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STUDY OF SOME PHYSICO-CHEMICAL CHARACTERISTICS OF VRAHDHHA GANGA RIVER IN KASGANJ DISTRICT

Mani Gahlaut[1] and Meera Singh[1]
[1]Department of Zoology, Dharm Samaj College, Aligarh
Affiliated to Dr. Bhim Rao Ambedkar University, Agra, Uttar Pradesh, India
Corresponding Author E-mail: smani410@gmail.com
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Abstract

River water is crucial for every living thing. River water is a natural and vital resource of the freshwater system for all living beings however, human has been using aquatic resources that leads to contamination of water. The modernization and industrialization has affected the water quality. Disposal off industrial waste in water body become a matter of concern that affect the water quality directly or indirectly. Due to changes in water quality, it threatens the aquatic ecosystem most. The impact of household and industrial trash on the river's water quality is the main topic of this study Vrahadhha Ganga. The study is carried out at two sites during different seasons for a year. The sample was obtained, and it was examined using a conventional procedure that took into account variables like temperature, pH, BOD, DO, alkalinity, and ammonia.
Keywords : River, Ecosystem, Water quality, Water Pollution

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Introduction

Water is the most valuable asset on the earth, required by all living things. As water is crucial for all organisms, some organisms can thrive on saltwater but most of the higher plants and mammals need freshwater to live. River water is a natural and vital resource of freshwater system for all living beings (Singh, M., 2017). However, In India, water contamination is a serious problem which leads to the declining quality of water. Biodiversity is greatly impacted by the contamination of water due to climate change and other factors (Prakash and Srivastava, 2019). The rapid urbanization and industrialization near water bodies are one of major cause of declining water quality (Chandra, M., Saxena, R. S., and Sharma, H. N., 2014). As consequence, the amount of harmful chemicals is rising, and the quality of river water is steadily declining as a result of the growing amount of household and industrial trash being disposed of (Mishra, S. et al., 2015). Commoner (1976) said that while the environment was uncontaminated and unutilized in the past, the majority of water bodies are now polluted. The current dilemma in environmental and human health is represented by water pollution. In the poorest nations, the absence of basic sanitation and the presence of toxins in the water make it difficult to eradicate extreme poverty and illnesses (Moe, C.L. and Rheingans, R.D.,2006).

Fortunately, district Kasganj has plenty of water bodies other than Ganga River like Kali Nadi, Vrahdhha Ganga, main Ganga Water Canal etc.

Study Area: The 71st district in the Indian state of Uttar Pradesh is Kasganj. It is situated has the Sahawar, Patiali, and Kasganj tehsils and located under Aligarh division. It is bordered by the districts of Etah in the north, Badaun in the south, Aligarh in the west, and Farrukkhabad in the east. The district is located in the middle of the Ganga, in the western region of the state.

The Ganga River and its tributaries, the Kali and Vrahdhha Ganga, govern the district's drainage system.River Vrahdhha Ganga has a significant value in Kasganj District because of its religious affiliation. Earlier the main Ganga and the Vrahdhha Ganga flowed together, later, the stream separated and became far away. It covers 118 Km distance and ends at the main Ganga. It passes through 60-gram panchayat of Kasganj district and provides about 7500 hectares of farming land.

Due to negligence by government for a long period time, it is unknown for most of the people. Therefore, the present of the Vrahdhha Ganga river water exhibits seasonal variations in its physico-chemical features.

District Kasganj

A

B

Sampling sites (A and B)

Material and Methods

River Vrahdhha Ganga originates from Sankara and covered about 118 Km distance and ends at Kampil. Two sampling sites (A- Nardauli & B- Kampil) were selected to compare seasonal variation data.

In winter the water collected between 6 am to 8 am and during summer, the water sample collected between 5 am to 7 am. The physico-chemical parameters were analysed by using standard techniques. For sample collection 1 liter capacity plastic bottles with stopper were used. Samples were analysed for temperature, pH, DO, BOD, Alkalinity, and ammonia in the laboratory.

A mercury bulb thermometer was used to measure the temperature. pH measured by standard Philips pH meter, DO by Winkler's method, BOD by standard method given in American Public Health Association (2005), Alkalinity by titration and Ammonia by Nesslerization method.

Result and Discussion

Acceptable and maximum limits of physico-chemical parameter of water by WHO are shown in table-1 and calculated value and seasonal average values of selected sampling sites are shown in table-2 and table-3 respectively

Temperature: Since temperature affects the solubility of many gases (Palharya et al., 1993), measuring temperature is a crucial part of evaluating the quality of water. In June, the highest recorded temperature was 33.9 $\overline{C}$ at site A and 33.5 oC at site B. In December, the lowest recorded temperature was 13.0 $\overline{C}$ at site A and 13.2 oC at site B.

pH: pH value varied between 8.9 to 7.2 at site A and 8.8 to 7.5 at site B.

Table-1: Different analytical water quality parameter as per WHO

Sr. No.	Parameter	Acceptable value	Maximum Value
1	Temperature (℃)	12-18	25
2	pH	7.2 to 8.2	6.5 to 8.5
3	DO (mg/L)	5	8
4	BOD (mg/L)	6	30
5	Alkalinity (mg/L)	200	600
6	Ammonia (mg/L)	0.15	2

Table-2: Monthly variation in physico-chemical characteristics of Vrahdhha Ganga river water

Sr. No.	Month	Temperature (℃)		pH		DO (mg/L)		BOD (mg/L)		Alkalinity (mg/L)		Ammonia (mg/L)	
	2021	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
1	**Nov.**	22.0	22.2	8.6	8.5	6.8	7.9	80	30	297	150	1.42	0.37

2	**Dec.**	13.0	13.2	8.0	8.3	7.0	8.5	58	25	309	190	1.28	0.27
	2022												
3	**Jan.**	18.5	18.7	7.8	7.7	6.6	7.3	41	24	258	155	1.32	0.30
4	**Feb.**	18.9	19.0	8.1	8.3	6.4	7.8	82	29	270	143	1.26	0.25
5	**Mar.**	26.0	25.9	8.4	8.5	6.0	7.6	109	20	291	188	1.22	0.22
6	**Apr.**	28.2	28.5	8.5	8.7	5.1	7.5	139	34	263	176	1.37	0.35
7	**May**	30.5	30.3	8.7	8.8	4.2	6.5	110	28	312	214	1.32	0.33
8	**June**	33.9	33.5	8.9	8.6	2.5	5.7	152	26	276	200	1.29	0.28
9	**July**	30.1	30.5	8.1	8.2	3.8	6.7	133	35	301	170	1.18	0.15
10	**Aug.**	30.5	30.7	7.2	7.6	4.1	5.4	108	28	265	130	1.21	0.19
11	**Sep.**	29.9	29.8	7.3	7.5	5.1	6.6	99	22	279	150	1.25	0.21
12	**Oct.**	28.5	28.6	8.3	8.4	5.6	7.7	89	21	273	172	1.30	0.26

Table-3: Seasonal mean variation of physico-chemical characteristics of Vrihdhha Ganga river water

Season	**Temperature (℃)**		**pH**		**DO (mg/L)**		**BOD (mg/L)**		**Alkalinity (mg/L)**		**Ammonia (mg/L)**	
	A	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
Winter	17.8	18.0	8.1	8.1	6.8	7.9	59.6	26.3	288	165	1.34	0.31
Spring	24.3	24.3	8.3	8.5	5.8	7.6	110	27.6	274.6	169	1.28	0.27
Summer	31.5	31.4	8.5	8.5	3.5	6.3	131.6	29.6	296.3	194.6	1.26	0.25
Rainy	29.6	29.7	7.6	7.8	4.9	6.5	98.6	23.6	272.3	150.6	1.25	0.22

Dissolve Oxygen: The DO measured by Winkler's method followed by titration. DO level in two sites was ranged between 2.5 mg/L to 8.5 mg/L. It was minimum 2.5 mg/L at site A and 8.5 mg/L at site B in December month and minimum 5.2 mg/L in the June month. The low concentration of DO causes stress in aquatic organism.

Biochemical Oxygen Demand: The range of BOD was 20 mg/L to 152 mg/L. The month of June saw the highest BOD value, while the month of March saw the lowest.

Alkalinity: Throughout the year, the alkalinity ranges from 130 mg/L to 312 mg/L. The months of May and August were when the maximum and lowest values were reported, respectively.

Ammonia: Throughout the year, the range of ammonia is 0.15 mg/L to 1.42 mg/L. November was the month with the highest reported value, while July was the month with the lowest.

Conclusion:

The water is clear in winter and rainy season usually, but summer and spring season's observation shows slightly disturbance in results. During winter and rainy season all the calculated values are according to the accepted value given by WHO. In summer and spring, the temperature, Biochemical Oxygen Demand, Alkalinity and Ammonia level is slightly more than standard value at sites A. The overall observation shows that water at site A is slightly polluted during summer and spring season comparing to the site B. So, the water of site A is not suitable for domestic purposes but can be uses for irrigation and the water of site B can be used for domestic purposes other than drinking.

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