

## **Analysis of Physico-Chemical Parameters and Ground Water Quality of Sakharkherda Village 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 Sakharkherda Village of Sindkhed Raja Taluka, district Buldana, Maharashtra. The water samples analysis involved pH, TDS, temperature, Alkalinity, Chloride, nitrate, total hardness and fluoride. The water samples were collected from different localities of the village and analyzed for the suitability of drinking purposes. It was found that some of the water samples were found not suitable for drinking and domestic purposes directly without prior treatment.

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

### **Introduction:**

Healthful environment is fundamental right of every person. Health conscious people are always interested in the impact of environment on them. But recently, it is observed that human action affect the natural environment. Due to human action, environment is mostly affected by means of water pollution. In contrary, different parts of the country, are experiencing drought and water scarcity due to drastic climatic changes. Ground water plays a vital role in human life, and it forms a major source of drinking water in urban as well as in rural areas. As water is called as 'Universal solvent', it contains many chemicals like nitrates, sulphates, fluorides in dissolved state. Some, harmful chemicals like Arsenic, ammonia and calcium and magnesium salts above permissible limits makes the water bodies toxic in nature<sup>1-3</sup>.

Therefore, in view of the above, it is of great importance to study the quality of water, especially in those regions, where, water level is decreasing due to less rainfall. The present article is focused on the analysis of some physico-chemical parameters and ground water quality of the village Sakharkherda, Taluka Sindkhed Raja, district Buldana, Maharashtra, India. The water sample analysis involved pH, temperature, Alkalinity, Chloride, sulphate, nitrate, total hardness and fluoride. The water samples were collected from seven different localities of the village and analyzed for the suitability of drinking purposes during the period of 15<sup>th</sup> March to 15<sup>th</sup> June 2013. The seven spots of the village chosen for water analysis were Old Teachers colony/Dwarika Nagri (DN), Malipura (MP), Jafrabad Mohalla (JM), Bhim Nagar (BN), Bus Stand (BS), Gujri Chowk (GC), Mehkar Phata (MPH)

### **Materials and Methods:**

- **Sampling:** The water samples of the seven selected spots were collected for three months from the bores/ wells (from 15<sup>th</sup> March to 15<sup>th</sup> June 2013) when the shortage of direct rainwater normally put pressure on the water resources in question. All samples were collected same day and kept in Plastic bottles, which have been previously washed with 10% HNO<sub>3</sub> and 1: 1 HCl for 48 hr. The Plastic bottles were labeled and immediately few drops of HNO<sub>3</sub> 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, Chloride, sulphate, nitrate, total hardness and fluoride. The method used for the determination of these physico-chemical parameters was described by A.O.A.C. International<sup>4</sup> and using standard procedures by APHA<sup>5</sup> and EPA<sup>6</sup>. The chemicals and reagent used for analysis were of analytical grade.
- **Statistical Analysis:** All data generated were analyzed statistically by calculating the mean and compare 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, Chloride, Sulphate, nitrate and Fluoride. Borosilicate Glassware was used for all the estimations.

### **Result and Discussions:**

The physico-chemical parameters obtained from analysis of water samples from the bores/ wells are presented in the Table No. 1. The various physico-chemical characteristics were analyzed for ground water from ten different sampling locations. The details of the average results were summarized in table 1.

- **pH:** The pH 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<sup>7</sup> (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<sup>8</sup>. In the present analysis, the TDS values were observed from 390 to 745 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 1500 mg/l.
- Total alkalinity (TA): Alkalinity<sup>9</sup> 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<sup>10</sup> of water is an aesthetic quality of water and is caused by 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.
- Chloride (Cl): Chloride in ground water can be caused by industrial or domestic waste<sup>11</sup>. The chloride concentration serves as an indicator of pollution by sewage. Soil porosity and permeability also has a key role in building up the chloride concentration. High chloride content in water bodies, harms agricultural crops, metallic pipes and injurious to people suffering due to heart and kidney diseases. Most of the ground water samples show chloride concentration within the permissible limit (250 mg/l) of WHO, which indicates less contamination of chloride.
- Fluoride (F): Fluorine exists combining with other substances as fluoride. The main source of fluoride in ground water is fluoride bearing rock such as fluorspar, fluorite, cryolite, and fluorapatite. High fluoride content in ground water causes serious damage to the teeth and bones of human body, diseases caused called dental fluorosis and skeletal fluorosis. Hence excess fluoride should be removed from water and this process is called defluoridation. The value of fluoride concentration in ground water samples lie between 0.6-1.0

mg/l. All the ground water samples have fluoride concentration within permissible limit (1.0 mg/l) of WHO and are safe for drinking purpose.

- Nitrate ( $\text{NO}_3^-$ ): 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 are found to be higher in the findings as mentioned in Table No. 1. Which are quite higher than the permissible limit

**Table No. 1: Average results obtained for the different parameters and comparison with WHO (2004) Standards**

Sr. No	Spots	pH (1)	Temp. ( $^{\circ}\text{C}$ ) (2)	TA (3)	$\text{Cl}^-$ (4)	$\text{NO}_3^-$ (5)	TH (6)	$\text{F}^-$ (7)	TDS (8)
1	DN	6.9	34.1	76.5	198	45.4	524.35	0.7	390
2	MP	6.5	33.5	54.5	74.5	61.5	545.12	0.65	410
3	JM	7.1	31.3	66.5	103.5	66.4	522.12	0.78	440
4	BN	6.9	32.4	88.9	78.6	38.1	434.11	0.8	395
5	BS	7.4	33.3	65.3	100.5	48.2	511.12	0.65	650
6	GC	6.7	32.8	77.2	112.5	54.1	472.42	1.0	745
7	MPH	7.4	35.4	89.2	178.4	51.3	478.32	0.64	540
8	WHO standard	6.5-8.5	30-34	100	200-600	20-45	100-500	1.2-1.5	500-1500

\*All the results in the entries from (3) to (8) 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 and Indian standards.

### CONCLUSION:

The conclusion derived from these results is that some physico-chemical parameters examined were consistent with World Health Organization standard for drinking water (WHO). And for such parameters that had mean values below 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 wells be carried out to be sure if the water was safe for drinking and other domestic application.

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