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STUDY OF PHYSICO-CHEMICAL CHARACTERISTICS OF SONE RIVER WATER IN DEHRI-ON-SONE AREA OF BIHAR, INDIA

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Abstract

Fresh water is necessary for healthy living. River water is used for various purposes, such as drinking, bathing, irrigation, etc. This natural resource is being polluted by indiscriminate disposal of sewage, industrial waste, and human activities, which affect the quality of river water. This paper deals with a study of physico-chemical characteristics of the river water of Sone along the Dehri-On-Sone stretch during a period of 12 months from March 2023 to March 2024. Physico-chemical parameters like temperature, pH, TDS, TSS, TS, DO, COD, BOD, alkalinity, total hardness, chloride, and turbidity were determined. The results were compared with standards prescribed by WHO (1984). Temperature, pH, and chloride of all the samples were found below the permissible limit set by WHO. It is concluded that the water of the river is not highly polluted, but there is an indication of increasing pollutant due to anthropogenic activities. Proper monitoring is needed to avoid anthropogenic contamination.

Key word: Physico-Chemical, Temperature, pH, TDS, TSS, TS, DO, COD, BOD, Alkalinity, Total Hardness, Chloride, And Turbidity

I. Introduction

Rivers are the crucial freshwater resource in the world. The **Son River** (also spelled **Sone**) of central India is the second largest of the Ganges' southern tributaries after the Yamuna River. The tremendous increase in human population and industrialization influences the environment, especially the freshwater, and results in decreased water quality. The physico-chemical parameter of every water reservoir indicates the composition, type, and diversity of biotic components. Biotic components of any aquatic ecosystem, especially some plankton species, act as an indicator to determine the productivity potential and health of the system. Phytoplankton and zooplankton play the role of the basic support system of aquatic biota in the river and are highly sensitive to the changes in physico-chemical factors of river water. The hydrological and biological cycle of the water fulfills continuous transformations and remediation of water as it moves through many of the solid, liquid, and vapor phases. Decline in water quality and biodiversity is an issue of grave concern for all of us. River Sone flows in the Indo-Gangetic plain along the stretch of the Dehri area in Bihar. The data for the physico-chemical nature of water is collected at five research stations along the river for a stretch of about 50 km. The water samples were analyzed for some parameters like temperature, pH, alkalinity, chloride, TDS, TH, sulphate, and phosphate.

II. Materials and methods

Sample Collection

Sampling Protocol: Samples were collected according to the field protocol established by the Central Pollution Control Board (CPCB), New Delhi.

Analytical Standards: Physico-chemical parameters were analyzed using standard methods outlined in the APHA 2005 manual.

The study area is located at five sampling stations along the stretch of the river Sone in the Dehri area.

1 sampling station: Indrapuri Barrage (S1). The other four sampling stations are Jharkhandi Mandir (S2), Bal Govind Bigha (S3) Shiv Gang (S4), and Pali (S5) (Figure 1).



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Physico-Chemical Parameters of Water

Here's a concise overview of the physico-chemical parameters and the methods used for their determination:

1. Temperature:

Measured using a Celsius thermometer during sampling, expressed in degrees Celsius (°C).

2. pH:

Determined in the lab using a systronic pH meter with a combination electrode, calibrated with stock buffers before each measurement. Precision is ±0.05.

3. Total Dissolved Solids (TDS):

Measured using the evaporation method, where the sample is evaporated and the residue is weighed to quantify dissolved solids.

4. Total Suspended Solids (TSS):

A measured volume (≤1 L) of water is filtered through preweighed filter paper. The filter is dried at 104 ± 1°C, reweighed, and TSS is calculated based on the weight difference.

5. Total Solids (TS):

Calculated as TS = TSS + TDS.

6. Dissolved Oxygen (DO):

Estimated using Winkler's modified azide method, which involves chemical titration to quantify oxygen levels.

7. Chemical Oxygen Demand (COD):

Measured by the dichromate reflux method, using a ferroin indicator to assess the amount of oxygen needed to oxidize organic matter.

8. Biochemical Oxygen Demand (BOD):

Determined by incubating diluted water samples at 25°C for 5 days in the dark to measure the oxygen consumed by microbial activity.

9. Alkalinity:

Measured using a titration method, typically with a strong acid to determine the buffering capacity of the water.

10. Hardness:

Estimated by titration with EDTA, using Erichrome Black-T dye as an indicator to identify the endpoint.

11. Chloride :

Determined using Mohr's argentometric method, which involves titrating with silver nitrate to detect chloride levels.

12. Turbidity:

Measured using a nephelometer, which assesses the cloudiness of the water based on scattered light.

III. Results and discussion

The water samples were analysed some parameter like Temperature, pH, Alkalinity, Chloride, TDS, TH, Sulphate, and Phosphate. Analysed all the results are presented in Table-1. The results of water quality of River Sone in Dehri are given below.

Table 1: Physicochemical Parameters of Water Samples from different Sites

Parameter	S1 (Indrapuri Barrage)	S2 (Jharkhand Mandir)	S3 (Bal Govind Bigha)	S4 (Shiv Gang)	S5 (Pali)
Water Temperature (°C)	28	28.5	29	28	30
pH	6.2	6.4	6.5	6.5	7.1
BOD	4.2	4.8	4.5	5.0	3.9
COD	2.16	2.16	2.18	2.31	2.31
Alkalinity	439	450	210	451	460



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Hardness	315	330	266	260	249
TDS	137	139	136	139	147
TSS	280	289	279	289	300
TS	520	524	600	580	530
DO	9.2	9.6	8.8	8.7	8.4
Turbidity	2.4	3.0	2.8	3.5	2.2
Chloride	480	100	420	136	310

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