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Comparative Study Of River Water Quality at Different Ghats in Kanpur Region

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Abstract

In India, the river Ganga is believed as a goddess, and people worship it. Despite all the respect for the river, the river's condition is worsening, and we Indians are unable to maintain the purity of the river. The Ganga is a river of faith, devotion, and worship. Indians accept its water as "holy," which is known for its "curative" properties. The river is not limited to these beliefs but is also a significant water source, working as the life-supporting system for Indians since ancient times. The Ganga River and its tributaries come from cold, Himalayan-glacier-fed springs, which are pure and unpolluted. But when the river flows downgradient, it meets the highly populated cities before merging into the Bay of Bengal.

Nowadays, with the increasing urbanization, the Ganges basin sustains more than 40 percent of the population. Due to the significant contribution of the growing population and rapid industrialization along its banks, river Ganga has reached an alarming pollution level.

the present analysis, seasonal variation of Physio-chemical parameters of river Ganga at Kanpur, Indiawere studied. Samples for one year study (2021-22) were collected from six ghats of the river Ganga located in Kanpur city. The collected samples were analyzed for different Physio-chemical parameters viz.; temperature, pH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Total Dissolved Solids (TDS), Chlorides, Nitrate, Phosphate, Magnesium and with respect to Chromium metal contamination. The maximum water temperature was recorded in summer season and lowest in winter season.

The deterioration in water quality of the river, majorly due to Industry effluent and immersion of idol and disposal of waste, can be observed from Bithoor ghat upstream of Kanpur city to Siddhnath ghat at Jajmau downstream of Kanpur. The results were compared with the WHO water quality standards. The observed values of major parameters were slightly higher than the WHO limits. Therefore, the observed water quality suggests that the water could not be used for drinking and bathing purposes. It could only be used for irrigation after suitable treatment.

Key Words: Physio-chemical Analysis, BOD, Hardness, COD,DO, GroundWater, Nitrate, Kanpur

Introduction

Ganga river pollution is one of the most discussed topics on river water quality in the past few years. The uncontrolled discharge of domestic sewage without treatment, excessive pollutant discharge from the industries, agricultural runoff, etc. have made the river highly polluted (1). Ganga Action Plan (GAP) was launched in 1986 with an objective of restoring water quality to 'Bathing class'(2). Under GAP, several sewage treatment plants are constructed, common effluent treatment plants are constructed in

places where more industries are situated, and centralized monitoring systems are made compulsory for individual industries. While these actions have contributed to improve the water quality, it is still a long way before the quality can be restored to the bathing class standards (2). As per year 2011 records, out of the 764 grossly polluting industries discharging into Ganga River, 487 industries are from the Kanpur region (3).

Kanpur, a city in Uttar Pradesh, is famous for its leather industry, with nearly 400 tanneries housed in the suburbs of Jajmau alone. The industry has become a bane for the Ganga as it contaminates it severely with a heavy load of toxic chemicals and heavy metals such as chromium, cadmium, lead, arsenic, and cobalt, all of which have severe health implications. The drain at Dabka Ghat is just one of the four main drains that carry toxic tannery wastewater from around 400 tanneries of Jajmau. Under the Ganga Action Plan (GAP) phase 1 in 1986 (the oldest Ganga clean-up scheme), these drains were connected to the four intermediate pumping stations (IPS) that pump water to a 36 MLD (million liters daily) common effluent treatment plant (CETP) at Wajidpur in the city. This CETP plant has a capacity to treat just 9 MLD of industrial wastewater and 27 MLD of sewage.

Due to a lack of vision, the infrastructure that was put in place in 1986 catered to just 175 tanneries in Kanpur and can currently treat a maximum of 9 MLD tannery effluents. But the number of tanneries has more than doubled since then. Currently, up to 50 MLD of toxic tannery wastewater is generated daily, according to Central Leather Research Institute (CLRI), out of which only 9 MLD can be treated. This implies that almost 40 MLD of industrial effluents does not even reach the IPS for treatment and is dumped directly into the Ganga through overflowing drains like the one at Dabka Ghat. It is estimated that Kanpur generates 450 MLD of sewage every day as well but the existing infrastructure can only treat around 160-170 MLD. The remainder goes to the river directly. (4)

Aims And Objectives

To assess the water quality of Ganga River through analysis of selected water quality by parameters and to compare the results with the WHO standard.

Materials and Methods:

In this study four sampling station on Ganga river at Kanpur were selected. Samples were collected in Plastic 2 litre container to evaluate the over all quality of river water by the amalysis of parameters like DO, Ph, B.O.D. Turbidity, total alkalinity, Chloride, Total hardness, Magnesium, Calcium hardne, TDS, and T.S.S. The four sampling Points were Bithor, Bairaj, Parmat and Shekhpur (Siddnath Ghat). The analysis was done by physico chemical method. The water samples were collected from these points during pre and Post monsoon seasons in the year 2021-2022. The pH of the water samples were determined on the site immediately and rest of the sampled water preserved by keeping in ice Thermacol box for the analysis. within few hours by using standard methods (7,8,9). Plankton Samples were collected by standard methods (10,11)

Result and Discussions:

The results of the various parameters presented in Table-1.

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Average concentration of Various Parameters

Sampling Point /Parameter

S.No.	Mg/l	S_1 Bithoor	S_2 Bairj	S_3 Parmat	S_4 Shekhpur
1.	D.O.	6.9	5.6	5.1	4.8
2.	pH	8.76	9.4	9.2	6.0
3.	BOD	3.8	4.1	4.7	5.18
4.	Turbidity	168	179	178.9	398
5.	T. alkalinity	110	140.01	142.03	164.01
6.	Chloride	18	20	22	34
7.	Total hardness	320	380.23	385.00	480.00
8.	Calcium hardness	178	180	180.2	196
9.	Magnesium	130	149	148	156
10.	TDS	220	238	238.2	279.2
11.	TSS	160	167	169	197
12.	COD	20.2	24.4	24.5	29.2

Temperature is one of the most important physical factors which regulated natural process wither in the ecosystem Temperature influence several other parameters and can alter the physical and chemical properties of water (12) temperature were recorded between 34 to 37.5 during premansoon season (13). At S_1 point it was 34^0, S_2- 34.5^0 S_3 -35^0 and S_4 -37.5^0 and post mansoon it was observed at S_1 point 17.2^0, S_2-18.0, S_3 18.2 and S_4 19.5 The DO was 6.9, 5.6, 5.1 and 4.8 mg/l at S_1, S_2, S_3 and S_4 respectively in (table-1) DO was found (5.6, 5.1 and 4.8 mg/l) less than permissible limit 6.0 mg/l.

pH is a indicator to know the nature of water whether it is acidic or alkaline and measures the hydrogen ion concentration in water. Minimum concentration of pH was observed at S_4 point (4.8) and maximum was found at S_2 point (9.4) (Table-1) The pH was fond higher and lower then the prescribed standard limit 6.5-8.5 The amount of oxygen required by micro organism to stabilize the bridgeable organic matter present in water is known as Biochemical oxygen demand BOD (Gang war et al). Minimum BOD was fond at s_1 point (3.8 mg/l) and maximum at s_4 point (5.18 mg/l). BOD was higher than permissible limit 2.0mg/l at all sampling point. Turbidity is also an important parameter to determine the water quality. If there is more turbid water light will scatter more due to presence of dissolved suspended particles (14) The average range of turbidity was found 168 to 398 MTU in s_1 to s_4. Turbidity was much higher than the prescribed standard limit. However it was higher at s_4 point. The acid neutralizing capacity in water without any significance change in pH is called Alkalinity, Total alkalinity is due to carbonate, bicarbonate and hydroxide content. It was found 110 to 164.01 in s_1 to s_4 as mentioned in Table-1

Chloride is the most common inorganic present in water comes through sewage which indicates the sewage pollution (15).

Hardness refers to the lather farming capacity of a water sample and the two Cations are responsible for the hardness of water that are Calcium and magnesium (16) minimum mean total hardness (320 mg/l), Ca^{++} (178 mg/l), Mg^{++} (130mg/l) at S_1 point and maximum TH (480.01 mg/l), Ca^{++} (196 mg/l), Mg (156 mg/l) at S_4 point (Table-1) TH was found higher than the limit (200mg/l) in all samples. TDS is a measure of dissolved solide in water which can be expressed as the amount of residual left when sample has been dried. It helps to determine the suitability of water for domestic, agriculture and industrial purpose (17) Minimum mean TDS was observed (220 mg/l) at S_1 point and maximum (279.2 mg/l)at S_4 point.

TDS was found under the permissible limit (500 mg/l) at all sampling points.

TSS are particles that are larger than 2 microns found in the water column Most suspended solids are made up of inorganic materials though bacteria and algae can also contribute to the total solids concentration (18). The minimum TSS was observed (160 mg/l) at S_1 points and maximum (197 mg/l) at S_4 points it was found much more higher limit than the permissible limit (75 mg/l)

Chemical oxygen demand (COD) is the amount of oxygen required for chemical oxidation of organic matter using a strong chemical oxidant. This test indicates the pollution is water body and self purification capacity of it. observed value of COD ranged from 20.2 mg/l at S_1 point to 29.2 mg/l at S_4 points.

Conclusion:

Physico-chemical property of Ganga rive at Kanpur was studied al results showed that parameters do pH, BOD Turindity total alkalinity chloride, total hardness, Ca-hardness, magnesium hardness TDS, TSS COD were that the concentrations of all parameters were increasing gradually from s_1 to s_4 points.

This study is confirming that the pollution in Ganga river was in increasing trend. The study conclude that all sampling stations were unsuitable for drinking purpose.

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