Physico Chemical Analysis of Ground Water Quality of Sherghati Block, at Gaya District, Bihar (India)

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ABSTRACTABS

The present paper deals with Physico-chemical analysis of ground water quality of five different villages of Sherghati block at Gaya district, Bihar, i.e. **Bela (S1), Chanpi (S2), Cherki (S3), Chitabkala (S4) and Shrirampur (S5).** The groundwater parameters such as, **pH, Temrature, Alkalinity, Phosphate,Calcium, Magnesium, Sodium,Potassium,Turbidity, Total Hardness, Dissolved Oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand,TDS, Arsenic, Iron, Nitrate,Chloride** and **Fluoride** were estimated in the samples to evaluate their quality. The data of physico - Chemical parameters are compared with WHO (1992) and IS: 10500 standards for drinking water. Our result revealed that concentration of DO, BOD, Total Hardness, Nitrate, Calcium, Magnesium, Turbidity, Iron,Alkalinity,and Chloride are within permissible limits. Whereas Arsenic and Phosphate are negligible in comparison to permissible limits. The Ground water can be used as drinking and irrigation purposes. Finally it can be suggested that an intensive study may be carried out on other living organisms to avoid the hazardous/ injurious impact of the other chemical substances if these are present in the ground water.

KEYWORDS: GROUNDWATER, WATER QUALITY, DISSOLVED OXYGEN.

INTRODUCTION

The **Sherghati block** is situated at *Lat. 24.5000°N-24.6930°N, Long.* 84.7290°E-*84.8990°E* in southern part of Gaya District Bihar (formally Magadha), India. A meteorite that came from Mars fell here on 25 August 1865; it is now kept in a London museum and is known as the Shergotty meteorite. Sherghati forms part of Falgu, Morhar, Dardha and Paimar River. All streams emerge from the Chhotanagpur hills in southern part of the district and meet the Ganga to the north. Dendritic and parallel to sub-parallel drainage patterns are dominating in this region. The Sherghati Block is surrounded by Guraru block in the Norht, Amas block in the North-west, Bankebazar in the West , Dobhi block in the East and one State boundary, Jharkhand in the South.There are total 9 Panchayat and 84 Villages are present in the Sherghati Block. Geomorphologically the Sherghati block is covered by flat/gentle slope, which is made up of unconsolidated sediment. The elevation of gently sloping pediplain varies from 90 to 70 m above msl. The area experiences a continental monsoon type of climate owing to its great distance from the sea. The normal rainfall during Monsoon season is 1243.9 mm and during no Monsoon season is 160.6 mm. The climate is extreme and comprises three broad seasons-the summer, the monsoon and the winter. The groundwater regime of the Sherghati block has been monitored from the existing network monitoring wells and inventoried observation wells. Observation wells are dug wells and piezometer of minor irrigation department, Government of Bihar. The average depth of dug wells is 0-15 mbgl. Piezometers are on an average 55 m bgl depth. The pre monsoon water level in dug well zone 5-6 m bgl and in post monsoon water level varies from 1-2 m bgl. Comparatively deeper water level 7.73-8.84 m bgl is reported from the deep tube wells of PHED.

Water is extremely essential for survival of all living organisms. Life cannot exist on this planet without water. It is used for drinking, bathing, recreation, irrigation, navigation and power generation purposes etc. The total amount of water available on the earth has been estimated at 1.37 billion cubic km, enough to cover the planet with a layer of about 3 km deep (Garrison, 2005). More than two-third of the earth surface is covered with water.Approx 97.2% of water on earth is salty and only 2.8% is present as fresh water from which about 20% constitutes ground-water. Groundwater is generally considered to be much cleaner than surface water. About 70% of the fresh water (River,Lake,Ponds,Streams and Ground water) on the planet is blocked up in ice at the pole, and most of the remainder is retained as soil moisture or deposited in deep underground aquifers. In the final tally less than 0.5% of all the fresh water on the earth is technologically and economically accessible for human use. India is an integral part of the global water crisis. The National Water Policy 1987 underscores water as a prime natural resource to meet the basic human need and so it is a precious national asset.

A study was conducted by the Central Pollution Control Board (CPCB) with regard to the projected status of water consumption in 453 cities and towns in the country (CPCB, 2010). According to the study the water supply in these cities and towns of India, is being provided at a rate of 135 litres per person per day (CPCB, 2010); which has been restated in recent work by (Kumar, 2014).The management for waste water discharges from habitat centers, industries, agricultural activities etc to maintain the quality for various purposes. India required 60% water for irrigation and 85% for drinking purposes which depends upon

groundwater ; India has more than 20 million bore wells in comparison to 0.2 million in USA. The increasing human population has tremendously increased the demand of fresh water. The rapid growth of urban areas has affected the ground water quality due to over exploitation of resources and improper waste disposal practices. The present study and investigation has been designed to understand the *chemical characteristics of ground water of this region.*

OBJECTIVE

The objective of the present investigation has been made to understand the chemical characteristics of ground water quality of **Sherghati block.**

STUDY AREA

In the present investigation, there are five water samples from different Villages of Sherghati block were collected in the month of February 2023 to estimate quality of ground water. This water was extensively used for drinking purposes. The sampling stations are **Bela (S1), Chanpi (S2), Cherki (S3), Chitabkala (S4) and Shrirampur (S5).**

MATERIALS AND METHODS

The analysis of pH, Turbidity, Alkalinity, TDS, Calcium, Total Hardness, Magnesium,Iron,Nitrate, Phosphate,Fluoride, Chloride, Arsenic,BOD,COD,DO etc. were carried out in P.G.Department of Botany,Magadh University,Bodh-Gaya by water testing kits which are supplied by Nice Chemicals (P)Ltd. Cochin, Kerala The Temperature of water samples were measured by Thermometer (Celsius).Method of Water analysis followed by APHA (American Public Health Association) 23rd Edition 2017 and observed data were compared with the standard data provided by WHO for drinking purposes.

RESULTS AND DISCUSSION

The ground water is quality parameters given in **Table-1.** And data are comparing with WHO (2011) and IS: 10500 standards for drinking water.

Temperature: Temperature of water plays important role for living beings. Quality of water is also maintained by temperature. The temperature of different sampling points ranges from 27°C to 28°C

pH: The pH of ground water ranges from 7.05 to 7.25 which is within the range of drinking purposes, proposed by ISI 1991 is 6.5 to 8.5

Alkalinity: Generally ground water associated with dissolved carbon dioxide, bicarbonates and hydroxides which occurs due to dissolution of minerals in the soil. The values of alkalinity ranges from 214 to 247 mg/l.

Iron: The concentration of iron varies from 0.4mg/l to 0.11 mg/l whereas permissible limit for iron is 1.0 .

Calcium Hardness: The value of calcium hardness varies from 102.11mg/l to 114.70mg/l.

Nitrate: The biochemical oxidations of nitrogenous substances coming from domestic wastes are main source of nitrate in Ground Water concentration of nitrate in present study varies from 0.48 mg/l to 1.0 mg/l which is under the permissible limit of WHO health based guide line values

Chloride : The chloride values ranges from 102.30 mg/l to 115.80 mg/l in the present sample. The permissible limit of chloride in drinking water is 250mg/l as suggested by WHO and ISI. The higher concentration of chloride may affect heart and kidney disease, (Patil et al., 2002)

Total Hardness: The temporary hardness of water is only due to dissolved of Calcium and Magnesium bicarbonate in water, where as permanent hardness is due to presence of chlorides of Calcium and Magnesium in water. The value of total hardness ranges 161mg/l to 202 mg/l. The BIS Limit is 200 to 600 mg/l

Magnesium: Magnesium of all water samples ranged between 16 to 20 mg/l. The BIS Limit is 30mg/l to 100 mg/l.

Fluoride: As per BIS the permissible limits of fluoride concentration in drinking water is 1.0 to 1.5 ppm with a rider lesser the fluoride the better, as fluoride is injurious to health. All the water samples were value between 0.68 to 0.93 mg/l.

Turbidity: Turbidity of water samples ranged between the values of 1.0 NTU to 2.0 NTU. Which are all well below the maximum permissible limit.

TDS (Total Dissolve Solid): Al the samples are analyzed to have TDS values in the range of 502 mg/l to 564 mg/l, which were well within the BIS Limit between 500 mg/l to 2000 mg/l.

The values of **BOD** (2.0mg/l to 2.44 mg)/l, **COD** (4.8 mg/l to 5.9 mg/l)**, DO** (2.1 mg/l to 4.0 mg/l)**,Na** (35 mg/l to 60 mg/l)**,**and **K** (6 mg/l to 11mg/l) level was well within the limits.

Phosphate and Arsenic: the values of Phosphate and Arsenic are negligible.

TABLE 1: SHOWING DIFFERENT PARAMETERS OF GROUND WATER OF SHERGHATI BLOCK

SI No	Parameters	Experimental Area Location				
		S1	S2	S3	S4	S5
1	Temperature(ºC)	28	28	28	27	28
2	PH	7.05	7.14	7.13	7.17	7.25
3	Alkalinity (mg/l)	239	243	237	214	247
4	Phosphate (mg/l)	0.0	0.0	0.0	0.0	0.0
5	Iron (mg/l)	0.11	0.10	0.06	0.07	0.04
6	Calcium Hardness (mg/l)	109	103	114	113	102
7	Nitrate (mg/l)	0.48	1.0	0.80	0.56	0.57
8	TDS(mg/l)	515	526	502	506	564
9	Magnesium(mg/l)	16	19	16.4	18	20
10	Fluoride (mg/l)	0.68	0.88	0.83	0.93	0.84
11	Chloride (mg/l)	111	102	116	109	107
12	Turbidity(mg/l)	1.0	1.0	1.0	1.0	1.0
13	Arsenic (mg/l)	0.0	0.0	0.0	0.0	0.0
14	Total Hardness (mg/l)	218	193	236	161	202
15	COD(mg/l)	5.0	5.7	5.5	4.8	5.9
16	Sodium (mg/l)	60	40	35	55	47
17	Potassium (mg/l)	6	8	10	7	11
18	DO(mg/l)	3.2	3.5	2.3	2.1	4.0
19	BOD(mg/l)	2.0	2.34	2.44	2.24	2.20

CONCLUSION

1. It was observed that the concentration of all parameter of ground

Water were the permissible limit of WHO health based guide line values.

2. The observed values of pH ,Sodium, COD,BOD,DO,TDS,Nitrate,

Potassium,Turbidity, are within the permissible limits as per

WHO guide lines for drinking water.The values of Phosphate,

and Arsenic are observed negligible.

3. The values of Iron is less than the BIS Limits (> 1.0 – NR mg/l).

4. The values of Fluoride is less than the BIS Limits (> 1.0 to 1.5

mg/l).

SUGGESTION

The detail investigation may be carried out on other living organisms to avoid the hazardous/ injurious impact of the other chemical substances. Overall the block comes under"Safe"category, says that there is some scope for ground water development and water can be used for irrigation and safe drinking purposes.

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