# Environment Pollution and Climate Change

**Research Article** **Open Access**

# Hydrobiological Study on Summer Season of River Ramganga at Bareilly

**Prity Singh\***

*Department of Zoology, IFTM University, India*

## Abstract

The river is a natural resource of fresh water. Its water has received a wide variety of harmful pollutants in a summer season. The present study is aimed at assessing the water quality of river Ramganga in Bareilly district. This has been determined by collecting river water samples from five villages of Bareilly district and analyses the samples to different fourteen Physico-chemical and biological parameters. It may be concluded that fast and powerful winds like storms which contain harmful dust and other harmful things. These harmful things come into contact and mixed with river water which is also creating problems, water pollution. This is not good for river water and also for human being's health. It harms the aquatic plants and animal's species too.

**Keywords:** Summer; Pollutants; Winds; Pollution; River water

## Introduction

About 71% of Earth's surface is covered with water and most of it, is salt-water. About 97.5%, of this abundant water is found in oceans as salty water which is not good and fit for irrigation, industry and also not good for drinking. Most of the remaining water about 2.5% is found as fresh water which is locked up in glaciers or found very deeply in the ground. Only 0.015% of Earth's total water is easily available as ground water, lake water and river water for our use which is fit for every work [1]. Increment in population during from the last century has led to demand for every things like more food, more water, more housing, more transport, more energy and more of other things of human need which is as resulting in over utilization and exhausting of resources. As a result, environment is getting modified or changed.

Water pollution is the contamination of water bodies such as rivers, lakes and pollution occur when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds. There are many factors which lead to water pollution. It is essential that firstly understand the sources which contribute to the problem. There are point sources of water pollution that the contaminants which enter a waterway from a single source and non-point sources of water pollution that are diffused contaminants which do not originate from a single discrete source, both that raise the problem of water pollution. Water pollution is the worldwide cause of death and disease due to waterborne disease.

Pollution in rivers is increasing day by day. Lots of factors lead to water pollution and reducing overall river water quality. some of the most serious contributing factors are industrial waste, agricultural waste, nature's rain domestic waste, regular disposal of plastic objects, animal washing, clothes washing, dumping of human remains, dead bodies, etc. which contribute to river pollution. The Ramganga River starts flow its journey at an elevation of 3,110 m from the mountainous regions of Kumaon Himalayas near Lobha village, through the forests of Jim Corbett National Park and the Ganga flood plains. It is the first major tributary of the Ganga River, carrying high sediment load causing frequent floods in major cities like Moradabad, Badaun, Hardoi, Bareilly, Shahjahanpur which are placed on the banks of Ramganga river of Uttar Pradesh [2]. The approximate catchment area of Ramganga basin is 32,493 sq.km. The most polluted stretches of river Ramganga are from Moradabad to Farrukhabad via Bareilly especially in terms of organic pollution [3].

## Material and Methods

The present study was conducted on river water of five different villages viz-site A (Ajampur Balarau), site B (Ghura Raghavpur), site C (Sarai Talfi), site D (Uncha Gaon) and site E (Kundara) of district Bareilly which are situated on the bank of Ramganga River. All the sampling has been done the second week in the month May and June 2018. Water pollution is measured by analyzing five water samples and physical, chemical and biological tests can be done. Five water samples were examined for Temperature, Transparency, pH, BOD, DO, COD, nitrate, alkalinity, total solids, total dissolved solids, calcium, electrical conductivity, turbidity, and total biomass.

The quality of water analysis of the rivers gives the exact nature, cause, and levels of the pollutants. The physical parameters such as temperature, turbidity, conductivity plays an important role in river productivity, The level of chemical parameters such as nitrate, BOD, COD, pH, dissolved gases, minerals, and nutrients decide the quality of river water and in order to get an indication of river conditions over a longer period of time, we need to look at the biological community that the river supports.

APHA norms and methods were used for analysis of Ramganga River water [4]. Some 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 way, dissolved oxygen by Winkler method, calcium by EDTA method, nitrate by UV spectrophotometer, TDS by gravimetric method after filtration, total solids by gravimetric method, COD for dichromate titration method and biological parameter (total biomass on the sites). Transparency was determined by Secchi disc method at the site. The Result of Physico-Chemical and Biological properties are given in Tables 1 and 2 [5,6].

**\*Corresponding author:** Prity Singh, Department of Zoology, IFTM University, Moradabad, India, E-mail: sprity9090@gmail.com

|  | Site A | Site B | Site C | Site D | Site E |
|---|---|---|---|---|---|
| **Temperature** | 34 | 33 | 34 | 33 | 33 |
| **Transparency (cm)** | 10.5 | 9.95 | 7.85 | 7.7 | 8.5 |
| **pH** | 7.5 | 8.9 | 7.64 | 7.82 | 8.12 |
| **TS (mg/l)** | 880 | 600 | 500 | 560 | 620 |
| **TDS (mg/l)** | 540 | 640 | 280 | 400 | 360 |
| **DO (mg/l)** | 5 | 5.65 | 4.88 | 5.43 | 5.67 |
| **BOD (mg/l)** | 13.4 | 9.8 | 12.7 | 13.1 | 15.6 |
| **COD (mg/l)** | 30 | 26 | 39.3 | 60.1 | 69 |
| **E.C. (μmoh/cm)** | 970 | 700 | 680 | 760 | 740 |
| **Turbidity (NTU)** | 180 | 240 | 160 | 390 | 330 |
| **Alkalinity (mg/l)** | 650 | 450 | 550 | 600 | 500 |
| **Calcium (mg/l)** | 20.04 | 10.02 | 20.04 | 20.04 | 16.03 |
| **Nitrate (mg/l)** | 0.89 | 0.81 | 1.17 | 1.26 | 1.29 |
| **Total biomass (mg/l)** | 14.5 | 11.1 | 12 | 10.5 | 12.3 |

**Table 1:** Physico-chemical and biological characteristics of Ramganga River water during summer in month May 2018.

|  | Site A | Site B | Site C | Site D | Site E |
|---|---|---|---|---|---|
| **Temperature** | 33.5 | 34 | 33.5 | 33.5 | 34 |
| **Transparency (cm)** | 11.5 | 8.35 | 8 | 7.5 | 8.3 |
| **pH** | 8 | 7.98 | 7.2 | 7.2 | 7.64 |
| **TS (mg/l)** | 810 | 655 | 570 | 525 | 632 |
| **TDS (mg/l)** | 590 | 685 | 310 | 392 | 315 |
| **DO (mg/l)** | 6.1 | 7.01 | 5.98 | 6.76 | 6.35 |
| **BOD (mg/l)** | 10 | 8.9 | 13.2 | 13.9 | 14.4 |
| **COD (mg/l)** | 30.9 | 30.2 | 45 | 65.9 | 73 |
| **E.C. (μmoh/cm)** | 910 | 680 | 710 | 710 | 820 |
| **Turbidity (NTU)** | 200 | 220 | 195 | 400 | 380 |
| **Alkalinity (mg/l)** | 610 | 480 | 520 | 620 | 550 |
| **Calcium (mg/l)** | 21.09 | 11.01 | 21.02 | 20.08 | 17.04 |
| **Nitrate (mg/l)** | 0.87 | 0.78 | 1.15 | 1.2 | 1.21 |
| **Total biomass (mg/l)** | 12.7 | 13.5 | 13.2 | 12 | 13.9 |

**Table 2:** Physico-chemical and biological characteristics of Ramganga River water during summer in month June 2018.

## Result and Discussion

The results of various hydrobiological parameters (physico-chemical and biological) analysis in summer season (May and June, 2018) are given above in Tables 1 and 2. The water quality of Ramganga River is near to deterioration due to the addition of different types of pollutants through drains of villages, cities and factories and in case of hydro biological studies of Ramganga river water indicated that the water of site C and site D are more polluted comparison to other sites of Ramganga river at Bareilly [7,8]. In the present study, Temperature was found the min. range from 33.00-34.00°C of the summer season. The temperature of water affects directly or indirectly to many abiotic or biotic components of aquatic components [9,10].

Transparency was min. range 7.5 mg/l of site D and max. 11.5 mg/l of site A in the month June of the summer season. Transparency is a characteristic of water which varies with the combined effect of color and turbidity and it is measured by using Secchi disc. PH is an important chemical parameter that determines the suitability of water for various purposes [11]. PH of water is very important for the biotic communities because an average pH is adopted by most of the aquatic organism. PH was found the min. range 7.2 of site C, D in the month of June and max. 8.9 of Site B in the month of May respectively [12]. Total solids determined in this study min. range 500 mg/l of site C and max. 880 mg/l of site A in the month of May. Analysis of total

solids has great implications in the control of physico-chemical and biological wastewater treatment processes. The amount of dissolved and undissolved matter and also its naturally occurring in liquid materials vary greatly. Analysis of Total Dissolved Solids has great implications in the control of biological and physical wastewater treatment processes. TDS was observed the min. range 280 mg/l of site C in the month of May and max. 685 mg/l of site B in the month of June.

Dissolve oxygen is one of the key factors of natural or wastewater; it is influenced by the physico-chemical parameter and biological activity in the water body such as rivers, lake [13]. Dissolved oxygen was recorded min. 4.88 mg/l of site C in May and 7.01 of site B in June. Directly or indirectly, D.O. quantity of water is dependent on water temperature, a partial pressure of air etc.

Biological Oxygen Demand was min. range 8.9 mg/l of site B in month June and max. 15.6 mg/l of site E in month May. BOD is the measure of degradable organic matter which is present in a water sample and it can be defined as the amount of oxygen required by micro-organisms in stabilizing the biodegradable organic matter under aerobic condition [14]. Chemical Oxygen Demand was min. range 26 mg/l of site B in month May and max.73 mg/l of site E in month June. COD is the amount of oxygen which is consumed during the chemical oxidation of organic matter using strong oxidizing agents and gives valuable information about the pollution potential of industrial effluents and domestic sewage [15].

The high value of alkalinity could be due to cattle bathing and laundering of clothes, etc. A high value of alkalinity indicates that the compounds are responsible for an increase in alkalinity and may work as a chemical oxidant for COD and hence increase the value of COD [16]. Alkalinity was observed the min. range 450 mg/l of site B in May and max 21.09 mg/l in May. Turbidity is a measure for water clarity that how is affect the water clarity by suspended particles and it is an indicator of suspended sediment and erosion levels. Turbidity was min. recorded 160NTU of site C in May and 400NTU of site D in June of summer season respectively [17]. E.C. was min. range 680 μmoh/cm of site B, C in May and June and max. 970 μoh/cm of site A in May. It is utilized a pointer in water of the grouping of broke up electrolyte particles and critical increments in conductivity demonstrated that dirtying releases have entered in water.

To convert $N_2$ gas into nitrate, this ability has by blue-green algae and legumes which can be used by plants. The nitrate was min. recorded 0.78 mg/l of site B in month June and max. 1.29 mg/l of site E in May. Nitrate's presence in water indicates the organic matter which is fully oxidized [10]. The nearness of calcium in water comes about because of entry through or over stores of limestone, dolomite, gypsum and such other calcium-bearing rocks. Calcium was observed the min. range 10.02 mg/l of site B in May month and max. 21.09 mg/l of site A in June month. Calcium adds to the aggregate hardness of water and is an imperative small scale supplement in amphibian condition and is particularly required in expansive amounts by molluscs and vertebrates.

Biomass is the mass of living plant characteristic material, and generally in respect to volume and basal locale at the stand level, and width and stature at the individual plant level. Total biomass was observed in the present study min. range 10.5 mg/l of site D and max. 14.5 mg/l of site A in May month of the summer season. Biomass is moreover related to water, supplement, and essentialness requirements of individual vegetation. The carbon substance of vegetation is directly related to biomass.

## Conclusion

On the basis of discussion, the main sources of organic pollution are non-point sources like cattle bathing, agricultural run-off, used water discharge from nearby villages etc. Discharge of sewage from Bareilly city, nearby villages, heat and powerful winds like a storm, their pollutants have affected the river water quality which acts on elements existing in water such as DO and nitrates etc. and therefore also affect the flora and fauna. River water is also not suitable for agriculture due to high alkalinity.

## References

1. Khan YA, Gani KM, Chakrapani GJ (2017) Spatial and temporal variations of physicochemical and heavy metal pollution in Ramganga river atributary of river Ganges. India Environ Earth Sci 231: 1-13.

2. Tripathi SS, Isaac RK (2016) Rainfall pattern and groundwater fluctuation in Ramganga River basin at Bareilly district, UP, India. Int JAdv Eng Man and Sci 2: 576-587.

3. Anshu S, Ravi K, Vikas G, Gaurav A, Shakun S, et al. (2011) Water quality assessment of Ramganga river at Moradabad by physico-chemical parameters analysis. VSRD-Technical Non-Technical J 2: 119-127.

4. Arnold EG, Lenore SC, Andrew DE (1985) Standard methods for the examination of water and waste waters. American Public Health Association.

5. Ramesh C, Kanchan K, Adarsh P (2010) Pollution status of river Ramganga: Physico-chemical characteristics at Bareilly. J Exp Sci 1: 20-21.

6. https://www.researchgate.net/publication/291337392_monitoring_of_river_ram_ganga_physico-chemical_characteristic_at_bareilly

7. Mohammad A, Pathak JK (2010) Rapid assessment of water quality index of Ramganga river western Uttar Pradesh (India) using a computer programme. Nature Sci 8: 1-8.

8. Ephrem G (2015) Review on slow sand filtration in removing microbial contamination and particles from drinking water. American J Food Nutrition 3: 47-55.

9. http://www.indiaenvironmentportal.org.in/content/258792/seasonal-variation-in-the-aquatic-environment-of-ram-ganga-river-at-moradabad-a-quantitative-study/

10. Prity S, Ashish G (2018) Physico-chemical and biological characteristics of river Ramganga at Bareilly. Inter J Dev Res 8: 19198-19201.

11. Bhutiani R, Khanna DR, Shubham, Faheem A (2016) Physico-chemical analysis of sewage water treatment plant at Jagjeetpur, Haridwar, Uttarakhand. Env Conv J 17: 133-142.

12. Gangwar RK, Jaspal S, Singh AP, Singh DP (2013) Assessment of water quality index: A case study of river Ramganga at Bareilly, UP, India. Int J Sci Eng Res 4: 2325-2329.

13. Sayeed A, Chandra S, Singh J (2017) Characterization and influence of rainy season on ground water quality of Moradabad city. Int J Adv Res 5: 335-338.

14. https://www.researchgate.net/publication/290297907_Assessment_of_physico-chemical_properties_of_water_River_Ramganga_at_Bareilly_UP

15. Ashish K, Yogendra B (2009) Physico-chemical studies on the pollution potential of river Kosi at Rampur (India). World J Agri Sci 5: 1-4.

16. Animesh A, Manish S (2011) Assessment of pollution by physico-chemical water parameters using regression analysis: A case study of Gagan river at Moradabad, India. Advan in Applied Sci Res 2: 185-189.

17. Khan MYA, Daityari S, Chakrapani GJ (2016) Factors responsible for temporal and spatial variations in water and sediment discharge in Ramganga River, Ganga Basin, India. Environ Earth Sci 75: 283.