

ASSESSMENT OF GROUND WATER QUALITY BY PHYSICO-CHEMICAL PARAMETERS IN THE BHAMURIA GRAM PANCHAYET OF NETURIA BLOCK OF PURULIA, W.B., INDIA.

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ABSTRACT

Water plays an essential role in human life. It is available in the forms as surface water and sub-surface water or ground water. Evaluation of ground water quality is a significant matter to promise from its potable use. The present study has been carried out to explore the Physico-chemical quality of ground water in six chosen sampling stations at Bhamuria Gram Panchayet of Neturia Block of Purulia District, West Bengal, India. Water sample from bore wells were collected during June to August, 2015 and physico-chemical characteristics were analysed for the parameters viz., pH, electrical conductivity (EC), turbidity, dissolved oxygen (DO), alkalinity, hardness, chlorides, fluorides, TDS, iron, sulphates, calcium, magnesium, and nitrate nitrogen as per the standard procedures. The pH of the samples is found to be varying from a minimum value of 6.4 to a maximum value of 9.1. Conductivity varied from a minimum of 240 micro-seimans to a maximum of 800 micro-seimans. Turbidity is found to vary from 0.8 NTU to 1.19 NTU. Dissolved oxygen levels are found to be in the permissible limits and they varied from a minimum of 5.02mg/l to maximum of 7.2mg/l. Alkalinity is varying from a minimum of 346 mg/l to a maximum of 812mg/l. The maximum and minimum values of hardness are found to be 978 mg/l and 136 mg/l. Chloride concentration is varied from a minimum of 71mg/l to a maximum of 282mg/l. Fluoride concentration is varied from a minimum of 1.12mg/l to a maximum of 1.54mg/l. TDS is found to vary from 520mg/l to 980mg/l. Iron is found to vary from a minimum of 0.28mg/l to a maximum of 0.72mg/l. Sulphates varied from a minimum of 42mg/l to a maximum of 138mg/l. Calcium varied from 24.6mg/l to 61.2mg/l. The maximum and minimum values of magnesium are found to be 12mg/l and 33mg/l. Nitrates are found to vary from a minimum of 32.5mg/l to a maximum of 58.5mg/l. The analysis reports that the water quality parameters lies within the maximum permissible limit prescribed by WHO and BIS drinking water standards.

Keywords: water quality, Ground water, bore well, physico-chemical characteristics.

INTRODUCTION

Water is an essential component for our life support system. It is available in the forms of surface water, sub – surface water or ground water. Surface water is mostly used for public water supply systems. However, the rapid growth of population and the demand of water are increasing day by day. The growing urbanization and industrialization and the resulting pollution of surface water sources, also the requirement of using ground water for various household and in-

dustrial purposes increased. Ground water has unique characteristics which make it chiefly suitable for public water supply. Although the WHO reports that approximately 65% of rural and 36% of urban Indian were without access to potable drinking water (Sexenal and Mishra, 2011). Human and ecological use of ground water depends upon ambient water quality. During last few decades, this is observed that ground water get polluted drastically because of increased anthropogenic activities. So quality of ground water is equally important to its quantity owing to the suitability of water for various purposes. Therefore the present investigation is undertaken to study the

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physico-chemical parameters of bore wells from different points (six i.e., Asanbani, Baidyapara, Debiapara, Alkusa, Hirakhun, and Bonra) of Bhamuria gram panchayet of Neturia block which is one of the important area of Purulia district located at latitude 23°39'47"N, 86°49'37"E. People residing in this block are mainly depends on bore well water for domestic and agriculture purpose therefore these bore wells acts as lifeline for these peoples.

Materials and methods: Water samples from bore wells were collected during June, 2015 and August, 2015. The sampling points are located in such a way that, they are uniformly distributed in all the para (community area) of the study area. The water samples were collected in polythene bottles (which were cleaned with acid water, followed by rinsing twice with distilled water), and brought to the laboratory for further analysis. The samples for Dissolved Oxygen (D.O.) was fixed in the BOD bottle at the site and brought to the laboratory for analysis by Wrinkle's iodometric method. All the physico-chemical parameters were analyzed within 24 hours. The pH and Electrical Conductivity (EC) was measured by using Eutech cybernetics pH meter and EC Scan meter (Yadav and Kumar, 2010). Hardness, calcium, magnesium were measured by EDTA titration methods (Kumar and Yadav, 2011). Alkalinity was determined by volumetrically by silver nitrate titrimetric methods using potassium chromate as indicator (Yadav and Kumar, 2011). Turbidity and TDS were observed with the help of digital water kit (Kotaiah and Kumaraswamy, 1994). The Physico-chemical parameters like chloride was carried out according to standard methods (Kumar and Yadav, 2011; APHA, 1995; Shah, 2006; Trivedi and Goel, 1984). Iron was determined by spectrophotometer (Bhutra and Soni, 2008). Sulphate was determined nephelometrically using ELICO-52 Nephelometer (Manivasgam, 1984). Fluoride content in water was measured by ELICO-52 Spectrophotometer. Nitrate was determined by Phenol Disulfonic method (Kalra et al., 2012).

RESULT AND DISCUSSION

All water samples were clear, colourless & odourless. Taste of the water of the water sample in most of the locations pleasant in taste. The result of the physico

- chemical analysis of water in the present study in Table-1, and Table-2; so it is necessary to make a comparison with water standards. The pH of the samples is found to be varying between 6.4 and 9.1. The pH of water shows variation in its ranges. All samples are within the permissible limit. During August, 2015; Debiapara was exceptional and may reflect contamination by strong bases. The EC of water samples shows wide variation, varied from a minimum of 240 micro-seimens to a maximum of 800 micro-seimens and indicate the presence of some ionic matters in water, indicating high TDS concentration in groundwater of these areas. Turbidity is found to vary from 0.8 NTU to 1.19 NTU. Turbidity are found to be within the permissible limits. Dissolved oxygen is very important parameter; low dissolved oxygen gives bad odour to water due to anaerobic decomposition of organic waste. Dissolved oxygen levels are found to be in the permissible limits and they varied from a minimum of 5.02mg/l to maximum of 7.2mg/l. Alkalinity is varying from a minimum of 346 mg/l to a maximum of 812mg/l; which was within the permissible limit. The total hardness is due to the presence of divalent cations of which Ca and Mg are the most abundant in ground water. The maximum and minimum values of hardness are found to be 978mg/l and 136mg/l. Chloride occurs in all natural waters in widely varying concentration. Excessive Chloride in potable water is not particularly harmful and the criteria set for this ion are based primarily on palatability and its potentially high corrosiveness (Bhujangaiah, and Nayak, 2005). Chloride concentration is varied from a minimum of 71mg/l to a maximum of 282mg/l. Chlorides also found to be in acceptable limits. Fluoride concentration is varied from a minimum of 1.12mg/l to a maximum of 1.54mg/l, found to be exceeding the permissible limit of 1.5 mg/l but which is not so high, due to this no dental and Skelton problem arises in the study area. TDS is found to vary from 520 mg/l to 980 mg/l. Iron is found to vary from a minimum of 0.28 mg/l to a maximum of 0.72mg/l found to be in acceptable limits. Sulphates varied from a minimum of 42 mg/l to a maximum of 138 mg/l, are found to be more than the permissible limits, may be due to intrusion from agricultural field. Calcium varied from 24.6mg/l to 61.2mg/l, found to be slightly more than the permissible limits. The maximum and minimum values of magnesium are found to be 12mg/l and 33mg/l. Nitrates are

Table 1: Physico – chemical parameters of Borewell water of Bhamuria gram panchayet of Neturia block of Purulia district, W.B., India

Sample Details		pH	EC (micro - seimans)	Turbidity (NTU)	Dissolved Oxygen (mg/l)	Alkalinity (mg/l)	Iron (mg/l)	Hardness (mg/l)
Asanbani	June, 2015	6.8	562	0.87	7.2	524	0.64	347
	August, 2015	7.1	556	0.92	6.09	496	0.72	371
Baidyapara	June, 2015	6.4	240	1.06	5.62	574	0.34	894
	August, 2015	6.7	291	1.07	6.12	589	038	978
Debiapara	June, 2015	8.6	762	0.80	5.01	683	0.52	462
	August, 2015	9.1	800	0.92	5.02	695	0.58	486
Alkusa	June, 2015	7.3	374	1.08	5.36	346	0.28	642
	August, 2015	7.4	393	1.12	5.18	419	0.36	659
Hirakhun	June, 2015	6.8	483	1.14	6.14	487	0.42	158
	August, 2015	6.6	509	1.19	7.12	543	0.50	136
Bonra	June, 2015	7.9	678	1.03	5.18	776	0.38	654
	August, 2015	8.1	713	1.06	6.24	812	0.32	753

Table 2: Physico – chemical parameters of Borewell water of Bhamuria gram panchayet of Neturia block of Purulia district, W.B., India

Sample Details		Fluorides (mg/l)	Chlorides (mg/l)	Sulphate (mg/l)	Calcium (mg/l)	TDS (mg/l)	Magnesium (mg/l)	Nitrate Nitrogen (mg/l)
Asanbani	June, 2015	1.52	71	58	25.2	980	26	28.5
	August, 2015	1.54	76	62	24.6	960	24	29.5
Baidyapara	June, 2015	1.36	218	112	47.6	450	33	54.5
	August, 2015	1.32	226	106	47.2	440	31	58.5
Debiapara	June, 2015	1.24	268	48	34.6	740	27	47.5
	August, 2015	1.32	282	42	36.4	720	29	44.5
Alkusa	June, 2015	1.46	112	138	53.8	510	18	51.5
	August, 2015	1.52	118	128	53.6	520	14	51.5
Hirakhun	June, 2015	1.28	86	76	37.8	730	27	33.5
	August, 2015	1.24	94	84	38.2	710	26	32.5
Bonra	June, 2015	1.12	116	126	61.2	660	12	37.5
	August, 2015	1.16	114	128	60.6	640	13	36.5

found to vary from a minimum of 32.5mg/l to a maximum of 58.5mg/l. Nitrates are found to be in permissible limits. This study shows that ground water is the only source for people in the study area, and the results of the chemical analysis of ground water indicate considerable variation. Most of the water samples do not comply with ICMR standards for drinking purpose. The water quality in the investigated area is found to be suitable for drinking only in few locations, while as out prior treatments. Since the study is conducted for a period of few days only, it is suggested to extend the study for at least of one year and covering all seasons, in order to make more authentic conclusions.

REFERENCES

APHA American Public Health Association, 19th Edition, Washington, D.C. (1995).

- Bhujangaiah N.S., and P. Vasudeva Nayak, *J. Ind. Coun. Chem.*, 22 (1), 42 (2005).
- Bhutra M.K., A. Soni, *J. Ind. Council Chem.*, 25(1), 64-67 (2008).
- Kalra Neerja, Kumar Rajesh, Yadav S.S., Singh R.T., *Der Pharma Lettre.* (2012).
- Kotaiah B., Kumaraswamy N., *Envirnmental Engg. Lab Manual*, 5th Edition, Charotar Publishing House, India (1994).
- Kumar Rajesh, Yadav S.S. *Int. J. Chem. Sci.*, 9(1), 440-447 (2011).
- Kumar Rajesh, Yadav S.S. *Shodh Samiksha aur Mulyakan*, 2(22), 19-20 (2011).
- Manivasgam N. *Physico chemical examination of water*, Pragati Publication, Meerut (1984).
- Sexenal Nidhi, Mishra S.N. *J.Chem. Pharma. Res*, 3(2), 162-167 (2011).
- Shah M., *Poll. Res.*, 25(3), 549-554 (2006).
- Trivedi R. K., and Goel P. K., *Chemical and Biological methods for water pollution status* Environmental publication, Karad, India (1984).
- Yadav, S.S., Kumar Rajesh, *Advances in Applied Science Research*, 2(2), 197-201 (2011).
- Yadav, S.S., Kumar Rajesh, *Ultra Chemistry*, 6(2), 181-186 (2010).