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AN ASSESSMENT OF PHYSICO-CHEMICAL WATER QUALITY OF KOLONG RIVER, NAGAON DISTRICT (ASSAM), NORTH EAST INDIA

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Abstract

The present communication reveals the occurrence of different levels of pollutants in different extent in several study sites of the up and down stream of Kolong river course. In this study, river water samples were collected and analyzed from five different study sites. Parameters like pH, temperature, conductivity, T.D.S, D.O, B.O.D, turbidity etc. are determined by using different standard methods. The thickly populated urban areas of Nagaon is the most polluted segment of the river, due to the high level disposal of pollutants into the river, which in turn adversely affects different aquatic plants and animals. The upstream and downstream parts of the river are comparatively less polluted due to low level anthropogenic disturbances. A noticeable variation in the quantity of the parameters is found in both seasons from several sites. The pH of water was found to be highest 8.5 in Kaliabor during winter season and lowest 6.4 in Samoguri during the monsoon season.

Key words : Kolong, pollution, Nagaon, anthropogenic.

Introduction

Water is vital to the existence of all living organisms on earth, which is increasingly being threatened as human populations growing-up day by day and demand for water of high quality for domestic purposes and economic activities also growing up (UNEPGEMS/WP, 2000). The quality of any surface or ground water depends upon either or both natural influences and human activities (Stark *et al*., 2001 and Kolawole *et al*., 2008). River, which is the best freshwater resource for man are being polluted by indiscriminate disposal of sewerage, industrial waste and plethora of human activities, which affects their physico-chemical characteristics and microbiological quality (Koshy and Nayar, 1999). Increasing numbers and amounts of industrial, agricultural and commercial chemicals discharges into the aquatic environment has led to the various deleterious effects on aquatic organisms. In some aquatic organisms, including fish, accumulate pollutants directly from contaminated water and indirectly via the food chain (Hammer, 2004 and Mohammed, 2009). Prevention of river pollution requires effective monitoring of physico-chemical and microbiological parameters (Chandra *et al*., 2006).

Originating at Kolongmukh, Jakhalabandha and the River Kolong passes through the middle of Nagaon district of Assam going through a staid phase of degeneration as a result of human intervention, for the last century. The river extends to 100 km through Nagaon district and meets Kapili river at Dukhutimukh of Morigaon district. In 1972, a heavy erosion led to devastating flood in the area and consequently a high level committee decided to block the mouth of the river resulting in degradation and stagnancy of the river. At present, the river receives effluents from urban areas, domestic wastes, sewage and garbage along with other anthropogenic disturbances. According to the study of CPCB (2013), it is among the 71 most polluted stretch of river in India. Khan and Hazarika (2012) reported the presence of different pollutants specifically from Nagaon urban areas. Buragohain and Yasmin (2014) studied the occurrences of different pollution tolerant aquatic algae from the Kolong river. Therefore, the present investigation has been undertaken to assess the water quality of different study sites of up and downstream course in different seasons by using standard parameters.

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Materials and Methods

For the assessment of upstream and downstream river water quality 5 study sites have been selected from up and downstream as well as from middle part of the river, passing through heavily populated areas. The G.P.S location of the study sites were determined by using a G.P.S. recorder.

Again for winter or dry seasons (Nov-April) assessment and summer or wet season (May-October/

monsoon) assessment, two seasonal visits were carried out, to collect water samples for laboratory analysis as well as on the spot testing of water quality, using portable multi water testing kit. The samples were taken into pre-sterilized bottles in required quantity and transported immediately to the laboratory for different physicochemical analyses. The collected river water samples were analyzed in the laboratory for pH, temperature, turbidity, conductivity, total dissolved solids (TDS), total suspended solids (TSS) and biochemical oxygen demand (BOD) per standard methods. The pH of the samples was determined using a LT/49 LABOTRONIUS pH meter. The temperature of each sample collected was measured on-site with the use of a mercury bulb thermometer. The TDS was measured by electrical conductivity method. B.O.D. was measured by B.O.D. incubator Winkler Method. PO_4 and NO_3 were measured by Stannous chloride method and Phenol Disulphonic acid method, respectively (tables I and II).

Table I : Water quality parameter and different methodology.

S. no.	Water quality Parameter	Methodology
1	p^H.	By digital p^H meter Model – LT/49 (LABOTRONIUS) ISO-9001:2008.
2	Conductivity	Digital conductivity meter Model- NDC-736.
3	Turbidity	By Sacche disc. Method/Turbidity Tube Method.
4	T.D.S.	Electrical conductivity method. E.C. Model- NDS-03
5	D.O.	Membrane electrode method (Oxygen sensitive electrode-D.O. Meter) Model-NDO-34/Winkler Method.
6	B.O.D.	APHA, 16th edn., 1985, (B.O.D. incubator Winkler Method)
7	PO_4	Stannous chloride Method. ApH4 1985(pp-446-447)
8	NO_3	Phenol. Disulphonic acid method. (Trivedy & Goel 1986:pp-61) [9].
9	Temperature	Thermometer.

Table II : G.P.S. Location of different selected study sites.

S. no.	Selected study sites	Latitude	Longitade
1	Jakhalabandha	$26^0$30'45.5"N	$92^0$58'27.5"E
2	Kaliabor	$26^0$35'24.5"N	$92^0$56'34.2"E
3	Samaguri	$26^0$25'37.5"N	$92^0$53'37.5"E
4	Nagaon	$26^0$20'09.4"N	$92^0$40'02.8"E
5	Raha, Hariamukh	$26^0$13'22.8"N	$92^0$32'31.0"E

Fig. (a) : Hariamukh

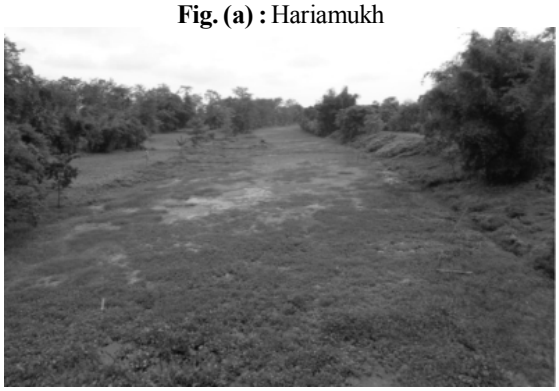

Fig. (b) : Kaliabor.

Fig. (c) : Jakhalabandha.

Fig. (d) : Nagaon Town.

Fig. 1 (a-d) : Different selected study sites.

Table 1: Physicochemical Parameters of different study sites of River Kolong in winter season.

Sl No	Sampling Sites	p^H	TDS	TSS	D.O	B.O.D	PO4	NO_3	Tem	Turbidity
1	Jakhalabandha*	-	-	-	-	-	-	-	-	-
2	Kaliabor	7.2-8.4	200-300 mg/l	130-350 mg/l	6.9-7.6 mg	4.0-5.0 mg/l	0.3-0.6 mg/l	2.3-5.3 mg/l	9-25^{0}C	10.2-15.5 NTU
3	Samaguri	7.2-8.5	200-350 mg/l	155-395 mg/l	6.8-7.5 mg	5.8-6.5 mg/l	0.3-0.6 mg/l	2.3-5.01 mg/l	9-25^{0}C	10.2-15.5 NTU
4	Nagaon Town	6.8-8.0	250-400 mg/l	160-410 mg/l	6.8-7.2 mg	5.9-6.8 mg/l	0.4-0.9 mg/l	2.8-5.5 mg/l	9-25^{0}C	10.2-15.5 NTU
5	Hariamukh, Raha	7.3-8.4	200-300 mg/l	155-350 mg/l	6.9-7.5 mg	5.3-6.2 mg/l	0.2-0.5 mg/l	2.2-3.5 mg/l	9-25^{0}C	10.2-13.5 NTU

*In winter season at Jakhalabandha the river remain dry.

Table 2 : Physicochemical parameters of different study sites of river Kolong in summer season.

S. no.	Sampling sites	pH	TDS	TSS	D.O	B.O.D	PO4	NO_3	Tem	Turbidity
1	Jakhalabandha*	6.5-7.9	250-400 mg/l	70-200 mg/l	7.5-7.9 mg	4.5-5.0 mg/l	0.2-5.00 mg/l	3.0-5.00 mg/l	20-30^{0}C	10.2-50.8 NTU
2	Kaliabor	6.5-7.9	250-400 mg/l	70-200 mg/l	7.5-7.9 mg	4.8-5.5 mg/l	0.4-0.7 mg/l	3.5-6.8 mg/l	20-30^{0}C	10.2-51.8 NTU
3	Samaguri	6.4-7.9	300-400 mg/l	70-220 mg/l	7.1-7.8 mg	5.1-5.8 mg/l	0.5-0.9 mg/l	5.5-7.8 mg/l	20-30^{0}C	10.2-61.8 NTU
4	Nagaon Town	6.1-7.9	350-500 mg/l	90-240 mg/l	6.9-7.5 mg	5.5-6.2 mg/l	0.5-1.00 mg/l	6.0-8.2 mg/l	20-30^{0}C	20.2-61.8 NTU
5	Hariamukh, Raha	6.1-7.9	300-400 mg/l	80-220 mg/l	7.5-7.8 mg	4.8-5.3 mg/l	0.4-0.8 mg/l	5.0-7.00 mg/l	20-30^{0}C	10.2-55.8 NTU

Results and Discussion

The water samples were analyzed for different physicochemical characteristics. Total of nine physicochemical parameters were analyzed namely pH, TDS, TSS, DO, B.O.D, PO4, NO_3, water temperature and turbidity (Tables 1 and 2). In the present study, the D.O. value is found to be lowest (D.O. = 6.8-7.2) and B.O.D. value is found to be highest (B.O.D. = 5.5-6.8) in Nagaon town. Dissolved oxygen concentration is a remarkable Indicator of water pollution (Basavaraddi *et al*., 2012). D.O. and B.O.D. are the two important physiochemical parameters to determine the water quality of any aquatic ecosystem. NO_3 concentration was found to be highest in Nagaon town during the monsoon season (6.0-8.2 mg/l) and lowest in Hariamukh during the winter season (2.2-3.5 mg/l). Similarly, PO_4 concentration was found to be highest in Nagaon town during the monsoon season (0.5-1.00 mg/l) and lowest in Hariamukh during the winter season (0.2-0.5 mg/l).

Conclusion

From the above study, it is revealed that, there are variations in water quality in different seasons in a same site. Again there are also variations in water quality in different study sites. D.O. and B.O.D. value, which are very crucial biological parameter, are found to significant. In urban areas like Nagaon, Kaliabor, D.O. value is lowest and B.O.D. value highest. This clearly indicates that, in these parts of the river, water quality is not up to the mark for growth and development of all natural flora and fauna. Interestingly, the diversity of species is also found to be low in these parts, particularly in Nagaon Township area.

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