



## SEASONAL VARIATION IN PHYSICO-CHEMICAL PARAMETERS OF THE HARWA JABBAR JHEEL OF KATIHAR, BIHAR

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**Abstract:** Water is the important component for life and for rural development. The Katihar district of Bihar is one of the important districts from Agricultural point of view. The Harwa Jabbar Jheel is a natural depression of 180 ha and depth 40ft. the present study was made to study the physico-chemical status of the Jheel from fisheries point of view. The study revealed that air temperature  $28.05 \pm 4.32$  water temperature  $25.06 \pm 4.67$  the pH  $7.09 \pm 0.26$  dissolved oxygen  $6.35 \pm 1.18$  free carbon dioxide  $20.75 \pm 10.11$  and total alkalinity  $127.16 \pm 11.62$ . It is concluded that above parameters of the Jheel is within favorable range for fish culture.

**Keywords:** Physico chemical, fish pond, Katihar.

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### INTRODUCTION

The district Katihar lies between  $25^{\circ} 13'$  and  $25^{\circ} 53'$  North latitudes and  $87^{\circ} 12'$  and  $88^{\circ} 04'$  East longitudes. The district covers a total area of 3010 sq. km. The climate of this district is on the whole dry, hot in summer and cold in winter. The temperature in the district starts increasing from the beginning of March till May, which is generally the hottest month. January is usually the coldest month. The slope of the district Katihar is gradually from north to south. Ganga, Mahananda, Kosi are three perennial river of this district. Due to the presence of these three rivers Katihar district is very much affected by flood. As sand deposited by the rivers the land has become slightly sandy. The district is generally form by alluvial soil. There is no highland in the district except a small hill which is composed by nodular lime stone. The total wetland area in the district is 31011 ha including 602 small wetlands having area less than 2.25 ha which comprises the highest extent of wetland about 10 per cent of the geographical area of the district.

Rivers/streams contribute almost 69% of wetland extent of the district that accounts for 21255 ha. After rivers/streams, lakes/ponds (3146 ha), ox-bow lakes/cut-off meanders (2768 ha) and natural waterlogged (2377 ha) are the major wetland category of the district. Water spread is 17135 ha in post-monsoon which is decreased 15 per cent in pre-monsoon (14574 ha). Qualitative turbidity is observed to be dominantly low (12538 ha) followed by moderate (3935 ha) and high (668 ha) in post-monsoon season. However, in pre-monsoon moderate turbidity (14574 ha) singularly dominated the open water. Out of 30409 ha, 17135 ha and 14574 ha area is infested by aquatic vegetation in post and pre-monsoon season respectively. One of the important features of Katihar district (Koshi zone) is the presence of a large number of swamps, marshes and wetlands covering a considerable area. High rate of primary production, luxuriant growth of macrophytes for shelter, lesser water level with slow current, favor the growth and development of air-breathing fishes. The maintenance of a healthy aquatic ecosystem

depends on the physico-chemical properties of water. Lots of works have been performed on the seasonal changes in the physico-chemical parameters of rivers, lakes, ponds, reservoirs and streams in India by several workers as Pahwa and Mehrotra (1966), Mishra and Yadav (1978), Singh (1985), Pandey *et al* (1989), Bohra (1990), Birsal *et al.* (1991), Pandey *et al.* (1992), and others, but the swamps of Katihar district are more or less untouched and neglected. Keeping in mind the socioeconomic importance of swamps in human life, the present work has been undertaken which deals with the monthly and seasonal variation in the physico-chemical parameters of the lake.

### EXPERIMENTAL

**Study Area:** The Study site is known as Harwa Jabbar Jheel located at a distance of 15 Km from Aazamnagar block of Katihar district. The Jheel is 2000 m in length and 900 m in width.

**Sampling and Analysis:** Water samples for the physico-chemical analysis were collected from sampling stations every month at a regular interval, for one year from June 2011 to

May 2012. Most of the parameters were analysed at the sampling sites. Atmospheric and water temperature were recorded with a mercury thermometer and pH of water was measured by a portable pH meter. The transparency of the water was recorded with help of secchi disc. Chemical parameters like Dissolved Oxygen, Free CO<sub>2</sub>, Total alkalinity, plankton was collected with the help of plankton net made up of bolting silk and were estimated according to standard methods of APHA, 1989 and Trivedy and Goel, 1984.

### RESULTS AND DISCUSSION

The monthly and seasonal fluctuations in Physico-chemical parameters of the Jheel water are shown in Table 1. Water temperature was recorded between 18.2°C and 31.5°C, while atmospheric temperature varied between 20.8°C and 33.8°C. The water was observed mostly transparent except in the monsoon season. Turbid water was observed in July which was due to monsoon rain which brought additional water from catchments areas, transforming the water muddy and turbid.

Table 1-Physico-chemical Parameters of Harwa Jabbar Jheel

Month/ Parameters	Air Temp. (°C)	Water Temp (°C)	Transparency (cm.)	pH	DO (mg/L)	Free CO <sub>2</sub> (mg/L)	Total Alkalinity (mg/L)
March	26.0	23.1	15.0	7.3	7.0	18	135
April	30.2	27.0	24.0	7.2	6.8	20	130
May	33.8	31.5	26.0	6.9	6.2	31	120
June	32.5	30.2	20.0	6.8	5.8	28	102
July	33.0	30.0	8.5	6.6	5.2	38	110
August	30.6	28.2	19.4	6.8	5.0	36	125
September	29.5	27.3	12.0	7.0	4.8	16	130
October	28.0	25.2	14.5	7.2	5.2	18	132
November	26.5	21.0	18.4	7.4	6.4	14	140
December	22.0	18.9	18.0	7.3	8.0	10	130
January	20.8	18.2	16.0	7.2	8.2	12	130
February	23.7	20.2	18.6	7.4	7.6	8	142
Mean	28.05±4.32	25.06±4.67	13.78±6.54	7.09±0.26	6.35±1.18	20.75±10.11	127.16±11.62

The pH value of the swamps varied between 6.8 and 7.4 and it was slight acidic (pH 6.9) in monsoon season. The value of dissolved oxygen varied between 5.0 mg/L to 8.2 mg/L. The average value of DO was observed minimum (5.0 mg/L) in monsoon and maximum (7.5 mg/L) in winter. The free CO<sub>2</sub> concentration of the Jheel water ranged from 8

mg/L to 38 mg/L and it was observed higher in monsoon and summer seasons. Total alkalinity ranged from 102 mg/L to 142 mg/L. The average value of total alkalinity was found highest (135 mg/L) in winter and lowest (122 mg/L) in summer. The water temperature and atmospheric temperature were found interrelated like the other aquatic ecosystems.

Normally the atmospheric temperature affects the temperature of a water body. Unlike the above condition the water temperature of a thermal spring is always higher and almost constant at the source (Sarkar 1953, Saha et al., 1978, 1980 and Tanti and Saha, 1993).

The Jheel water was found slight acidic (pH = 6.8) in monsoon season. This might be due to cyclic production of more H<sup>+</sup> (Towheed et al. 1988). According to Zafar (1966), pH of water is controlled by the relative quantity of bicarbonate and free CO<sub>2</sub>. Higher value of HCO<sub>3</sub><sup>-</sup> and lower value of free CO<sub>2</sub> favor the higher value of pH. According to Banerjee and Ghosh (1967) pH 6.5-7.8 is most suitable for fish production. The low concentration of dissolved oxygen (5.0 mg/L) during monsoon season might be due to highly turbid water reducing the rate of photosynthesis, at the same time the high rate of free CO<sub>2</sub> in this season is due to not proper utilization of free CO<sub>2</sub> by the primary produces facing the problem of low transparency. Pahwa and Mehrotra (1966) observed the lowest range of free CO<sub>2</sub> in the river Ganga from January to June due to increased photosynthetic activity of higher amount of phytoplankton. The value of DO in the Jheel was found between 5.0 mg/L and 8.2 mg/L. This value of oxygen is best for fish production (Reddy, 1982). The lower value of free CO<sub>2</sub> (11 mg/L) and higher value of DO (7.5 mg/L) in winter were observed due to comparatively clear water and cloudless sky facilitating more and more photosynthesis. The free CO<sub>2</sub> concentration was also observed high in summer and early monsoon (March to August). It was probably due to comparatively higher temperature which accelerated the decay and decomposition of submerged vegetation causing the release of free CO<sub>2</sub>. Pandey et al. (1989) also reported the hypoxic and hypercarbic conditions due to decay of organic matters during day time in Shivganga pond of Deoghar (South Bihar). Aeration and increasing of pH can control the high concentration of CO<sub>2</sub>. Experiment has shown that 1.0 mg/L of hydrated lime can remove 1.68 mg/L of free CO<sub>2</sub> (Adhikari, 2006). Total alkalinity was found higher in all seasons (Table 1). As the alkalinity was always found

more than 100 mg/L, on the basis of Moyle's (1946) classification and Phillipose (1959) the Jheel water can be classified as hard water type and kept under the high category of nutrient type. Thus it may be concluded that the Jheel water having higher value of dissolved oxygen and higher productive range of alkalinity favor the production of fishes.

## CONCLUSION

The study of Physico-chemical parameters of Harwa Jabbar Jheel revealed that the important parameters were within favorable range for fish culture. On the basis of natural productivity of the Jheel, the fish seed should be stocked for better utilization of the water bodies.

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