

Water quality analysis through the determination of physico-chemical parameters of different water samples, at Hingna, Nagpur Maharashtra

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ABSTRACT

The present study was carried out to determine the physico-chemical properties of water samples from different region of vidarbha of Nagpur district, Hingna Taluka. The analysis was done for the parameters like Turbidity, pH, Total Dissolved Solids, Electrical Conductivity, Total Hardness, Total Alkalinity, Chloride, Calcium and Magnesium. The results indicated that physico-chemical parameters of the water were within the permissible limits and can be used for domestic, irrigation. Water is one of the most important of all natural resources known on earth. The safety of drinking water is important for the health. The safety of drinking water is affected by various contaminants which included chemical and microbiological. Such contaminants cause serious health problems. Due to these contaminants quality of the Drinking Water becomes poor. Sometimes such poor quality water causes many diseases in the humans so that quality of the water must be tested for both the chemical as well as for the microbial contaminants. During the study it was found that maximum number of physical and chemical parameter were within the desirable limit, as suggested by WHO (1971) and BIS (1991). The objective of the present research is to provide information on the physicochemical characteristics & detailed ecological studies of well water and Bore water in order to discuss it's suitability for human consumption. Physicochemical aspects of the water have been investigated to assess the quality of water.

Keywords: Well water and Bore water, Nagpur (Hingna), Physico-chemical parameters and Investigation, Comparative studies.

INTRODUCTION

Water is the most essential and prime necessity of life. It is an essential requirement for the life supporting activities. Physico-Chemical Analysis The collected samples were analyzed for major physical and chemical water quality parameter like pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Total Alkalinity (TA), Total Hardness (TH), Chloride (Cl⁻), Calcium (Ca⁺⁺), Magnesium (Mg⁺⁺), Sodium (Na⁺) and Potassium (K⁺). The Chemical analysis was carried out the following the methods by Trivedy and Goel (1986)¹ and standard methods of APHA (1995) ². Int.J.ChNeha Gupta eemTech Res.2013, 5(1)5293. The usual source of drinking water is from streams, rivers, wells and boreholes which are usually not treated. Nagpur (Hingna Taluka) of Vidarbha region situated in Maharashtra. . The objective of this study is to investigate the physicochemical properties of different water samples. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is depended on the physico-chemical and biological characteristics (Venkatesharaju et al 2010)³. The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of physico-chemical parameters and biological characteristics

. Many researches are being carried out till present (Rajesh et al 2002, Jayaraman et al 2003, Sharma & Gupta 2004; Rajasekar et al., 2005; Sridhar et al., 2006; Anilakurmary et al., 2007; Prabu et al., 2008; Raja et al., 2008; Pradhan et al., 2009; Srivastava et., 2009; Damotharan et al., 2010; Prasanna and Ranjan, 2010)⁴⁻¹⁴

Table 1: Observation (Sample 1)

Sr. No.	Parameters	B-1	W-1
1.	pH	6.2	6.9
2.	Conductance	0.68	0.31
3.	TDS	609	300
4.	HCO ₃	0.5	0.3
5.	Cl ⁻	4.4	1.3
6.	Ca ₂ ⁺	7.4	4.2
7.	Mg ₂ ⁺	8.7	3.4
8.	Total Hardness	0.52	0.288
9.	Temporary	0.02	0.186
10.	Permanent	0.4	0.196

Table 2: Observation (Sample 2)

Sr. No.	Parameters	B-2	W-2
1.	pH	6.6	6.1
2.	Conductance	0.44	0.87
3.	TDS	419	848
4.	HCO ₃	0.3	1.8
5.	Cl ⁻	2.6	6.8
6.	Ca ₂ ⁺	6.4	9.4
7.	Mg ₂ ⁺	6.8	10.1
8.	Total Hardness	2.8	0.64
9.	Temporary	0.228	0.456
10.	Permanent	2.572	0.184

Table 3: Observation (Sample 3)

Sr. No.	Parameters	B-3	W-3
1.	pH	6.9	0.6
2.	Conductance	0.23	0.62
3.	TDS	186	615
4.	HCO ₃	0.2	0.4
5.	Cl ⁻	0.4	3.9
6.	Ca ₂ ⁺	3.1	11.3
7.	Mg ₂ ⁺	6.1	7.3
8.	Total Hardness	0.256	0.56
9.	Temporary	0.208	0.528
10.	Permanent	0.048	0.032

Table 4: Observation (Sample 4)

Sr. No.	Parameters	Corporation
1.	pH	6.7
2.	Conductance	0.33
3.	TDS	269
4.	HCO ₃	0.6
5.	Cl ⁻	1.7
6.	Ca ₂ ⁺	7.8
7.	Mg ₂ ⁺	3.6
8.	Total Hardness	0.496
9.	Temporary	0.332
10.	Permanent	0.164

Sample Collection of water samples from selected sites were collected during the months of March and April, 2016. The samples were collected from the bore water & well water in pre-cleaned polyethylene bottles. Potable water is the water that is free from disease producing microorganisms and chemical substances.

MATERIAL AND METHODS

The present study was carried out for six different water samples located in Nagpur city region of Maharashtra. Three water samples and three Bore samples were studied. Samples were analyzed for different physico-chemical parameters such as, pH, electrical conductivity (EC), total dissolved solids (TDS), total hardness (TH), Calcium (Ca₂⁺), Magnesium (Mg₂⁺), Chloride (Cl⁻) etc. as per standard procedures (APHA, Standard).

Graphs (figures)

Fig 1: Determination of pH

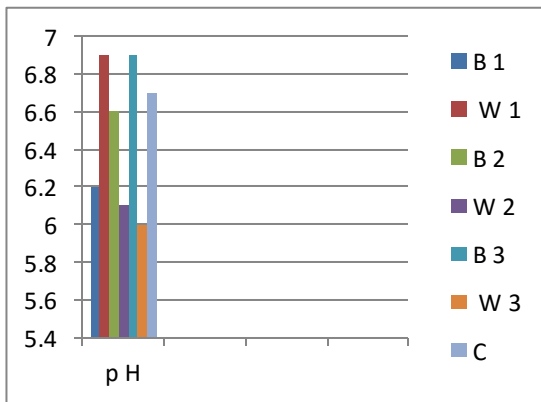


Fig 2: Determination of Conductance

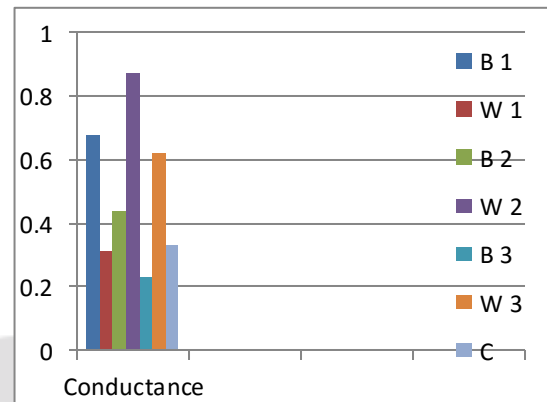


Fig 3: Determination of TDS

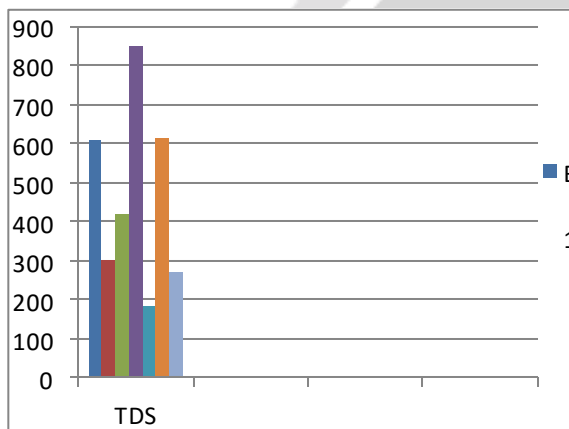


Fig 4: Determination of Chloride

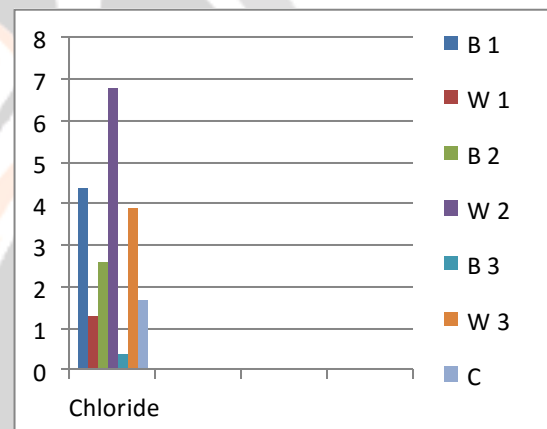


Fig 5: Determination of Calcium & Magnesium

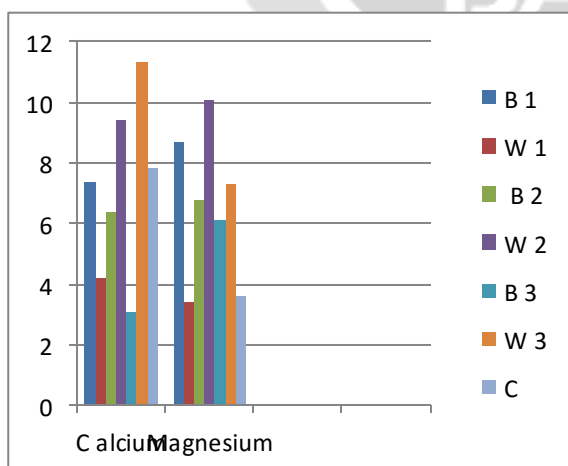
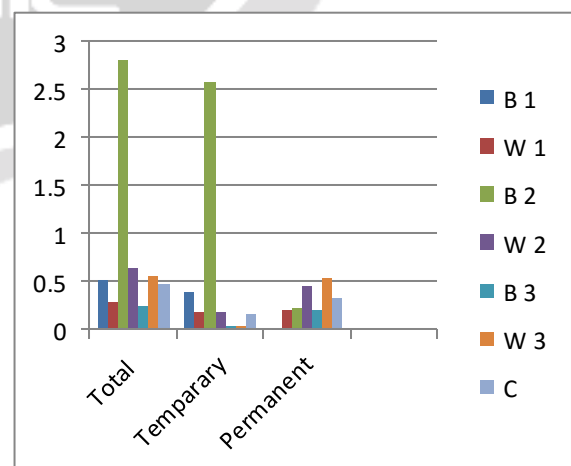


Fig 6: Determination of Hardness



1. **pH:** pH is most of the important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water. pH was positively correlated with electrical conductance and total alkalinity.

The reduced rate of photosynthetic activity. The assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH, the low oxygen values coincided with high temperature during the summer month. Various factors bring about changes the pH of water. The higher pH values observed suggested that carbon dioxide, carbonate-bicarbonate equilibrium is affected more due to change in physico-chemical condition.

High pH value is conserved in sample W1 while low pH value observed in sample W3. pH values indicates the acidic or alkaline nature in water.

Sample W1 show higher value of pH 6.9. Therefore it is basic in nature while sample W3 has 6.0 values which also show acidic in nature.

2. Electrical Conductivity: Conductivity shows significant correlation with ten parameters such as temperature, pH, value, alkalinity/ total hardness, total dissolved solid, chlorine, iron, etc. The underground drinking water quality of study area can be checked effectively by controlling conductivity of water and this may also be applied to water quality management of other Study areas. It is measured with the help of EC meter which measures the resistance offered by the water between two platinum electrodes. The instrument is standardized with known values of conductance observed with standard KCL solution.

Sample W2 has 0.87 EC value as compare to other samples this indicates more ionic salt present in the sample. Similarly sample B3 shows 0.23EC value it is lower as compare to other sample.

3. Bicarbonate: It is measured by titration with standardized hydrochloric acid using methyl orange as indicator. Methyl orange turns yellow below pH 4.0. At this pH, the carbonic acid decomposes to give carbon dioxide and water.

Bicarbonate values of sample W2 is 1.8 me/L which is high and in sample B3 it is found to be 0.2 me/L which is low as compare to other samples.

4. Chloride: It is measured by titrating a known volume of sample with standardized silver nitrate solution using potassium chromate solution in water or eosin/fluorescein solution in alcohol as indicator. The latter indicator is an adsorption indicator while the former makes a red colored compound with silver as soon as the chlorides are precipitated from solution. Sample W2 has high value of chloride i.e 6.8me/L while sample B3 has lower value of chloride is 0.4 me/L.

5. Calcium: It is measured by complexometric titration with standard solution of EDTA using Patton's and Reeder's indicator under the pH condition of more than 12.0. These conditions are achieved by adding a fixed volume of 4N sodium hydroxide. The volume of titre (EDTA solution) against the known volume of sample gives the concentration of calcium in the sample.

6. Magnesium: It is also measured by complexometric titration with standard solution of EDTA using Eriochrome black T as indicator under the buffer condition of pH 10.0. The buffer solution is made from ammonium chloride and ammonium hydroxide. The solution resists the pH variations during titration. Sample W3 has high value of 11.3 and sample B1 has high value of 8.7 me/L of calcium and magnesium. And low value of sample B3 of calcium is 3.1 and sample W1 is 3.4 which is low value of magnesium. High value of calcium and magnesium indicates more hardness of the sample. While low value indicates more softness of the water.

CONCLUSION

The present study was undertaken with an aim to analyze certain physico-chemical parameter in the bore water sample and well water samples in Nagpur District. The parameters analyzed have shown that they are all within the permissible limits for drinking water pH, EC, carbonate, bicarbonate, chlorine, calcium, magnesium in certain water samples. From the analysis of all the sample is conclude that sample W3, sample B3 (5), sample W1, sample B3 contain low value of pH, conductance, TDS, bicarbonate, chlorine, calcium, magnesium and hardness respectively and hence these samples are very good as compare to other for drinking and all other purpose.

REFERENCES

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