Research Paper :

Analysis of abiotic parameters of river Sikrahana, near Motihari, Bihar, India

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ABSTRACT

The present study concerns with the abiotic parameters of sikrahana river water, located near motihari, the district head quarter of east champaran. The exact location of the spot is 84⁰43'48"E and 26⁰46'48"N. This analysis was carried out from January 2010 to December 2010. The abiotic parameters such as water temperature, turbidity, hardness, pH, alkalinity free CO_2, DO, BOD, COD, CHLORIDE, PHOSPHATE, SULPHATE etc. were analyzed during the present investigation. The data obtained from the analysis were compared with the data recommended for water quality standard by WHO and BIS.

Water is the elixir of any life. It is one of the prime necessities of life. We can hardly live for a few days without water. There are many resources of water on the Earth. Due to its unique properties water is of multiple uses such as drinking, irrigation, fishery and energy production (Iscen *et al.,* 2008) for living organism. About 77 per cent of water is used in agricultural sector in India. Although water is very abundant on the earth yet it is very precious. Out of the total reserves of the world about 97 per cent is salty while only 3 per cent is fresh water (Gleick, 1996). Even this small fraction of fresh water is not available to us as most of it is locked up in polar ice caps and just 0.003 per cent is readily available to us in the form of ground water and surface water. Abiotic parameters are very important for any aquatic ecosystem. In aquatic environment, the biotic fauna especially fish perform their all biological phenomenon in aquatic medium. Addition of organic matter or sewage depletes the oxygen and increases the CO_2 owing to bacterial degradation. Addition of nutrients also increases the algal growth which when die and decompose further deplete the oxygen and increases the BOD. Due to increase in BOD some of the aquatic insects dies and change the whole aquatic ecosystem. The present study forms to know the water quality of river Sikrahana.

EXPERIMENTAL METHODOLOGY

Water sample of the river were taken in a cleaned 1.5 liter plastic bottle from the two spots (Sapaha ghat G1 and Dhanahi ghat G2) from January 2010 to December 2010 in every month. The exact location of the sampling spot is 84⁰43'48"E and 26⁰46'48"N. Sapaha ghat is about 1.5 km while Dhanahi ghat is about 11km from the Sagauli railway junction. Analysis of sample water was done for different abiotic parameters such as water temperature, turbidity, hardness, pH, alkalinity free CO_2, DO, BOD, COD, Chloride, Phosphate, Sulphate etc. following the standard methods.

EXPERIMENTAL FINDINGS AND ANALYSIS

Results of the analysis is given in the Table 1.

Color:

Color of water indicates the degree of pollution caused by human materials, metallic substances, weeds and protozoa etc. Industrial waste waters also contribute to color. Yellow color of water indicates the presence of organic matter. At Ghat-1 the color of water is slightly yellowish but at Ghat-2 the color is clear and colorless.

Temperature:

Temperature is an important parameter to determine the pH, Conductivity and dissolved ions etc. Temperature of the water at both the Ghats are fluctuated throughout the research year. Temperature ranged from 9.1⁰C to 38.3⁰C at Ghat-1 while at Ghat-2 it was ranged from 10.2⁰C to 37.1⁰C.

Turbidity:

Turbidity is caused due to presence of particulate

matter such as slit, clay, organic and inorganic matter. Turbidity at Ghat-1 was ranged from 71 to 127 while at Ghat-2 it was ranged from 76 to 138. Aquatic plants also contribute the turbidity when they decay.

pH (potential of hydrogen):

It determines the acidity and alkalinity of water. pH at Ghat-1 were ranged from 7.3 to 8.3 while at Ghat-2 it was 7.0 to 8.1. pH of selected Ghats showed the alkaline nature of water. Lowest pH was 7.3 in the month of January and 7.0 in the month of April at Ghat-2. Highest PH at Ghat-1 was 8.3 in the month of August and at Ghat-2 it was 8.1 is September.

Alkalinity:

Alkalinity shows the buffering capacity of water. It is directly related to pH. 100mg/l to 250mg/l is good for river water. It was higher during the summer while lower during the winter at both Ghats. At Ghat-1 235 was the maximum value in the month of August while minimum 88 was in the month of January while at Ghat-2 maximum

and minimum value was 234 and 83, respectively.

Free CO_2:

Free CO_2 is the normal component of natural water. It is dissolved in water and its dissolution depends upon the temperature, pressure and minerals in water. Free CO_2 was at Ghat-1 ranged from 18.1 to 46.2 while at Ghat-2 it was from 20.3 to 45.5 mg/l.

Dissolved oxygen(DO):

Dissolved oxygen indicates the organic pollution levels of water. It is necessary for planktons (both phyto and zoo). At Ghat-1 it was ranged from 3.5 to 6.9 while at Ghat-2 it was ranged from 3.9 to 6.7.

Biochemical oxygen demand (BOD):

BOD is the measure of oxygen used by aquatic microorganism to degrade the organic matter under the aerobic condition. Domestic and industrial wastes increases its value. Higher value of BOD decreases the DO and consequently decreases the productivity of the

Table 1 : Abiotic parameters of the river Sikrahana at sampling Ghats -2010

Months Parameters		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Color	G-1	Yellowish	–	–	–	–	–	–	–	–	–	–	–
	G-2	Clear	–	–	–	–	–	–	–	–	–	–	–
Temperature	G-1	9.1	17.3	22.6	26.1	31.3	34.5	38.3	36.5	32.3	28.7	26.3	21.1
	G-2	10.2	18.2	20.3	26.4	32.6	35.3	36.2	37.1	30.2	28.1	25.6	20.1
Turbidity	G-1	127	107	97	82	95	88	71	120	111	103	117	99
	G-2	138	121	101	76	87	103	90	115	123	106	92	84
pH	G-1	7.3	7.6	7.7	7.5	7.7	7.9	8.1	8.3	7.9	7.6	7.4	7.3
	G-2	7.3	7.2	7.1	7.0	7.3	7.8	8.0	7.9	8.1	7.3	7.5	7.6
Alkalinity	G-1	88	104	119	128	135	195	212	235	201	163	127	101
	G-2	83	105	115	132	147	203	216	234	231	206	163	137
Free CO_2	G-1	18.1	29.2	31.3	30.2	36.0	42.3	44.4	46.2	25.3	28.6	26.5	19.7
	G-2	20.3	27.4	29.2	33.6	38.1	39.2	45.5	43.1	27.3	31.2	30.1	21.4
DO	G-1	3.5	4.5	5.0	5.2	5.7	6.0	6.9	6.6	6.0	5.6	5.1	5.0
	G-2	3.9	4.1	4.6	5.1	5.7	6.0	6.2	6.7	5.7	4.9	5.1	5.5
BOD	G-1	4.0	5.2	2.3	2.2	5.3	5.1	4.3	5.2	3.2	5.1	2.6	2.3
	G-2	4.3	3.4	3.5	2.6	5.3	4.6	4.7	4.7	3.6	4.6	3.5	3.5
Hardness	G-1	46.1	101.3	121.0	127.3	151.2	165.3	171.3	180.6	150.5	131.3	122.1	101.6
	G-2	43.2	91.6	101.2	116.7	123.1	146.5	143.1	158.6	141.1	129.4	113.2	102.5
Nitrate	G-1	0.23	0.27	0.25	0.29	0.26	0.25	0.26	0.28	0.27	0.30	0.31	0.30
	G-2	0.21	0.26	0.26	0.25	0.28	0.27	0.26	0.29	0.25	0.29	0.30	0.31
Nitrite	G-1	0.25	0.29	0.27	0.30	0.32	0.31	0.35	0.33	0.30	0.31	0.29	0.31
	G-2	0.23	0.31	0.33	0.37	0.33	0.36	0.39	0.41	0.40	0.41	0.38	0.35
Chloride	G-1	12.1	12.5	12.4	12.6	12.7	12.3	12.9	12.3	12.0	11.8	12.1	12.4
	G-2	12.3	12.6	12.3	12.5	12.8	12.7	12.8	12.6	12.5	12.0	12.3	12.5
Phosphate	G-1	26.3	23.2	17.6	30.2	22.1	15.6	27.4	31.5	19.1	26.8	32.7	18.2
	G-2	17.3	23.5	21.4	25.6	29.3	22.3	16.3	13.2	31.6	25.6	23.3	31.3

All values are expressed in mg/l except Color, pH, Temp., Turbidity.

river. At Ghat-1 it was ranged from 2.2 to 5.3mg/l. Maximum 5.3mg/l was in the month of May and minimum 2.2mg/l in the month of April. At Ghat-2 BOD was ranged between 2.6 to 4.7mg/l. At this Ghat maximum 4.7mg/l and minimum 2.6mg/l was in the month of July and April, respectively.

Hardness:

It is caused by divalent metallic ions dissolved in water. Ca and Mg are principally the most important cations associated with bicarbonates, sulphates, chloride and nitrate etc. It is not the water pollution but indicates the moderate quality of water. At Ghat-1 it was ranged from 46.1mg/l to 180.6mg/l while at Ghat-2 it was from 43.2mg/l to 158.6mg/l. Hardness up to 60mg/l is soft while 120 to 180mg/l is hard.

Chloride:

Chloride is one of the important parameters to indicate the pollution . It is toxic in nature. Its value depends upon eutrophication. At Ghat-1 it's value ranged from 11.8mg/l to 12.9mg/l while at Ghat-2 it was from 12.0mg/l to 12.8mg/l.

Nitrate:

Nitrogen is required by all organisms for the waste waters from chemical, fertilizers and sewage contribute to nitrate. More than 45mg/l of nitrate causes methaeonoglobinaemia(a diseases characterized by blood change) in infants. It's value at Ghat-1 was ranged from 0.23mg/l to 3.1mg/l while at Ghat-2 it was from 0.21mg/l to 3.1mg/l.

Nitrite:

Nitrates are formed by the action of bacteria upon NH_3 and organic nitrogen. The concentration of nitrate at Ghat-1 was ranged from 0.25mg/l to 0.35mg/l while at Ghat-2 it was from 0.23mg/l to 4.1mg/l.

Phosphate:

Phosphate is an important nutrient and essential for growth of algae. It's value was observed at Ghat-1 between 15.6mg/l and 32.7mg/l while at Ghat-2 it was between 13.2mg/l and 31.6mg/l. Generally its value increase in the rainy season.

Conclusion:

The abiotic data obtained in this investigation at both the Ghats clearly shows the water is not polluted and may be used for drinking purpose. All the chemical data falls under permissible limit prescribed by WHO and BIS. This data also support for the good productivity of the river.

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