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PHYSICO-CHEMICAL PARAMETERS OF RIVER KOSI AT LALPUR BARRAGE DISTRICT RAMPUR UTTAR PRADESH, INDIA

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ABSTRACT

Present study deals with the Physico-chemical parameters of river Kosi at Lalpur barrage situated in the district of Rampur, Uttar Pradesh, India, during one year study period from September 2013 to August 2014. It includes quantitative analysis of physico-chemical parameters temperature, pH, transparency, velocity, total dissolved solids (TDS), dissolved oxygen (DO), alkalinity and chloride. The aims of the study were designed to monitor monthly variation in water quality parameter of Kosi river at study points so as to assess its status and suitability through the agriculture and aquaculture point of view and to compare observed levels of studied parameters with the corresponding WHO and BIS guidelines.

Key Words : Physico-chemical parameters, Kosi river, TDS, DO, Alkalinity, pH, Chloride

INTRODUCTION

Water is one of the most common and precious resources, without which there would be no life on earth. It is widely distributed on earth as freshwater in glaciers, rivers, lakes, ponds etc. and marine water in sea and oceans. The maintenance of fresh aquatic ecosystem is depending on the physico-chemical properties of water and its biological diversity. Rivers play an important role in the development of nation and sustenance of life. The quality of water in rivers is characterized by various physico-chemical parameters. These parameters change widely due to many factors like source of water, type of pollution, seasonal variation and anthropogenic activities etc. Kosi River is one of the major tributaries of river Ramganga and is one of the important rivers of Northern part of India.

River Kosi originates from Budha Peenath of Kausani region in the district of Almora (Uttarakhand), India. In the initial stretch through the Shivalik range of Himalayas, it takes water from a number of major streams, and a major portion is diverted into a canal for irrigation purposes. After traveling a distance of about 100 km. in lower Himalayas with higher velocity, it emerges at Ramnagar (Nainital) in Indo-Gangetic Plains, after which the velocity reduces considerably. River Kosi flows from Ramnagar towards Kashipur, U S Nagar, Uttarakhand and Rampur District of Uttar Pradesh, India where a number of industries discharge their effluents in to river water.[1]

MATERIAL AND METHODS

The samples were collected from the sampling station of Kosi river at a depth of one feet using polythene containers of two liters capacity for a period of one year (September 2013 to August 2014) at monthly intervals. pH and Temperature were measured at the site of sample collection. pH was measured on the spot by using pH meter and temperature with help of simple mercury filled Celsius Thermometer having the accuracy of 0.1 and range 0^0C to 50^0C. The physico-chemical parameters analysis were carried out the following standard methods.[2-7]

OBJECTIVES

1. To monitor the selected physico-chemical parameters for Kosi water at selected sites.
2. To study seasonal variation in physical and chemical parameters of river Kosi.

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3. To study pollution status of river Kosi.
4. To assess water quality of river Kosi in terms of its suitability for irrigation and aquaculture.

RESULTS AND DISCUSSION

Maximum temperature was recorded in the month of June 33.9±0.4 ^{O}C and minimum temp was recorded in the month of January 12.4±0.1 ^{O}C **(Table 1** and **Fig. 1)**. The Temperature were Positive correlated with the velocity, TDS and chloride and negative correlated with transparency, pH, DO and alkalinity **(Table 2)**.The maximum velocity was recorded in the month of August 1.6±0.2 m/s and minimum velocity was recorded in the month of April 0.4±0.3 m/s **(Table 1)** and **(Fig. 1)**. The velocity was positively correlated with TDS, chloride and negatively correlated with transparency, DO, alkalinity **(Table 2)**.[8-10]

Table 1 : Physico-Chemical parameters of Kosi river at Lalpur barrage

Month	Temp (^{0}C)	Vel (m/s)	TDS (mg/l)	Trans (cm)	pH	DO (mg/l)	Cl (mg/l)	Alk (mg/l)
Sep(2013)	23.8±0.5	1.3±0.4	544.5±1.5	**4.5**±0.6	**7.4**±0.1	**6.9**±1.5	**17.7**±0.1	**91.9**±1.4
Oct	19.7±0.5	0.9±0.02	305.8±1.1	**4.9**±0.5	**7.6**±0.5	**8.1**±1.2	**16.5**±1.2	**98.6**±1.3
Nov	16.4±0.2	0.5±0.05	211.5±0.8	**13.5**±1.2	**7.5**±0.4	**10.4**±1.5	**12.2**±0.5	**108.6**±1.2
Dec	13.8±0.4	**0.6**±0.02	**194.6**±0.5	**12.9**±0.6	**7.7**±0.4	**11.5**±0.4	**2.5**±0.5	**116.4**±1.6
Jan(2014)	12.4±0.1	**0.5**±0.05	**115.6**±0.7	**10.4**±0.9	**7.8**±0.4	**9.3**±0.4	**2.9**±0.1	**139.8**±0.9
Feb	13.7±0.6	**0.4**±0.04	**95.9**±1.2	**13.6**±0.4	**7.7**±0.3	**8.6**±0.6	**3.6**±0.1	**129.8**±0.5
Mar	21.5±0.4	**0.6**±0.02	**89.9**±1.4	**9.5**±0.8	**7.6**±0.7	**7.4**±0.7	**4.5**±0.3	**116.4**±0.5
Apr	22.8±0.5	0.4±0.3	75.5±1.5	6.6±0.1	7.5±0.5	8.7±0.3	4.0±0.3	99.8±0.3
May	25.1±0.7	0.8±0.04	78.6±0.8	6.4±0.3	7.4±0.2	6.8±0.4	10.1±0.2	100.4±0.4
June	33.9±0.4	0.4±0.03	85.4±0.5	5.8±0.2	7.7±0.2	7.9±0.5	18.6±0.5	104.6±0.4
July	31.8±0.6	1.4±0.5	665.2±1.4	4.9±0.1	7.5±0.4	7.8±0.6	21.5±0.6	89.5±0.5
Aug	28.1±1.2	1.6±0.2	670.5±1.6	3.9±0.1	7.3±0.6	6.6±0.6	28.9±0.6	87.8±1.1
Average±	21.9±0.5	0.7±0.4	265.6±1.5	8.07±0.6	7.5±05	8.3±0.9	11.9±0.8	106.9±1.2

Table 2 : Correlation coefficient in selected physico-chemical parameters of Kosi river

	Temp(^{0}C)	Vel(m/s)	TDS(mg/l)	Trans(cm)	pH	DO(mg/l)	Cl(mg/l)	Alk(mg/l)
Temp (^{0}C)	**1**							
Vel. (m/s)	0.479	1						
TDS (mg/l)	0.421	0.946	1					
Trans (cm)	-0.788	-0.669	-0.553	1				
pH	-0.354	-0.257	-0.219	0.245	1			
DO (mg/l)	-0.656	-0.558	-0.366	0.771	0.358	1		
Cl (mg/l)	0.733	0.793	0.798	-0.725	-0.421	-0.561	1	
Alk (mg/l)	-0.753	-0.710	-0.666	0.781	0.541	0.520	-0.782	1

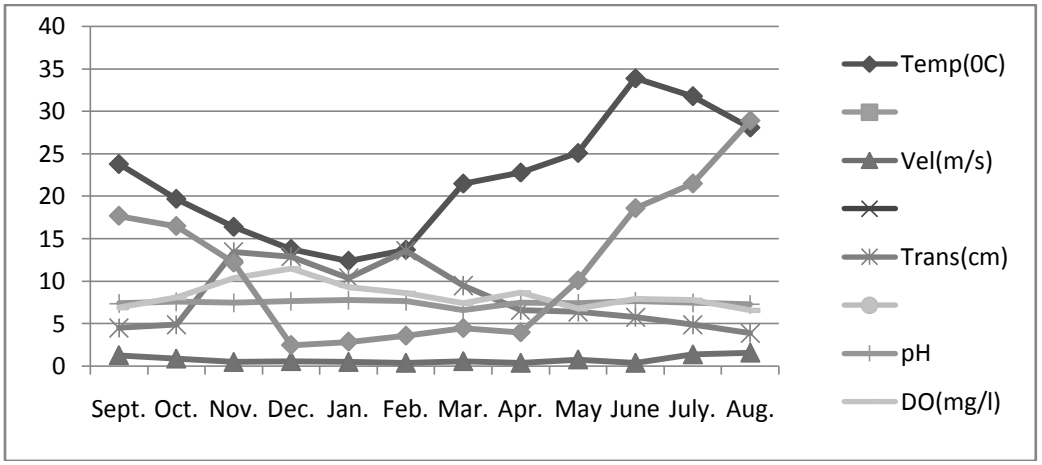

Fig. 1(a) : Seasonal variation in selected physio-chemical parameters of Kosi river at selected sampling site (Lalpur barrage) - I

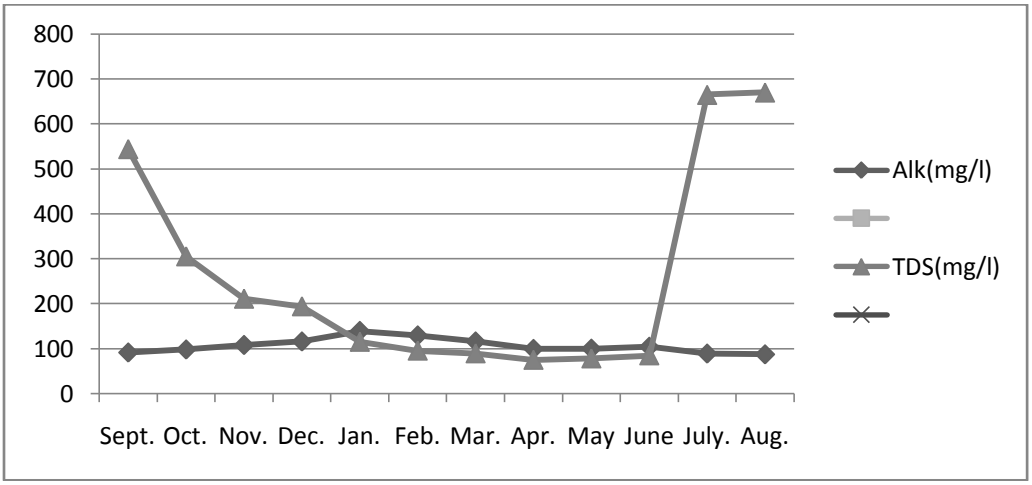

Fig. 1(b) : Seasonal variation in selected physio-chemical parameters of Kosi river at selected sampling site (Lalpur barrage) - II

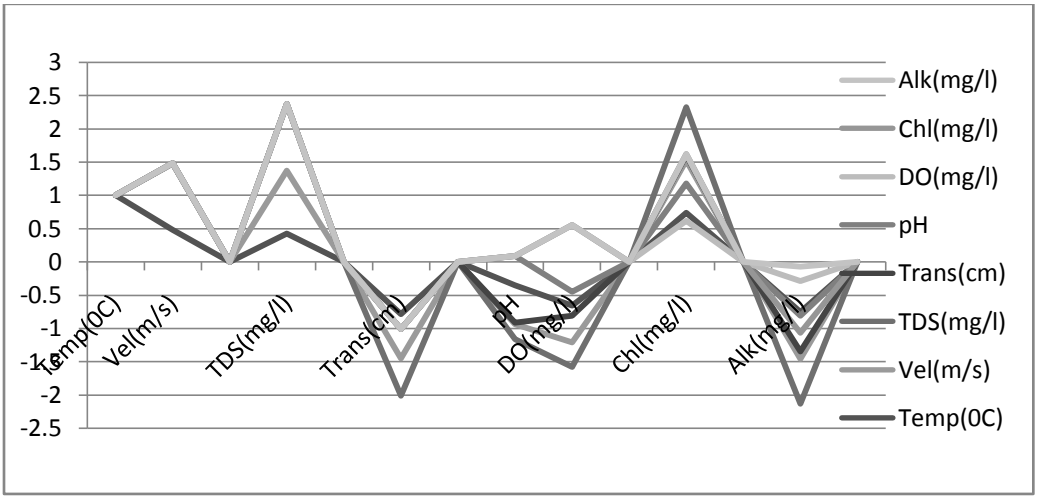

Fig. 2 : Correlation coefficient in selected physico-chemical parameters at selected sampling site

Maximum TDS was recorded in month of August 670.5± 1.6 mg/l and minimum TDS was recorded in month of April 75.5± 1.5 mg/l **(Table 1** and **Fig. 1)**[11,12] The TDS was positively correlated with chloride, velocity and temperature and negatively correlated with alkalinity, DO and pH **(Table 2)**.

Maximum transparency was recorded in month of February 13.6±0.4 cm and minimum transparency was recorded in month of August 3.9±0.1 cm **(Table 1** and **Fig. 1)**. Transparency was positively correlated with DO, alkalinity and pH and negatively correlated with chloride, velocity and TDS **(Table 2)**[13, 14].

Maximum DO was recorded in month of December 11.5±0.4 mg/l and minimum DO was recorded in month of May 6.8±0.4 mg/l **(Table 1)** and **(Fig. 1)**. The dissolved oxygen reflects physical and biological processes prevailing in the water. The oxygen present water can be dissolved from air produced by photosynthetic organism. The DO was positively correlated with alkalinity, transparency and pH and negatively correlated with chloride, TDS and velocity as shown in **(Table 2)**[15-19].

Maximum pH was recorded in the month of January, 7.8±0.4 and minimum pH was recorded in the month of August 7.3±0.6 **(Table 1** and **Fig. 1)**.

Maximum chloride was recorded in the month of August 28.9±0.6 mg/l and minimum chloride was recorded in the month of December 2.5±0.5 mg/l **(Table 1** and **Fig. 1)**.[20-25]

The maximum alkalinity was recorded in the month of January 139.8±0.8 mg/l and minimum alkalinity was recorded in the month of August 87.8±1.1 mg/l **(Table 1** and **Fig. 1)**. Alkalinity was positively correlated with DO, pH and transparency and negatively correlated with chloride TDS and velocity **(Table 2)**.[26-30]

Observed levels of studied parameters in river water are within range of WHO and BIS guidelines. Trend of monthly variation and correlation in physico-chemical parameters of Kosi river in this study is supported by similar studies on different rivers by other limnologists.[31-36].

Correlation coefficient obtained from **Fig. 2** also depicts the same results.

CONCLUSION

Present study concluded that the physico-chemical parameters indicate fair quality of water in the study area. It was not polluted with respect to physico-chemical assessment. Therefore this water is suitable for agriculture, aquaculture and other purposes. However it would be good to examine the water quality with respect to heavy metal and bacteriological impurities / contamination before any final recommendations.

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