

Water quality of River Ganga in respect of physico-chemical characteristics at Shyampur, District Haridwar

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Abstract

The water quality status of River Ganga at Shyampur was studied with respect to physico-chemical characteristics. Parameters studied were pH, total solids, total dissolved solid, T.S.S., conductivity, alkalinity, hardness, D.O., B.O.D. and C.O.D. The nature of water quality of Ganga with respect to pH is alkaline.

Introduction

Shyampur (District Haridwar), is situated at the east bank of river Ganga where number of people and cattle take bath daily. Shyampur is connected by the Haridwar –Najibabad road. Ganga river passed through the Haridwar, Kangri and Gendi khata villages. The waste water of near by village is ultimately mixes into the river. The washing and bathing activity by village may also affect the physico-chemical parameters of the river. Number of workers have carried out their investigations on water quality of river Ganga with respect to different physico – chemical characteristics from its origin to merging point (Singh *et al.*, 1988, 91, Khanna *et al.*, 2003, Gautam and Sati 1987). But no study has been conducted to assess the water quality of river Ganga at Shyampur. Therefore it was proposed to conduct a study on water quality of river Ganga at Shyampur. The present paper include one year study (Jan. –Dec. 2005).

Materials and Method

Water samples of river Ganga were collected in neat and clean two litre white plastic Jericanes for physico chemical parameters. Samples for Dissolved oxygen (DO) were collected in a neat and clean 300 ml. Borosil glass stoppered DO bottles, DO was fixed by using 1ml. of each reagent MnSO₄ and alkaline azide on the spot. Grab sample collection methods was adopted through out the study. Sample preservation and analytical methods were adopted as per APHA, AWWA, WPCF-1992, Khanna and Bhutiani (2004).

Two sampling stations were selected as Upstream Shyampur denoted as sampling station A and Downstream Shyampur denoted as sampling station 'B'. sampling station A is approximate 500 meter in Upstream of Shyampur and sampling station 'B' is situated 1 Km in Downstream of Shyampur.

Result and Discussion

Results of samples analyses for physico-chemical parameters are given in Table-1 to 3. The values of studied parameters pH, TS, TSS, TDS, alkalinity, total hardness, chloride, free CO₂, conductivity, water temperature varied between 7.0-8.8, 120.9-232 mg/l, 30.9-52.2 mg/l, 55-98 mg/l, 11.6-89 mg/l, 6.9-116 mg/l, 6.9-27.4 mg/l, 1.8-3.8 mg/l, 0.11-0.60 mg/l, 12.2-22 mg/l; at sampling station-A where as at sampling station-B the values of these parameters ranged from 7.0-8.6, 133-266 mg/l, 98-189 mg/l, 32-81 mg/l, 60-107 mg/l, 62-99 mg/l, 7.4-59.1 mg/l, 1.5-4.1 mg/l, 0.15-0.68 mg/l, 13-21.5 mg/l. respectively; and of DO, COD, BOD, ranged between 9.5-12.5 mg/l, 11.0-30 mg/l, 0.5-1.5 mg/l. at sampling station A where as at sampling station B the

values of these parameters ranged from 8.5-11.0 mg/l, 9.5-28.2 mg/l, 0.8-3.1 mg/l respectively. The average value of pH, TS, TDS, TSS, conductivity DO, COD, alkalinity, total hardness and chloride were obtained within the tolerance limit of drinking purpose where as average values of BOD was found 1.03 mg/l at sampling station-A and 2.2 mg/l at sampling station-B (Table-3).

Maximum values of the studied parameters were observed during monsoon season except DO and minimum values of these parameters obtained during winter, lower values of DO were observed during rainy period at both sampling station which may be due to dilution in rainy season and super saturation of Oxygen at lower temperature and less human activity like bathing/ washing etc. in winter. After winter period as temperature of water rises free CO₂, COD, BOD was increased and DO decreased of river Ganga, Khanna *et al.* 2003 has also found the similar trend. Water quality of river Ganga with respect to pH is alkaline similar trend of water quality of river Ganga were also found by Singh (1988) and Khanna (1993).

References

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Table-1: Variation in physico-chemical characteristics of river Ganga at sampling station A of Shyampur (Haridwar), during January to December 2005.

Parameters	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Water Temp.	12.2±0.2	14.0±0.63	19.4±0.4	19.6±0.3	21.3±0.3	22.0±0.4	19.0±0.2	18.7±0.1	18.6±0.12	18.3±0.12	20.0±0.12	14.8±0.07
T.S.	125±2.0	120.9±1.0	130.0±2.8	160.0±2.1	179.1±7.6	213.0±10	224.2±18	232±0.20	222±0.20	223.9±0.12	200.0±8	187.0±4.6
T.D.S.	94±1.4	90±0.9	92±2.0	120±3.4	129±2.9	161±4.5	172±3.0	180±3.4	179±3.0	182±3.0	160±3.4	148±1.5
T.S.S.	31.0±0.6	30.9±1.0	38.0±1.0	40.0±0.8	50.0±0.9	52.0±1.3	52.2±1.2	52±1.2	43.0±1.4	41.9±1.3	40.0±1.6	39.0±1.0
Conductivity	0.11±0.0	0.16±0.00	0.21±0.0	0.20±0.02	0.25±0.02	0.30±0.03	0.60±0.02	0.48±0.4	0.50±0.00	0.40±0.01	0.3±0.01	0.22±0.0
pH	7.3±0.07	7.6±0.11	7.2±0.07	8.0±0.05	8.0±0.04	8.1±0.2	8.8±0.3	8.2±0.2	8.6±0.10	8.0±0.01	7.0±0.12	7.6±0.0
DO	12.5±0.2	11.8±0.02	11.0±0.1	11.0±0.7	11.2±0.5	10.0±0.4	9.5±0.7	10.5±0.6	10.5±0.1	11.0±0.04	11±0.01	12.0±0.0
Free CO ₂	1.8±0.3	2.0±0.09	2.0±0.10	2.5±0.7	2.2±0.8	2.6±1.2	3.8±1.0	3.2±1.4	2.6±1.2	2.5±0.02	2.0±0.7	1.8±0.3
COD	11.0±0.2	12.4±0.11	12.5±0.11	13.0±0.8	17.0±0.9	21.0±1.2	25.0±1.0	30.0±1.5	24.0±1.2	12.2±0.02	19.0±0.8	14.5±0.3
BOD	0.60±0.01	0.90±0.01	1.4±0.01	0.8±0.1	1.0±0.1	1.5±0.2	1.5±0.2	1.2±0.2	1.2±0.2	1.0±0.0	0.8±0.04	0.50±0.3
Alkalinity	55±1.1	59±0.6	60±1.0	64±0.3	72±1.0	74±1.2	75±0.7	80±1.0	72±0.8	98±3.0	89±0.07	75±1.1
Total Hardness	79.0±1.2	66.0±1.0	72.0±1.3	72.0±0.4	76.0±1.3	89.0±1.3	11.6±1.6	76.0±0.6	81.0±1.0	82.0±2.0	81.0±1.2	74.0±0.9
Chloride	6.9±0.1	7.2±0.02	7.7±0.02	11.9±0.5	18.0±0.7	20.0±0.0	27.4±0.3	24.0±0.3	17.6±0.2	9.0±0.1	7.0±0.03	7.0±0.02

Table-2: Variation in physico-chemical characteristics of river Ganga at sampling station A of Shyampur (Haridwar), during January to December 2005.

Parameters	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Water Temp.	13.8±0.2	13.0±0.4	19.3±0.2	20.0±0.1	21.0±0.09	21.5±0.25	21.0±0.10	19.6±0.1	18.7±0.1	20.4±0.3	19.1±0.1	15.0±0.10
T.S.	133±2.0	146±1.7	148±2.0	175±10.2	188±10.2	231±17.5	261±14	266±20.2	255±2.5	233±3.12	225±3.8	198±3.0
T.D.S.	101±3.2	110±2.7	98±1.5	138±2	130±3.2	179±3.2	189±4.1	185±7.2	181±3.9	188±2.5	161±3.8	137±4.9
T.S.S.	32±1.5	36±1.6	50±1.3	37±1.0	58±1.3	52±1.3	72±1.3	81±1.5	74±2.0	45±2.1	64±1.3	61±1.8
Conductivity	0.15±0.1	0.20±0.1	0.21±0.1	0.15±0.0	0.16±0.0	0.38±0.0	0.68±0.02	0.61±0.02	0.60±0.01	0.58±0.01	0.51±0.0	0.324±0.02
pH	7.0±0.5	7.0±0.3	7.1±0.5	7.1±0.10	7.2±0.25	7.3±0.2	7.9±0.45	7.8±0.25	7.6±0.2	7.7±0.45	8.6±0.2	7.6±0.15
DO	11±0.15	10.1±0.15	8.5±0.2	9.8±0.01	9.1±0.02	8.8±0.1	9.8±0.15	10.6±0.11	10.2±0.11	9.9±0.1	10.2±0.15	11.0±0.20
Free CO ₂	1.5±0.2	3.0±0.2	2.3±0.12	3.0±0.1	2.5±1.2	3.9±0.02	4.1±0.01	2.9±0.02	2.8±0.03	3.4±0.1	2.9±0.7	2.7±0.09
COD	9.5±0.04	11.0±0.03	11.5±0.04	12.0±0.15	15.5±0.14	20.2±0.15	23.5±0.15	28.2±0.40	23.4±0.25	10.2±0.20	17.5±0.07	13.5±0.05
BOD	2.8±0.02	0.8±0.03	1.9±0.02	2.2±0.05	2.9±0.02	3±0.03	3.1±0.02	1.6±0.01	1.8±0.0	1.5±0.1	2.1±0.01	2.9±0.20
Alkalinity	60±1.0	64±1.5	61±1.4	80±1.1	98±1.4	101±1.0	107±1.1	79±0.75	81±0.8	99±0.0	95±0.0	80±2.00
Total Hardness	62±1.2	65±1.5	79±1.2	81±1.3	93±1.0	98±1.1	99±1.6	80±1.7	95±1.0	90±1.5	98±1.6	89±1.6
Chloride	7.4±0.11	7.9±0.13	9.0±0.15	13.0±0.2	22.0±0.2	34.0±0.15	59.1±0.16	25.5±0.14	21.0±0.18	17.0±0.17	15.0±0.12	13.0±0.10

Table-3: Average value of physico-chemical parameters at sampling station a and b at Shyampur during period January to December 2005

Parameters	Jan. – Dec. 2005			Jan. – Dec. 2005		
	Sampling –A			Sampling -B		
	Min.	Max.	Average	Min.	Max.	Average
Water Temp.	12.2	21.3	18.1	13.0	21.5	18.5
TS	187.0	232.0	184.7	133.0	226.0	204.9
TDS	90.0	182.0	142.2	98.0	189.0	142.3
TSS	31.0	52.2	42.5	32.0	81.0	55.1
Conductivity	0.11	0.6	0.31	0.15	0.68	0.38
pH	7.0	8.1	7.8	7.0	8.6	7.5
DO	9.5	12.5	11.0	8.5	11.0	9.9
free CO ₂	1.8	3.8	2.4	1.5	4.1	2.9
COD	11.0	30.0	17.6	9.5	28.2	16.3
BOD	0.5	1.5	1.03	0.8	3.1	2.2
Alkalinity	55.0	98.0	72.7	60.0	107.0	83.7
Total Hardness	66.0	116.0	80.3	62.0	99.0	85.7
Chloride	6.9	27.4	13.6	7.4	59.1	20.3