PHYSIOCHEMICAL ANALYSIS OF GOMTI RIVER IN LUCKNOW CITY, UTTAR PRADESH

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Abstract-River water is significant for every living organism. In Indian mythology rivers are given the status of Goddess and were worship. Modernization and urbanization has polluted the river water and degraded their status. Assessment of water quality and determination of pollution level has become a big necessity today. In view if above, the present work envisages findings of various physicochemical characteristics (pH, hardness, chloride, alkalinity, etc.) examined for Gomti river water samples collected from three different locations of Lucknow. This study was meant to determine the recent status of River Gomti along the Lucknow stretch. Results of the study indicated that river water is highly contaminated and not suitable for recreational activities.
Keywords: Gomti River, Physiochemical studies.

1. INTRODUCTION

River Gomti, one of the major affluent of river Ganga triggers from a reservoir located near Madhotanda (Miankot) with an altitude of 200 m. Its origin starts about 50 km south of the Himalaya foot-hills and about 3 km east of Pilibhit in Uttar Pradesh. From public health point of view,increase in water pollution level due to dumping of unwanted substance into water bodies has created a big necessity for assessment of river water quality used for drinking and domestic purposes. Water quality is one of the keyconcerns for human beings, due to its direct link with all living things.Besides, urbanization, dumping of religious materials viz. flowers, food, sweets, clothes etc. in the river has increased the pollution level and deterioration of river water quality of the river Gomti which is also a major source for drinking/ portable water supply for urban population. Unprocessed industrial and household waste along with sewage are disposed directly into it through gutters has increased the water contamination to a great extent. . Festivals are an integral part of ritual and diverse cultural heritage of India.

Months from September to November are full of Hindu festivals. Navaratri, Dussehra, Ganpati utsav, Deepawali are some of the famousHindu festivals celebrated during this tenure. On these occasions, every year, thousands of small to large idols of Lord Ganesh,Goddess Durga and many more are engrossed in the river water. Innumerable biodegradable and non-biodegradable materials viz.plaster of paris, papers, clay, colors, jutes, clothes, wooden frame, thermocol etc. are present in them].Reports on presence of heavy metals like lead, chromium, nickel, cadmium and zinc to a significant extent are also available .A number of persistent colors and toxic chemicals leach from these idols and strewin the river water. These toxic non-biodegradable chemicals enter into human bodies through food chain. In the present work, various physiochemical studies have been made in order to find out some possible methods for water quality improvement and its protection.

2. SAMPLING SITES

Three sampling sites were selected namely Red pakka pul(I), Hanuman Setu (II) and Indira Dam(III). Samples were collected and analyzed.

3. MATERIAL AND METHODS

Three sampling sites were selected which cover the residential Lucknow region namely Red pakka pul(I), Hanuman Setu (II) and Indira Dam(III). The samples of water were collected from both the banks and middle stream of the river on each site. For collection of water sample, sampling bottles were soaked overnight in 10% HNO3 solution, which were then washed twice with double distilled water and rinsed three times with stream water, leaving the last rinse for five minute to equilibrate. Water samples were collected in acidified PVC bottles. Preservation and transportation of the samples to the laboratory were done following standard methods. (APHA1998). The ice boxes were used during transportation to avoid unpredictable changes in physiochemical characteristics. The containers were carefully filled just to overflowing, without passing air bubbles through sample or trapping air bubbles in sealed containers. Preparation of the containers included washing with detergent, rinsing with tap water, ultrapure water (Millipore) and air dried. Each sample was identified clearly and indelibly by allocating a unique identification number. Color, odor and taste in water are

determined physically. PH value in water is determined by using pH meter (Labtronics LT-49). Total dissolved solids in water were determined by TDS measurement apparatus. Total Hardness in water was determined by EDTA complexometric titration using EDTA as Titrant and EBT indicator. The alkalinity was examined by acid base titration using indicators. Dissolved oxygen and Chloride were estimated by iodometric titration and argenometric titration respectively. Determination of sulphatein water was done byNephelometry method using Nephelometric turbidity meter. Flame photometer was used for the determination of sodium and potassium.

4. RESULTS AND DISCUSSION

Various parameters observed during water analysis of Gomti River at Lucknow are listed in The data collected by sampling at various locations are analyzed and the results are discussed.

Table-4.1 The Data Collected by Sampling at Various Locations

Parameters	**Units**	**Requirement (Acceptable limit) [5]**	**Permissible limit in the absence of Alternate Source**	**Sampling location 1 Pakka Pul**	**Sampling location II Hanuman Setu**	**Sampling location III Indira Dam**
pH value		6.5-8.5	No relaxation	6.6	6.72	6.84
TDS	mg/L	500	2000	1385	1310	1415
Total Hardness(as CaCO3)	mg/L	200	600	545	570	535
Total Alkalinity	mg/L	200	600	520	545	515
Chloride Content	mg/L	250	1000	390	376	315
Sulphate (as SO4)	mg/L	200	400	167	215	189
Phenolic compounds	mg/L	0.0001	0.0002	0.00098	0.00010	0.00010
D.O.	mg/L	8	10	15	18	16.5

4.1 pH

The pH is a significant parameter for analyzing the quality of water and the extent of the pollution in the river water. A review of pH data with respected to primary water quality criteria prescribed by Environmental Protection Act. 1986 in terms of pH required in the range 6.5-8.5 for class 'A'water. pH is found to be within the range at the three sites, but is at lower site due to industrial and domestic discharge at this place which also affects the taste of water at the place. It has been observed that pH of water gets drastically changed with time due to temperature changes, exposure to air and biological activity.

4.2 Total Dissolved Solids (TDS)

Total dissolved solids in water are mostly salts of carbonates, bicarbonates, chlorides, phosphates and nitrates of calcium, magnesium, sodium, potassium and manganese, organic matter, salt and other particles. The maximum acceptable range of TDS in water is 500 mg/L. The analysis of the three water samples showed the values nearer to the permissible limit.

4.3 Total Hardness

Sulphates, Chlorides, Carbonates and Bicarbonates of calcium and magnesium are responsible for the total hardness. As the presence of organic matter increases the level of dissolved oxygen decreases thereby increasing

the concentration of carbon dioxide which gives more carbonate which hen combine with calcium and magnesium ion gives hardness to the water. The total hardness found in water samples were 545, 570 and 535 mg/l respectively.

4.4 Total Alkalinity

Alkalinity of water is the capacity of the water to accept protons. It may be defined as the quantitative capacity of an aqueous medium to react with hydrogen ions to pH 8.3 (phenolphthalein alkalinity) and then to pH 3.7 (total alkalinity or methyl orange alkalinity). Thealkalinities found in all the three water samples were 520mg/L, 545mg/L and 515mg/L respectively.

4.5 Chloride C**ontent**

Chloride in the form of chloride ion is one of the major inorganic anions in water and wastewater. The chloride concentration is higher in wastewater than in raw water because sodium chloride is a common article of diet and passes unchanged through the digestive system. Along the sea coast chloride may be present in high concentration because of leakage of salt water into the sewage system. It also may be increased by industrial process. In potable water, the salty taste produced by chloride concentration is variable and depends on the chemical composition of water. Some waters containing 250 mg/L may have a detectable salty taste if sodium cation is present. On the other hand, the typical salty taste may be absent in waters containing as much as 1000 mg/L when the predominant cations are calcium and magnesium. In addition, a high chloride contents may harm metallic pipes and structures as well as growing plants. The chloride content found in all three water samples were found to be 390 mg/L, 376 mg/L and 315mg/L respectively.

4.6 Sulphates (as SO4)

Sulphates are widely distributed in nature and may be present in natural water in concentration ranging from few hundred to several thousand mg/L. Sulphates occur naturally in numerous minerals including barite, epsomite and gypsum. These dissolved minerals contribute to the mineral content of drinking water. Sulphate is a second most abundant ion in sea water. Thesulphate content in all the three samples were 167 mg/L, 215 mg/L and 189 mg/L.

4.7 Phenolic Compounds

Most phenols react with 4-amino antipyrine at pH7.9 +0.1 in the presence of potassium ferricyanide to form a colored antipyrine dye. This dye is extracted from water with Chloroform and the absorbance is measured at 460 nm. The minimum detectable quantity is 1µg of phenol/liter in 460 distillate. This method is more sensitive and is adoptive for use in water sample containing less than 1 mg of phenol/liter. The Phenolic content were found as 0.00098mg/L, 0.00010mg/L and 0.00010mg/L respectively in all the three water samples taken.

4.8 Dissolved Oxygen (DO)

DO not less than 3-5 mg/l is essential for the survival of aquatic life D.O. at every location is above the permissible value. So these sites are least polluted from industrial, sewage and domestic waste. The dissolved level declines during rainy season as compared to summer and winter as in rainy season runoffs from the content of dissolved oxygen is sufficient enough so that the aquatic animals can survive here.

CONCLUSION

The water pollution level of Gomti riverwas found to be very high thereby indicating the poor quality of water which is unsafe and non - acceptable for any purpose. The level of all the indicators is above the standards, which are the serious concern for the ecology of the river. The deterioration of water was due to 26 drains along its stretch. Various industrial waste, agricultural waste and domestic wastes are the main cause of increasing urbanization and population resulted in the increase in the content of heavy metals that result in pollution of river water. Due to huge amount of organic and inorganic matter, river lost its self-purification nature resulting higher bacterial growth. That is why it is very necessary to treat the waste coming from industries and other sources before merging into the river so that aquatic species as well as human life may not get affected.

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