



PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER QUALITY OF MOHANIA BLOCK, DISTRICT KAIMUR, BIHAR WITH SPECIAL REFERENCE TO NITRATE.

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ABSTRACT

Mohania is a city in Kaimur district in the Indian state of Bihar. It serves as headquarters for the Mohania sub-division in Kaimur district. It is 17 km by road north of the city of Bhabua, at the intersection of National Highway (old number: NH 2) and State Highway 14. National Highway 319 originates from Mohania. The present study deals with physico-chemical parameters of Ground Water of five different areas of Mohania block that is Village Bhokhari (Bhokari Panchayat) (S1), Village Mohamadpur (Mohnadpur Panchayat) (S2), Village Bhirikhara (Bomhour Panchayat) (S3), Village Turkwalia (Panapur Panchayat) (S4) and Village Dadva (Dadva Panchayat) (S5). The ground Water Parameters such as PH, Alkalinity, Total hardness, Calcium hardness, Iron, Nitrate, Nitrite, Ammonium, Fluorides Chloride, and Residual chlorine etc. were estimated in the samples to evaluate their quality. Our results reveals that concentration of DO, BOD, Sulphate, Phosphate etc. are negligible in comparison to permissible limits. Whereas concentration of Nitrate in the selected samples were found from 20 mg/l (S2 and S4) to 30 mg/l (S1 and S3). In Samples S5 and S3 have a high value of Nitrate exceeding the permissible limit that is 55mg/l and 54mg/l. The high value of Nitrate needs proper treatment of ground water before use.

Keywords: Physico-Chemical Parameters, Ground Water, Nitrate.

INTRODUCTION

Groundwater constitutes about 95% of the fresh water on our planet performed fundamental need of human beings and economic growth. Ground water is an integral part of hydrological cycle. The availability of ground water depends upon its recharge technique mainly by rainfall. As per United Nations Environment Programme (UNEP) about two billion people depend directly upon aquifers for drinking water. About 40% of world's food are produced by ground water irrigation. Due to rapid growth in agriculture development, industrialization and urbanization there is overexploitation and contamination of ground water resources in parts of the country, resulting in various adverse environmental impacts and threatening its long term sustainability. In this situation, The National Water Policy, 2002 had given guide lines that exploitation of ground water resources should be so regulated as not to exceed the recharging possibilities, as also to ensure social equity. Ground water contamination are mainly due to seepage pits, refuse dumps, septic tanks, barnyard manures, transport accident and different pollutants. Raw sewage which are mainly dumped in shallow soakpits is responsible for cholera, hepatitis, dysentery etc. health problems especially in June 2012 to estimate quality of Ground water. These water were extensively used for drinking purposes. These sampling stations are Village Bhokhari (Bhokari Panchayat) (S1), Village Mohamadpur (Mohnadpur Panchayat) (S2), Village Bhirikhara (Bomhour Panchayat) (S3), Village Turkwalia (Panapur Panchayat) (S4) and Village Dadva (Dadva Panchayat) (S5). The analysis of Phosphate, Iron, PH, Total Alkalinity, Calcium Hardness, Nitrate, Nitrite, Ammonium, Fluoride,

Residual chlorine, chloride, Total hardness areas with high water table. The industries of woollens, bicycles in areas of Punjab (Ludhiana) and Haryana (Ambala, Sonapat) contribute high amounts of Ni, Fe, Cu, Cr and cyanides to ground water. (Ecology and Environment-P.D. Sharma 10th edition). According to Ground Water Estimation Committee (GEC)-97 the total annual replenishable ground water resources of the country have been estimated as 432 billion cubic meter (bcm) in which 34 bcm naturally discharge and only 398 bcm ground water are available annually for the entire country. The annual ground water draft is 231 bcm out of which 213 bcm (92%) is for irrigation use and 18 bcm (8%) is for domestic and industrial use. (92%). (Bimal Prasanna Mohanty et al. 2011).

MATERIAL AND METHODS

STUDY AREA Mohania experiences a humid subtropical climate with large variations between summer and winter temperatures. The temperature ranges between 22 and 46 °C (72 and 115 °F) in the summers. Winters in Mohania see very large diurnal variations, with warm days and downright cold nights. The dry summer starts in April and lasts until June, followed by the monsoon season from July to October. Cold waves from the Himalayan region cause temperatures to dip across the city in the winter from December to February and temperatures below 5 °C (41 °F) are not uncommon. Fog is common in the winters, while hot dry winds, called loo, blow in the summers. The average annual rainfall is 1,110 mm (44 in). In the present investigation, there are five water samples from different areas of Mohania Block were collected in the month of

April to June were carried out by water testing kits which are supplied by Nice Chemicals (P)Ltd. Cochin, Kerala. The temperature of water samples were measured by thermometer (Celsius). The estimation of Nitrate was carried out immediately on the sampling station. The water analysis observed data were compared with the standard data provided by WHO for drinking purposes.

RESULTS & DISCUSSION

The physico-chemical characteristics of Ground Water are given in Table-1 and data are comparing with WHO (1992) and IS : 10500 standards for drinking water.

1. TEMPERATURE: The temperature of different sampling Stations ranges from 37°C (S1, and S2) to 38°C (S3, S4 and S5). The temperature of ground water depend upon the solar radiation and atmospheric temperature (Garg et al., 2009; Narayana et al. 2008, Verma et al. 2011). The Temperature of ground water also effect the phosphate, hardness and DO but it shows negative result with ammonia.

2. PH: The PH value of Ground water varies from 8 (S3) to 9 (S1, S2, S4 and S5). The desirable PH range for drinking water is 6.5 to 8.5 (WHO). The Slightly increase in PH is due to presence of salt of weak acid or strong bases. The alkaline nature of water is also related to the bicarbonate formed due to reaction takes place between carbon dioxide and minerals (Sinha and Biswas, 2011; Saxena and Saxena, 2012).

3. ALKALINITY: The Alkalinity values are varies from 60 mg/l to 90 mg/l. The values of alkalinity are within the permissible limit as per WHO (200 mg/l) and BIS (120 mg/l) with respect to the drinking water.

4. IRON: The Iron values are varies from 0.1 mg/l to 0.2 mg/l. of iron generally observed higher than permissible limit for drinking water as per WHO guidelines. (1 mg/l).

5. TOTAL HARDNESS: The values of total hardness varies from 100 mg/l (S1) to 150 mg/l (S3) which are within the permissible limits i.e. 250 mg/l as per BIS guide lines for drinking water.

6. CALCIUM HARDNESS: The calcium hardness in ground water samples were varies from 50 mg/l (S3) to 100 mg/l (S1). The permissible limit for calcium hardness in drinking water is 200 mg/l IS: 10500-1993. The observed values of calcium hardness in sampling stations are within the permissible limit.

7. NITRATE: The values of nitrates were varied from 20 mg/l at S1, 50 mg/l at S3 and S5, 105 mg/l at S4 and 50 mg/l at S2 sampling stations. These values are within the permissible limit i.e., 100 mg/l (WHO). The use of highly contaminated ground water can cause health disorder such as digestive, respiratory, nervous system, kidney, spinal cord, heart and mental imbalance.

8. NITRITES: The value of nitrites were varied from 0.5 mg/l at sampling station S1, S4, S5 and 1.0 mg/l at S2

and 3 mg/l at S3 sampling stations. These observed values are within the permissible limits.

9. CHLORIDES: The chloride value ranged from 20 (S1) and 30 mg/l (S3 and S4) 80 mg/l (S2 and S5) which are within the permissible limits. The Permissible limit for chloride is 250 mg/l as suggested by WHO and ISI.

10. Ammonium, Phosphate, Residual Chlorine, Fluoride, DO, BOD etc. were observed negligible concentration in the ground water samples of Mohania.

Table 1 : Showing different Physico-Chemical Parameters of Ground Water of Mohania Block

S. N	Parameters	Study area Location				
		S1	S2	S3	S4	S5
1	Temperature (°C)	37	37	38	38	38
2	PH	9	9	8	9	9
3	Phosphate (mg/l)	0.5	0.0	0.0	0.0	0.0
4	Iron (mg/l) 5 1 5 1 3	0.1	0.2	0.1	0.1	0.1
5	Alkalinity (mg/l)	90	80	60	90	80
6	Calcium Hardness (mg/l)	100	75	50	50	60
7	Nitrate (mg/l)	20	105	50	105	50
8	Nitrite (mg/l)	0.5	1.0	3.0	0.5	0.5
9	Ammonium (mg/l)	0.5	0.5	0.5	0.0	0.0
10	Fluoride (mg/l)	0.0	0.0	0.0	0.0	0.0
11	Chloride (mg/l)	20	80	30	30	80
12	Total hardness (mg/l)	100	100	150	120	100
13	Sulphate (mg/l)	160	130	120	120	140
14	Residual chlorine (mg/l)	0.0	0.0	0.0	0.0	0.0

15	Sodium (mg/l)	30	40	50	40	30
16	Potassium(mg /l)	9	9	10	12	11
17	DO (mg/l)	2.2	2.4	2.4	3.0	3.0
18	BOD(mg/l)	2.0	2.4	2.6	2.5	3.0

CONCLUSION:

It was observed that the value of , P H , Calcium Hardness, Nitrate, Nitrite, Ammonium, Fluoride, residual Chlorine, Chloride and Total hardness are within the permissible limits where the value of Nitrate is more than the permissible limits. The high concentration of Nitrates needs proper treatment before, the use for drinking and Irrigation purposes to avoid harmful effects.

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