Analysis of drinking water of rural area of Kahalgaon Sub division, Bhagalpur: Bihar

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ABSTRACT

Physiochemical parameters like pH, electrical conductivity, total dissolved solids, total hardness, calcium chloride and dissolved oxygen have been studied for drinking water of Kahalgaon sub division area lying under Bhagalpur district, Bihar. The result of the physio chemical parameters related to water quality standard were compared with the World Health Organization.

Key words : *Drinking Water, Physiochemical Parameters, Kahalgaon, Bhagalpur.*

Introduction

The physio chemical parameters of water quality is of prime importance to assess its quality for different purposes like domestic, agriculture, Industry, etc. It is a measure of condition of water related to the requirements of one or more biotic species. It is most frequently used by reference to a set of standards against which compliance can be assessed. The most common standards used to assess water quality relate to health of ecosystems, safety of human contact and drinking water.

Ground water is the major source of drinking water in urban as well as rural areas. The importance of ground water for the existence of human society cannot be neglected. Besides this, it is an important source of water for the agricultural and industrial sector. Till today, it is considered as a most important source of water. Ground water crisis is not because of the natural factors. It is because of the unjust behavior of human beings. Much of ill health which affects humanity, especially in the developing countries can be traced to lack of safe and whole some water supply.

The quality of ground water is the resultant of all the processes and reactions that acts on the water from the moment it condensed in the atmosphere to the time it is discharged by a well or spring and varies from place to place and with the depth of the water table. Ground water is essential as it accounts for about 88% safe drinking water in rural areas, where population is widely dispersed and the infrastructure needed for treatment and transportation of surface water does not exist.

Standard desirable limit of water quality parameters in drinking water prescribed by different agencies is shown in Table 1.

Materials and Methods

Study Area and Significance of Research

Kahalgaon is a town and a municipality in Bhagalpur district in Bihar, India and it is situated at elevation 16 meters above the sea level. It is located close to Vikramshila that was once a famous Centre

S156

Eco. Env. & Cons. 27 (February Suppl. Issue) : 2021

Table 1.

Parameters All in mg/ L except pH	ISI		WHO		ICMR		BIS	
	HDL	MPL	HDL	MPL	HDL	MPL	HDL	MPL
pH	6.5-8.5	-	7.0-8.5	6.5-9.5	7.0-8.5	6.5-9.2	7.0-8.3	8.5-9.0
TDS	500	2000	-	-	500	1500	500	2000
Ca	-	75	-	75	-	-	-	75
Cl⁻	250	-	250	-	250	-	250	-
TH	300	600	200	600	300	600	200	600
Alkalinity	200	600	-	-	-	-	200	600
COD	150	255	-	-	-	-	150	255

ISI- Indian Standard Institute
ICMR- Indian Council of Medical Research
HDL- Highest Desirable Level
TDS- Total Dissolved Solids
COD- Chemical Oxygen Demand.

WHO-World Health Organization
BIS- Bureau of Indian Standards
MPL-Maximum Permissible Level
TH- Total Hardness

of Buddhist learning across the world, along with the Nalanda during the Pala dynasty. The Kahalgaon NTPC located near the the town is very useful to the people. It is also a city of historical importance on the southern banks of the Holy river Ganga.

Significance of Research in this Area

Kahalgaon is a developing town and there is a number of educational institutions and hospitals are situated in and around the town. About 50 villages are entirely depending upon this town. Everyday around thousands of students and people travels through the town. There are number of mango pulp and small scale industries in and around the city.

Therefore, it was very essential to do assessment of environment with respect to water as it is a daily consumption and essential for humans. Now a days, awareness has been increased on environmental issues and trace elements play a vital role, either helpful or harmful to human health.

In this regards, the complete study and assessment of water quality around Bhagalpur district was required. It would be helpful to the public as well as administration about the status of the rural areas water quality, public health, environmental conditions and issues of the country.

Objectives

1. Survey and selection of a appropriate number of sampling locations around Kahalgaon subdivision.
2. Collection of water samples from different locations.

3. The quality of water has been estimated by its physical, chemical and biological parameters.

Preparation of Water Samples

The samples were collected in clean polythene bottles without any air bubbles.

The bottles were rinsed before sampling and tightly sealed after collection and labelled in the field. The temperature of the samples were measured in the field itself at the time of sample collection. The samples were kept in refrigerator maintained at 4º C.

Results and Discussion

The results of the physiochemical analysis of the drinking water samples S1 to S10 collected from 10 different places in Kahalgaon subdivision Bhagalpur District are presented in Table 2.

pH

pH is considered as an important ecological factor and provides an important piece factor and piece of information in many types of geochemical equilibrium or solubility calculation. pH is an important parameter in water body and the pH values fluctuated between 6.67 to 6.98 (Table 2). The limit of pH value for drinking water is specified as 6.5 to 8.5. The pH usually shows slightly alkaline trend.

Temperature

During survey the temperature of that area was about 31.6-33.6 ºC. Water temperature governs the

Table 2. Water analysis of Sample Report

Sample No	Village Name	pH	Observed conductivity		TDS		Salinity	DO	Temp° C
			200 μ.Mho/cm	20 μ.Mho/cm	200 ppt	20 ppt			
S_1	Pirpainti	6.70	1.16	1.20	0.5	0.78	1.5	7.4	31.8
S_2	Bateshar	6.67	1.48	1.41	0.6	1.03	2.3	7.2	32.6
S_3	Barahat	6.96	1.26	1.60	1.3	2.2	1.9	7.8	32.4
S_4	Vikramshila	6.82	1.69	1.28	1.2	1.34	2.6	7.7	33.0
S_5	Ekchari	6.97	1.38	1.44	0.5	1.65	3.2	7.6	31.6
S_6	Nandlalpur	6.72	1.23	1.63	0.6	1.10	2.8	7.8	32.9
S_7	Ishipur	6.92	1.90	1.35	1.7	0.90	1.7	7.7	33.1
S_8	Shivnarayanpur	6.89	1.56	1.22	0.04	1.46	2.4	7.6	33.6
S_9	Rampur	6.98	1.28	1.30	0.06	1.70	2.3	7.5	32.6
S_{10}	Maheshpur	6.95	1.26	1.56	0.9	1.56	2.0	7.3	32.8

composition and activities of biological species to a large extent. It has an effect on most of the chemical reactions that occur in natural water system and has pronounced effect on the solubility of gases.

Chlorides

Chlorides are important in detecting the contamination of ground water. The permissible limit of chloride in the drinking water is 250 mg/L. The Chlorides are estimated by titrating the water samples with standard solutions of Silver Nitrate using Potassium Chromate as an indicator in this method. This method is called Mohr's method.

Total hardness (TH)

ISI has specified the total hardness to be within 300 mg/L of $CaCO_3$. Total hardness has fluctuating trends in its value were observed in all the stations.

Chemical Oxygen Demand (COD)

The observed COD values in all the stations are varying from 6.4 to 12 mg/L. The permissible limit of COD for drinking water is 255 mg/L. Hence, the observed COD values in all the stations are well within the desirable limit.

Total Alkalinity

The standard desirable limit of alkalinity in potable water is 120 mg/L. The maximum permissible level is 600 mg/L. The mean value of alkalinity in the ground water of area of present study was 128.68 mg/L (Table 3). This exceeded the desirable limit in all stations. The value of alkalinity in water provides an idea of natural salts present in water. The cause of alkalinity is the minerals which dissolve in water from soil. The various ionic species that contribute to alkalinity includes bicarbonate, hydroxide, phosphate, borate and organic acids. These factors are characteristics of the source of water and natural process taking place at any given time.

The analysis of the water quality parameters of ground water from Kahalgaon division, Bhagalpur, Bihar, shows that the pH, Chloride ions, total hardness, calcium and COD values are well within the

Table 3.

Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	WHO
pH	6.70	6.67	6.96	6.82	6.97	6.72	6.92	6.89	6.98	6.95	7.0-8.5
T °C	31.8	32.6	32.4	33.0	31.6	32.9	33.1	33.6	32.6	32.8	-
TDS 200 ppt	0.5	0.6	1.3	1.2	0.5	0.6	1.7	0.04	0.06	0.9	-
TDS 20 ppt	0.78	1.03	2.2	1.34	1.65	1.10	0.90	1.46	1.70	1.56	-
Ca^{2+}	51.2	49.3	40.2	37.5	70.8	46.3	51.3	55.7	46.7	40.8	75
Cl-	185.9	165.6	168.2	128.6	230.2	247.2	235.4	198.2	212.6	244.5	250
TH	212.2	198.6	188.5	198.6	159.6	192.6	201.5	166.5	194.2	165.2	200
Alkalinity	145.5	130.7	129.6	155.2	132.0	102.8	128.5	122.6	112.6	127.3	120
COD	9	10	9.2	10.3	7.8	12	9.2	8.6	6.4	7.5	-
DO	7.4	7.2	7.8	7.7	7.6	7.8	7.7	7.6	7.5	7.3	8.0

S158

Eco. Env. & Cons. 27 (February Suppl. Issue) : 2021

permissible limits. The TDS was well above the desirable limits which was due to improper drainage system of dyeing units. In conclusion from the results of the present study, it may be said that the ground water of Kahalgaon division, Bhagalpur, Bihar is though fit for domestic and drinking purpose need treatments to minimize the contamination especially the alkalinity. This is an increasing awareness among the people to maintain the ground water at their highest quality and purity levels and the present study may prove to be useful in achieving the same.

Application

This survey is very useful to know the quality of drinking water to public before using in this area. This water is safe to drink and is not contaminated.

Conclusion

The result of the present survey indicates that the quality of drinking water varies from place to place. Drinking water of some places of certain parameters indicate that the water of those places is less suitable for drinking as such. Hence, it is suggested that any water sources in the study area should be analyzed before use for its suitability for drinking purpose. The results also suggest that the contamination problem is not alarming at present but ground water quality may deteriorate with time. Hence, proper care must be taken to avoid any contamination of drinking water and its quality should be monitored periodically.

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