eISSN 2581-8996
[Date]
THE INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN MULTIDISCIPLINARY SCIENCES (IJARMS)
A BI-ANNUAL, OPEN ACCESS, PEER REVIEWED (REFEREED) JOURNAL
Vol. 4, Issue 02, July 2021

Studies On The Water Quality Assessment In Bagicha Nagar Panchayat Neighbouring Areas Jashpur, Chhattisgarh: Seasonal Parametric Variation

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Received: 07 July 2021, Accepted: 15 July 2021, Published with Peer Review on line: 10 Sep 2021

Abstract

In this paper an attempt has been made to study the water quality of Bagicha, Jashpur, Chhattisgarh and its neighbouring area with an aim to area the suitability of drinking water of the selected points. The parameters have been compared with the standard values recommended by the international standard of drinking water of World Health Organisation (here in after referred to as the "W.H.O."), United States Public Health (here in after referred to as USPH) and European standard. In the research water of the project area was found to be moderately hand. Other parameter has also been compared with the standard values and the result shows that they are well within the optimum permissible limits.

Key words: Water quality, Drinking water. Bagicha Nagar Panchayat.

Introduction

Water is used for diverse purpose like drinking, cooking, washing, bathing, gardening, irrigation, industrial purpose etc. The total fresh water reserves constitute less than 3% of the total water available on the earth and a great part of fresh water is not assessable to human beings as 87% of the same in locked in the ice-caps and glaciers, atmosphere, soil and underground. The requirement of water quality varies with uses drinking water quality is a matter of great concern as it is directly and deeply related to human health. This concern becomes more prominent in the light of the fact that drinking water reservoirs are being contaminated directly or indirectly by pollutants released from various sources. In our area of Bagicha block, Jashpur, Chhattisgarh, utilization of total water is currently estimated 1050 lakh litre. The total amount of water as estimated in 2020, required for the purpose of irrigation and live stock as follows.

It is pertinent to note here that available amount of underground water is 6005 lakh litre. The utilization of water for drinking and other domestic purpose is generally considered to be most essential to human beings. An average person utilizes approximately 60 thousand litres of water during his life span. In our study area the average rate of water consumption in approximately at 65 litres per person per day.

PURPOSE	QUANTITY OF WATER IN LITRE(IN LAKH)
Irrigation	845
Live Stock & Power	285
Total	1130

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STUDY AREA:

Bagicha is situated at National Highway-43, 92 km west of Jashpur district headquarter. It is under the Bagicha block and comprises of 15 wards. The total area of Bagicha Nagar Panchayat is hectares and as per the 2021 census total population is. The population density of this area is at persons per sq. km. The area is surrounded by small hills and mild forest of sal, sagwan, bamboos etc. The topographic height of this area is metre from the sea level and it witnesses an average temperature and average rain fall. Geologically it is a high grade area.

For the reasons of unscientific and indiscriminate dumping of solid and liquid waste products in the area, different components of environments such as air water and soil are being continuously contaminated, making then unfit for domestic and agricultural by the existing scenario, researcher decided to undertake the instant analysis of physic-chemical characteristic of water of this area.

MATERIAL AND METHOD

Water sample from the selected ponds, tapnal and bore well, located in the study area and its neighbouring area were collected on a monthly basis for an entire year starting from February 2018 to January 2019. The study period was divided into three seasons namely pre-monsoon (February to May), monsoon (June to September) and post-monsoon (October to January) based on the intensity and duration for rainfall. The instant analysis was carried out by applying the standard methods in following steps.

SELECTION OF THE SAMPLING SPOTS

The sampling spots are named as SP-1 to SP-10.

SAMPLING COLLETION

Water samples were collected in a one litre plastic bottle previously soaked with cone. HNO_2 acid and then cleaned with detergent followed by rising with double distil water.

SAMPLE PRESERVATION & EXAMINATON:

Collected water samples were preserved in an ice cooled chamber and they were kept in a dark room. Temperature, pH, electricity conductivity, dissolve oxygen (here in after referred to as the DO), biological oxygen demand (here in after referred to as the BOD) and chemical oxygen demand (here in after referred to as the COD) sampling were carried out and determined.

Source	Sampling Points	Type of Water
SP-1	Rajpuri Falls	River Water
SP-2	Gamhariya	River Water
SP-3	Damhatoli	River Water
SP-4	Jhapidarha	River Water
SP-5	Ronni Road	Bore well Water
SP-6	Thana Bagicha	Tapnal Water
SP-7	Govt. Hospital Bagicha	Tank Water
SP-8	Govt.Girls H. S. School	Well Water
SP-9	DAV School Bagicha	Bore well Water
SP-10	Dodki River	River Water

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Table no1: List of sampling points

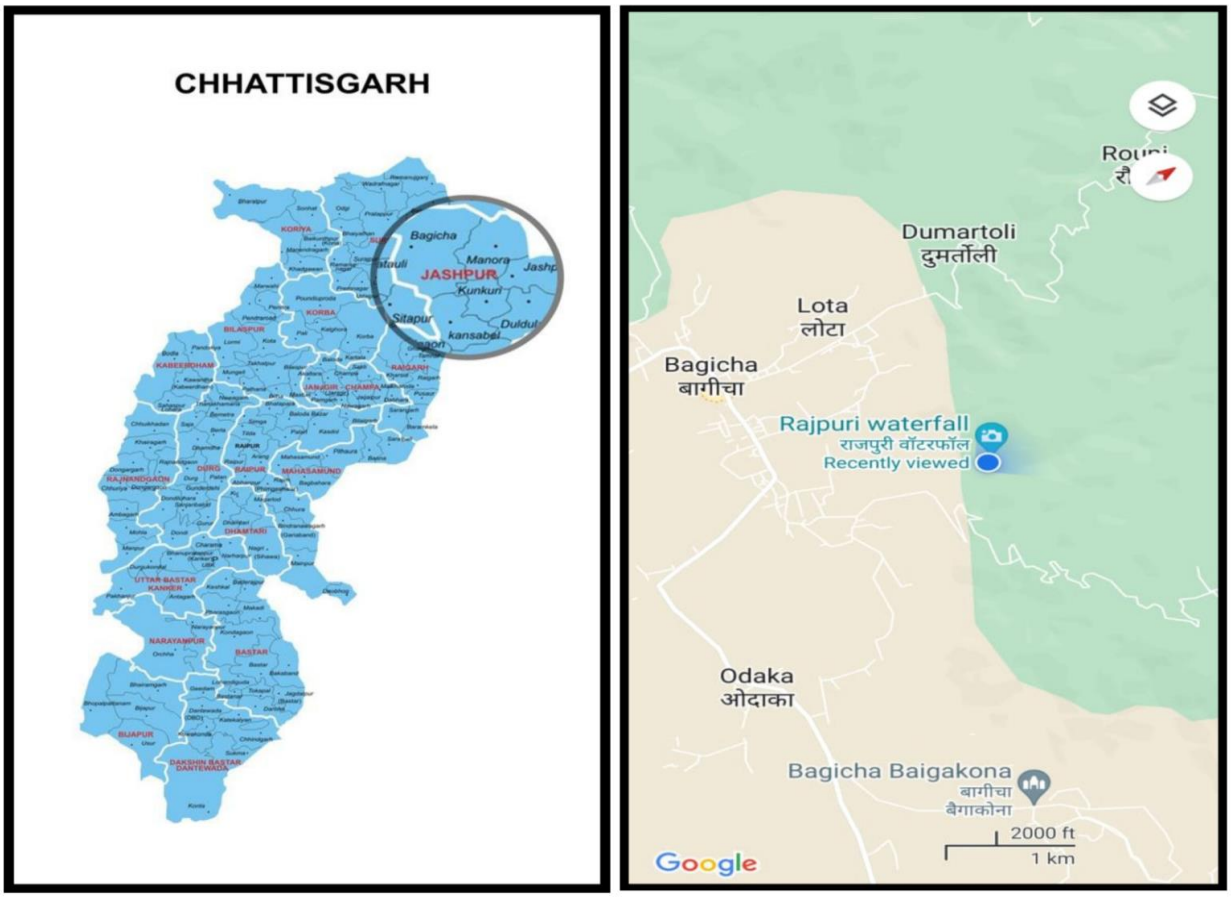

Figure – Map of the study area

RESULT AND DISCUSSION

The data on the physic-chemical analysis of water carried out at various sites has been provided in Table. The seasonal effect plays a vital role in determining water temperature at 9.0^0C and the maximum temperature at 30.6^0C were recorded during the post-monsoon and pre-monsoon seasons respectively. The maximum pH value at 9.1 and the minimum pH value at 7.1 were recorded in the month of May and March respectively, following the standard as suggested by W.H.O. of 6.5 to 9.2. The pH values were founded to be slightly alkaline. Electrical conductance was found to be maximum and minimum at 360micromho/cm and 286micromho/cm respectively. Lengengger (2010) has noted the importance of electrical conductance as a measure for salinity, which affects the taste of water. The permissible value of conductivity, as suggested by USPH, is 300mircromho/cm. TDS was observed to be maximum and minimum at 298mg/L and 200 mg/L respectively. The permissible value of TDS is 500 mg/L.

TOTAL HARDNESS

The maximum and minimum value of total hardness of collected water samples were at 765 mg/L and 300 mg/L respectively. This was due to dissolved ions of Cl^-, $SO_4$2- and carbonates of Ca++ and Mg2+ ions. The permissible value of hardness as suggested by USPH, is at 500 mg/L.

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DISSOLVE OXYGEN

The maximum and minimum value of DO was found to be at 12.5 mg/L ppm and 4.5 mg/L ppm respectively. As suggested by USPH, the permissible value is 4.0 to 6.0. It is pertinent to note here that the lower values of DO are reported is the pre-monsoon season. It may be due to the decomposition of organic matters and limited flow of water. During monsoon and post-monsoon, the level of DO was quite satisfactory, perhaps because of good aeration caused by rain water as it has been observed by Hannan (2005).

PARAMETERS	MAXIMUM PERMISSIBLE USPH SANDARD	LEVEL,W.H.O. STANDARD
pH value	6-8.5	6.5 - 9.2
Conductivity(micromhos/cm)	300	-
TS(mg/L)	-	-
TDS(mg/L)	500	-
TSS(mg/L)	5.0	-
Alkalinity(mg/L)	-	-
Total Hardness ($CaCo_3$ mg/L)	-	500
DO(mg/L)	4.0 - 6.0	-
COD(mg/L)	4.0	10
BOD(mg/L)	5.0	6.0
Fluoride(mg/L)	1.5	-
Chloride(mg/L)	250	500
Sulphate(mg/L)	250	-
Phosphate(mg/L)	0.1	-

Table no 2: Parameters of water quality in international standards.

CHEMICAL OXYGEN DEMAND

The maximum value of COD was observed to be at 13.0 mg/L which was during the post-monsoon season while the minimum value was observed to be at 4.0 mg/L, which was during the post-monsoon season. The higher value was compared with the permissible value limit of 10 mg/L, as suggested by W.H.O. The higher value was due to the presence of coal particles carbonaceous material.

BIOLOGICAL OXYGEN DEMAND

The maximum value of BOD was observed to be at 9.0 mg/L, during the month of May while the minimum value was observed to be at 1.2 mg/L, during the month of September. The permissible value 6.0 mg/L high for BOD is due to the presence of a large number of living organisms in water.

CHLORIDE

The chloride content in drinking water is generally not harmful to human beings, though it may be injurious to people suffering from kidney related diseases. Chloride imparts salty taste to water. 250 mg/L of chloride in water is the maximum permissible limit for domestic purposes. The maximum value of chloride was detected to be at 35.0 mg/L while the minimum value was detected to be at 13.0 mg/L. Chloride content of all studied samples was well below the prescribed limit.

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SULPHATE

Sulphate is one of the important ions present in natural water. It produces cathartic action in human beings when present in excess amount. It is also associated with respiratory diseases. Therefore, the recommended content of sulphate in drinking water is limited to 250 mg/L. In the present study, sulphate ion was observed by the instrumental method and the minimum and maximum value was found to be present in sampling spot SP-1 and SP-6 at 32.2 mg/L and 66.0 mg/L respectively.

Parameters	**Seasons**	**SP-1**	**SP-2**	**SP-3**	**SP-4**	**SP-5**	**SP-6**	**SP-7**	**SP-8**	**SP-9**	**SP-10**
Temp ^{0}C	PRM	29.1	27.0	27.1	25.3	29.1	25.1	29.1	29.3	29.1	30.6
	M	26.9	25.1	18.9	16.0	18.2	19.1	16.0	17.0	18.1	18.2
	POM	12.3	10.1	9.0	11.1	10.1	11.0	10.4	11.1	10.1	9.2
pH Value	PRM	9.0	8.0	7.1	7.9	9.1	7.1	8.3	7.8	8.1	7.4
	M	7.5	7.7	7.9	7.6	8.0	7.6	8.0	7.3	8.0	7.8
	POM	8.2	8.0	8.2	8.0	8.2	7.5	8.2	7.8	7.5	7.6
Conductivity (micromhos/cm)	PRM	298	298	285	290	300	298	305	307	30	298
	M	285	300	310	320	350	296	305	302	300	305
	POM	350	390	350	380	358	298	300	305	298	305
Total Hardness ($CaCO_3$,mg/L)	PRM	500	435	476	500	448	765	515	490	499	615
	M	308	340	350	360	322	350	302	320	360	405
	POM	315	325	320	325	300	326	321	300	301	342
TDS(mg/L)	PRM	295	250	295	298	280	296	281	296	286	287
	M	282	260	250	252	265	268	285	200	280	286
	POM	282	260	252	250	268	266	285	298	286	280
DO(mg/L)	PRM	12.5	10.0	8.2	6.7	6.7	6.7	7.0	7.3	7.3	8.2

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	M	8.2	8.0	8.2	9.0	9.2	7.0	7.4	8.0	7.5	8.1
	POM	8.6	8.6	8.8	9.8	12.0	3.8	8.0	4.5	3.6	6.0
BOD(mg/L)	PRM	4.0	5.2	4.2	6.2	7.8	9.0	7.8	8.0	6.0	5.5
	M	3.5	3.0	3.5	5.8	4.5	6.2	5.2	3.5	2.8	6.8
	POM	2.0	1.4	1.4	2.1	2.1	2.2	1.5	1.4	1.2	2.0
COD(mg/L)	PRM	7.8	9.0	10.1	7.6	11.0	13.0	11.6	7.8	8.5	10.6
	M	7.2	8.0	9.5	7.0	10.3	12.2	9.6	6.1	8.0	8.5
	POM	6.5	7.5	8.0	6.2	9.0	6.2	6.2	4.0	8.0	8.2
Chloride(mg/L)	PRM	25.5	25.0	26.2	30.2	28.2	35.0	28.0	25.4	30.0	30.0
	M	21.2	24.0	25.0	28.0	26.5	28.8	28.3	26.0	30.2	32.0
	POM	14.5	15.0	16.0	14.5	13.0	25.0	25.4	24.0	30.0	32.4
Sulphate(mg/L)	PRM	66.0	58.0	58.0	45.0	54.0	50.2	50.0	50.0	45.0	35.0
	M	37.0	36.2	38.0	35.0	35.1	48.8	48.6	49.0	45.2	38.0
	POM	35.0	34.0	35.2	32.2	33.0	50.0	52.0	52.8	49.0	35.5
Phosphate(mg/L)	PRM	1.0	1.7	3.5	1.6	1.5	1.8	0.6	2.5	2.0	2.2
	M	1.7	1.5	4.6	1.8	2.1	1.4	1.2	2.4	1.2	2.4
	POM	1.0	1.2	1.6	3.6	0.8	1.0	0.9	0.7	1.0	1.6

Table 3: Physico-chemical quality of water during pre monsoon (PRM), Monsoon (M) & Post-monsoon (POM), Seasons Samples (SPI-SP10).

PHOSPHATE

Phosphate in water indicates the degree of pollution in a water body. In our study, phosphate concentration in water samples varied from 0.7 - 4.6 mg/L. This might be due to contamination of ground water by the effluents discharged from the stone crusher units. The permissible limits of phosphate are 0.1 mg/L. Phosphate content of all the studied samples was above the permissible limit.

CONCLUSION

The above study has given sufficient reasons to researchers to advise the concerned authorities of Nagar Panchayat Bagicha and Jashpur District area to replace old and rusted supply pipe lines with the new ones in order to provide desirable quality of water to public for drinking and other domestic purpose.

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