Int. J. Chem. Sci.: 7(4), 2009, 2429-2433

ASSESSMENT OF WATER QUALITY OF BUDHI GANDAK RIVER AT MUZAFFARPUR, BIHAR, INDIA

S. MUMTAZUDDIN*, ABUL KALAM AZAD and MANOJ KUMAR

University Deptt. of Chemistry, B. R. A. Bihar University, MUZAFFARPUR – 842001 (Bihar) INDIA

ABSTRACT

This paper represents the results of chemical characteristics during one year across five sampling stations located on the bank of Budhi Gandak river at Muzaffarpur. The water quality parameters like pH, TDS, DO, BOD, COD, hardness, chloride, calcium and magnesium were studied by various analytical techniques. It was observed that most of the water quality parameters are in the acceptable limits in accordance with WHO standards.

Key words: Water quality, Budhi Gandak river, Muzaffarpur.

INTRODUCTION

The river Budhi Gandak, also known as Burhi Gandak, is an important perennial river of north Bihar. It is believed that the river "Vishala" or "Vihalya", which finds a description in the Mahabharatta, is present day Budhi Gandak. The Chaur of small village Vishambar in the east of Chautarwa near "Bagha" in the district of West Champaran is supposed to be its point of origin. However, its original source is Someshwar mountain range near West Champaran. The river Budhi Gandak, passing through the district of West Champaran, East Champaran, Muzaffarpur, Samastipur, Darbhanga, Begusarai, Munger and Khagaria, covers a distance of about 410 km and finally merges into the river Ganges near a village called Mansi in the east of Khagaria[1].

The river Budhi Gandak is an important source of drinking and domestic water, irrigation and fish protein. But due to intense human interferences and rapid urbanization, this river has become contaminated with discharge of municipal wastes, domestic sewage and fertilizers from fields with receding flood water.

In the present work, an attempt has been made to assess the quality of water and to

*Author for correspondence

determine the extent of pollution in the river Budhi Gandak.

Location of sampling points

For monitoring the chemical characteristics of Budhi Gandak river at Muzaffarpur, five sampling stations were selected. These are Banghara ghat, Bahadurpur, Mithansarai, Sikandarpur and Kanhaulidhab and are referred to in this paper as SM_1, SM_2, SM_3, SM_4 and SM_5, respectively. Each sampling station was located nearly about 5-7 km from its nearest sampling station.

EXPERIMENTAL

Material and methods

Water samples were collected from each point once in a month for a period of one year between 8 to 10 a.m. at monthly intervals. To determine the BOD according to the standard method[2], samples were incubated at 20^0C for five days. COD, hardness, chloride, Ca and Mg were analyzed by standard methods prescribed by APHA 1995[2]. DO, TDS and pH were determined by VSI – 06 Water Analyzer Kit.

RESULTS AND DISCUSSION

In the present investigation, DO range of dissolved oxygen over a period of one year was found to be high as shown in the Table 1. However, the dissolved oxygen content was found to be low during the summer season at all the five stations.

BOD measures the amount of oxygen used by microorganism during aerobic decomposition of organic pollutants, which is comparatively low for the river water, indicating it to be less polluted. However, there are some fluctuations in the BOD level. This may be due to faecal pollution and discharge of domestic wastes in the river.

The COD values were also found to be within the permissible level set by WHO[3] of 10 mg/L. The COD is linked with heavy pollution from industries, domestic sewage, industrial effluents on the bank of river and reduced water flow in summer.

TDS and hardness values of river water were also found within the permissible standard limits set by WHO. The pH values were also found within the desirable limits prescribed by WHO[3] and ISI[4].

Table 1: Physico-chemical characteristics of water samples

Parameters	Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WHO (MPL*)
DO	SM_1	7	6.3	6.9	6.2	6.2	6.4	6.1	6.9	7.3	8.0	7.8	8.2	4.0-6.0
	SM_2	6.9	6.2	6.8	7.2	6.1	6.2	6.9	7.2	7.4	7.6	8.0	7.8	
	SM_3	7.3	7.4	7.1	6.7	6.0	6.3	6.2	7.1	7.3	6.7	8.1	8.4	
	SM_4	6.9	7.2	6.2	6.8	5.7	5.9	6.4	6.7	7.1	7.9	7.6	7.9	
	SM_5	7.8	7.2	6.9	6.4	6.2	6.1	7.5	7.8	8.2	7.7	7.8	8.0	
BOD	SM_1	3.6	2.9	2.4	2.1	2.0	2.6	3.2	2.8	2.2	1.9	2.1	2.3	10
	SM_2	2.4	2.6	2.3	2.0	3.0	2.2	1.9	2.3	2.7	2.6	3.0	3.1	
	SM_3	2.6	3.0	2.5	2.2	2.1	1.5	2.5	3.0	2.4	2.5	2.1	2.6	
	SM_4	3.1	3.2	2.9	2.4	2.2	2.6	2.8	2.9	2.6	2.8	2.4	2.5	
	SM_5	2.3	2.8	2.7	1.9	2.4	2.8	2.9	2.2	1.9	3.0	2.7	2.8	
COD	SM_1	6.6	8.4	9.6	9.8	7.0	9.5	8.9	8.3	8.0	6.8	9.0	9.8	10
	SM_2	8.0	8.2	9.3	8.9	9.1	9.3	7.9	8.0	9.5	9.6	9.7	9.1	
	SM_3	8.4	9.2	9.2	9.5	8.3	8.0	9.3	8.6	9.2	8.8	9.9	9.3	
	SM_4	6.9	6.7	8.9	7.8	8.1	7.6	8.8	9.8	7.9	7.8	8.2	8.1	
	SM_5	8.9	9.3	9.6	8.6	10.0	8.2	8.5	7.9	7.1	9.8	9.1	9.2	
TDS	SM_1	290	230	250	300	210	288	278	287	315	335	340	315	500
	SM_2	295	220	245	280	190	175	215	245	290	310	319	325	
	SM_3	310	322	295	280	220	278	305	290	333	340	335	380	
	SM_4	265	280	315	348	325	375	295	282	310	366	345	340	
	SM_5	225	265	240	280	305	285	312	290	280	320	295	310	
pH	SM_1	7.7	8.2	7.6	8.2	8.1	7.6	7.8	7.3	7.2	8.4	8.1	7.2	
	SM_2	7.5	8.0	7.8	7.7	8.0	8.2	7.9	7.6	7.5	7.4	7.9	7.4	

Cont...

Parameters	Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WHO (MPL*)
	SM_3	8.1	7.6	7.9	7.6	7.8	8.2	7.1	7.9	7.6	8.2	7.8	7.7	6.5- 9.2
	SM_4	7.2	7.7	7.2	7.9	8.2	7.9	7.6	7.8	7.9	8.3	8.1	7.8	
	SM_5	7.6	7.5	7.9	8.1	8.3	8.4	8.1	7.9	7.7	8.2	7.7	8.3	
	SM_1	172	145	132	180	179	165	170	190	134	195	185	178	
	SM_2	122	130	110	118	160	130	156	152	143	155	160	152	
Hardness	SM_3	145	142	162	115	148	160	180	164	185	175	165	130	500
	SM_4	178	140	185	210	195	215	165	168	182	190	186	172	
	SM_5	125	138	115	140	145	255	150	135	148	160	152	165	
	SM_1	25.5	27.9	31.4	34.2	22.8	27.3	25.6	49.9	28.2	23.8	35.2	27.9	
	SM_2	40.7	45.3	32.3	49.9	56.2	41.8	47.7	38.8	42.7	51.1	58.3	57.3	
Chloride	SM_3	35.4	48.4	56.7	57.2	42.7	43.7	49.7	38.7	40.1	45.9	35.8	37.9	500
	SM_4	36.2	40.2	48.9	29.2	32.3	43.8	41.7	45.2	36.9	37.9	38.4	40.2	
	SM_5	42.7	45.1	46.1	56.9	52.2	49.9	60.2	65.2	39.4	45.6	48.6	37.9	
	SM_1	37.3	24.5	20.8	38.4	24.4	49.2	29.2	28.6	24.4	20.7	35.4	49.2	
	SM_2	28.3	32.0	18.8	14.4	19.7	24.4	26.8	21.7	22.7	25.6	35.8	46.8	
Calcium	SM_3	20.1	25.6	23.1	31.2	18.6	35.7	35.1	28.6	20.5	25.7	30.8	49.4	100
	SM_4	22.3	18.7	26.4	27.9	28.7	16.8	23.7	31.8	35.5	26.4	29.9	26.6	
	SM_5	19.8	16.6	23.7	21.8	18.7	28.6	32.6	24.9	36.9	28.8	22.9	29.1	
	SM_1	22.8	19.6	16.3	14.2	12.1	18.6	15.8	17.9	11.2	22.2	21.6	19.8	
	SM_2	19.8	21.3	14.5	14.6	16.9	17.2	18.8	12.9	13.9	22.1	14.2	16.1	
Magnesium	SM_3	16.7	17.3	18.8	16.2	13.9	17.8	20.8	10.2	11.2	13.4	12.6	10.1	150
	SM_4	17.8	19.2	20.1	21.7	18.6	19.7	13.6	14.7	18.1	16.9	13.6	17.9	
	SM_5	18.9	20.2	17.2	19.1	13.8	14.7	12.8	18.7	11.2	12.7	13.4	14.4	

*Maximum permissible limit

In our observations, it was recorded that magnesium, calcium and chloride values have similar range at different stations and found to be quite low, which is in agreement with WHO standards.

CONCLUSION

Comparing the observations with the maximum permissible limits (BIS[5] and WHO[4]), it was noted that the water of Budhi Gandak river at Muzaffarpur is permissible for drinking, bathing and even survival of aquatic life.

To summarize, the present studies indicate that the Budhi Gandak water quality along Muzaffarpur city is in permissible limits due to high level DO and consequent low BOD and COD values. Similarly, TDS, hardness, pH, chloride, Ca and Mg are within permissible limits.

However, the final conclusion regarding the pollution status of Budhi Gandak requires the assessment of heavy metal pollution, which is in progress.

REFERENCES

1. H. Tripathi, Bihar ki Nadiyan, Bihar Hindi Granth Academy, Patna, (1977) p. 208.
2. APHA, Standard Methods for Analysis of Water and Waste Water, 19th Ed., American Public Health Association, Washington, D.C. (1995).
3. WHO, The Guidelines for Drinking Water Quality Recommendations, I, International Standards for Drinking Water, World Health Organisation (1971).
4. ISI, Indian Standards of Drinking Water Specification Bureau of Indian Standards, New Dehli (1993).
5. BIS, Standards Tolerance Limits for Bathing Water, Bureau of Indian Standards 1S (1982) p. 2296.

Accepted : 27.07.2009