

## Physico-chemical analysis of river Ganga at Vindhyachal Ghat

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### ABSTRACT

Here an attempt has been made to assess the pollution by physico-chemical analysis and concentration level of some trace metals in water of river Ganga at Vindhyachal ghat during Navratri Pooja. The study evaluates physico-chemical properties of water of the river covering sampling during September to November 2005 and March to May 2006. The result indicates that the river Ganga at Vindhyachal ghat is in a serious grip of water pollution during Navratri Pooja due to huge gathering of population. The few toxic metals namely Fe, Cu, Ni, Cr, Zn & Cd were collected and studied at sites. This site was polluted and the water is not suitable for domestic use, irrigation and other purpose, making it essential to devise suitable strategies, so as to protect the river from the on slaught pollution. Water is said to be polluted when it has changes in its quality and its chemical composition, Trivedi (1998).

**Key words:** Pollution, river Ganga, Vindhyachal ghat.

### INTRODUCTION

Vindhyachal is the holy place of Hindus due to the temple of the Goddess Vindhyachal and it is situated at the bank of river Ganga at a distance of about 5-6 km. from Mirzapur city. Ganga is one of the important components of the water resources at Mirzapur district. Water of river Ganga is used for domestic, agricultural and residential purpose. But unfortunately it is being polluted through a number of polluting sources such as sewage, carpet industries, metal industries, metal industries etc and also due to disposal of burnt and unburnt human and animals carcasses and run off from agricultural fields containing pesticides and other agrochemical. At the Vindhyachal ghat The river is highly polluted during Navratri pooja as about 5 to 6 lakh people use to come from Mirzapur and neighboring districts. Peoples bath in Ganga, and worship the Goddess Vindhyachal. That is continued for nine days during the month of April (light summer) and October (light winter). The purpose of present investigation was to assess the heavy metal contamination in water of river Ganga.

### MATERIAL AND METHOD

At upstream near Imilia ghat before the river enters in the city, to assess the quality of water free from contamination induced with the city sewage and other pollutants, was selected as a control site. The sample was taken from Vindhyachal ghat during the month of September to November 2005 and March to May 2006 because in the month of October and April the pilgrim population is increased during Navratri period. Water sample was collected from above site in washed and dried polythene bottle of 1 litre.

Temperature was measured by Fahrenheit thermometer at the site. Ph was measured by Digital Ph meter. Alkalinity is measured by Potentiometric titration. Turbidity was measured by digital turbidity meter. Total Dissolved solids were determined by evaporating using Barium chloride solution in trace amount of residue. BOD (Biological Oxygen demand) was measured by 5 days of BOD Test. COD (Chemical Oxygen demand) was measured by Dichromate Reflux

method. DO (Dissolve Oxygen) was measured by Winkler method. Sulphate was determined by using Barium chloride solution in trace amount, which was precipitated as BaSO<sub>4</sub>. Chlorides were simply and rapidly determined by titration with AgNO<sub>3</sub>. Solution using K<sub>2</sub>CrCO<sub>4</sub> as an indicator. Copper content was measured by Neocurproine method. Chromium was determined by biphenyl carbazide method. Nickel content was measured by frame AAS method. Iron was determined by Phenathroline method. Zinc was determined by Zicron method. Cadmium content was measured by Dithizone method. Total hardness was analysed by complexometric Titration. Above all parameters were analysed by using standard method of APHA in the laboratory.

### RESULTS AND DISCUSSION

The results of observation of various physico-chemical parameters of the Ganga River were presented at Table. The data shows that the temperature of water ranges form 30.0 to 35.0 °F.

It shows that variation in temperature is not much of Oct. and April in comparison to the month of Sept. and May respectively because of heavy population accumulation in these months. pH value determine on site holding about 6 hrs. is also high in both months. Alkalinity of water is its acid neutralizing capacity. It is a measure of an aggregate property of water (APHA 17<sup>th</sup> Edn, 1989 page 2-35). It is maximum in both the months or Navratri. Since, people bath in the river and so the turbidity of water rises in both the months. This was 58.5 JTU and 84.0 JTU. Total dissolved solids are dispersed in water in the form or inorganic and organic particles or of immiscible liquids. It is found maximum in both Oct and April month due to bathing and washing cloth by pilgrim population. The level of BOD and COD indicates of pollution. Maximum BOD and COD values were observed 6.7 and 6.5 and 6.0, 6.9 respectively in the month of Oct and April. Jain and Dhameja (2000) observe that COD is required Oxygen by the organic substance in water to oxidize them by a strong chemical oxidant.

Table - 1:

S. No.	Parameters	Unit	Control Site	Sept. - 2005	Oct. - 2005	Nov. - 2005	March - 2006	April - 2006	May - 2006
1.	Temperature	°F	35.0	34.8	34.00	30.0	31.0	34.6	35.0
2.	pH		7.00	7.49	7.98	8.00	8.1	8.00	7.2
3.	Alkalinity	Mg/l	150.00	151.00	200.00	195.5	152.00	205.00	151.5
4.	Trubidity	JTU	80.00	82.5	85.5	83.5	82.5	84.0	81.2
5.	Total Solids	ppm	1000.00	1058.00	1065.00	1061.00	10040.00	1062.00	1050.00
6.	BOD	ppm	3.5	5.88	6.7	6.6	6.01	6.5	5.5
7.	COD	ppm	5.5	6.95	6.0	5.95	6.1	6.9	5.6
8.	DO	ppm	4.58	4.32	4.43	4.35	4.36	4.40	4.08
9.	SO <sub>4</sub>	Mg/1	350.00	351.98	360.00	357.00	352.00	358.00	351.00
10.	Cl	Mg/1	300.00	345.9	355.00	353.00	350.00	356.00	340.00
11.	Cu	Mg/1	1.70	1.98	2.0	1.95	1.75	1.99	1.76
12.	Cr	Mg/1	1.09	0.17	0.2	0.19	0.18	0.19	0.16
13.	Ni	Mg/1	0.1	0.5	0.9	0.6	0.8	0.9	0.6
14.	Fe	Mg/1	1.0	1.3	1.4	1.5	1.3	1.4	1.2
15.	Zn	Mg/1	0.50	0.59	0.6	0.57	0.55	0.6	0.53
16.	Cd	Mg/1	0.1	0.12	0.15	0.13	0.11	0.16	0.14
17.	Total Hardness	Mg/1	500.00	530.00	600.00	585.00	590.00	599.00	520.00

Dissolved oxygen is one of the most important parameter in water quality studies. It influences that distribution and abundances of algae population and is important in bring in about various biochemical changes. DO is maximum in during Navratri Pooja but in the month of May 2006 it is slightly increased due to the summer season. The range of sulphate maximum in the Pooja month, it is because of human waste and detergent used in these months. Excess amount of sulphate in water has cathartic effect on human health Rangwala, K.S and Rangwala, PS (1927).

Chloride in drinking water is relatively harmless if present in amounts of below 250 ppm. Chloride content was found to be in the range of 340 to 345 at the site. High percentage of chlorides was probably due to large amount of sewage discharges in the river. Similar observations have been reported by Khanna and Bhutani (2003).

Copper is an essential element in traces for plants and animals. It is an essential component of ascorbic Acid oxidase, tyrosinase, cytochrome

oxidase and galactose oxidase (Naggle and Fritz 1986 De. A.K.-IV edition). It is maximum in the month of Oct and April. Presence of Chromium indicates the industrial pollution in water. Here Chromium value goes up to 0.2 during both the months. Presence of Ni also indicates the industrial input in the water. During both the month the percentage of Ni is same but more in comparison with other months. Iron is found in dissolve state form Iron-bearing sediments, wines, industrial processes. Thus variation in Fe percentage is not more. Zinc indicates industrial inputs having little variation. Presence of Cadmium also industrial input the river Ganga. Total hardness of the water was also maximum in the analyzed months.

### Conclusion

On the basis of these studies it is concluded that water of Ganga River before entering the Vindhyachal Ghat (Mirzapur district, U.P.) is already polluted by industrial and sewage pollutant and at site it become more polluted by the accumulation of a huge pilgrim of populations during the Navratri Mela/Pooja in the month of April & Oct.

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