

Evaluation of Water Quality in River Ganga Due To Contaminant of Heavy Metals, Kanpur, India

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Abstract - Ganga River is the most polluted in Jajmau area Kanpur due to rapid industrialisation. These industrial effluent particularly in developing countries are in most cases discharged in river Ganga. Some of these effluents are not well treated or not even treated at all before being discharged. All the samples analyzed for physico-chemical parameters. The pH was 8.5 having 11500moles/cm. The level of alkalinity, BOD, COD, TS, TDS, DO and conductivity were above in permissible limit. The aim of this study was to evaluate the effect of heavy metals contaminate in Ganga River. For this sample, were collected from two stations and analyzed for various parameters for the period of one year. The present study was intended to calculate heavy metal contamination in National River (Ganga) at Kanpur for drinking, recreation and other purpose such as by using eight water quality parameters.

Keywords- Ganga River, parameter, heavy metal, samples, BOD

1. INTRODUCTION

Water quality refers to the chemical physical, biological and radiological characteristic of water. It is a measure of the condition of water relative to the requirement of one or more biotic species. Tannery effluents are ranked as the highest pollutants among all industrial wastes. India is the third largest producer of leather in the world having about 3000 tanneries with annual processing capacity of 0.7 million tones of hides and skin.

In Uttar Pradesh (India) Jajmau, Kanpur is a major industrial town (about 400 tanneries) located on the bank of river Ganga which specialized in processing hide into heavy leather (Sinha *et al.*, 2008; Gupta *et al.*, 2011). Industries are the major sources of pollution and various level of pollutant can be discharge in to the environment either directly or indirectly (Glyn and Gary, 1996). However, discharged effluents from industries have been other chemicals equally present are poisonous to human and toxic to aquatic life. (Kupechella and Hyland, 1989; WHO, 2002). Effluents from industries were found to alter the physical, chemical and biological nature of receiving water bodies (Kanu *et al.*, 2011).

The tannery effluents contain chiefly chromium salts, copper, magnesium, iron, cadmium and arsenic salts when it discharged into the rivers it greatly affects the aquatic ecosystem. The effluents and sludge from these tanneries are discharging onto land and into water bodies. The

dissolved and suspended particles of the effluent would affect the quality of ground water, in addition to reduced clarity. There is also a great danger to man and livestock toxic to humans at levels as low as 0.1 mg/L [unido 2005]. The Ganga River, a major source of water for northern India and has been extensively survey for its physiochemical parameters [Saikia DK *et al.*, 1988, Subramania V *et al.*, 1987 Ajmal M *et al.*, 1987]. Sediment samples of river water contaminated by various heavy metals which have adverse effect on human health in some cases [Davutluoglu OI *et al.* ,2011, Kae D *et al.*, 2008 Pawlikowski M,*et al* 2006, Kunwar *et al* 2005, Ahmad *et al.* ,2010].

The industrial discharge, therefore contribute a larger portion of the flow of the river during the dry season, with the result that the water quality of the river is further deteriorated. Uses, for which the river is employed involving body contact, expose serious hazards to users due to the bacterial situation.

The present work deals with the study of 8 physicochemical parameters like pH, temperature, turbidity ,Ts , Fe , Cl⁻ , TDS ,Ca²⁺, SO₄²⁻ , NO₃⁻ , F⁻, TA,Mg²⁺ , BOD, TSS of Ganga river water in Kanpur. The observed values of various physico-chemical parameters of water samples were compared with standard values recommended by World Health Organization (WHO).

2. MATERIALS AND METHODS

Samples and sampling station

Samples were from Jajmau Industrial area, tanneries from these areas discharge into the river Ganga. Water samples were collected twice in every month during pre-monsoon (March to June), monsoon (July to October) and post-monsoon (November to February) at two stations viz. chandan ghat and siddhnath ghat from the river Ganga.

These rivers are strategically located in the rapidly expanding northern region of Kanpur city and catering to a large population. In Jajmau area many tanneries are located and they discharging their effluents which converge at a confluent point and flow into the River

Ganga. Water samples from these areas were collected sterile glass bottles was transported on ice to the laboratory and processed within 6h of collection.

Table 1

Season	Month
Pre- monsoon	March-June
Monsoon	July-October
Post-monsoon	November-February

Table 2 Sampling sites of river Ganga

Sampling station 1	Chandan ghat
Sampling station 2	Siddhnath ghat

Physic-chemical analysis of the treated tannery effluent

The effluent was analyzed for different physic-chemical properties viz. pH, temperature, BOD, COD, conductivity, alkalinity and presence of different heavy metals. The concentration of each of the component was determined as per the procedure outlined in APHA.

The concentration of dissolved oxygen (DO) present in the water samples was estimated By Winkler method for measuring dissolved oxygen involves titrating a sample with a series of reagents. The parameters included colour, odour, temperature, pH, total hardness, total solids (TS), total dissolved solids (TDS), total solids (TS). The alkalinity described by Trivedi and Goel (1986) by titrating against sodium thiosulphate using as indicator. The dissolved oxygen content was determined before and after incubation. Sample incubation was for 5 days at 20°C in BOD bottle and BOD was calculated after the incubation period. Determination of chemical oxygen demand (COD) was carried out according to the method described by Ademoroti (1996).

3. RESULTS AND DISCUSSION

Physicochemical characteristics of water samples at different stations in the three consecutive seasons have been presented in Table. As is clear from the table and values of parameters, station I is the most polluted along Ganga River.

It is also clear from Table 1 that parameters like conductivity show increased in 11500 which permissible limit 850 in wast water. Temperature is an important factor for its effect on certain chemical reactions taking place in organisms inhibiting aquatic media and also on the soil-

water interphase. The is can be attributed to the decreased Total Dissolved Solids (TDS) which also follows the same trend (Bahadur et al 1996).the relative higher values of Chemical Oxygen Demand (COD) as compared to Biochemical Oxygen Demand (BOD) indicate higher level of industrial pollution caused by industrial units situated jajmau .

The quality of water in the river Ganga is seriously affected by pollutants which enter through drains that bring industrial effluents. These industrial waste waters, besides other pollutants also contain high concentration of heavy metals.

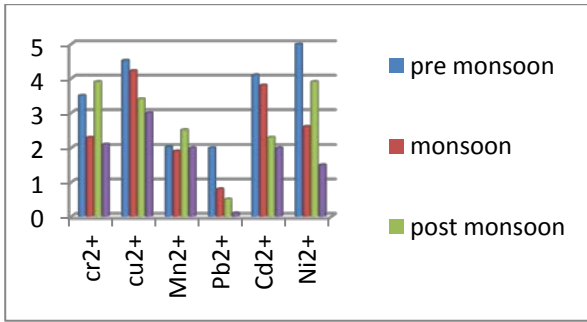
Because of adsorption, hydrolysis and co precipitation only a small portion of free metal ions stay dissolved in water and a large quantity of them get deposited in the sediment (Beg et al 2008) watersamples was collected from 02 station from different location and different season of ganga river Jajmau area of Kanpur and analyzed for selected metals their concentration are given in Table 4 to Table 5.

Table 3 Physico-chemical analyzes of the treated tannery effluent for sampling station 1

Parameter	Effluent	Permissible limit
pH	8.50	7.0
Conductivity	11500	850
Alkalinity	760	500
Total solids(TS,mg/l)	2450	2200
BOD	272	30
COD	460	250
DO	3.1	5
Total dissolved solids (TDS,mg/l)	3010	2100

Table 4 Heavy metal content of treated tannery effluent

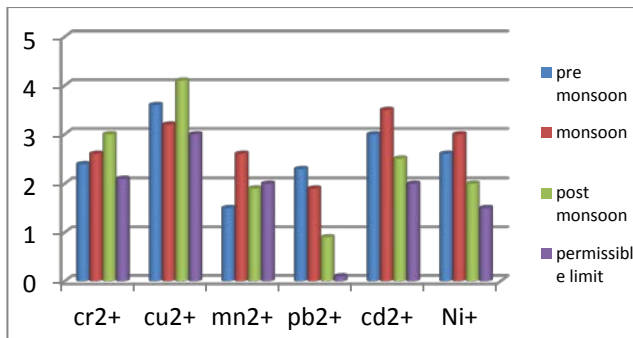
Heavy metal (mg/kg)	Station -1			Permissible limit
	Chandan ghat			
	Pre-monsoon	monsoon	post monsoon	
Cr2+	3.5	2.3	3.9	2.1
Cu2+	4.52	4.22	3.4	3.0
Mn2+	2.03	1.9	2.5	2.0
Pb2+	2.00	.8	.5	.1
Cd2+	4.1	3.8	2.3	2.0
Ni2+	5.0	2.6	3.9	1.5



Station 1: heavy metal content polluted water in different season

Table 5 Heavy metal content of treated tannery effluent

Heavy metal(mg/kg)	Station- 2			Permissible limit
	Siddhnath ghat			
	Pre- monsoon	Monsoon	post- monsoon	
Cr2+	2.4	2.6	3.0	2.1
Cu2+	3.6	3.2	4.1	3.0
Mn2+	1.5	2.6	1.9	2.0
Pb2 +	2.3	1.9	.9	.1
Cd2+	3.0	3.5	2.5	2.0
Ni2+	2.6	3.0	2.0	1.5



Station 2: heavy metal content polluted water in different season

4. CONCLUSION

Heavy metal levels in collected from 3 different seasons and find that chandan ghat Jajmau area was higher than siddhnath ghat area. The concentration of heavy and transition metals in the wastewater is extremely high. The pH of was 8.50 having conductivity is 11500 moles/cm. The level of alkalinity, BOD, COD, TS, TDS, magnesium, and DO were above the permissible limits. The Heavy metal such as cr, As, Fe, Cu, Mn, Zn, Pb, Cd ,and Ni were present in significant quantities..

It also underlines the need to control the quality and quantity of the waste water that is being discharged into the river, so as to maintain the desired quality of water.

Regular monitoring of the water quality is thus required to assess the condition of river water. It is helpful in saving the river from further degradation. From the above study it is clear that the water of river Ganga is very much polluted but still can be used for agriculture and fish culture. But there is an urgent need to control the further deterioration of river water.

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