

ANALYSIS OF WATER QUALITY OF GOMTI RIVER AT DISTRICT SULTANPUR (U.P.)

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Abstract: The present research study was focused to evaluate the physico-chemical quality of Gomti river water at district Sultanpur (U.P.). The water samples collected from three selected sampling stations viz. Dhobighat (S-I), Shamsan Ghat (S-II) and Paparghat (S-III). The water samples were analysed for Temperature, Colour, Turbidity, pH, Total hardness, Total dissolved solids, Alkalinity, free Ammonia, Sulphate, Chlorides, Dissolved oxygen, BOD, COD and free CO₂ between April, 2010 to March 2011. The water quality declined due to bathing, washing, domestic, municipal and industrial waste from various areas of town which directly or indirectly affects the biotic community of the river. The mean value (\pm SD) of all physico-chemical parameters, mentioned above are observed.

Key Words: Water quality, Gomti River, Sultanpur (U.P.).

I INTRODUCTION

The Gomti river is tributary of the river Ganga and also known as Aadi Ganga. Gomti river flows in the state Uttar Pradesh in India. It originates from a small reservoir named as "Gomat Tal" which is situated approximately 32 km east of district Pilibhit and merges in to river Ganga in between Varanasi and Gazipur. The river extends 940 km through 15 district of the state. In recent years, because of continuous growth in population, rapid industrialization and sewage disposal, the rate of discharge of pollutants in to the river water is far higher than the rate of their purification. The present study attempts to investigate the water quality of Gomti river at District Sultanpur (U.P.).

II MATERIAL AND METHODS

Water samples were collected once in a month from three selected sites of study area during the course of investigation for a period of one year from April, 2010 to March, 2011. Analysis was done for determination of 14 physico-chemical parameters viz. Temperature, Colour, Turbidity, pH, Total hardness, Total Dissolved solids, Alkalinity, free Ammonia, Sulphate, Chlorides, Dissolved Oxygen, BOD, COD, and free CO₂ as per the standard methods (APHA, 1999).

III RESULTS AND DISCUSSION

The mean and standard deviation of physico-chemical parameters for three selected sampling stations Dhobighat (S-

I); Shamsanghat (S-II) and Paparghat (S-III) are presented in Table-1. The maximum water Temperature was recorded 30.2 °C at site-II during summer season in the month of June, 2010 and minimum was recorded as 18.4 °C at site-III during winter season in the month of December 2010. The maximum mean value of water temperature was recorded 25.02 ± 2.88 at site-I and minimum mean value was recorded 24.65 ± 4.12 at site-III. In the summer, water temperature was generally higher as compared to winter months (Yogesh Shastri et.al. 2004).

The maximum value of Colour of Gomti River water was recorded (on pt-co-scale) as 9.6 at site-III in the month of June, 2010 and minimum value was recorded as 4.3 at site-II in the month of April, 2010. The maximum mean value of colour of river water was recorded 8.29 ± 1.11 at site-III and minimum mean value was recorded 6.25 ± 1.10 at site-II.

The maximum value of Turbidity was recorded as 48.5 at site-I in the month of June 2010 and minimum value was recorded as 31.2 at site-III in the month of October, 2010. The maximum mean value of turbidity of Gomti river water was recorded 42.0 ± 3.63 at site-I and minimum mean value was recorded 36.99 ± 3.18 at site-III.

The maximum values of pH of Gomti river water were recorded as 8.5 at site-II and III in the month of June and August, 2010. and February and March, 2011 and the minimum value of pH was recorded 7.1 at site-I in the month of May, 2010. The maximum mean value of pH of Gomti river water was recorded as 8.13 ± 0.36 at site-III and the minimum mean value was recorded as 7.83 ± 0.42 at site-I. The values of pH are well within the standard limit for fresh water standards (Yashodhara & Ashok, 2003).

The maximum value of Total Hardness was recorded as 272.6 at site-I in the month of July, 2010 and minimum value was recorded as 175.0 at site-III in the month of November, 2010. The maximum mean value of Total hardness was recorded 245.23 ± 18.41 at site-I and minimum mean value was recorded 208.84 ± 19.96 at site-III. The value of Total hardness of samples were found in the range between 175.0 to 272.6 mg/l, which are found well within the standard limit (Sankar Amita et.al. 2007).

The maximum value of Total Dissolved Solids was recorded as 562 at site-II in the month of July, 2010 and minimum value was recorded as 428 at site-III in the month of

August, 2010. The maximum mean value of Total Dissolved Solids were recorded as 503.42 ± 26.89 at site-II and the minimum mean value was recorded as 466.17 ± 24.26 at site-III. The high amount of suspended, dissolved and total solids adversely affect the quality of water and unsuitable for any purpose including irrigation (**Karthikeyan et.al., 2002**).

The maximum **Alkalinity** was recorded as 196 at site-II in the month of May, 2010 and the minimum was recorded as 145 at site-I in the month of November, 2010. The maximum mean value of Alkalinity was recorded 180.67 ± 13.39 at site-II and the minimum mean value was recorded 174.0 ± 16.87 at site-I. In the present study the total Alkalinity was high during summer season followed by steep fall in monsoon periods. The low alkalinity was recorded in the month of November (After monsoon) due to dilution. A similar opinion has been expressed by **Sinha et.al. 1996; Shanthi et.al. 2002 and Shivkumar et.al. 2003**.

The maximum value of **free Ammonia** was recorded as 9.1 at site-III in the month of December, 2010 and the minimum value was recorded as 6.3 at site-II in the month of May, 2010. The maximum mean value of free Ammonia was recorded 8.36 ± 0.47 at site-III and the minimum mean value was recorded as 6.92 ± 0.46 at site-II. The large value of free Ammonia at all site is due to the presence of nitrogenous organic matter, sewage disposal etc. The presence of excess amount of ammonia in water causes threat to human and aquatic fauna which depend on such water (**Srivastava, R.K. and Seema, 2003**).

The maximum concentration of **Sulphate** was recorded as 215.0 at site-I in the month of November, 2010 and the minimum concentration was recorded as 135.8 at site-III in the month of March, 2011. The maximum mean value of sulphate was recorded 195.01 ± 7.78 at site-I and the minimum mean value was recorded 138.85 ± 1.81 at site-III.

The sewage consisting of organic sulphur compound, are decomposed by protolytic bacteria to H_2S in the absence of oxygen, which get oxidised in to sulphuric acid. The sulphuric acid is the source of sulphate in water. A very low concentration of the sulphate ion is lethal to fish and the presence of H_2S also inhibits oxygen utilization like cyanides.

The maximum concentration of **Chlorides** was recorded as 80.8 at site-II in the month of February, 2011 and the minimum concentration was recorded as 28.5 at site-I in the month of November, 2010. The maximum mean value of chlorides was recorded 71.53 ± 6.10 at site-II and the minimum mean value was recorded 37.73 ± 5.54 at site-I. The high value of chlorine present in water is due to the sewage disposal as well as disposal of industrial effluents in to river water. The excess amount of chlorine makes the water salty and possess serious problem to the aquatic fauns (**Ravi Prakash and Krishna Rao, 1998**).

The maximum value of **Dissolved Oxygen** in the Gomti river water was recorded 7.5 at site-II in the month of January 2011 and the minimum value was recorded 4.0 at site-I in the month of June, 2010. The maximum mean value of dissolved oxygen was recorded 6.25 ± 0.93 at site-II and the minimum

mean value was recorded 5.04 ± 0.67 at site-I. It is obvious that the flowing water at low temperature contain higher D.O. compared to stagnant or slow moving water at high temperature. In the present study, the D.O. was minimum during summer season and maximum during winter (**Saradhamani and Shivakumar 1995**).

The maximum value of **B.O.D.** was recorded 11.5 at site-I in the month of June 2010 and the minimum value was recorded as 6.0 at site-II in the month of January 2011 and at site-III in the month of December 2010. The maximum mean value of B.O.D. was recorded 10.03 ± 0.75 at site-I and the minimum mean value was recorded 6.90 ± 0.57 at site-III. The standard value of B.O.D. for fresh water is 3.0 but when the value of B.O.D. reaches 5.0 then the purity of water is doubtful (**Tiwari R.K. et.al. 2005**).

The maximum value of **C.O.D.** was recorded as 21.5 at site-II in the month of June, 2010 and the minimum value was recorded as 13.8 at site-III in the month of December, 2010. The maximum mean value of C.O.D. was recorded 18.39 ± 1.63 at site-II and the minimum mean value of C.O.D. was recorded as 14.83 ± 0.86 at site-III. The C.O.D. level for all the samples are too high than the standard limit, thus such water can't be used for drinking purpose and also harmful to the aquatic life (**Singh K.P. et.al., 2006**).

The maximum value of **free CO₂** was recorded as 9.0 at site-II in the month of June 2010 and the minimum value was recorded as 5.7 at site-II in the month of September, 2010. The maximum mean value of free CO₂ was recorded 8.07 ± 0.54 at site-III. and the minimum mean value was recorded as 6.96 ± 0.99 at site-I. In the present study, the maximum free CO₂ level was recorded during summer season and minimum level was recorded in winter, which is antagonistic to dissolved oxygen level. The CO₂ being injected in to water by decay of organic matter, disposal of combustion of fuels, ash of dead bodies and industrial effluents (**Srivastava Neera et.al. 2003**).

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Table No. 1

Values of mean and standard deviation of physico-chemical parameters recorded at three selected sampling station during April, 2010 to March 2011 from Gomti river at district Sultanpur (U.P.).

S. No.	Physico-chemical Parameters	Mean			Standard deviation		
		S-I	S-II	S-III	S-I	S-II	S-III
1.	Temperature (°C)	25.02	24.9	24.65	2.88	3.93	4.12
2.	Colour (on pt-co scale)	7.28	6.25	8.29	1.07	1.10	1.11
3.	Turbidity (JTU)	42.00	39.03	36.99	3.63	3.05	3.18
4.	pH	7.83	8.08	8.13	0.42	0.30	0.36
5.	Total Hardness (ml/l)	245.23	235.40	208.84	18.41	19.79	19.96
6.	Total dissolved solids (ml/l)	501.08	503.42	466.17	30.47	26.89	24.26
7.	Alkalinity (ml/l)	174.00	180.67	179.58	16.87	13.39	9.37
8.	Free Ammonia	7.37	6.92	8.36	0.38	0.46	0.47
9.	Sulphate	195.01	178.69	138.85	7.78	1.67	1.81
10.	Chlorides	37.73	71.53	57.47	5.54	6.10	6.26
11.	Dissolved Oxygen	5.04	6.25	6.07	0.67	0.93	0.65
12.	B.O.D.	10.03	7.04	6.90	0.75	0.77	0.57
13.	C.O.D.	17.85	18.39	14.83	1.37	1.63	0.86
14.	Free CO ₂	6.96	7.23	8.07	0.99	1.08	0.54