Monitoring Water quality of Kosi River in Rampur District, Uttar Pradesh, India

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ABSTRACT

Pollution of water bodies is one of the areas of major concern to environmentalists. Water quality is an index of health and well being of a society. Industrialisation, urbanisation and modern agriculture practices have direct impact on water resources. These factors influence the water resources quantitatively and qualitatively. The study area selected were the Kosi river basin of Rampur district, Uttar Pradesh, India. The Kosi river water is an important source of potable water supply for Rampur city as well as adjointed areas of the district for all purposes. The physico-chemical parameters like temperature, pH, turbidity, total hardness, alkalinity, BOD , COD, chloride, nitrate and phosphate and fluoride content in water of Kosi River were studied to ascertain the drinking and domestic as well as irrigation water supply in Rampur district. In this present study water quality of Kosi River is taken into account and river water is found to be severely polluted with reference to these analyzed parameters.

Keywords: - Kosi river, Dissolved oxygen, Water quality, Rampur District, Monitoring.
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INTRODUCTION

Water is one of the most common yet the most precious resources on earth without which there would be no life on earth. Pollution is a serious problem as 70% of India's surface water resources and as growing number of its ground water reserves have been contaminated by biological, organic and inorganic pollutants. In south Asian countries such as Nepal, India and Bangladesh, pollution of rivers is more severe and critical near urban stretches due to huge

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amounts of pollution load discharged by urban activities. The Bagmati River in the Kathmandu valley, Yamuna River at Delhi, Buriganga River of Dhaka, Tamiraparani River and Ganga River and Ruva River, suffer from severe pollution [1-3]. Water of river Hindon was found to be more polluted than river Narmada [4]. The pollution of Pamba River is due to Sabrimala pilgrimage, free flow of sewage, domestic waste and faecalmatter into the river [5]. The main cause of water pollution is human activities. Humans produce bodily wastes that enter the river and polluted water [6]. Industries discharge variety of pollutants in the waste water including heavy metals, organic toxins, oil nutrients and solids. Many of the substances are toxic or even carcinogenic. Pathogens can obviously produce water born diseases in either human or animal hosts. These wastes also increase the concentration of suspended solids (turbidity), bacteria and virus groeth leading to potential health impacts. Increase in nutrient load may lead to eutophication; organic wastes increases the oxygen demand in water leading to oxygen reduction in water with potentially severe impacts on whole ecosystems [6]. The river Kosi is spread across Rampur district.

MATERIALS AND METHODS

Study area: - The area under study is the basin of river Kosi which pass through district Rampur, Uttar Pradesh. It is located between longitudes 78^o54" to 69^o28" E and latitude 28^o25" to 29^o10"N and on coordinate it 28.8N to 79.0^oE. It covers 2,367 Km² areas. The people of this area work mainly in agriculture and industries in nearest places [7]. The Kosi River water is used for agricultural, domestic use and as well as drinking purpose.

Water Sampling: - A total of 60 water samples were collected from 15 locations which are situated in Kosi river basin and from each location four water samples were taken for study to analyse the water quality. The samples are collected in clean polyethylene bottles and prior to collection, the samples are rinsed throughly with sample water [8]. The water samples are taken through pumping so the samples will be a representative and order to avoid only contamination from the surface of river basin [9].

Methodology
The following methods are adopted to evaluate water quality parameter of Kosi River.
- Water temperature was recorded in the field using mercury thermometer.
- The pH of the samples was determined by using digital pH meter [10].
- Turbidity was determined by Naphelo-turbidity meter [11].
- Total hardness was determined tetrimetrically using EDTA method [12].
- Total alkalinity was determined by tetrimetrically method.
- BOD was determined as per standard method.
- COD was determined by potassium dichromate open reflex method [13].
- Chlorides were determined by Mohr's argentometry method.
- Nitrate and phosphate content is determined per standard method [14].
- Fluoride content is determined using ELICO-52 UV spectrophotometer [15].

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RESULT AND DISCUSSION

Temperature:- The maximum water temperature (21.7°C) was obtained at station 9 and minimum water temperature (17.8°C) was obtained at station1. The variation in water temperature may be due to different timing of collection. Temperature controls behavioral characteristics of organisms, solubilty of gases and salts in water. No other factor has so much influence on temperature [16].

PH: - The maximum value of pH of the water samples was recorded as 8.5 at station 3 and minimum value of pH was recorded as 7.2 at station 5. In general pH was within the limits of standard value. For drinking water, a pH range of 6.0-8.5 is recommended [17].

Turbidity:-The present study shows the turbidity in the range of 5.6 -26.3 NTU. World Health Organization prescribed the highest desirable limit 5.0 NTU and maximum permissible limit 25.0 NTU. In few stations the value of turbidity present is higher than permissible limits.

Total Alkalinity: - The alkalinity of water is its capacity to neutralize acids. The maximum alkalinity was recorded as 516 ppm at station 6 and minimum value is recorded as 154 at station 10. BIS has set a desirable level of alkalinity in drinking water to be 200 ppm where as its value has been prescribed to be 600 ppm in the absence of alternative source. So in maximum stations value of total alkalinity present in water is higher.

Total hardness: - In the present study water samples of different locations was observed in the range of 181-296 ppm. The hardness of water is not a pollution parameter but indicates water quality.

BOD: - Biochemical oxygen demand is usually defined as the amount of oxygen required by bacteria in stabilizing the decomposable organic matter. BOD gives an idea about the extent of pollution. In present study water samples, sampling stations BOD was found in the range of 12.7-53.6 ppm, it indicates that the pollution affects the water quality.

COD: - The chemical oxygen demand is a measure of oxygen equivalent to the requirement of oxidizing organic matter contents by a strong chemical agent. The COD test is helpful in indicating toxic conditions and the presence of biologically resistant organic substances. The maximum COD value was recorded 193 ppm at station 8 and the minimum values was recorded as 69ppm at station 2. The high value of COD due to high level of pollutants present in water samples.

Chlorides: - Chlorides occurs in all natural waters in widely varying concentrations. The chloride contents normally increases as the mineral content increases [18]. In present study the chloride concentration were found in the range of 18-88 ppm. The maximum chloride contents were due to addition of natural contaminants and pollutants in the Kosi River.

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Table 1: Parameter studied in Kosi River at different stations

Parameter	Station at Kosi River Basin														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Temp. (°C)	17.8	19.2	18.6	18.3	18.9	18.0	17.9	19.6	21.7	18.2	19.6	20.2	19.3	21.2	20.9
pH	7.9	8.1	8.5	8.3	7.2	8.2	8.1	7.6	8.1	7.9	8.1	7.3	7.5	8.1	8.4
Turbidity (NTU)	15.8	5.9	26.3	14.2	15.9	5.8	16.2	6.4	16.3	7.4	7.0	17.1	5.6	15.8	7.2
TA (ppm)	232	356	447	352	158	516	339	227	162	154	250	164	448	168	238
TH (ppm)	235	181	269	206	182	296	205	226	269	223	268	267	201	212	245
BOD (ppm)	12.7	34.1	22.3	15.2	53.6	25.1	14.3	47.9	32.9	26.3	34.8	18.9	45.9	16.3	33.3
COD (ppm)	114	69	168	91	187	115	186	193	122	93	171	183	120	121	117
Chlorides (ppm)	24	41	26	18	56	62	77	82	51	47	32	45	74	88	67
Nitrate (ppm)	33	41	4.7	6.7	8.5	43	48	11	32	23	10	15.8	39.6	22	21.6
Phosphates (ppm)	4.4	5.7	3.3	5.5	3.9	4.1	6.7	5.1	3.9	6.3	4.4	5.0	3.4	4.9	3.5
Fluoride (ppm)	1.5	1.2	1.0	1.8	0.32	0.56	1.4	0.68	0.72	1.2	1.7	0.80	0.97	1.3	1.2

Figure 1:- Map of Rampur district showing Kosi River

Nitrate: - The nitrate content of water bodies was found in the range of 4.7-48 ppm. The highest value of 48 ppm was recorded at station 7 while minimum at station 3 and it is observed that it is higher the accepted limits of drinking water standards (20 ppm-ICMR, 45 ppm-ISI).

Phosphates: - The phosphate content of water bodies was found in the range of 3.3-6.7 ppm. The highest value of 6.7 ppm was recorded at station 7 while minimum value of 3.3 at station 3.

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The United State Public Health standards limit for phosphates in drinking water is 0.1 ppm, so it is not within the acceptable limits.

Fluoride: - The fluoride content in water is found in the range of 0.32-1.7 ppm   which is in limits in station no.4 and 11 and it put effects i.e., dental and Skelton problems in the peoples of the areas [19].

CONCLUSION

Most of the water samples collected in Kosi river basin is evident in all physico-chemical parameters examined. In general all the parameters are not within the range of standard values prescribed by various agencies. The water of Kosi River is highly contaminated at all the stations during the course of study and it is unfit for consumption, domestic and irrigation purposes. Some steps are needed urgently to improve the quality of Kosi River.

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