

Studies on Physicochemical Parameters to Assess the Ground Water Quality in Ballia District

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No water, no life, no blue, no greenie without water life is impossible. The quality of water change day by day depending upon sources [1] People on globe are under tremendous threat due to undesired changes in the physical, chemical and biological characteristics of air, water and soil. Due to increased human population, industrialization, use of fertilizers and man-made activity water is highly polluted with different harmful contaminants. Natural water contaminates due to weathering of rocks and leaching of soils, mining processing etc. [2]. It is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population also suffers from varied of water borne diseases. These could have serious heal. The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. It is necessary to know details about different physico-chemical parameters such as Colour, Odour, Temperature, Hardness, pH value, Electrical Conductivity (EC), Total Dissolved Solid (TDS), Total Dissolved Oxygen (DO), Total Hardness (TH), Calcium (Ca^{2+}), Magnesium (Mg^{2+}), Chloride(Cl^-), Sulphate (SO_4^{2-}), Chemical Oxygen Demand (COD), were analyzed for testing of water quality .and compared with maximum permissible limits. The drinking water recommended by aome water analysis reports with physic-chemical parameters have been given for the exploring parameter study. Guidelines of different physic-chemical parameters also have been given for comparing the value of real water sample.

Keyword: Water, Physio - chemical, Parameters, Hardness, EC, OD, COD, TDS, DO.

1. INTRODUCTION

Water is the world's most natural resource and without it there would be no life on earth. Nature limits our available supply of water [3]. Virtually all of human uses require fresh water, but 97% of the Earth's water is salty and only 2.5% is fresh water of which over two thirds are frozen in glaciers and polar ice caps. Every organism is made up of water. Water is pumped throughout our bodies to support our organs. Plants and animals cannot exist without it. Two-thirds of the human body is water. Our bodies are really sacks of water walking around on dry land [1].

Groundwater is fresh water (from rain or melting ice and snow) that soaks into the soil and is stored in the tiny spaces (pores) between rocks and particles of soil. Groundwater accounts for nearly 95 percent of the nation's fresh water resources. It can stay underground for hundreds of thousands of years, or it can come to the surface and help to fill rivers, streams, lakes, ponds, and wetlands. Groundwater can also come to the surface as a spring or be pumped from a well. Both of these are common ways we get

groundwater to drink. About 50 percent of our municipal, domestic, and agricultural water supply is groundwater. Unfortunately, groundwater also becomes contaminated easily, and the more frequently human beings interact with sources of groundwater. People can survive for only three or four days without drinking. Camels have found a way around the problem. The humps on their backs are made of tissues that can store water. This allows them to survive for long periods without eating or drinking – as much as eight to ten days [2].

Some plants and animals can survive hugely long periods of drought because they are so good at keeping moist inside. The thick, leathery exterior of a cactus has hardly any pores. It is almost impossible for the moisture inside it to escape. Lungfish burrow into the river bed just before the river dries up. They can survive there because the mud stays moist and cool for a long time. The present paper is an attempt to examine the possible impact of the ground water quality of some water sample collected from different locations of Balliadi district. In this paper the physico-chemical parameters of ground water like odour, colour, pH value, Electrical Conductivity (EC), Total Dissolved Solid (TDS), Total Dissolved Oxygen (DO), Total Hardness (TH), Calcium (Ca^{2+}), Magnesium (Mg^{2+}), Chloride(Cl^-), Sulphate (SO_4^{2-}), Chemical Oxygen Demand (COD) were determined. The analyzed data were compared with WHO and BIS (2,5a) [3] as given in Table 1.

Table 1: Different analytical water quality parameters with analytical technique and guidelines (values as per WHO and Indian standard).

S.No.	Parameters	WHO Standard	Indian standards BIS	EPA Guideline
1.	Temperature	--	--	--
2.	Colour	--	5	--
3.	Odour	Acceptable	Acceptable	--
4.	EC	--	--	2000
5.	pH	6.5-9.5	6.5-9.5	6.5-9.5
6.	DO	--	--	--
7.	TH	200ppm	300ppm	<200ppm
8.	COD	10	--	40
9.	Chloride Cl^-	250ppm	250ppm	250 ppm
10.	Magnesium Mg^{2+}	1500ppm	30ppm	--

2. MATERIALS AND METHODS

Different analytical water quality parameters with their Physical and chemical parameters exhibit considerable variations sample to sample. Five numbers of ground water samples were collected from shallow hand pumps. The locations of sampling points are shown in Table 2. Prior to sampling, the hand pumps flushed with 40 to 50 Liters of water. The samples were collected in plastic sterilized bottles without any air bubbles for analysis. Before filling the samples, bottles were rinsed for three times with water. The samples

were collected during in month of October in Ballia. The complete process of methods for examination of water sample preparation and analysis of physico-chemical properties were adopted based on standard procedures [4] All the measurements were carried out at the vicinity 35 °C. The observation are summarized in Table 2.

Table 2: Different analytical water quality parameters of samples and their collected areas.

S.No.	Parameters	S1	S2	S3	S4	S5
1.	Areas	Ballia	Reoti	Sikandarapur	Rasara	Surainmanpur
2.	Colour	Colourless	Colourless	Colourless	Colourless	Colourless
3.	Odour	Odourless	Odourless	Odourless	Odourless	Odourless
4.	Temperature (°C)	31	30	30	32	31
5.	pH value	7.4	7.5	8.2	7.7	8.1
6.	Total Dissolved Solid (TDS) (mg/l)	175	232	285	271	246
7.	Electrical Conductivity (EC) (mho/cm)	693	916	1118	1059	954
8.	Ca ²⁺ Hardness (mg/l)	116	112	210	165	156
	Mg ²⁺ Hardness (mg/l)	52	51	121	89	85
	Total Hardness (mg/l)	168	163	331	254	241
9.	Chlorite (Cl ⁻) (mg/l)	123	144	223	220	176
10.	Sulphate (SO ₄ ²⁻) (mg/l)	40	58	89	88	78
11.	Dissolved Oxygen (DO) (mg/l)	7.5	5.2	6.9	6.0	6.3
12.	Chemical Oxygen demand COD (mg/l)	9.8	15	12	14	15

2.1. Total dissolved solid (TDS)

Total dissolved solid comprises magnesium, calcium, potassium, sodium, bicarbonates, chloride, sulphate and small amounts of organic matter that are dissolved in water. TDS indicate salinity of groundwater. According to Environmental Protection Agency PEA, World Health organization WHO and bureau of Indian standard (BIS:10500) guidelines the limiting value of TDS for drinking water is 200 mg/l. Present investigation revealed the good value of TDS 175-285 mg/l their value is acceptable for domestic use and agricultural purposes.

2.1. Total hardness (TH)

The results shows that the concentration of calcium is double than that of magnesium. Each of the sample showed a high value of calcium hardness 112 mg/l to 210 mg/l, magnesium hardness ranges from 51 mg/l to 121 mg/l. Hence total hardness ranges from 163 mg/l to 331 mg/l.

2.2. Dissolved Oxygen (DO)

Dissolved Oxygen is one of the most important factors in any living ecosystem. The main source of dissolved oxygen are atmosphere and photosynthetic process of producer organisms. The amount of dissolved oxygen in water depends on area exposed, temperature etc.. Dissolved oxygen is an important factor in assessing water quality and it add taste in drinking water. In this study dissolved oxygen content varied in a limited range of 5.2 mg/l to 7.5 mg/l.

2.3. pH Value

pH value is classed as one of the most important water quality parameters. Measurement of pH relates to the acidity or alkalinity of the water. A sample is considered to be acidic if the pH is below 7.0. Meanwhile, it is alkaline if the pH is higher than 7.0. Acidic water can lead to corrosion of metal pipes and plumping system. Meanwhile, alkaline water shows disinfection in water. The normal drinking water pH range mentioned in WHO and BIS guidelines is between 6.5 and 8.5 as in Table 1. pH of water at all the study sites showed a narrow range of variation (7.4-8.2) is in guideline limit.

2.4. Chemical Oxygen Demand (COD)

COD is another measure of organic material contamination in water specified in mg/l. COD is the amount of dissolved oxygen required to cause chemical oxidation of the organic material in water. COD is a key indicator of the environmental health of a Surface water supply e.g. Lakes and river making COD is the useful measure of water quality. According to Table 2 it is found in permissible limit [5].

2.5. Electrical Conductivity (EC)

Conductivity shows a significant correlation to various parameters such as temperature, pH value, alkalinity, total hardness, calcium, total solids, total dissolved solids, chemical

oxygen demand and chloride concentration of water. The quality ground water for drinking can be checked effectively by controlling the conductivity of water. The analyzed water sample results ranging from 693 -1118 mho/cm is in permissible range.

3. CONCLUSION

By observing the result, it can be concluded that the parameters which were taken for study the water quality are showing that, all the pH values above 7.4 and the maximum pH was recorded at 8.2 indicating that the water is in WHO permissible limits [6]. EC values were observed from 693 to 1118. Chloride concentration was found in the range of 123 mg/l to 223 mg/l. TDS and TH is in between 176 to 285 and 163 to 331, and DO and COD 5.2 to 7.5 and 9.8 to 15 respectively. All the physio-chemical parameter of water samples are in permissible limit of WHO, BIS and PEA guidelines.

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