



Diel Cycle of Some Abiotic Factors in Summer season of Talla Pond, sukhjora, Ranishwar, Dumka Jharkhand

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ABSTRACT

Fluctuation in different abiotic and biotic factors of aquatic ecosystems at different hours of the day irrespective of day and night is known as 'diel cycle'. Diel cycle refers to the events that recur at 24 hours intervals or less, irrespective of day and night. Diurnal studies of water bodies given an idea about successional changes in the physico-chemical parameters as well as biological spectrum of the water reservoir at different hours of the day. Diel cycle of some abiotic factors of Talla pond, Sukhjora, Ranishwar, Dumka, Jharkhand was assessed during summer season in the year 2012-2013. Maximum air temperature was found to be 29.6°C at 3:00pm. and minimum 25.4°C at 3:00am in summer water temperature of pond fluctuated in between at 26.2°C at 3:00am. To 29 at 3:00pm pH ranged between 7.2 to 7.5 Lowest dissolved oxygen (D02) .48 ppm was recorded at 3:00am and highest 4ppm at 3:00pm. Minimum amount 26ppm of free carbon dioxide (FC02) was analysed at 3:00am and maximum 32ppm at 11:00pm. Carbonate (C03) alkalinity remained completely absent throughout the entire period of diurnal study. Bicarbonate (HC03) varied from 242ppm at 7:00pm to 280ppm at 7:00am

Keywords:

Diel cycle, abiotic, abiotic, physico-chemical, parameters, biological spectrum, successional changes, reservoirs, alkalinity, ecosystem, ecosystem, biota, autotrophs, photosynthesis.

INTRODUCTION

Fluctuation in different abiotic factors of aquatic ecosystems at different hours of the day irrespective of day and night is referred to the 'Diel cycle' It reflects the biological activities going on in the aquatic environment. Diurnal fluctuation gives an idea about the variation in the physico-chemical factors caused by the biological activities in the system. Ecosystem is constituted by abiotic and biotic factors which interact in such a way that there is a flow of energy in the form of food, leading to the formation of trophic structure represented by producer, consumer and decomposer. Pond is a fresh water, lentic, aquatic ecosystem. Diurnal fluctuation of some abiotic factors of Talla pond of village sukhjora, Ranishwar, Dumka, Jharkhand was carried in rainy season of the year 2012-13. Earlier diel cycle of different ponds have been evaluated by several scientists like Singh and Saha (1981), Khan and Siddiqui (1970), Nesar (1977), Patil, Singh and Harshey (1982) etc. According to Odum (1971) diel is referred to the events that recur at 24 hour intervals or less, irrespective of day and night. Diurnal studies of water bodies give an about the successional changes in the physico-chemical parameters as well as biological spectrum of the reservoir at different hours of the day. Some research scholars have paid special attention to the diurnal changes in the hydrobiological features of different fresh water ecosystems.

MATERIALS AND METHODS

Samples of subsurface water were collected in BOD bottles and standard methods prescribed in standard workbook of Welch (1948) were followed to analyse the different physico-chemical parameters at the spot, as given below:

TEMPERATURE

Air temperature and surface water temperature was recorded with the help of a centigrade mercury thermometer (0-50^oc).

HYDROGEN-ION CONCENTRATION(pH):

It was assessed by using the water quality analyser (Elico type PE 132). Buffer solution of pH 9.2 and 4.00 were used for standardization.

DISSOLVED OXYGEN(DO₂):

Modified winkler's method was used to analyse DO₂. This standard method was given by Welch (1948). Concentrated sulphuric acid, alkaline iodide, magnesium sulphate and N/40 sodium thiosulphate were taken as reagents. Starch solution was used as indicator. Sodium iodide was employed as preservative in alkaline iodide. At the end initial dark blue colour changed to colourless or original colour which was the end point.

FREE CARBON DIOXIDE (FCO₂):

Method given by Welch (1948) was followed to analyse free carbon dioxide (FCO₂). It is the titrimetric method. 100ml of sample was titrated against N/44 sodium hydroxide (NaOH) solution. Ten drops of phenolphthalein indicator was added to it. Pink colour indicates of absolute FCO₂. If the sample colour remained colourless then it was titrated again against N/44 NaOH. At the end, pink colour appeared.

CARBONATE ALKALINITY (CO₃):

Carbonate (CO₃) was determined by the method prescribed by Welch (1948). It is a titrimetric method. 100ml of sample water was taken in a conical flask. 2 to 3 drops of phenolphthalein indicator solution was added. If the solution remains colourless then the carbonate alkalinity was absent. If the colour changed to pink, the carbonate alkalinity was determined by titrating the solution with 0.02N sulphuric acid (2/50 H₂SO₄) until the colour disappeared, as the end point.

BICARBONATE ALKALINITY (HCO₃):

Method described by Welch (1948) was employed to assess the Bicarbonate alkalinity. 100ml of sample water was taken into a conical flask. 2 to 4 drops of methyl orange indicator was added to it. The solution was titrated with 0.02N sulphuric acid (N/50 H₂SO₄) until the yellow colour change to pink as the end point. For diurnal study sample of sub-surface water collected abiotic factors were assessed just after sampling at the spot, using standard methods. The results are given below:

RESULT AND DISCUSSION

AIR TEMPERATURE:

Ambient temperature fluctuated in between 25.4^oc to 37.2^oc. It was assessed as 29.6^oc at 7.00am, 36.2^oc at 11.00 am, 37.2^oc at 3.00 pm, 30.4^oc at 7.00pm, 28.2^oc at 11.00pm and 25.4^oc at 3.00am. Higher temperature were noted in day time which might be due the bright sunlight influencing the air temperature. Low air temperature in night might be due to absence of sunlight in night.

WATER YEMPERATURE:

Table2 (c) Graph-16 exhibits the variation in water temperature during diel cycle. It ranged between 26.2⁰cto 33.2⁰c. It was analysed as 29.00⁰c at 7.00 a.m. 33.2⁰c. at 11.00am, 30.8⁰c. at 3.00pm. 29.4⁰c at 7.00pm. 28.2⁰c at 11.00 pm and 26.2⁰c at 3.00 am. Water temperature also showed a definite pattern of fluctuation i.e upward trend during day hours and downward trend in night. it is in conformity with the reports of saha and pandit (1948) and Bilgrami and Datta

Munshi (1985). It appears that the ambient temperature has directly influenced the water temperature, which is the impact of light intensity.

HYDROGEN ION CONCENTRATION (pH):

pH value of pond water ranged between 7.2 to 7.5. It was recorded as 7.4 at 7.00am. 7.5 at 11.00am. 7.5 at 3.00 pm. 7.5 at 11.00pm and 7.3 at 3.00am. Pond remained slightly alkaline during the entire period of diel cycle. Slight increasing trend was observed during daytime which declined slowly during night. similar reports were made by pandit (1986). George (1961), khan and siddiqui (1970) and Singh and Singh (1985). Lower pH during night was perhas due to greater accumulation of free carbon dioxide. In daytime c02 might be utilized by plants in photosynthesis.

DISSOLVED OXYGEN (D02):

Table 2 (c) graph-16 shows the fluctuation in dissolved oxygen of the Talla pond, sukhjora during diurnal study in summer. It ranged between 0.48 ppm to 4.00ppm.It was assessed as 0.56ppm at 7.00am.2.4ppm at 11.00 am 4.00ppm at 3.00 am. It increased in daytime and declined in night hours. Higher value of D02 in day time might be due to greater photosynthetic activities by green aquatic plants, which supports the reports of Hutchinson (1957). Its depletion during night was probably due to its utijization in respiration by plants and animals of the system.

FREE CARBON DIOXIDE (FC02):

The range of diurnal fluctuation of free carbon dioxide in the pond is in between 26.00ppm to at 3.00 pm,32.00 ppm at 7.00pm at 7.00pm, 32.00 pm,32.00 ppm at 11.00 pm and 28.8ppm at 3.00 am .No definite pattern of fluctuation was observed. Maximum amount of free carbon dioxide was observed at night probably due to its accumulation by respiration of aquatic plants and animals of the pond. It supports the findings of pandit (1986) and Mulgund & Hosmani (1978). Lower concentration of free carbon dioxide in day hours might be due to its utilization by green autotrophs of the pond in photosynthesis.

CARBONATE(C03):

Carbonate remained absent throughout out the entire period of diel cycle. As per reports of cole (1969). carbonate alkalinity was found only when pH value was than 8, which is in conformity with the present findings.

BICARBONATE (HC03):

The diurnal fluctuation of bicarbonate concentration in pond water during summer. It ranged in between 242.00ppm at 11.00am, 256.00ppm at 3.00pm,242.00ppm at 7.00pm 260.00 ppm at 11.00 pm and 264.00 ppm at 3.00am. Its maximum value was recorded during day hours which might be due to addition of Bicarbonate in the form of soaps and detergents by greater washing activities. photosynthetic activities mainly governs the diel cycle of c02 c03 and Hc03. High alkalinity makes the water unpalatable as reported by Singh and saha (1979).

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DIEL CYCLE OF SOME ABIOTIC FACTORS DURING SUMMER

TABLE

TIME	7.00 am.	11.00 am.	3.00 pm.	7.00 pm.	11.00 pm.	3.00 am.
Parameters Atma Temp.Oc	29.6	36.2	37.2	30.4	28.2	25.4
Water Temp.oc	29.0	33.2	30.8	29.4	28.2	26.2
pH	7.4	7.5	7.5	7.5	7.2	7.3
D02(ppm)	0.56	2.4	4.0	1.36	0.64	0.48
FC02(ppm)	30.0	28.0	26.0	32.0	32.0	28.8
C03(pph)	0.0	0.0	0.0	0.0	0.0	0.0
HC03(ppm)	280.0	242.0	256.0	242.0	260.0	264.0

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