

Physicochemical Analysis of Bore Well Water(Winter Season) in Rural Aria, Gram Panchayat Sitapur, District Rewa, Madhya Pradesh State, India

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Abstract :

The study aims to find out the quality of Borewell water used for drinking purpose and at household level in Gram Panchayat Sitapur. Bore well water is the most necessary source of water. So, the present work deals with valuation of borewell water of different three sampling site places in Gram Panchayat Sitapur carried out in year 2021-22. The Physico Chemical analysis such as pH, Temperature, Electric Conductivity, Total Dissolved Solid, Total Hardness, Alkalinity, chloride, calcium are studied to measure quality of water.

Key words: Physico chemical analysis, Borewells Water, Gram Panchayat Sitapur.

INTRODUCTION

Water is one of the most intrinsic and most valuable natural resources. It is an imperative of the life of all living organism (Onifade, 2008)^[1]. Water is fundamentally important to all human, plants and animals. It is significance due to its unique chemical and Physical properties. Water is a combination is H₂O and Known to be the most banded compound (70%) on the earth surface (Ajewole, 2005)^[2]. All over the world bore well water is represent the largest and most important source of fresh potable water. Bore well water is the enormous source of drinking water in both urban and rural areas. Due to increasing demand of water, most people in rural areas resorts to bore well water sources such as boreholes as an alternative water resource. Thus, humans can abstract bore well water through a borehole, which drilled into the aquifer for industrial, agriculture and domestic uses.

However, bore well water resource are commonly not secure to pollution, which may degrade their quality. Generally, bore well water quality changes from place to place according to the nature of soils, rocks and surface through which it move (Okoro N, (2017)^[3], (Seth, 2014)^[4], water is universal solvent that dissolve all solutes. Bore well water forms a major source of domestic, industrial and agriculture sources (O.M. Akinfolarin, 2016)^[5]. As a result of rapid population growth in the world, and accelerated industrialization, there is an increase in demand and use of fresh water. The purity of ground and surface is constantly affected due to pollution caused by improper waste disposal method both in urban and rural area. (C.C Obunwo, 2013)^[6]

MATERIALS AND METHODS

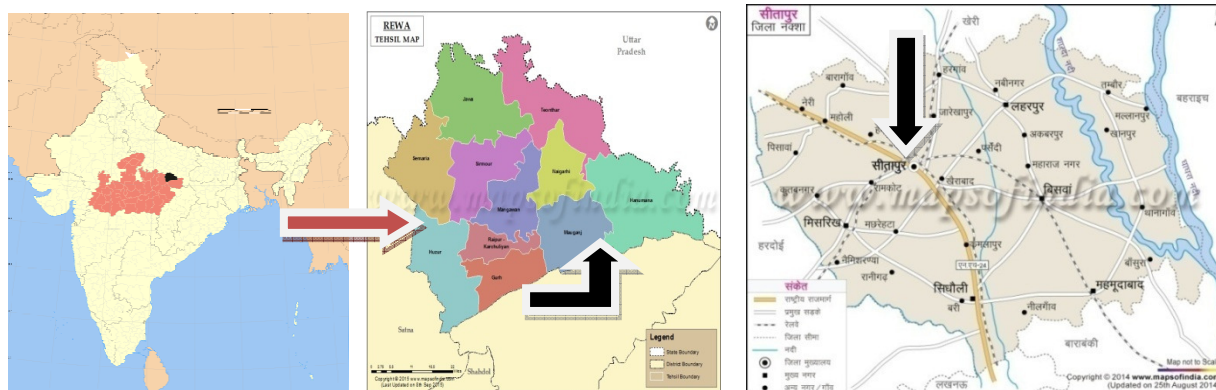
Description of the study area

Gram Panchayat sitapur is located in Tehsil Mauganj District Rewa, Madhya Pradesh, state in India. It belongs to Rewa Division, is located 55 KM towards and 543 KM from state capital of Bhopal. It lies between North latitude and East longitudes and is bounded on south by Shidhi district, on the north and northeast by Uttar Pradesh state, on the east by Prabhganj district up state and south by Shidhi district. Total geographical area of the district is 10.5 Sq km. The Gram Panchayat Sitapur is situated at an elevation of 669.47 m above MSL. The Panchayat is divided into villages taluks coming under two sub divisions. Sub division comprises. The total area is 23% forest and 45% are forming and 32% area of planet^[7].

Analysis of Underground water Samples: The bore well water quality was assessed by the analysis of chemical parameters such as pH, temperature, Electrical Conductivity(EC), Total Dissolved Solids(TDS), Total Alkalinity(TA), Chlorides, Total Hardness(TH), Calcium Hardness(CH), Nitrates, Sulphate, Iron and Fluorides as per standard procedure (APHA, 2003)^[8]. The Bureau of Indian Standards (BIS) for drinking water quality for various parameters is presented in the table 1. The analytical methods used to measure chemical parameters of groundwater samples collected from all the sampling stations are listed in the table. 2. The water samples were analyzed adopting standard methods in the Environmental Laboratory.

Geography of sampling points:

The Gram Panchayat Sitapur Tehsil Mauganj District Rewa, is located in the eastern part of the of 750-900m above MSL. The soil types are mainly three, 1. Red - yellow, 2. black & laterite for suitable for farming and agriculture. There are few sporadic outcrops of rocks as hills and few fertile shallow valleys. In the south-eastern and west side parts^[9]



Study area of sampling collection:

Sample collecting time to carefully planning and preparation of bore well (underground) water sampling trip to made and save time preparation in the college and laboratory before sample collection. The collecting time of different sample site and different bore wells of winter season, in 2 liter capacity bottle were collected in polythene containers.

Table-1 Laboratory analytical method ^[11]

SL.NO.	Physicochemical Parameters	Methods
1	Ph	Potentiometer (PH) meter
2	Electric Conductivity (mg/L)	Conductivity probe
3	Alkalinity(mg/L)	Argentometry (Titration)
4	Chloride(mg/L)	Argentometry (Titration)
5	Total Hardness (mg/L)	Complexometry by EDTA titration
6	Calcium (mg/L)	Argentometry (Titration)
7	Magnesium (mg/L)	Argentometry (Titration)
8	Total Dissolved Solid (ppm)	TDS Probe
9	Fluoride (mg/L)	Ion Analyzer
10	Iron(mg/L)	Spectroscopy
11	Nitrate(mg/L)	Spectroscopy
12	Sulphate(mg/L)	Spectroscopy

Table 2 standard of parameters for drinking water ^[12] (Value ppm &mg/l)

Parameters	ISI		ICMR		WHO	
	P	E	P	E	P	E
Physical						
Colour	10	50	5	25	5	25
Taste	Unobjected		Unobjected		Unobjected	
Turbidity	10	25	10	25	10	25
Chemical						
Ph	6.5-8.5	6.5-9.2	7.0-8.5	8.5-9.2	7.0-8.5	8.5-9.2
Conductivity	-	-	-	-	500	1500
Alkalinity	6.0	9.0	6.0	9.0	8.8	9.5
Chloride	250	1000	250	1000	250	600
Total Hardness	300	600	300	600	-	-
Calcium	75	200	75	200	75	200
Magnesium						
Total Dissolved Solid	-	-	-	-	500	1500
Fluoride	0.5	1.5	1.0	2.0	0.5	1.5
Iron	0.3	1.0	0.3	0.1	1.0	1.5
Nitrate	45	-	30	50	-	100
Sulphate	150	400	200	400	200	400

Table 3 The resultant value of different parameters recorded in four sample points is plotted in a table.

Sr. no.	Parameters determined	Sampling points			
		P1	P2	P3	P4
1	pH	7.2	7.4	6.9	7.5
2	Temperature (°C)	12	16	15	14
3	Turbidity (NTU)	12	10	9	14
4	Electric conductivity (us.cm ⁻³)	1.64*10 ⁻³ 1.66*10 ⁻³	1.45*10 ⁻³	1.36*10 ⁻³	
5	Total dissolve solid(mg/L)	520 600	570	545	
6	Total alkalinity (mg/L)	20	31	25	36
7	Chloride	210 265	195	246	
8	Total Hardness	226 210	255	195	
9	Dissolve Oxygen (DO)(ppm)	6-7	7	6	8
10	Sulphate (mg/L)	180 175	220	195	
11	Nitrate (mg/L)	20.5 22	15	27	
12	Magnesium	5.2	7.9	4.9	5

RESULT AND DISCUSSION

The analysis data of winter season in Bore Well Water of Gram Panchayat Sitapur is present in Table-3, From the results. It is the evident that's, the pH is well within permissible limit. (6.9 -7.5) is no direct adverse effects on health, however of a lower higher value below 4 will produce sour that germicidal potential of chlorine, high PH was determine with the healp of digital Ph meter with electrodes model no., 335 by standedr methods of according to parameters of ISI, ICMR and WHO are approved.

Potential of Hydrogen (PH):

In the present study of PH ranged from (6.9 – 7.5) which of the range in the prescribed by the value of drinking water, is important ecological parameters in aquatic habits, since most of the organism is adapted optimum pH range have between the permissible limit. According to WHO guidelines of the pH value for drinking water of Generally influenced by buffering capacity of water (K. Chandra Et. al, 2014).^[13]

Temperature: In the present study is temperature ranged from 14 - 16⁰C the most essential parameters in water. Its affects the Physical and chemical properties of the water sample. Winter Season are sample of temperature is 16⁰C-12⁰C ranged between as shown. It affect the Physical and chemical properties and their biological activities (Mali Vidya C, et, Al, 2018) ^[14].

Electric Conductivity (EC): Electric current is known as Electric Conductivity (EC), the ability of an aqueous solution of conduct is a useful tool to evaluate the purity of water (Acharya, 2008) ^[15]. Measure of the ability of a solution to conduct an electric current have been received units of 1.36*10³ – 1.66*10⁻³ ppm is between highest and lowest value.

Total Alkalinity (TA): the value of alkalinity in water is measure of mostly natural salts, hydroxide and carbon ions present of water sample. Mean alkalinity was founded to be have detected 200-260 ppm. The excess of alkalinity could be to the minerals, which dissolved in water from mineral rich soil. Bicarbonates borens, silicates organic acids are also accountable to the alkalinity (Sawayer, 2000)^[16].

Total Hardness (TH): ISI has specified the total hardness to be present study is range between 195 - 255 mg/L (ppm) of CaCO₃. Regarding total hardness of shown the permissible limit, hardness in water is cause by certain salts held's in solution total hardness of water is caused of Ca & Mg salts.

Total dissolved Solids (TDS): the average value of TDS in the investigated of minerals present in water. In the present study ranged have been receive 520 – 600 ppm mg/L. Indian standard TDS values be less than 500 mg/L and WHO 600ppm for drinking water. All the sample units are under the permissible limits of according to WHO (the Gazette if India,1991)^[17].

Desolved Oxygen: (DO)

The drinking water should be rich in dissolved oxygen for good taste and the values of DO are well within limit and found suitable for appropriate taste. (R. E. khadsan, et al, 2022) ^[18]

Turbidity:

Turbidity is measure of the loss of transparency or clarity of a solution. The presence of colloidal solid gives water a cloudy appearance which reduces its transparency shown is Fig: 6 widely used parameter around the world for the describing of a drinking water quality. Sometimes, turbidity of

water treatment plant outlets may be a reach high value during short periods of to some time. Turbidity is makes water cloudy or opaque.

Chloride: In the present study of chloride in the sample of November-Jauary 2021-22, have been 235-180 ppm 250 mg/l water. While the tolerance range for chloride is 200 - 600 mg/l. Magnesium, fluoride, Iron Nitrite and sulptate are under the permissible limit

CONCLUSION:

After the carefully study and analysis, interpretation and discussion the numerical data to following conclusion have been drawn for the Physico chemical analysis of Bore Well Water in Gram Panchayat Sitapur, during 2021-22. The collected sample from wenter season into same bore well water of different days R1, R2, R3 & R4 are Winter season in collected to sample. ISS, ICMR & WHO as per standard in shown normal pH, Total Dissolved Solid TDS are cross the permissible limit some extra little units. Though alkalinity is high but the Permissible limit.

According to standard of WHO, total hardness are 300-600 ppm mg/l, the received ridings of total hardness 630-840 mg/l while total hardness are all reading units is high of the WQI Water Quality Index, for by of TDS. The result that chemical parameters such as color, turbidity, odor and taste in change of a few difference. Overall observation is good in the permissible limit but therefore water is not good from the suitable for drinking use, but useable for Domestic and Agriculture sector.

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