



RESEARCH ARTICLE

PHYSICO-CHEMICAL AND BIOLOGICAL CHARACTERISTICS OF RIVER RAMGANGA
AT BAREILLY

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ABSTRACT

For every living one, water is an invaluable and treasure but due to its over consumption and pollution necessitate to think carefully about it. When heavy and harmful substances from many sources like factories, industries or the hazardous smoke released by the vehicles, garbage and sewage from houses, agricultural runoff, cattle's bathing, etc. are mixed with water, it cause water pollution. The present study is based on the analysis of some physico-chemical and biological parameters by collecting samples in rainy season (August- September) from 5 different sampling sites of River Ramganga at Bareilly. With the passing of time, river water become more polluted due to excessive growth of algae and bacteria by which BOD and nitrate increase and quality of the river water and aquatic environment including fisheries, flora and fauna and other living and non-living beings related to the river are affected, so it is necessary that this serious issue should be exhibit.

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INTRODUCTION

Water pollution is the contamination of water bodies and occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds. The water after the merging of polluted water is potentially hazardous for human health and proper cautions should be taken before the polluted water is allowed to merge with fresh water in order to save the biota dwelling there in form adverse effects (Chandra *et al.*, 2011). Bareilly is a city in Bareilly District in the northern Indian state of Uttar Pradesh, at 28°10'N 78°23'E. Located on the river Ramganga, it is the capital of Bareilly division and the geographical region of Rohilkhand. It is the eight largest metropolis in Uttar Pradesh and the 50th largest city in India. Bareilly also figured amongst the PM Narendra Modi's ambitious 100 smart city list in India. The Ramganga river receives most of the drainage from the Kumaun mountains. Ramganga west river emerges from Dudhatoli range in Pauri Garhwal district of Uttarakhand. The length of Ramganga river is 155 km and catchment area of the basin is 30,641 km square. This river flows to the southwest from Kumaun Himalayas. Ramganga is a tributary of Ganga, which originates from the high altitude zone of 800m to 900m.

The impact of effluents discharged through industrial wastes and sewage into Ramganga and to observe the change in the quality of water (Chandra *et al.*, 2010).

MATERIALS AND METHODS

In rainy season (August-September), water samples were collected in order to study the physico-chemical and biological characteristics of river Ramganga from 5 different sampling site (Ajampur Balarau, Ghura Raghavpur, Sarai Talfi, Uncha Gaon and Kundara) at Bareilly. Methods are used for the study of physico-chemical parameters are temperature by thermometer, pH by pH meter, turbidity by turbidity meter, electrical conductivity by EC meter, BOD by 5 days of BOD test, alkalinity by titrimetric method, dissolved oxygen by Winkler's method, calcium by EDTA titrimetric method, nitrate by UV spectrophotometer, TDS by Gravimetric method after filtration, total solids by Gravimetric method, COD by dichromate titration method and transparency as given in standard methods for the examination of water and waste water (APHA *et al.*, 1985). Total biomass

RESULTS AND DISCUSSION

Tables and columns are showing the result of some physico-chemical and biological analysis at 5 sites of river Ramganga.

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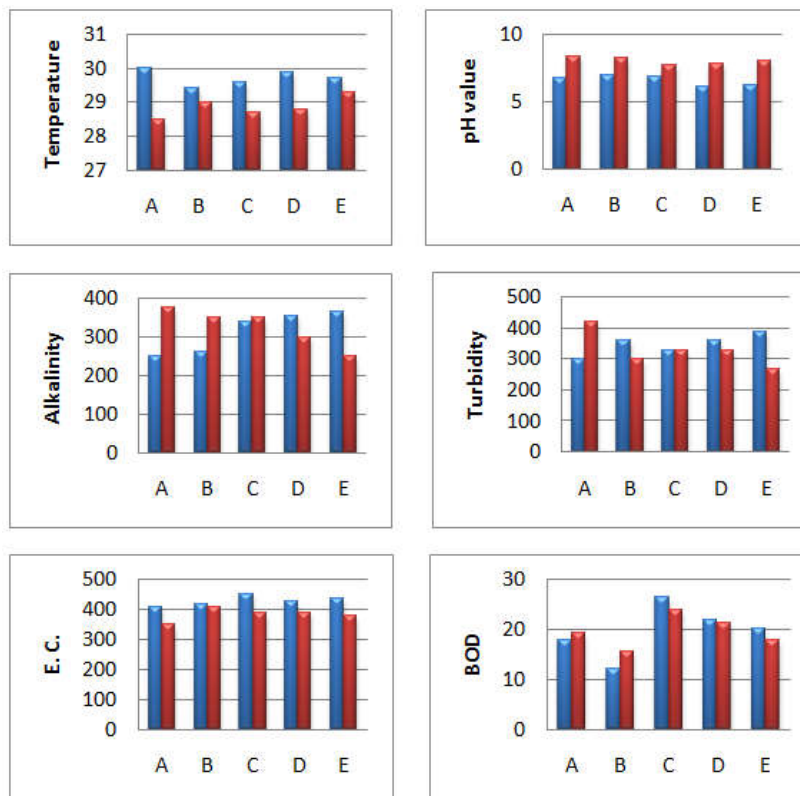
Table 1. Site-wise values of different physico-chemical parameters in month of August

	Site A	Site B	Site C	Site D	Site E
Temperature ($^{\circ}$ C)	30	29.4	29.6	29.9	29.7
Transparency (cm)	8.5	7	6	5	6.5
PH	6.8	6.98	6.93	6.18	6.2
TS (mg/l)	530	680	680	660	550
TDS (mg/l)	510	540	640	600	620
DO (mg/l)	3.88	3.49	2.25	4.1	3.25
BOD (mg/l)	17.8	12	26.4	22	20.3
COD (mg/l)	39.9	37.3	74.6	59.7	48.6
E. C. (μ moh/cm)	410	418	450	429	435
Turbidity (NTU)	300	360	330	360	390
Alkalinity (mg/l)	250	260	340	355	365
Calcium (mg/l)	104.2	96.19	80.16	76.15	62.12
Nitrate (mg/l)	0.98	0.93	1.3	1.08	1.02
Total Biomass (mg/l)	13	10	22	13	11

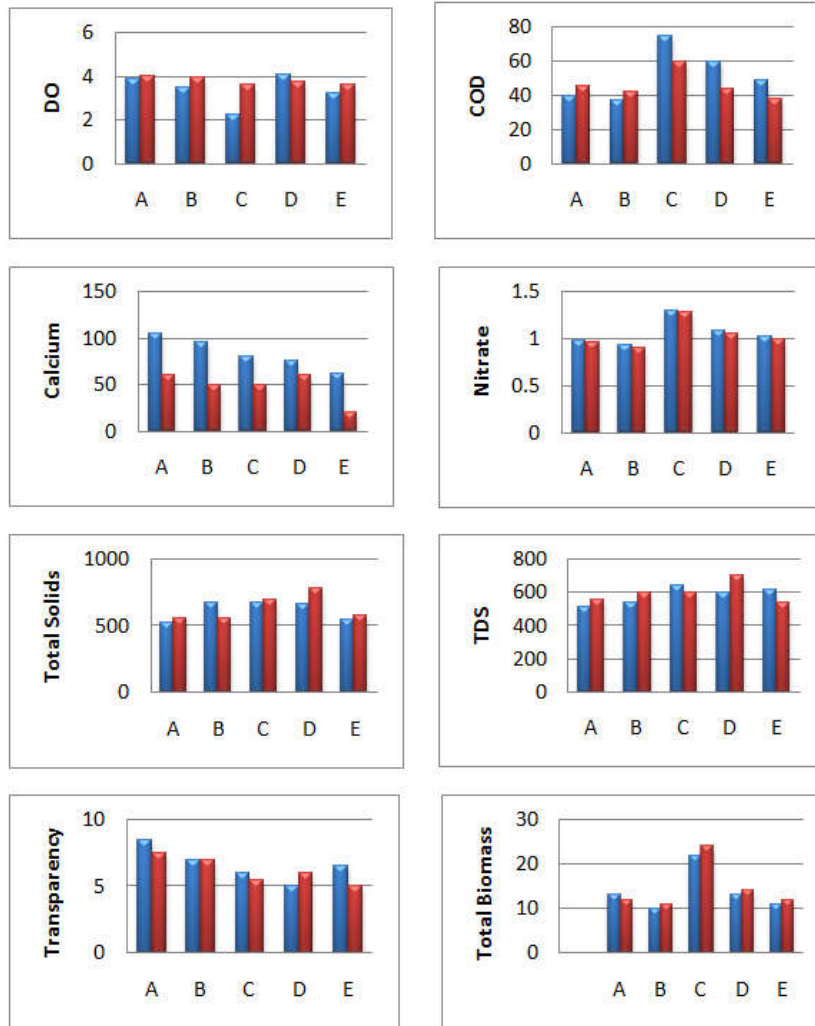
Table 2. Site-wise values of different physico-chemical parameters in month of September

	Site A	Site B	Site C	Site D	Site E
Temperature ($^{\circ}$ C)	28.5	29	28.7	28.8	29.3
Transparency (cm)	7.5	7	5.5	6	5
pH	8.35	8.31	7.74	7.85	8.06
TS (mg/l)	560	560	700	780	580
TDS (mg/l)	560	600	600	700	540
DO (mg/l)	4.03	3.98	3.6	3.73	3.64
BOD (mg/l)	19.2	15.6	24	21.4	18
COD (mg/l)	45.2	42.3	59.7	43.4	38.1
E. C. (μ moh/cm)	350	410	390	390	380
Turbidity (NTU)	420	300	330	330	270
Alkalinity (mg/l)	375	350	350	300	250
Calcium (mg/l)	104.2	96.19	80.16	76.15	62.12
Nitrate (mg/l)	0.96	0.9	1.28	1.05	0.99
Total Biomass (mg/l)	12	11	24	14	12

All column shows the site-wise (site A- Ajampur Balarau, site B-Ghura Raghavpur, site C-Sarai Talfi, site D-Uncha Gaon and site E-Kundara) physico-chemical and biological values of both month(blue column indicate to August month and red column indicate to September month)



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Temperature plays an important role in aquatic ecosystem health. The temperature of drinking water has an influence on its taste. Temperature of every site are varies from 28.5 to 30 in both month of rainy season.

pH (potential of hydrogen) is a numeric scale used to specify the acidity or basicity of an aqueous solution. pH of every site is varies from 6.20 to 8.35 in both month of rainy season.

Alkalinity measuring is important in determining a stream's ability to neutralize acidic pollution from rainfall or wastewater. Alkalinity of every site are varies from 250 to 375 in both month of rainy season.

Turbidity is the cloudiness or haziness of a fluid caused by suspended solids that are usually invisible to the naked eye. Turbidity of every site are varies from 270 to 420 in both month of rainy season.

Electrical Conductivity of a substance is defined as 'the ability or power to conduct or transmit heat, electricity, or sound'. E.C. of every site are varies from 350 to 450 in both month of rainy season.

Biological Oxygen Demand test indicates the amount of water-dissolved oxygen consumed by microbes incubated in darkness for five days at an ambient temperature of 20°C. BOD values of every site are varies from 12 to 26.4 in both month of rainy season.

Dissolved Oxygen is the most important indicator of the health of a water body and its capacity to support a balanced aquatic ecosystem of plants and animals. DO of every sites are varies from 3.25 to 4.10 in both month of rainy season.

Chemical Oxygen Demand test procedure is based on the chemical decomposition of organic and inorganic contaminants, dissolved or suspended in water. COD of every site are varies from 37.3 to 74.6 in both month of rainy season.

Calcium is an important determinant of water hardness, and it also functions as a pH stabilizer, because of its buffering qualities. Calcium also gives water a better taste. Its values of every site are varies from 50.10 to 104.20 in both month of rainy season.

Nitrate is not normally dangerous for the health unless it is reduced to nitrite (NO_2). NO_3^- of every site are varies from 0.9 to 1.28 in both month of rainy season.

Total Solids is the term applied to the material residue left in the vessel after evaporation of a sample and its subsequent drying in an oven at a defined temperature. TS values of every site are varies from 530 to 780 in both month of rainy season.

Total Dissolved Solids is a measure of the combined total of organic and inorganic substances contained in a liquid. TDS values of every site are varies from 510 to 700 in both month of rainy season.

Transparency of water relates to the depth that light will penetrate water. Transparency of every site are varies from 5 to 8.5 in both month of rainy season.

Total Biomass is the mass of living biological organisms in a given area or ecosystem at a given time. Total Biomass of every site are varies from 10 to 24 in both month of rainy season.

Conclusion

In face of inaccessible material (organic, inorganic and biological), foreign substances are reducing the water quality and importance of water. All the contaminants reduce the level of dissolved oxygen in the water and affecting the lives of animals and human beings to a great extent.

Aknowlegment

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