parts of the country are experiencing severe conditions of drought and decrease in water level due to drastic climatic changes. Ground water plays a pivotal role in everyday life of the living beings, and it forms a major source of drinking water. Water is also called as 'Universal solvent' [2], it contains many chemicals like nitrates, sulphates, fluorides in dissolved state. Some, harmful chemicals like Arsenic, ammonia and calcium and magnesium salts if present above the permissible limits makes the water bodies toxic in nature [3-5].

Therefore, it is of great importance to study the ground water quality, especially in those regions, where water level is less due to low rainfall. The present paper describes the analysis of some physico-chemical parameters and ground water quality of some villages of Lonar, Taluka Sindkhed Raja, district Buldana, Maharashtra, India. The water sample analysis involved pH, temperature, Alkalinity, sulphate, nitrate, total hardness. The water samples were collected from five different localities of the village and analyzed for the suitability of drinking purposes during the period of 13th March to 17th May 2018. The Five villages chosen for water analysis were Sultanpur, Palaskhed, Gaikhed, Hirdav and Ardav. According to Census 2011 information, the Geographical details of villages are as follows:

Table No. 1:   Geographical locations and Population of selected villages of Lonar Taluka.

Name of the Village	Geographical Location		Total Population
	Latitude	Longitude	
Sultanpur	76.5184	20.0875	8688
Palaskhed	76.5806	20.0033	1478
Gaikhed	76.5632	20.0078	1422
Hirdav	**76.6008**	**20.0136**	**2795**
Ardav	76.6123	19.9911	1065

II. MATERIALS AND METHODS

Sampling : The water samples of the Five selected villages were collected from the Hand Pumps/ bores/ wells (from 13th March to 17th May, 2018) when the shortage of direct rainwater normally raises pressure on the water resources. All samples were collected on same day and kept in Plastic bottles, which have been previously washed with distilled water and 10% HNO3 and 1:1 HCl for 48 hr. The Plastic bottles were labeled and immediately few drops of HNO3 were added in order to prevent loss of metals and the growth of any micro-organisms. Temperature and pH of water samples were measured at the time of collection.

Chemical Analysis: The collected samples were estimated for Alkalinity, sulphate, nitrate, total hardness and pH. The method used for the determination of these physico-chemical parameters was described by A.O.A.C. International [6] and using standard procedures by APHA[7] and EPA[8].The chemicals and reagent used for analysis were of analytical grade.

Statistical Analysis: All generated data was analyzed statistically by calculating the mean and compared the mean value with the acceptable standards. pH meter Equiptronics model was used to determine the pH of the samples; titrimetric procedures were followed for the analysis of total hardness, alkalinity, nitrate. Borosilicate Glassware was used for all the estimations.

III. RESULT AND DISCUSSIONS

The results of the physico-chemical parameters obtained from analysis of water samples from the hand pumps/bores/ wells are presented in the Table No. 2. The various physico-chemical characteristics were analyzed for ground water from five different sampling locations. The details of the average results were summarized in table 2.

pH: The pH[9] value of water source is a measure of the hydrogen ion concentration in water and indicates whether the water is acidic or alkalinity. Most of the biological and chemical reactions are influenced by the pH of water system. If pH is beyond the permissible limit, it damages the mucous membrane of cells. In the present study all the ground water samples have pH values between 6.5 -7.4. Which is within the permissible limit laid down by WHO (7.0 - 8.5).

Total dissolved solids (TDS): The total dissolved solids in water are due to presence of all inorganic and organic substances. The solids can be iron, manganese, magnesium, potassium, sodium, calcium, carbonates, bicarbonates, chlorides, phosphates and other minerals. The high values of TDS causes gastrointestinal irritation to the human beings but long time use of water with high TDS can cause kidney stones and heart diseases[10]. In the present analysis, the TDS values were observed from 390 to 510 mg/l. The most desirable

limit of TDS is 500 mg/l and maximum allowable limit is 1500 mg/l. The TDS value for all the ground water samples are well within the permissible limit of 500-1500 mg/l.

Total alkalinity (TA): Alkalinity [11] of water is the measure of the ability to neutralize a strong acid. The bases like Carbonates, bicarbonates, hydroxides, phosphates, nitrates, silicates, borates etc are responsible for alkalinity of water. Alkalinity provides an idea of natural salts present in water. Alkalinity is a parameter, which is not harmful to human beings. The alkalinity values were recorded below the desirable limit. So, all samples are within the desirable limit for drinking water 100 mg/l (WHO).

Total hardness (TH): Hardness[12] of water is an important quality of water and is caused by dissolved carbonates, bicarbonates, sulphates and chlorides of calcium and magnesium. It prevents the lather formation with soap and increases the boiling point of water. The maximum permissible limit of total hardness for drinking purpose is 300 mg/l (BIS). The water having hardness up to 75 mg/l is classified as soft, 76 - 150 mg/l is moderately soft, 151-300 mg/l as hard and more than 300 mg/l as very hard. Hardness more than 300 mg/l may cause heart and kidney problems. The total hardness in ground water samples listed in the present article is beyond the desirable limit. All the ground water samples are very hard and hence require suitable treatments before use.

Nitrate (NO3-):

Nitrate is an inorganic chemical that is highly soluble in water. Major sources of nitrate in drinking water include fertilizers, sewage and animal manure. Most nitrogen containing materials in natural waters tend to be converted to nitrate. Nitrates also occur naturally in the environment, in mineral deposits, soil, seawater, freshwater systems, and the atmosphere. High nitrate content may lead into Irritability, lack of energy, headache, dizziness, vomiting, diarrhea, labored breathing, and a blue-gray or pale purple coloration to areas around the eyes, mouth, lips, hands and feet. The Nitrate levels in the findings as mentioned in Table No. 2 are quite higher than the permissible limit.

Table No. 2: Average results obtained for the different parameters and comparison with WHO (2004) Standards

Sr. No	Spots	pH (1)	Temperature (oC) (2)	Total Alkalinity (3)	Nitrates (4)	Total Hardness (5)	Total Dissolved Solids (6)
1	Sultanpur	7.1	32.1	69.4	55.4	534.35	440
2	Palaskhed	6.3	31.5	74.6	51.5	576.32	392
3	Gaikhed	6.8	31.4	76.5	56.4	542.22	421
4	Hirdav	6.5	30.4	68.9	48.1	534.26	465
5	Ardav	6.9	31.3	75.3	58.2	531.23	510
6	WHO standard	6.5 - 8.5	30-34	100	20-45	100-500	500-1500

*All the results in the entries from (3) to (6) are in mg/l

It is observed that from the above data, ground water quality of the village is not so good and not suitable for domestic purposes without prior treatment as it contains more nitrates and total hardness beyond the permissible limits as recommended by WHO[13-14] and Indian standards.

IV. CONCLUSION

From these results analysed from the testing of the water samples examined were consistent with World Health Organization standard for drinking water (WHO). And for such parameters that had mean values above the recommended WHO standard, water treatment plant should be built for these people to correct these anomalies. In addition, bacteriological determination of water from these different hand pumps/ bores/ wells be carried out to be sure if the water was safe for drinking and other domestic application.

V. REFERENCES

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