

Impact of IDPL effluent on water quality of river Ganga at Shyampur Khadir, Rishikesh (Uttaranchal)

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Abstract

Present paper deals with the impact of IDPL effluent on water quality of river Ganga at Shyampur Khadir, Rishikesh. A significant deterioration of water quality of Ganga was recorded at Shyampur Khadir. Water quality of river Ganga at Pashulok Barrage (1.5 Km. before discharge of IDPL effluent) was better in term of various physicochemical characteristics, valued mg/lit, chloride- 5.6, DO- 8.8, BOD- 7.14 and COD- 20.95 was observed. Bacterial load of water in term of MPN and SPC was found $11.6 \times 10^2/100$ ml and $102 \times 10^3/$ ml respectively. But a high degree of deterioration of water quality was recorded at Shyampur Khadir located about 1.5 Km. away from discharge point in down stream of the river. Various parameters were found highly enhanced i.e. Hardness- 137.8, chloride- 14.3, BOD- 58.8, COD-162.45, MPN - 64×10^2 and SPC- 290×10^3 . Main cause of deterioration of water quality of Ganga at Shyampur Khadir was found due to the discharge of IDPL effluent which was highly polluted as evident by low level of DO-2.8 and high degree of BOD- 181, COD- 261.8 mg/l and MPN- 209×10^2 and SPC- 380×10^3 .

Introduction

Humans use water in the home, in industry, in agriculture and for recreation. These applications differ widely in quantity and quality of the water which they require. In general consumption of water per capita daily is more higher in urban areas than rural areas all over the world. Since last two decades regular demand of water has much enhanced due to over growth of population and rapid increase in urbanisation which had a direct effect on demand of water quantity in terms of liter/capita.

More food grains production is highly needed to fulfill nutritional requirement of the society and has forced to take up additional agricultural land for the purpose. Maximum consumption of water occurs in agriculture followed by domestic use and industry. Since a very little percentage of Fresh water, hardly 3% is available for civic use and out of which only 0.2% is in land water. The land surface water is a major source of civic supply in a large number of cities because these are located on the bank of the various rivers.

Inland surface water receives different kinds of pollutant from different sources in varying amount

which has a direct effect on water quality of that aquatic system in terms of various physico-chemical and bacteriological counts. Practice of indiscriminate discharge of untreated or partially treated municipal and industrial waste water has become a major cause of water pollution in India and abroad. Most of the rivers of country are being used for disposal of waste water (domestic and industrial sewage) as raw sewage/ or treated sewage. Since the maximum number of the cities including both Municipality corporation and Industries, either they do not possess treatment plant or they are not fit for a dequate treatment or not in working condition, resulting pouring of raw sewage directly at different points in the several rivers and Ganga is one of them.

Ganga receives contaminants form of raw sewage at different places throughout its course. Rishikesh which seems an entry point of river Ganga in the plains, contains large number of drains carrying city sewage and industrial effluent and pouring it in the river at different points. Albeit a large number of industries are found in the Rishikesh region but Indian drug pharmaceutical limited (IDPL) is a major source of pollution of river Ganga. A lot of information is available regarding impact of drains on water quality of receiving system. Some important contribution in this area in the recent past can be mentioned (Shanker *et al.* 1986, Chopra & Rehman 1992, Chopra & Patric 2000, Prasad & Shankar 1999, Prasad *et al.* 2003 and Khanna and Chugh 2004). To find out intensity of pollution load of IDPL effluent and their impact on the water quality of Ganga at Shyampur Khadir, the present investigation was carried out.

Material and Methods

Haridwar is located in North India at foot hills of Shivalik hill range at altitude of 294.15 meter from sea level. The area has a tropical climate with seasons winter, summer and rains in a year. Following sampling points were selected to find out the real impact of IDPL effluent on water quality or river Ganga at Shyampur Khadir about 1.5 Km. in the down stream.

Sampling sites

1. Pashulok Barrage (up stream, without any out falls)
2. IDPL drain outfalls (carrying-IDPL effluent)
3. Shyampur Khadir (A point- showing impact of effluent on Ganga water after proper mixing dilutions)

Sample collection analysis

Water sample were collected from above mentioned sampling stations once in a month for estimation of various physical, Chemical and bacteriological parameters. Samples were collected

according to APHA (1985). DO was analysed at the spot by Winkler-idiometric method. Samples were collected in sterilized BOD bottles for bacteriological examination. These samples were brought to the laboratory and were analysed within 8 to 10 hours. Mac Conkey broth was used for estimation of most probable number (MPN) of total coliform bacteria and Nutrient agar media (NAM) for standard plate count of bacteria. pH of the medium was adjusted to 7.4 After inoculation and incubation at 35 °C MPN and SPC were recorded after 24 hrs. COD was estimated by autoclave method (1985). BOD was measured by seeding method. Chloride and sulphates were measured by titration method.

Results and Discussion

An average value of Physico-chemical and bacteriological characteristics studied for the period of three years at different sampling stations i.e. Pashulok Barrage, IDPL drain and Shyampur Khadir has been presented in the table. Water quality in terms of average value was found better at Pashulok Barrage 8.8mg/lt but most polluted water was recorded in IDPL drain, where it (DO) was found very low 2.8 mg/lt (Table). Similarly other parameters of organic contaminants i.e. BOD and COD were found very low at Pashulok Barrage 7.13 mg/l and 20.5 mg/l respectively, whereas these values were maximum recorded in IDPL effluent i.e. 181 mg/l and 261.8 mg/l. MPN and SPC were also found very low at Pashulok Barrage compared with IDPL drain. Low values of pollution indicator parameters at Pashulok Barrage were probably due to absence of any kind of discharge as well as minimum chances of soil erosion which contributes lot in raising of organic contaminants in the Ganga water. Besides this low temperature i.e. 17.96 has also played the significant role in minimizing the bacterial multiplication and lowering the consumption of dissolved oxygen by bacterial population.

Albeit enhanced value of BOD, COD, MPN, SPC and low level of DO in IDPL effluent, was directly related with organic contaminants but it seems that temperature has also played the role of a governing factor for all above parameters as it was found more about 7°C from Pashulok Barrage. Higher temperature towards 30°C facilitates for the multiplication of most genera and species of bacteria on one hand and also enhances the consumption of dissolved oxygen. Therefore a high level of reduction of dissolved oxygen occurs which is evident by the recorded data i.e. 8.8 > 2.80. Findings of different parameters related with organic pollution load of Shyampur Khadir indicated a high degree of deterioration of water quality at this sampling site compared with Pashulok Barrage. Since there was no any other discharge between IDPL factory and Shyampur Khadir except IDPL drain therefore it was only IDPL effluent which caused a serious loss of Ganges water in terms of water quality and it is evident by the recorded data at both sampling sites i.e. IDPL drain and Shyampur Khadir (Table-1).

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Table-1: Mean values of Physico-Chemical and bacteriological characteristics for the period of three years of IDPL effluent and their impact on water quality of river Ganges at Shyampur Khadir, Rishikesh.

Parameters	Sampling Stations		
	Pashulok Barrage	IDPL Drain	Shyampur Khadir
Temperature(° C)	17.96	25.25	21.80
Turbidity(NTU)	7.00	95.00	7.00
pH	7.50	6.77	7.60
Conductivity(mmhos)	0.122	0.358	0.257
Hardness (CaCO ₃) (mg/l)	103.43	191.00	137.80
Chloride(mg/l)	05.6	45.00	14.33
Sulphate (mg/l)	2.73	20.42	3.98
DO (mg/l)	8.80	2.80	5.33
BOD (mg/l)	7.13	181.00	58.80
COD (mg/l)	20.95	261.80	162.45
MPN (per 100ml)	11.16X10 ²	209.3X 10 ³	64 X 10 ²
SPC (per ml)	102.6 X 10 ³	380 X 10 ³	290 X 10 ³

