



Water Quality Assessment of River Ganges at Allahabad, Uttar Pradesh, India

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General Note

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ABSTRACT

The present study represents the water quality changes in concentration of physico-chemical parameter in river Ganges of Allahabad. The water sample was collected at five different sites viz. Site 1st (Govindpur), Site 2nd (Daraganj ghat), Site 3rd (Ram ghat), Site 4th (Sangam), Site 5th (Arail ghat), Feb-April 2015 at an interval of 10 days. The analyze results of water quality parameters Temp. ranges between 20.1°C to 30.5°C , pH 7.4 to 8.9, EC 0.3 to 1.7µmho, TDS 202 to 476 mg/l, Dissolved Oxygen 5.8 to 10.1mg/l, Biochemical Oxygen demand 2.7 to 5.4 mg/l, Total Hardness 116 to 232mg/l at selected site. The results of study reflect that water quality of river slightly deteriorated.

Keywords: River Ganges, water quality, Pollution

1. INTRODUCTION

River Ganges is the largest river in India spread over almost 2,525 km long from Gangotri to Bay of Bengal and its basin covers about 8,61,404 km², providing water for life to more than twenty five cities and thousands of villages (Meher et al., 2014). Ganges

River represents vast diversity of billions of microbial and aquatic habitats living in it and therefore, monitoring of the water quality of the river is of central importance especially because of known worldwide concern for declining the water quality (Carpenter et al., 1998, Singh et al., 2008). Due to increasing industrial, agricultural and domestic factors river Ganges is considered a largely polluted river in the world (Singh et al., 2007; Sharma et al., 2012).

The river is also a site for religious bathing, washing and watering of animals and the disposal of human and animal corpses Due to rapid population growth, agricultural and industrial developments, and the quality of water in rivers is being degraded continuously making it unsuitable for various uses (Khan and Nath, 2014). An accurate and rational assessment for river water quality is required for determining the extent of usefulness of water bodies for various uses.

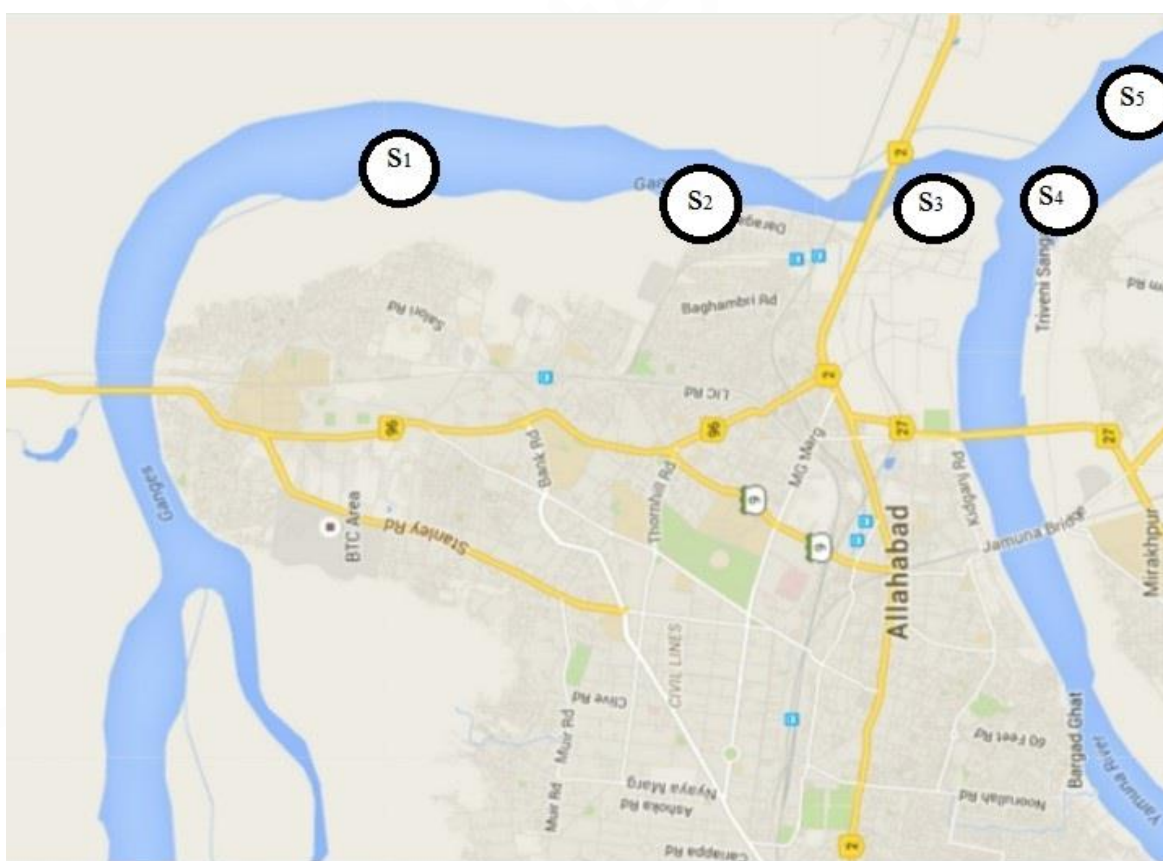
2. MATERIAL AND METHODS

2.1. Sampling Location

Sample was collected from selected sampling location on river Ganges at Allahabad City, U.P. (India). Detailed of sampling location and location map are present in Table 1 and Figure 1.

Table 1 Details of the Sampling Stations with Latitude and Longitude

Sampling Station	Site notation	Latitude	Longitude
Govindpur	S1	25° 48.53 N	81° 88.25 E
Daraganj ghat	S2	25°44.49 N	81° 88.54 E
Ram ghat	S3	25° 43.47N	81° 88.45 E
Sangam	S4	25°42.64 N	81° 88.60 E
Arail ghat	S5	25° 43.50 N	81° 89.38 E



S₁= Govindpur, S₂= Daraganj ghat, S₃= Ram ghat, S₄= Sangam & S₅= Arail ghat

Figure 1 Sampling site map on course of river

2.2. Sampling Interval and Time

In this study, water sampling was collected every 10 days interval during period (Feb, 2015-April, 2015) at each sampling stations, water sample was collected during 6 AM to 8 AM.

2.3. Sampling Procedure

Water samples were collected in plastic containers (cleaned thoroughly and rinsed with distilled water) from 0.5m below the water surface simultaneously at all fives sampling stations.

2.4. Analytical procedure

The samples were analysed as per Standard methods (APHA, 1995).The standard reagents used in analysis were prepared using double distilled water. All analysis was performed in Department of Environmental Science Laboratory, SHIATS, Allahabad.

3. RESULTS AND DISCUSSIONS

The water quality samples has been carried out for Temperature, pH, EC, Total Hardness, TDS, BOD, DO. The results of the physicochemical analysis of the river water samples are presented in Table 2

Table 2 Physico- chemical characteristics of water quality parameter in different Stations

Parameter	Site 1	Site 2	Site 3	Site 4	Site 5
Temp(^o c)	20.2 ^o C – 29.5 ^o C	20.6 ^o C-29.5 ^o C	21.4 ^o C-29.5 ^o C	20.1 ^o C-30.5 ^o C	21 ^o C- 29.5 ^o C
pH	7.4 – 8.7	7.4- 8.6	7.4- 8.3	7.4- 8.6	7.6- 8.9
EC (µmho)	0.48 – 1.0	0.3- 0.9	0.6- 1.2	0.6- 1.1	0.4- 1.7
TDS(mg/l)	202 – 286	212- 302	286- 347	218- 281	249- 476
DO(mg/l)	6.1 – 8.8	5.8- 10.1	6.4- 10.1	7.3- 8.8	6.4- 8.4
BOD(mg/l)	3.1 – 5.3	2.7- 4.5	2.7- 4.7	3.2- 5.4	3.1- 4.4
Total Hardness(mg/l)	123 – 214	123-164	128- 156	116- 184	161- 232

3.1. Temperature

Temperature is mainly depending on the atmosphere and whether condition. It is basically important for its effect on certain chemical and biological reactions taking place in water and aquatic organism The present investigation reveals that the temperature increases more rapidly within given interval period i.e. 10days, temperature varies between min 20.1^oC February and maximum 30.5^oC in the month of April indicating a gradual increasing trend due to major disposal of untreated sewage and industrial effluents, which rise the temperature.

3.2. pH

The pH values ranges between 7.4 to 8.9.The minimum pH was recorded 7.4 at site 3 and maximum site 8.9 at site 5 during sampling period. The values of pH increases from Feb to April may be due to increased photosynthesis of the algal blooms resulting into the precipitation of carbonates of calcium and magnesium from bicarbonates.

3.3. Electrical Conductivity (EC)

It represents the total concentration of soluble salts/mineral salts in water, thereby making it sour and unsuitable for drinking. The EC values ranges between 0.3 to 1.7 µmho. The minimum EC was recorded 0.3 µmho at site 2 and maximum 1.7 µmho at site 5. The narrow decrement of electrical conductivity can be due to the unexisting lithology of the region of the River Ganga.

3.4. Total Dissolved Solids (TDS)

Total Dissolved solids is measure of the combined content of all organic and inorganic substances contained in a liquid in molecular, ionized or micro-granular suspended form. The TDS values ranges between 202 to 476 mg/l. The minimum TDS was recorded 202mg/l at site 1 and maximum 476 mg/l at site 5 variation in the total dissolved solids due to huge effluents without or partial pre-treatment.

3.5. Dissolved Oxygen (DO)

The amount of dissolved oxygen is a measure of the biological activity of the water masses and is widely used in water quality studies and routine operation of water reclamation facilities. The DO values range between 5.8 to 10.1 mg/l. The minimum DO was recorded 5.8 mg/l at site 2 and maximum 10.1 mg/l at site 3. The trend of DO variation during three months indicates more or less a normal distribution of DO during the sampling period.

3.6. Biochemical Oxygen Demand (BOD)

BOD value is an indication for the entry of organic waste in the river and shows that high values are an indication of organic pollution. The BOD values range between 2.7 to 5.4 mg/l. The minimum BOD was obtained 2.7 mg/l at site 2 and maximum 5.4 mg/l at site 4.

3.7. Total Hardness (TH)

Hard water is water that contains high levels of dissolved calcium, magnesium and other mineral salts such as iron. A high amount of dissolved minerals in the water causes more of the water to be hard. The hardness in the water due to the concentration of multivalent metallic ions of calcium and magnesium. The Total Hardness values range between 116 to 232 mg/l. The minimum Total Hardness was recorded 116 mg/l at site 4 and maximum 232 mg/l at site 5.

4. CONCLUSION

The results of the study reflected that the physico-chemical characteristics of river Ganges water were within permissible limits, except BOD, which was significantly affected due to domestic waste adjoining areas. This study will help the water quality monitoring and management in order to improve the quality of water with maintaining better sustainable management.

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