

Pollution Profile of River Ganga

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The monitoring of pollution status of river Ganga is very essential and vital at intervals of every two years. It has been observed that Ganga water maintains a uniform character throughout Munger and Bhagalpur having high turbidity and alkalinity. However, hardness is quite tolerable. The dissolved oxygen content ranging from 6.5–7.7 ppm is quite favourable for aquatic life.

INTRODUCTION

The river Ganga flows from Gangotri Glaciers and merges into the Bay of Bengal. This river after travelling about 2,700 kms reaches the town of Munger (Bihar). This river carries 33% of water flowing in Indian river system after passing through important towns like Kanpur, Varanasi, Patna, Munger and Bhagalpur. The population of Munger and Bhagalpur largely depends on the waters of river Ganga. The river also passes through the important town of Sultanganj where pilgrims take water for Deoghar worship. The average rate of flow of Ganga water at Patna is $7,626 \text{ m}^3/\text{sec}$.¹ and at Munger the rate of flow is about $3000 \text{ m}^3/\text{sec}$. approximately.

In these two towns of Munger and Bhagalpur, municipal discharges along with some industrial effluents mix in flowing waters of Ganga river. The significant industries in Munger are Cigarette Factory, Distillery, Silk-Dyeing Industry and Oil Refinery at Barauni, etc. These discharges bring about a considerable change in the water quality.

The present study has been undertaken to ascertain the impact of pollution on the eco-system of the river due to growing population at Munger, Sultanganj and Bhagalpur.

EXPERIMENTAL

Five sampling sites were selected at river Ganga at Munger located at Kashtarni Ghat and Chandi Asthan. At Bhagalpur, main Ganga Ghat (near Adampur) and Barari Ghat were selected for sampling. The fifth sampling site was selected at Sultanganj Ghat where Deoghar pilgrims take Ganga water for

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carrying to Baba Dham (Deoghar). These sampling sites were selected in order to have a fairly comprehensive picture of the intensity of pollution. The samples were collected at these sampling sites between 1994–95 round the year in three seasons. The total number of samples collected in one year was about fifteen in number.

The methods adopted for the analysis of these water samples were both conventional and instrumental. pH, temperature, dissolved oxygen and conductivity were estimated on the spot by universal water analysis kit. The other constituents were determined by following procedures adopted by A.P.H.A. 1985 (American Public Health Association)², Indian Standard Institution (I.S.I., 1974) and World Health Organization (W.H.O., 1970).

RESULTS AND DISCUSSION

The pH value of Ganga water in these regions shows that it is alkaline in nature which has also been supported by earlier workers^{3,4}. pH is lower in monsoon and summer as compared to winter. Higher turbidity in monsoon is due to reduction of pH.

High D.O. value in the range of 10 ppm shows organic pollution by sewage outfalls. The dissolved oxygen content shows the health and ability of the stream to purify itself through biochemical process. Only coarse types of fishes can predominate. High turbidity decreases photosynthetic activity and depletion of oxygen content. The sunlight has bleaching action and thus reduces the colour. During monsoon, the Ganga water carries red soil brought by Sone and Punpun; hence the turbidity goes high. The turbidity decreases in winter and also due to ageing. But the average turbidity at Bhagalpur and Sultanganj is more. During monsoon the process of photosynthesis is completely inhibited and muddy colour of water is observed. Obviously the levels of free ammonia and silica give a positive rise.

The calcium and magnesium concentration ranging between 30–36 ppm shows the surface layer of calcareous kankar intercalated with the alluvial sediments. Microbes also consume calcium. The values of alkalinity are always higher than the hardness. The hardness is mainly due to carbonate and bicarbonate between 140 and 150 ppm. This has been supported by Handa.³ The organic compounds discharged by Barauni refinery complex, together with sulphate content and nitrogen are subsequently converted into carbon dioxide by bacterial action and finally form bicarbonate and carbonate.

Iron content in these regions is well within permissible limits. Iodine concentration is also within normal range (10 µg/L).

Fluoride concentration in these regions is well within the tolerance limits for human consumption. Only ground water and deep bore well water of Bhagalpur have been reported to be carrying fluoride concentration.

The conductivity of Ganga water in these regions is maximum in summer and minimum in monsoon. An increasing trend of conductivity has been marked from Munger to Bhagalpur (400 micro-mhos/cm).

Bio-chemical oxygen demand represents the intensity of bio-degradable

matters remaining in the stream at any time. The B.O.D. value in these regions is average which shows that the water after proper disinfection and treatment can be used for public purposes. The C.O.D. value in the region of Munger and Bhagalpur is higher than in other places. This may be on account of the presence of larger concentration of non-biodegradable chemicals in the local discharge which goes into the river. (Table 1)

Ammonical nitrogen concentration is higher in early monsoon, due to agricultural run-off containing high nitrogenous chemicals.

TABLE 1
PHYSICO-CHEMICAL CHARACTER OF RIVER GANGA WATER AT MUNGER,
SULTANGANJ AND BHAGALPUR (BIHAR)

Values are in ppm except pH, otherwise mentioned separately

S.No.	Parameters	Munger		Sultanganj	Bhagalpur	
		Kashtarni Ghat	Chandi Asthan		Adampur Ghat	Bharari Ghat
1.	pH	7.5	7.7	7.8	8.1	7.8
2.	D.O.	6.5	7.0	7.5	7.6	7.7
3.	Temp. (Air) (°C)	28	28	28	31	31
4.	Turbidity	145	146	250	340	320
5.	Temp. (Water) (°C)	26	26	27	28	28
6.	Total hardness	140	142	145	148	150
7.	Total alkalinity	150	155	160	198	200
8.	Calcium	30	33	35	36	36
9.	Magnesium	20	19	20	18	17
10.	Iron	0.075	0.07	0.07	0.08	0.09
11.	B.O.D.	1.5	1.6	1.8	2.0	1.6
12.	C.O.D.	21	20	22	18	19
13.	Ammonia	0.08	0.08	0.1	0.15	0.10
14.	Chloride	33	34	36	40	38
15.	Sulphate	17	18	22	25	20
16.	Phosphate	0.25	0.25	0.26	0.15	0.15
17.	Silica	16	15	14	11	12
18.	Fluoride	0.65	0.65	0.7	0.7	0.7
19.	Iodide (micro-mhos/cm)	5	4.5	4.5	5.0	5.0
20.	Conductivity (micro-mhos/cm)	385	385	400	405	410
21.	No. of analyses	15	15	15	15	15

The relatively high ammonical nitrogen at Munger is attributed to the discharge of refinery at Barauni power station, distillery and tannery of Mokamah, fertilizers factory at Barauni.

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