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***Short Communication***

# Physico-Chemical Determination of Pollution in Groundwater Sources in Sangamner Tahsil, 422605, Dist. Ahmednagar, MS, India

**Kiran T. Bharati*, Dipeeka K. Deshmukh, Dinkar T. Bharati and Keshav K. Deshmukh**
Sangamner Nagarpalika Arts, D. J. Malpani Commerce & B.N. Sarda Science College, Sangamner 422605, Dist. Ahmednagar, MS, India

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## Abstract

*This study deals with assessment of physico-chemical characteristic of groundwater around Sangamner tahsil of Ahmednagar district in Maharashtra. The study has been carried out to examine its suitability for drinking, irrigation and industrial purpose. Rapid industrialization and advance techniques of agriculture caused groundwater pollution has affected the quality of groundwater due to its overuse and improper waste disposal. Groundwater pollution caused by human being activities like more use of fertilizers, pesticides used in agricultural field, release of industrial waste water, percolation of surface water etc. In the present study, attempts has been made to investigate some physico-chemical parameters of 17 groundwater samples collected from two sources like as Bore well and Dug well of some villages in Sangamner tahsil of Ahmednagar district in Maharashtra. The parameters such as pH, electrical conductance, total hardness, total dissolved solid, turbidiance, calcium hardness, calcium, magnesium, sodium, potassium, chloride, iron, total alkalinity, carbonate, bicarbonate, sulphate and fluoride. The results indicate that all the groundwater parameter was found very high.*

**Keywords:** Physico-chemical, total dissolved solids, turbidiance, sulphate and fluoride.

## Introduction

Water is the most precious gift of nature to mankind and the terrestrial ecosystem, without water there would be no life on earth[1]. Water mainly classify as surface water and groundwater. Groundwater represents an important source of safe drinking water as compared to surface water, because surface water does not possess certain properties[2-4]. The safe water is essential for living and groundwater is one of the sources for human consumption, still groundwater is not absolutely free from pollutants. In India, more than 80% of the rural population depends on groundwater[5], therefore increased in human population has increased the demand for water to the extent that it has more pressure on water resources. Water is the universal solvent, because of its great dissolving powers, the quality of groundwater is directly related to the human health. Once the groundwater is contaminated, its quality cannot be restored by stopping the pollutants from the source[1].

The most common and widespread health risk associated with drinking water is microbial contamination which has the potential to cause large outbreaks of waterborne diseases like dysentery, cholera, typhoid, skin infections etc[6]. The chemical contaminations do not cause immediate acute health problems unless they are present in massive quantities through some accident and use of chemical fertilizers and pesticides in crop near the drinking water sources[7]. It therefore becomes essential to regularly control the quality of groundwater and to device ways and means to protect it.

Assessment of water quality is important for knowing the suitability of water for various purposes. Presently the groundwater quality of Sangamner tahsil of Ahmednagar district in Maharashtra, India has been assessed by analyzing the various physico-chemical parameters. The parameters that were analyzed including pH, electrical conductance, total hardness, total dissolved solid, turbidiance, calcium hardness, calcium, magnesium, sodium, potassium, chloride, iron, total alkalinity, carbonate, bicarbonate, sulphate and fluoride.

## Material and Methods

**Study area:** Sangamner is a tahsil of Ahmednagar district in Maharashtra state, India. It has a geographical area of 1705 $km^2$ and is located in the northwest direction of the Ahmednagar district. Sangamner tahsil is located in between longitude $74^0$ 0' 28" E to $74^0$ 29' 17" E and latitude $19^0$ 12' 52" N to $19^0$ 45'58" N. The average annual rainfall is about 560 mm.

**Sampling:** The sampling locations consist of rural as well as urban areas. 17 groundwater samples were collected from dug well and bore well of study area. The samples were collected in polythene containers of 1 liters capacity for physico-chemical analyses. The samples were collected and analyzed as per the standard procedure[8].

**Analysis:** The groundwater quality was assessed by the analysis of indicator parameters as per the Standard Methods for the Examination of Water and Wastewater[9]. The fluoride

concentration in the groundwater samples was determined by the "SPANDS" method. The SPANDS colorimetric method is based on the reaction between fluoride and zirconium dye-lake and formation of colorless complex between anion and the dye takes place. As the amount of fluoride increases, the color produced becomes progressively lighter.

Fluoride standard from 0 to 1.40 mg $F^-$/L were prepared and diluted to 50 ml with double distilled water. SPANDS and zirconil acid regent, each 5.00 ml mixed with each standard and spectrophotometer was set to zero Absorbance with the reference solution. Absorbance was measured spectrophotometrically at 570 nm employing Chemito UV2100 spectrophotometer.

## Results and Discussion

The results obtained for various physico-chemical parameters of 17 groundwater samples of Sangamner tahsil are indicated in table- 1.

Most of the water samples are slightly alkaline due to presence of carbonates and bicarbonates. All the sampling points showed pH value between the 6.99-8.59. These values are within the limits prescribed by WHO. Hardness of water depends upon the amount of calcium and magnesium salts. Hardness value is the studied area is between 144-1425 mg/L. Eight samples showed higher hardness values than the prescribed limit by WHO. It is considered to be an induction of the total dissolved salt content. Conductivity value in the studied area varied between 794.54-5650 mmhos/cm. Total Dissolved Solids, is an important parameter in drinking water quality standard. It develops particular taste to the water and at higher concentration, reduces its potability. Water with more than 500 mg/L usually has a disagreeably strong taste. In the present study, TDS in the studied area varied between the 518-2694 mg/L. All sampling sites showed the higher TDS concentration than the prescribed by WHO. Turbidity values in the studied area between 0.1-11 NTU. One sampling site showed the higher turbidity concentration than the prescribed by WHO.

The summation of calcium hardness and magnesium hardness is regarded as the total hardness of water. In the present investigation, it has been observed that calcium concentration is in between 95-804 mg/L. Calcium value in the studied area varied between 38-321.6 mg/L. Eleven sampling sites showed higher calcium values than the prescribed limit by WHO. If calcium is present beyond the maximum limit, it causes the incrustation of pipes and deterioration of clothes. Too high magnesium (400 mg/L and above) causes the nausea, muscular weakness and paralysis in human body[10]. Magnesium value in the studied area varied between the 2-196 mg/L. Eight sampling sites showed higher magnesium value within the prescribed limit by WHO. Sodium values in the studied area are between 53-750 mg/L. The higher concentration of sodium can be related to cardiovascular diseases and in woman toxemia associated with pregnancy. All sampling sites showed higher sodium concentration than the prescribed by WHO and Potassium values 0.0-20 mg/L. The potassium concentrations are relatively lower than those of sodium. The iron values in the studied area varied between 0.0-0.6 mg/L. If the value of iron is higher, it prevents the self purification of water and thereby produces adverse effect for aquatic lives.

**Table-1**

| S. No. | pH | EC | TDS | Turb. | HAR Total | HAR Ca | Ca | Mg | Na | K | Fe | Total Alk. | $HCO_3$ | Cl | $SO_4^{2-}$ | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S1 | 7.7 | 932 | 596 | 0.1 | 296 | 152 | 61 | 35 | 76 | 5.0 | 0.02 | 279 | 340 | 82 | 45 | 0.87 |
| S2 | 7.5 | 4210 | 2694 | 0.1 | 1172 | 420 | 168 | 183 | 462 | 4.0 | 0.01 | 292 | 356 | 910 | 440 | 0.73 |
| S3 | 7.5 | 4120 | 2637 | 0.2 | 1168 | 508 | 203 | 160 | 452 | 4.0 | 0.01 | 267 | 326 | 940 | 404 | 0.73 |
| S4 | 7.75 | 3300 | 2145 | 0.4 | 1040 | 804 | 321.6 | 57 | 500 | 4.7 | 0.1 | 355 | 433 | 960 | 290 | 0.6 |
| S5 | 8.19 | 1211 | 787 | 0.5 | 284 | 136 | 54.4 | 36 | 86.4 | 8.2 | 0.09 | 131 | 160 | 160 | 100 | 0.1 |
| S6 | 8.04 | 1733 | 1126 | 0.1 | 512 | 232 | 92.8 | 68 | 183 | 1.0 | 0.06 | 180 | 220 | 352 | 112 | 0.4 |
| S7 | 8.59 | 1710 | 1112 | 2.2 | 680 | 348 | 139.2 | 81 | 142 | 3.8 | 0.1 | 315 | 375 | 220 | 286 | 0.9 |
| S8 | 7.7 | 3700 | 2368 | 0.1 | 1160 | 508 | 203 | 158 | 356 | 1.0 | 0.56 | 226 | 276 | 920 | 306 | 0.77 |
| S9 | 7.7 | 1028 | 658 | 0.2 | 240 | 164 | 66 | 18 | 68 | 1.0 | 0.02 | 236 | 288 | 70 | 61 | 0.95 |
| S10 | 7.23 | 1030 | 660 | 0.4 | 144 | 136 | 54.4 | 2 | 139 | 0.4 | 0.02 | 98 | 120 | 185 | 60.7 | 00 |
| S11 | 8.1 | 5650 | 3616 | 1.0 | 1425 | 620 | 248 | 196 | 750 | 20 | 0.14 | 420 | 512 | 1420 | 549 | 0.9 |
| S12 | 7.0 | 1410 | 930 | 1.5 | 300 | 248 | 99.2 | 13 | 146 | 0.5 | 0.03 | 187 | 228 | 250 | 40.7 | 00 |
| S13 | 6.99 | 1770 | 1155 | 11.0 | 400 | 310 | 124 | 22 | 110 | 0.8 | 0.03 | 210 | 256 | 205 | 79.1 | 00 |
| S14 | 7.43 | 794.54 | 518 | 3.0 | 228 | 128 | 51.2 | 24 | 53 | 0.4 | 0.03 | 145 | 177 | 90.6 | 54 | 00 |
| S15 | 7.22 | 1332 | 869 | 1.0 | 344 | 276 | 110.4 | 17 | 67.9 | 1.0 | 0.06 | 197 | 240 | 130 | 73 | 00 |
| S16 | 7.9 | 1682 | 1076 | 0.5 | 600 | 170 | 68 | 104 | 208 | 2.0 | 0.22 | 395 | 482 | 398 | 52 | 00 |
| S17 | 8.2 | 1077 | 689 | 1.7 | 280 | 95 | 38 | 45 | 119 | 2.0 | 0.11 | 140 | 171 | 224 | 49 | 0.5 |

*All the values are in mg/L, except pH, Turb and EC. Units of EC are mmhos/cm and units of turb; is NTU

Alkalinity is due to the presence of bicarbonate, carbonate and hydroxide compounds of calcium, sodium and potassium. Alkalinity itself is not harmful to human beings[11]. Alkalinity value in the studied area varied between 98-420 mg/L. Nine sampling sites showed higher alkalinity value and rest are within the prescribed limit by WHO. Chloride values in the studied area are between 70-1420 mg/L. Eleven sampling sites showed higher chloride concentration than the prescribed by WHO. Sulphate in the studied area varied between the 40.7-549 mg/L. Six sampling sites showed the higher sulphate concentration than prescribed by WHO. Fluoride in the studied area varied between the 0.1-0.95 mg/L. These values within the limit prescribed by WHO. The fluoride content in the groundwater is a function of many factors such as availability and solubility of fluoride minerals, velocity of flowing water, temperature, pH and concentration of calcium and bicarbonate ions in water, etc[12].

## Conclusion

The present study clearly reveals that all the water sources chosen for study are not suitably for the utilization of drinking purposes. From the present study, it is observed that these drinking water sources are poorly managed and show sign of groundwater pollution. According to WHO, nearly 80% of all the diseases in human beings are caused by water[13]. After purification treatment only this water can be used for drinking. Drinking water pollution in the studied area should be controlled by the proper environment management plan to maintain proper health conditions of people.

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