

# Study on the variation of temperature and pH of Mahendra Nath pond, Siwan, Bihar

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**ABSTRACT :** The present paper explains the fluctuation of water temperature and pH in the perennial lentic water body, Mahendra Nath Pond, Siwan Bihar. The pH was generally higher during winter and lower in Monsoon months. It was observed that pH maintained a high buffering capacity in the two site of the pond. Water temperature follows ambient air temperature but is influenced by substrate composition turbidity, sewage effluent discharges and rain water inflows. Data from the both sites of Mahendra Nath pond showed that the water temperature was generally higher in the monsoon months.

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## Key Words :

Water temperature, pH, Lentic water body, Mahendra Nath pond

Temperature is undoubtedly one of the most important factor in an aquatic environment and it is influenced by the various meteorological conditions (Hutchinson, 1957), such as air temperature, humidity, wind speed, sun shine hours and intensity of solar radiation. Besides these, the removal of water through surface vaporization in a continuous process, which significantly control the temperature regime of water bodies, whilst season and size of the aquatic body are also an important factor which influence sun fluctuations. It has now been fairly well established that water temperature generally depends upon climate, sun shine hours and depth.

Hydrogen ion concentration is one of the most important chemical factor of the water (Davis, 1982) and is influenced by the water temperature and the concentration of free carbon dioxide (Talling, 1975). Besides this,

pH is generally considered as the index for sustainability of the aquatic environment. Roule (1931) suggested that the higher quantum of carps is generally produced in water which is on the alkaline side of naturally between 7.0- 8.0.

## EXPERIMENTAL METHODOLOGY

The present investigation was conducted for a period of two years (January 2017-December, 2018) for Mahendra Nath pond, district Siwan, Bihar. This is a perennial lentic ecosystem. Two sampling sites were designed to collect the water samples for the regular analysis of temperature and pH. Physico-chemical features like water temperature and pH were analysed consequently at both the sites for almost two years. The temperature and pH was analysed following standard methods (APHA, 1989). The data obtained

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was finally calculated and tabulated.

## EXPERIMENTAL FINDINGS AND DISCUSSION

Water temperature follows ambient air temperature but is influenced by substrate composition, turbidity, sewage effluent discharges and rain water inflows. Data from the both sites of Mahendra Nath pond showed that the water temperature was generally higher in the monsoon months.

At site I, the water temperature showed annual variation of 16.9°C (January, 2017) to 32°C (August, 2017), during the first year, while, in the second year the minimum temperature (18°C) was recorded in January 2018 with a maximum of 32.1°C in September, 2018. At site 2 similar seasonality was observed, the range of variation was 17.1°C (January, 2017) to 31.8°C (August, 2018) in the first annual cycle. During the second year, the lowest water temperature was registered in January 2018 (17.9°C) and the highest in September, 2018 (31.4°C). During the present investigation water temperature showed more or less similar seasonal pattern at the sites.

The pH value at site I ranged from 7.6 (September, 2017) to 8.4 (March, 2017) and 7.5 (August, 2017) to 8.2 (February, 2018), during both the annual cycles. While at site 2, the minimum value was recorded in September, 2017 (7.6) and maximum in February, 2017 (8.3) during the first annual cycle. In the second year, the lowest was observed in October, 2018 (6.5) and the highest in December, 2018 (9.5).

The pH was generally, higher during winter and lower in monsoon months. It was observed that pH

maintained a high buffering capacity in the two sites of the pond.

The observed data showed a close correlation between air and temperature of the epilimnion. Surface water temperature did not differ significantly at both sites, though the seasonal variations were significant. During the present investigation the higher values were observed in monsoon and summer months due to the bright sunshine and longer days, whereas low value in winter month may be attributed to shorter periods of sunshine and low atmospheric temperature. Several Indian workers reported the different range of water temperature various lentic water bodies Chalko and Krishnamurthy (1954) found the range of water temperature from a minimum of 34.2°C to a maximum of 42.8°C in some ponds of Madras. Alikahni *et al.* (1953) reported a slight variation in water temperature ranging from 29 to 27.2°C in the ponds of Cuttack, Orissa. Bhatnagar (1982) recorded a range of 18.6 to 37.0°C in lower lake of Bhopal. Singhal *et al.* (1986) reported the range of water temperature from 12.5 to 38.5°C in the managed ponds in Haryana and somewhat similar range was recorded by Das and Srivastava (1956). In the present study the water temperature of the lentic sites fluctuated within the range as reported by the above workers.

During the present investigation the two sites remained alkaline throughout the period of observation. The pH varying between 6.5 to 9.5 in the two sites of the Mahendra Nath pond. Hydrogen ion concentration showed a narrow fluctuation and from the lentic system almost similar range of variation in pH (7.5-8.5) has been recorded by Rao (1955). Das and Srivastava (1956);

**Table 1a : Variation of water Temp and pH value of Mahendra Nath pond at site I. During 2017-2018**

2017	Water temp (°C)	pH
January	(16.900) min	8.200
February	21.200	8.300
March	28.100	(8.400) max
April	27.200	8.100
May	31.100	7.900
June	26.100	7.800
July	29.200	8.000
August	(32.000) max	7.800
September	30.800	(7.600) min
October	30.400	7.800
November	21.700	7.900
December	18.900	8.000

**Table 1b : Variation of Temp (°C) and pH of water of Mahendra Nath pond at site (Site – 2)**

2018	Water temp (°C)	pH
January	(18.100) min	8.100
February	22.700	(8.200) max
March	28.200	8.100
April	29.100	7.900
May	29.800	7.800
June	27.100	7.600
July	26.000	7.800
August	29.600	(7.500)
September	32.100	7.800
October	28.100	7.800
November	21.200	7.900
December	17.000	8.000

**Table 2a : Variation of Temp ( $^{\circ}\text{C}$ ) and pH of water of Mahendra Nath pond at site 2 during 2017-2018**

2017	Water temp ( $^{\circ}\text{C}$ )	pH
January	(17.100) min	8.200
February	20.900	(8.300) max
March	27.900	7.800
April	27.300	8.100
May	28.900	7.900
June	27.700	8.300
July	28.000	7.800
August	(31.800) max	7.700
September	30.500	(7.600) min
October	31.200	8.000
November	21.000	7.900
December	19.100	8.200

**Table 2b : Variation of Temp ( $^{\circ}\text{C}$ ) and pH of water of Mahendra Nath pond at site (Site – 1)**

2018	Water temp ( $^{\circ}\text{C}$ )	pH
January	(17.900) min	8.100
February	22.200	8.200
March	27.200	8.100
April	28.300	7.900
May	29.500	8.400
June	25.400	8.100
July	26.100	7.500
August	26.500	7.800
September	(31.400) max	7.700
October	28.400	(6.510) min
November	28.400	8.750
December	18.300	(9.500) max

Moltra and Bhowmick (1968); Nayar (1970); George (1976) and Saha *et al.* (1971).

Agrawal (1978); Jana and Das (1979); Sharma (1981) and Singhal (1986). In the present study, the seasonal variation in pH of lentic sites showed the rise in their values during the winter and summer months. The photosynthetic activity of microscopic aquatic plants removes carbon dioxide from water during day light and causes a rise in pH. Swingle (1961) observed similar phenomenon and suggested that the pH of water may rise to high levels, during periods of rapid photosynthesis. In the rainy season, low values of pH were recorded from both lentic sites. Similar fall in the pH levels in monsoon season in the lentic environments was observed by Vas and Kumar (1968), George (1976) and Sharma (1976).

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