



PRELIMINARY STUDIES ON PHYSICO-CHEMICAL PARAMETERS OF RIVER GOMATI DISTRICT JAUNPUR, UTTAR PRADESH

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ABSTRACT

The total environment is a complex entity of which water is the essential component for survival of all the living beings. Life in aquatic environment is largely governed by physico-chemical characteristics and their stability in ecosystem. The precipitation, which is the main source of water gets contaminated as soon as it reaches on the earth's surface and during its flow anthropogenic activities in surrounding area further add impurities in it. The water samples were collected monthly for a period of one year from different sampling stations along the stretch of river. During study period, river maintained well alkaline nature of water in study area. Parameters like dissolved oxygen, conductivity, total hardness, total alkalinity and pH showed variation from upstream to downstream. Dissolved oxygen was found to be maximum during winter may be due to low temperature. However, conductivity, total hardness and total alkalinity were found to be maximum during the summer season.

Key words: Gomati river, pH, Conductivity, Alkalinity.

INTRODUCTION

Jaunpur is situated at 25.41°N 81.87°E in the Southern part of Uttar Pradesh at an elevation of 96 metre and stands at the confluence of two main river Gomati and Sai. Water and life have an inseparable relationship and are considered as two sides of a single coin. As such, water quality plays an important role in the growth of aquatic animals and their distribution and abundance. Fluctuations in optimum level of water quality may lead to abrupt changes in the aquatic life. Depending on its physical chemical and biological properties a contaminant that has been released into the environment may move within an aquifer in the same manner that ground water moves. Slow movement of running water (river), contaminants tend to remain concentrated in the form of a plume, that flows along

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the same path as the ground water. The size and speed of the plume depend on the amount and types of contaminant, its solubility and density.

The lotic ecosystem selected for the present study is the Gomati river, which is the only Perennial river of the area. Some substance found naturally in rocks or soil, such as iron, manganese, arsenic, chloride, fluoride, sulphate or radio nuclides can become dissolved in river water. Some substances may pose a health threat if consumed in excessive quantities other may produce an undesirable odor, taste or colour. The present piece of work was carried out for one year i.e. from October-2013 to September-2014. The parameters like water temperature, pH, conductivity, total hardness, total alkalinity, dissolved oxygen etc. were analyzed. A number of microorganism and thousands of synthetic chemicals have the potential to contaminate ground water. The availability of good quality water is an indispensable feature for preventing disease and improving quality of life.

Many reports are available in India¹⁻⁶ on the water quality assessment of lotic ecosystems. Except⁷, no report is available on this lotic ecosystem in the area, hence the present investigation.

EXPERIMENTAL

Materials and methods

To analyze physico-chemical parameters, water samples were collected every month for the period of one year. Water samples were collected from the marginal areas at 1 to 1.5 m depth in dried plastic cans of five liter capacity during morning hours. Three sampling sites were selected (SW1, SW2 and SW3) along the stretch of river at a distance of 1 to 1.5 Kms. from upstream to downstream. The parameters like water temperature, pH and D.O. were analyzed at the sampling sites while remaining were analyzed in the laboratory using pertinent literature, APHA⁸.

RESULTS AND DISCUSSION

Physico-chemical characteristics are very important since they have a profound effect on the diversity of living organisms dwelling in them. The seasonal variations in physico-chemical parameters are represented in Tables 1, 2 and 3.

Water temperature

Water temperature is an important factor in aquatic medium, which determines the quality of water. In the present investigation, maximum water temperature was recorded

during summer and minimum during winter season. Similar observations were also recorded by Sawane⁵ and Khinchi et al.⁹

pH

According to George¹⁰, pH is an important parameter of water, since most of the aquatic organisms are adapted to average pH and do not withstand abrupt changes. During study period, river maintained well alkaline nature in the study area. Maximum pH was recorded during summer and minimum during monsoon season. Narain and Chauhan¹¹ recorded maximum pH in summer and minimum in monsoon, similar observations were also reported by Bandela et al.¹² and Khalique and Afser¹³.

Table 1: Seasonal values of physico-chemical parameters in river Gomati during 2013-14 at site SW1

Parameters	Winter	Summer	Monsoon	Total
Water temp. (⁰ C)	23.13 ± 0.54	30.00 ± 2.62	29.00 ± 2.03	27.38 ± 1.73
pH	8.19 ± 0.07	8.28 ± 0.08	7.98 ± 0.05	8.15 ± 0.07
Conductivity (µmhos/cm)	0.374 ± 0.026	0.581 ± 0.094	0.502 ± 0.064	0.486 ± 0.061
Total hardness	52.75 ± 3.03	61.00 ± 9.41	41.25 ± 5.31	51.67 ± 5.92
Total alkalinity	78.75 ± 7.40	88.00 ± 14.82	66.38 ± 12.77	77.71 ± 11.66
Dissolved O ₂	8.23 ± 0.41	6.53 ± 1.28	6.85 ± 1.25	7.20 ± 0.98
Nitrate	0.857 ± 0.035	0.800 ± 0.063	1.010 ± 0.129	0.889 ± 0.076
Phosphate	0.750 ± 0.057	0.915 ± 0.064	0.788 ± 0.025	0.818 ± 0.049

Conductivity

In the context of an aquatic media conductivity totally depends upon the concentration of ions in the water. In the present investigation, maximum conductivity was recorded during summer and minimum during winter season. High concentration of municipal water due to anthropogenic activities and less flow during summer is responsible to increase the ionic content, which results in the increased level of conductivity. Similar results were reported by Israili and Ahemad¹⁴ in river Yamuna and Khataavkar and Trivedi¹⁵ in river Panchaganga.

Total hardness

Total hardness of water is the sum of the concentration of alkaline earth metal cations. In the present investigation, maximum total hardness was recorded during summer season at station SW2 may be due to low water level and addition of calcium and magnesium salts used for different anthropogenic activities in the vicinity. However, low values during rainy season attributed to dilution on account of heavy precipitation. Same was reported by Rajalakshmi and Shreelatha¹⁶ in river Gautami Godavari at Yanam.

Table 2: Seasonal values of physico-chemical parameters in River Gomati during 2013-14 at site SW2

Parameters	Winter	Summer	Monsoon	Total
Water temperature	24.00 ± 0.71	31.13 ± 3.15	29.75 ± 1.82	28.29 ± 1.89
pH	7.93 ± 0.06	8.33 ± 0.08	7.97 ± 0.04	8.08 ± 0.06
Conductivity	0.283 ± 0.009	0.403 ± 0.039	0.373 ± 0.026	0.353 ± 0.025
Total Hardness	59.50 ± 1.80	65.75 ± 7.63	45.00 ± 7.71	56.75 ± 5.71
Total Alkalinity	98.75 ± 4.15	111.25 ± 16.72	96.25 ± 5.45	102.08 ± 8.77
Dissolved O ₂	7.19 ± 0.19	4.80 ± 0.33	6.16 ± 0.67	6.05 ± 0.39
Nitrate	0.739 ± 0.041	0.740 ± 0.037	0.965 ± 0.090	0.814 ± 0.056
Phosphate	0.732 ± 0.045	0.789 ± 0.028	0.906 ± 0.038	0.809 ± 0.037

Total alkalinity

Alkalinity is the measure of buffering capacity of the water. It is generally imparted by the salts of carbonates, bicarbonates, phosphate, nitrates etc.¹⁷.

In the present investigation, maximum value of total alkalinity was recorded during summer and minimum during monsoon season. Sankaran¹⁸ in Adyar river reported high values of alkalinity in summer and low during rainy season.

Dissolved oxygen

Dissolved oxygen is extensively used as a parameter determining the water quality and to evaluate the degree of freshness of lotic ecosystem.

In the present investigation, the maximum D. O. was recorded during winter, moderate during monsoon and low during summer. Present results correlate with the findings of Bansal¹⁹, Mohanta and Patra²⁰, Khinchi et al.⁹ Maximum values of D. O. in winter might be due to the fact that the solubility of D. O. increases with the decrease in water temperature²¹.

Table 3: Seasonal values of physico-chemical parameters in river Gomati during 2013-14 at site SW3

Parameters	Winter	Summer	Monsoon	Total
Water temperature	23.13 ± 0.54	30.75 ± 2.84	29.63 ± 1.08	27.83 ± 1.49
pH	8.03 ± 0.07	8.29 ± 0.07	7.94 ± 0.07	8.08 ± 0.07
Conductivity	0.304 ± 0.017	0.389 ± 0.032	0.358 ± 0.024	0.350 ± 0.024
Total Hardness	58.25 ± 2.05	66.00 ± 7.81	48.75 ± 1.48	57.67 ± 3.78
Total Alkalinity	93.75 ± 11.92	102.5 ± 12.50	86.25 ± 5.45	94.17 ± 9.96
Dissolved O ₂	8.05 ± 0.11	6.68 ± 1.11	6.75 ± 0.34	7.16 ± 0.52
Nitrate	0.869 ± 0.034	0.758 ± 0.039	0.986 ± 0.096	0.871 ± 0.056
Phosphate	0.762 ± 0.054	0.799 ± 0.028	0.898 ± 0.050	0.819 ± 0.044

Phosphate

Phosphate is considered as the most critical single element for biological productivity²².

In the present investigation, maximum concentration of phosphate was recorded in summer and minimum in winter season. Similarly, Srivastava and Srivastava²³ reported high values of phosphate in summer in river Godavari at Nanded. Koshy et al.²⁴ reported that the major sources of phosphate in water are domestic sewage, agricultural runoff, industrial effluents and fertilizers.

Nitrate

Nitrate is an excellent parameter to judge organic pollution and it represents the higher oxidized form of nitrogen.²⁵ The present investigation redeems the maximum value of nitrate during monsoon and minimum during summer season.

Singh²² reported high value of nitrate during rainy season and attributed it to influx of nitrogen rich flood water that brings large amount of contaminated sewage.

Most of the parameters were maximum in summer may be due to high temperature, high evaporation and low water level and minimum in winter due to increased water level.

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