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Monthly Variations in Water Quality (Physico-Chemical) Parameters of Bakhira Lake Water of District Sant Kabir Nagar, Uttar Pradesh, India

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ABSTRACT

The water samples were collected monthly from July 2017 to June 2018 for the study of water quality (physico-chemical) parameters of Bakhira Lake water. The results showed variations in the water quality (physico-chemical) parameters within the months. The mean water temperature varied from 21-310C, pH 7.4-8.4, Alkalinity 122-168 mg/l, Turbidity 32-52, Total hardness 110-160 mg/l, TDS 390-470 mg/l, Conductance 340.6-368.4 µmhos/cm, Dissolved Oxygen 7.2-8.4 mg/l, BOD 1.7-3.6 mg/l and COD 20.6-48.0 mg/l. The results of all the analyzed water quality (physico-chemical) parameters were normal range recommended by national and international standards, hence the water of Bakhira Lake supports aquatic animals and also suitable for irrigation purposes.

KEYWORDS: *Bakhira lake, Monthly variation, Physico-chemical parameters, Water quality*

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INTRODUCTION

Water has been used since ancient times as a symbol by which to express devotion and purity. In fresh water aquaculture the quality of water is one of the most important factors. The Bakhira Lake **(Fig. 1)** is the largest natural flood plain wetland of Sant Kabir Nagar district of eastern Uttar Pradesh, India. Bakhira Lake was established in 1980. It is situated 44 km west of Gorakhpur city. It is a vast stretch of water body expanding over an area of 29 Km^2. This is an important Lake of eastern Uttar Pradesh which provides a wintering and staging ground for a number of migratory waterfowls and a breeding ground for resident birds. This is also used for farming activities as it is connected to Bakhira canal which covers the people of 15 Km from its origin. Bakhira Lake is the good source of common edible fresh water fishes, indigenous as well as exotic.

Fig. 1: Bakhira Lake of District Sant Kabir Nagar, Uttar Pradesh, India

Water is the most precious gift to mankind and is no possibility of life on earth without it. Water is the nature`s soul and a vital resource used for various activities such as drinking, irrigation, fish culture, industrial cooling, power generation and many others **(Naik and Purohit, 1996)**. It is an essential element for all living beings which are present on earth and is the primary source of food for root leveled producers in all food web on earth **(Espejo, *et. al.* 2012)**. Water quality imbalances can cause stress, poor growth and mortality of culture species **(Tidame and Shinde, 2012; Mahobe, 2013 and Mishra, 2014 a&b)**. Water quality is strongly influenced by feed inputs and lakes with high feeding rates frequently have more severe problems with low dissolved oxygen concentrations and excessive concentrations of ammonia and nitrite than ponds with low or moderate feeding rates **(Ani, *et. al.* 2016)**. In fisheries ground water is widely used in various stages as in hatchery operation and in aquaculture. Water quality refers physical and chemical characteristics of water relative to the requirements of one or more biotic species and to any human need or purposes **(Ankur, *et. al.* 2011 a&b and Mishra, 2015)**. The physico-chemical characteristics of water changes generally due to many factors like source of water, type of pollution, seasonal fluctuation and adjacent human intervention that directly or indirectly affect its quality and consequently its suitability for the distribution and production of fish and other aquatic animals **(Mishra, 2011 c&d; Dimowo, 2013; Idowu, *et. al.* 2013 and Khan, *et. al.* 2015)**. The aim of this study is to assess the water quality (especially physico-chemical parameters) of Bakhira Lake, Sant Kabir Nagar, Uttar Pradesh, India.

MATERIAL AND METHODS:

Water samples were collected from three different points on the lake and mean value of the three points were computed and recorded. The sampling was carried out every month between July 2017 to June 2018. Sampling was done between 8:00 am to 10:00 am every month. The water temperature, pH, turbidity, total dissolved solids and conductivity were carried out in situ while total hardness, alkalinity, dissolved oxygen biological oxygen demand and chemical oxygen demand were done in the Laboratory of Department of Zoology, L.B.S.S. P.G. College Anandnagar, Maharajganj, Uttar Pradesh, India. The temperature readings were taken by using mercury in glass thermometer to the nearest 0.1^0C. The thermometer was place at about 10 cm below the water surface for about 5 minutes to stabilize after which the readings were taken and recorded. The pH readings were measured using a pH meter (7020 model), turbidity was measured a sacchi disk of 20 cm marked with black and white. Total dissolve solids and conductivity were measured using a portable TDS meter (model). Other physico-chemical parameters were determined by using standard methods **(APHA, 1995 & 2005)**.

RESULT AND DISCUSSION:

The range of physico-chemical parameters are presented in **Table 1**. The temperature of lake water ranged between 21 - 31^0C, having maximum temperature in the month of June 2018 and minimum temperature during January 2018. The fluctuation in water temperature usually depends on season, geographic location, sampling time and temperature of effluents entering the stream **(Nirmala, *et. al.* 2012)**. The pH of water showed alkaline range throughout the study period. It varied from 7.4 - 8.4, having maximum pH in June 2018 and minimum pH in October 2017. The pH is an important factor that determines the suitability of water for various purposes. The pH of lake depends on water flow and nutrient strategy. Similar findings were reported by many workers **(Tepe, *et. al.* 2005; Shah, *et. al.* 2006; Ahangar, *et. al.* 2012 and Mahobe, 2013)**. The Alkalinity ranged between 122 - 168 mg/l, having maximum alkalinity in June 2018 and minimum alkalinity in November 2017. The turbidity ranged between 32 - 52, having maximum turbidity in May 2018 and minimum turbidity in December 2017. Total hardness ranged between 110 - 160 mg/l, having maximum in May 2018 and minimum in October 2017. Total dissolved solids ranged between 390 - 470 mg/l, having maximum TDS in January 2018 and minimum TDS in July 2017. The value of TDS was relatively high in this study which is higher than that of Dadin-Kowa **(Abubakar, *et. al.* 2015)**, Awba **(Anago, *et. al.* 2013)** reservoir and Ero **(Oso and Fagbuaro, 2008)** reservoir. Conductivity ranged between 340.6 - 368.4 µmhos/cm, having maximum conductance in May 2018 and minimum conductance in August 2017. The conductivity levels below 50 µmhos/cm are regarded as low; those between 50 - 600 µmhos/cm are medium while those above 600 µmhos/cm are high conductivity **(Sharma, *et. al.* 2017)**. Dissolved oxygen ranged between 7.2 - 8.4 mg/l, having maximum dissolved oxygen in January 2018 and minimum in May 2018. In this present study, the highest values of dissolved oxygen were recorded when the temperature value was lowest. This condition is similar to the report of **Idowu *et. al.*, 2013** from Ado-Ekiti reservoir. **Lewis, 2002** reported that tropical water with higher temperature poses poor ability to hold oxygen compared to water with lower temperature as well as high rates of microbial metabolism at higher temperature. Biological Oxygen Demand ranged between 1.7 - 3.6 mg/l, having maximum BOD in July 2017 and minimum in November 2017 and the Chemical Oxygen Demand ranged between 20.6 - 48.0 mg/l, having maximum COD in February 2018 and minimum in July 2017.

Table 1: Monthly variations in water quality (physico-chemical) parameters of Bakhira Lake, Sant Kabir Nagar, Uttar Pradesh, India.

Parameters	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Temperature (^{0}C)	30.0	29.0	27.0	25.0	24.0	22.0	21.0	24.0	26.0	28.0	30.0	31.0
pH	8.2	8.0	7.6	7.4	7.5	7.7	8.0	8.2	8.0	7.8	8.0	8.4
Alkalinity (mg/l)	165	150	138	135	122	142	150	160	142	134	152	168
Turbidity	47	46	40	36	34	32	36	42	46	50	52	50
Hardness (mg/l)	140	130	120	110	140	130	135	120	135	150	160	140
T.D.S. (mg/l)	390	422	438	442	410	398	470	416	432	440	448	418
Conductivity (µmhos/cm)	366.2	340.6	352.2	356.6	358.2	346.8	342.2	340.6	344.2	348.4	368.4	362.4
D.O. (mg/l)	8.0	8.2	7.8	8.0	7.6	8.0	8.4	8.2	7.8	7.6	7.4	7.2
B.O.D. (mg/l)	3.6	2.2	2.0	1.8	1.7	3.0	3.2	4.0	2.8	3.0	2.2	2.0
C.O.D. (mg/l)	20.6	21.2	22.6	22.4	23.6	30.0	32.0	48.0	32.6	25.6	26.2	28.0

The present study focused the monthly variations in the water quality (physico-chemical) parameters to monitor the lake ecosystem **(Sachidanandamurthy and Yajurvedi, 2004)**. The results indicated that analyzed parameters were normal range and the lake water is relatively less contaminated. The fluctuation in water temperature usually depends on the season, geographic location, sampling time and temperature of effluents entering the stream **(Shah, *et. al.* 2006)**. Temperature showed significant positive correlation with BOD and COD, but pH had a negative correlation with BOD and COD. The present study agrees with earlier observations **(Sahu, *et. al.* 1995; Caquet, *et. al.* 2001; and Sharma, *et. al.* 2017)**.

CONCLUSION:

The present study carried out in the fresh water Lake revealed that the water quality (physico-chemical) parameters were normal range and the water is relatively less contaminated in Bakhira Lake. Thus, the Bakhira Lake is much more suitable for aquatic animals especially for fish culture and its water is useful for irrigation and other domestic purposes.

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