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Water quality of some drinking waters in Parbhani City: A case study

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ABSTRACT

This study consisted of the determination of the physico-chemical properties of different types of drinking water of Parbhani city. The aim was to ascertain the quality of drinking water. On an average, the water in this area was suitable for drinking purpose. All the being rapid, economical and quantitative can be incorporate in existing water testing field kits. A very simple pre-treatment is enough to make the water potable.

Keywords: Physico-chemical parameters, drinking water, Parbhani city

INTRODUCTION

Parbhani city is considered to be oldest and religious town in Marathawada region. A famous for “Marathawada Krishi Vidyapeeth” is situated in Parbhani city. Population growth, rapid industrial and technological development, due regard to sustainable development have induced numerous changes in the environment [1-6]. Water is a main concern as over one billion people worldwide has no access to safe drinking water. Water is basic to life and health of all living beings. Adequate drinking water quality is essential for the well being of all humans who are depended on only water for drinking and domestic needs also in industry, agriculture etc [7-12]. Drinking water is supplied via surface, stored in the form of ground water sources [13-15].

The parameters pH, Conductivity, Atmospheric temperature, Hardness, Calcium, Magnesium, Chloride, Dissolved oxygen, Total dissolved solids (TDS), Total alkalinity, Turbidity of ten drinking water (Bore wells) samples from Parbhani city were measured to compare them with WHO standards in order to estimate whether the waters are suitable for any human uses and to give the control measures.

EXPERIMENTAL SECTION

Sample collection: Ten water samples from bore wells were collected for analysis. Each sample station is 5-10km away. Samples were collected in prewashed (with detergent, dilute nitric acid and double distilled water respectively) high density polyethylene one liter bottles. pH, Temperature of the samples were measured while collecting the water samples. The selected areas for bore wells drinking water sample

1. Boralkar Nagar, Jintur Road (S₁).
2. Trimurti Nagar, Jintur Road (S₂).
3. Municipal colony, Subhash Road (S₃).
4. Darga, Jam Road (S₄).
5. Shivaji Nagar, Basmat Road (S₅).
6. Shivram Nagar, Basmat Road (S₆).
7. Agriculture University, Basmat Road (S₇).
8. Pratap Nagar, Nankheda Road (S₈).
9. Shantiniketan colony, Gangakhed Road (S₉).
10. Railway Station (S₁₀).

For bore well water sampling, the water samples obtained directly from the water pump after allowing it to run for at least five minutes and each plastic can and its cap were rinsed three times. Samples were kept at 28 to 32°C at the time of filling. Suspended matter, sediment were removed at the time of sampling by 13/30 filtration before acidification. Samples were preserved according to USEPA (1983).

Methodology

A.R. grade reagents were used for preparation of all solutions. Measurement of pH by digital pH meter (HANNA INSTRUMENT), Electrical conductance by using ELICO digital conductivity meter, total dissolved solids by evaporation method at 105°C to 110°C, total hardness, Calcium, Magnesium and Chloride by complex metric method, dissolved oxygen by Winkler's (Iodometric) method and turbidity by turbid meter (ELICO) were carried out as in standard methods as prescribed by APHA, (1995).

RESULTS AND DISCUSSION

pH acts as index to determine the extent of pollution and dependent upon the pH of water system. In the present study pH ranged from 7.31 to 8.02 which lie in the range prescribed by WHO [16]. Electrical conductivity value in present study ranges from 156 to 208µm/cm all were found to be well above the permissible limit and are quite fit for drinking.

Drinking water quality is affected by the presence of different soluble salts. A total dissolved solid (TDS) is an important parameter in drinking water quality standards. It develops a particular taste to the water and at higher concentration reduces its portability; plants are also severely affected by higher values of TDS in irrigation of water. TDS value of present study area ranges 100 to 1200mg/lit. The high TDS level (1200mg/lit) will result in the excessive scaling in water distribution system [17].

Total alkalinity (TA) were found to be in the ranges 20 to 130mg/lit. All samples are below the permissible limit prescribed by ICMR [18]. The high alkalinity of ground water due to the presence of bicarbonates, [19] carbonates and some salts [20-21].

Water hardness is traditional measure of the capacity of water to reacts with soap, then water causes some problems in digestive system moreover, the possibility of forming calcium oxalate crystals in urinary track has been found. The hardness value of ground water in the present study area ranges from 62 to 176mg/lit. In the present work calcium varies from 61 to 131mg/lit. High content of calcium may due to soil deposition of limestone, gypsum [22].

Magnesium is an essential mineral for the living body. In the present work magnesium varies from 3.8 to 64.3mg/lit. The high concentration of magnesium present in the water sample S₄. High concentration of magnesium causes nausea, muscular weakness and paralysis in human body when it reaches up to the level of about 400mg/lit [23].

Dissolved Oxygen is the fundamental fuel of life in water. Dissolved Oxygen in water is of great importance to all aquatic organisms and is considered to be the factor that reflects the biological activity taking place in a water body and determine biological changes which are brought about by the aerobic organisms. Dissolved Oxygen is one of the most important parameters in water quality assessment and reflects the physical and biological processes prevailing in the waters lacking oxygen have an insipid taste [22]. In the present study dissolved oxygen ranges from 7.5 to 8.6mg/lit. Chloride occur naturally in all types of waters, its concentration remains quite low and generally less than that of sulphates and bicarbonates. Estimation of chlorides was done using silver nitrate method. In the present study chloride ranges from 86.6 to 374mg/lit. It was found highest in S₆ sample station and lowest in S₄ station. If the chloride content is more than 250mg/lit it is treated as salt water. Mainly high chloride content was recorded during summer season by other workers [24]. Temperature plays an important role to the speeding up of the chemical reactions in water, reduces the solubility of gases and amplifies the tastes and odors. In the present study atmospheric temperature ranges from 32°C to 35.5°C at sample stations.

Table. 1 Water Quality Data of the Physico-Chemical Parameters of the Study Area

| Sr. No. | Physico-Chemical Parameters | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | IS - 1991 | |
|---------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------|---------------|
| | | | | | | | | | | | | Desirable Limit | Maximum Limit |
| 1 | pH | 7.7 | 7.6 | 7.6 | 7.7 | 7.6 | 7.6 | 8.0 | 7.5 | 7.5 | 7.3 | 6.52 | 8.53 |
| 2 | EC (µm hos/cm) | 188 | 208 | 202 | 166 | 196 | 202 | 188 | 156 | 192 | 182 | 100 | 300 |
| 3 | TDS (mg/lit) | 500 | 800 | 500 | 100 | 600 | 900 | 200 | 500 | 1000 | 1200 | 500 | 2000 |
| 4 | DO (mg/lit) | 8.6 | 7.9 | 8.0 | 7.5 | 7.8 | 8.2 | 8.6 | 8.2 | 7.8 | 8.1 | 7.0 | 20.0 |
| 5 | TA (mg/lit) | 120 | 70 | 40 | 100 | NIL | 30 | NIL | 20 | 20 | 130 | 200 | 600 |
| 6 | TH (mg/lit) | 94 | 104 | 84 | 62 | 112 | 128 | 118 | 172 | 86 | 176 | 300 | 600 |
| 7 | CAL (mg/lit) | 66.5 | 60.9 | 80.9 | 130.6 | 70.5 | 84.9 | 96.1 | 75.3 | 57.7 | 89.7 | 75 | 200 |
| 8 | MAG (mg/lit) | 17.5 | 11.6 | 28.7 | 64.3 | 15.5 | 20.4 | 29.7 | 3.8 | 14.1 | 11.6 | 30.0 | 150 |
| 9 | TUR (NTU) | 1.2 | 1.0 | 1.8 | 1.4 | 2.1 | 1.2 | 1.1 | 2.2 | 1.4 | 1.9 | 10.0 | 25 |
| 10 | CHLO (mg/lit) | 142.8 | 149.1 | 164.7 | 86.6 | 310.9 | 374.8 | 133.4 | 193.1 | 291.1 | 355.8 | 250.0 | 1000 |
| 11 | ATM. TEMP (°C) | 32.6° | 33.2° | 33.4° | 34.0° | 32.0° | 32.5° | 35.6° | 32.0° | 33.0° | 33.0° | - | - |

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