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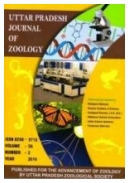

LIMNOLOGICAL STUDIES OF CERTAIN SELECTED CHEMICAL PARAMETERS AND ZOOPLANKTONS OF PEDDACHERUVU LAKE

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Author PV managed the analyses of the study, managed the literature searches, performed the statistical analysis and wrote the first draft of the manuscript. Author MMH designed the study and wrote the protocol. Both authors read and approved the final manuscript.

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ABSTRACT

Experiments were designed to investigate the certain chemical factors and biological examination of water with reference to zooplanktons to establish a relationship between the physico-chemical parameters and population density of water of Peddacheruvu Lake, L.B. Nagar, Hyderabad (T.S). These are the findings of the 192 samples of water which were analyzed during the two years study from four representative sampling (S1, S2, S3 and S4) sites of the water body. The maximum amount of calcium recorded was 58 ppm in the month of May 2012 at S4 station and the minimum quantity of calcium recorded was 39 ppm in the month of August 2011 at S1 station. The maximum value of magnesium recorded was 28 ppm in the month of November 2011 at S1 and the minimum value of 20 ppm was recorded in the month of May 2011 at S3.The chemical factors which have been taken for discussion in the present study are calcium and magnesium to understand the hardness of water and its possible relationship with zooplanktons. The range of *Tetrahymena pyriformis* observed was from 23,000 at S3 in September 2012 to 40,000 at S1 in May 2011. The range of *Keratella quadrata* observed was from 14,000 at S4 in September 2012 to 25,000 at S1 in April 2011.The preliminary studies of the water body has confirmed a clear relationship between hardness and population density of *Keratella*. The highest number of *Keratella* is directly proportional to quantities of calcium and magnesium.

Keywords: Peddachervu Lake; biological examination; calcium; magnesium; *Tetrahymena; Keratella.*

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1. INTRODUCTION

In the present study an attempt has been made to investigate limnological and zooplankton aspects of Peddacheruvu Lake so as to assess the quality of water and classify the water body as clean, moderately polluted or highly polluted lake. The chemical parameters like calcium and magnesium and zooplanktons have been identified and estimated in an attempt to establish a relationship between chemical factors and their interactive role with zooplanktons.

The Peddacheruvu lake is situated in Hyderabad on the Vijayawada highway, one km from L.B.Nagar on the left side. It is located at 17'20.860 latitude and 78'33.735 longitude. It is registered at S.No 278 with Lake ID No. 3605, out of the 2857 lakes in the Hyderabad metropolitan development area (HMDA).It is maintained by Hyderabad urban development authority (HUDA) under Indo Dutch green belt project, urban forestry and green Hyderabad environment programme and its area is 10.5 hectares. The sites of sampling namely S1, S2, S3 and S4 were identified so that they represent the totality of the water body. The study was carried out every fortnight from March 2011 to February 2013 for a period of two years. The water samples were collected around 8 am to10 am on every 1st and 15th of the month, in wide mouthed screw capped air tight and opaque polythene containers.

1.1 Objective

In the present work, the water body Peddacheruvu was identified for the limnlogical and biological examination of water. So far no work has been carried out and there is dearth of data available on this water body.

2. MATERIALS AND METHODS

Standard methods have been followed as suggested by American public health association (APHA) [1], Trivedy & Goel [2], Golterman [3], Saxena [4], Trivedi & Gurudeep Raj [5], Hussain [6] and Gupta [7].

2.1 Calcium: Methodology

50 ml of the water sample was taken; 1 ml of 1N sodium hydroxide solution and a pinch of muroxide indicator were added. It was titrated with 0.01 M EDTA solution, till the pink colour changed to dark purple.

Calculation

$$\text{Calcium in ppm} = \frac{\text{Titer value X Normality X Molecular weight X 1000}}{\text{Volume}}$$

Where T is the titer value of the EDTA solution
N is the normality of EDTA solution (0.01N)
Molecular weight of calcium=40
One litre=1000 ml
Volume of the sample =50 ml.

2.2 Magnesium: Methodology

In a 100 ml measured volumetric flask, 50 ml of the water sample was taken and to that 1 ml of sulphuric acid solution, 20 ml of calcium sulphate solution and 5 ml of aluminum sulphate reagent each were added one after the other, the volume was brought to 80 ml with distilled water, then 2ml of brilliant yellow solution and 3.5 ml of sodium chloride were added and diluted up to the mark with distilled water. It was shaken well and was left for five minutes for full color development. Sufficiently diluted solution was measured photo metrically within one hour at 525 nm against a blank prepared from distilled water, with all of the above reagents. The concentration was determined with the help of a standard graph.

Calculation

$$\text{Magnesium in ppm} = \frac{\text{Standard concentration X O.D. Value}}{\text{Standard O.D. Value}} = \frac{\text{Value of magnesium X 1000}}{\text{Volume of the sample taken}}$$

Where standard concentration is of magnesium
O.D.value of the sample
Standard O.D.value of magnesium
Volume of the sample taken=50 ml

BIOLOGICAL EXAMINATION OF WATER-The biological examination of water was carried out for the various zooplanktons present in the water body. It was done by collecting 20-25 liters of water samples from each site with plankton net made up of silk (no.25 mesh size 55 µm). The surface water was collected with the help of a plastic bucket or jug of known volume. The plankton net weighted at the base was lowered in the water with the help of a graduated cord. The net was then pulled slowly out. Around 100 liters of water was collected from the lake and 20-25 liters from each site, and the zooplanktons studies were carried. One liter of sample was taken in a wide mouthed glass bottle. The clear supernatant was removed with help of a pipette by stirring the container. The sample was drawn drop wise, and observed in the Sedgwick-rafter cell (it is a slide with a rectangular cavity (50mm×20mm×1mm) of volume

of 1 ml) under low magnification after adding a drop of 2% methyl cellulose.

The biological examination of this water body showed the presence of zooplanktons which were identified with the help of Fresh Water Biology by Edmondson (1958).These counted numbers were finally represented as population per liter for an individual organism using a suitable multiplication factor.

3. RESULTS AND DISCUSSION

Calcium: In the present study the calcium range was between 39 ppm and 58 ppm and found to be within the normal range. The maximum value of calcium recorded was 58 ppm in the month of May 2012 at S4 and the minimum value recorded was 39 ppm in the month of August 2011 at S1. The monthly station wise maximum and minimum values of S1 were 56 ppm in May 2012 & 39 ppm in August 2011, S2 was 56 ppm in May 2012 & 41 ppm in September 2012, S3 was 54 ppm in May 2012 & 40 ppm in September 2012 and S4 were 58 ppm in May 2012 & 40 ppm in August 2011 respectively. The monthly station wise variations of calcium are shown in, figures 1, 2, 3 and 4. The permissible value of calcium is up to 75 ppm (BIS, Drinking water standards (IS-10500-Revised 2003) [8]. The natural waters have 10 to 100 ppm depending upon the type of rocks which are leaching into the water body. It is one of the important nutrients required by the organisms. The slight rise in calcium content in summer at all stations could be attributed to the rapid oxidation of organic matter, while its decrease during rainy season might be due to dilution of the water body. Being an important contributor to hardness in water it reduces the utility of water for domestic use [9]. The weathering of the rocks, limestone from the soil through seepage, leaching and runoff increases the calcium value [10]. The acid rain increases the leaching of calcium from soil [11].

MONTHLY AVERAGE VALUES OF CALCIUM IN PPM IN PEDDACHERUVU LAKE AT FOUR STATIONS

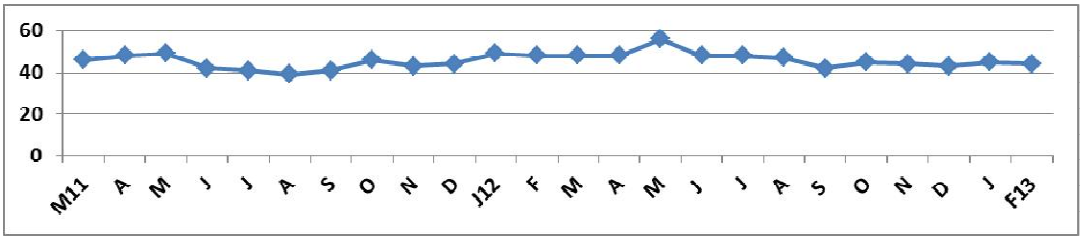

Fig. 1 S1

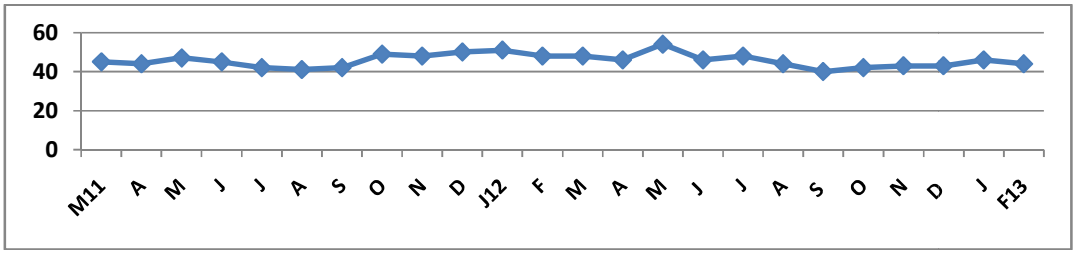

Fig. 2 S2

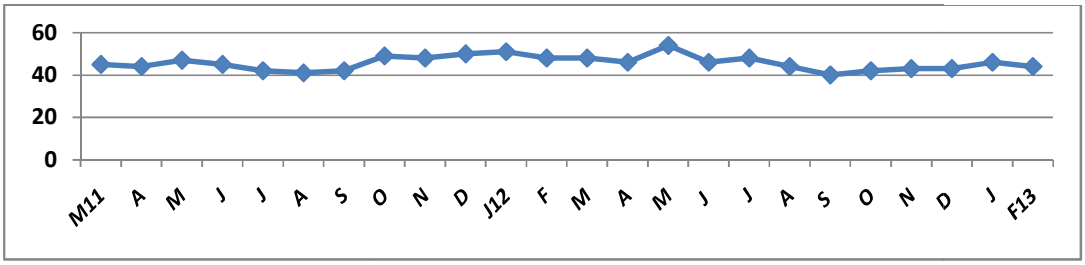

Fig. 3 S3

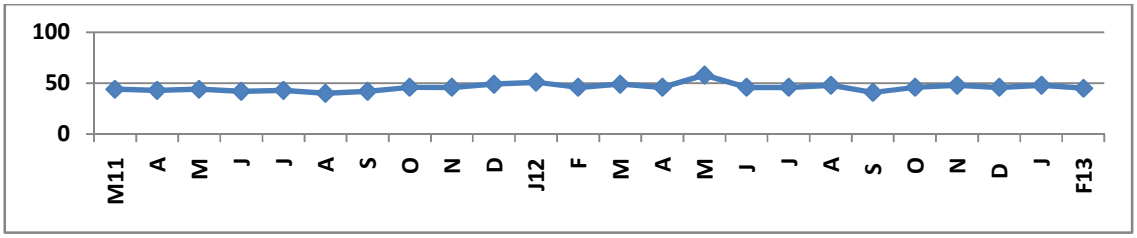

Fig. 4 S4
Note: The values are expressed in ppm.

Magnesium: In the present study the magnesium range was from 20 ppm to 28 ppm and is an important factor which equally contributes to hardness of water along with calcium. The maximum value of magnesium recorded was 28 ppm in the month of November 2011 at S1 and the minimum value of 20 ppm was recorded in the month of May 2011 at S3. The station-wise maximum and minimum values of S1 were 28 ppm in November 2011 & 21 ppm in May 2011, S2 were 27 ppm in November 2012 & 21 ppm in May 2011, S3 were 26 ppm in October 2012 & 20 ppm in May 2011 and S4 were 25 ppm in October 2012 & 19 ppm in May 2011. The monthly station wise variations of magnesium are shown in figures 5, 6, 7 and 8. The permissible value of magnesium is up to 150 ppm (Drinking Water Standards, ICMR [12]). The findings of the present study showed the values of magnesium well within the permissible range. It is beneficial but toxic at the higher concentrations.

MONTHLY AVERAGE VALUES OF MAGNESIUM IN PEDDACHERUVU LAKE AT FOUR STATIONS

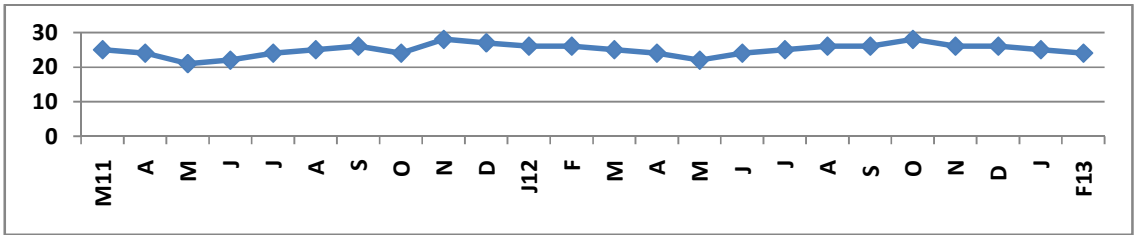

Fig. 5 S1

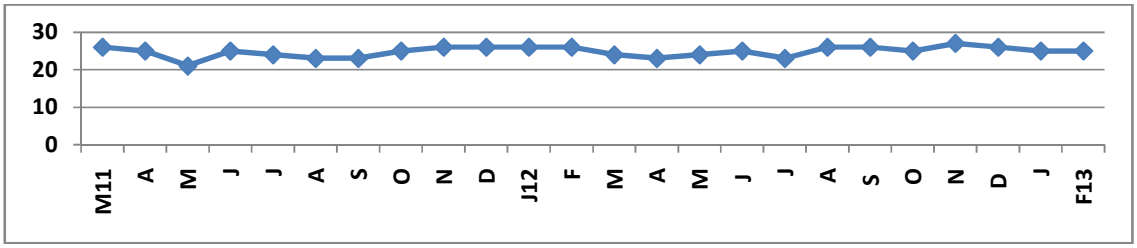

Fig. 6 S2

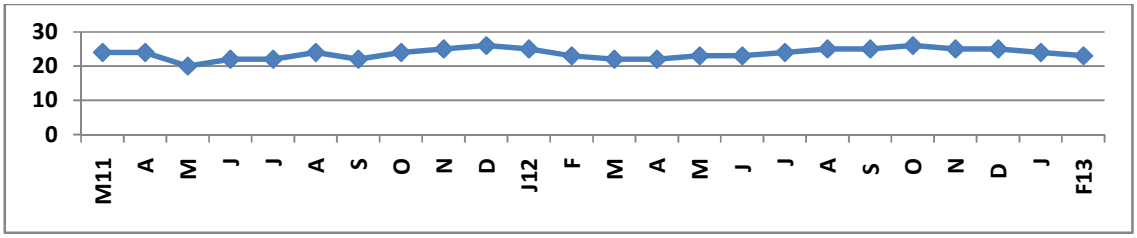

Fig. 7 S3

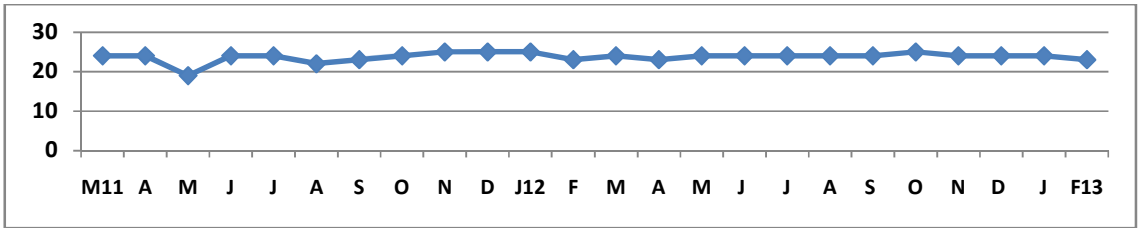

Fig. 8 S4
Note: The values are expressed in ppm.

3.1 *Tetrahymena pyriformis*

The range of *Tetrahymena pyriformis* observed was from 23,000 at S3 in September 2012 to 40,000 at S1 in May 2011.

The station-wise maximum and minimum values of *Tetrahymena pyriformis* at

S1 were 40,000 in May 2011 & 35,000 in August 2012, S2 were 38,000 in May 2011 & 34,000 in September 2012, S3 were 29,000 in May 2011 & 23,000 in September 2012 and S4 were 28,000 in April 2011 & 25,000 in September 2012.

The monthly station wise variations of *Tetrahymena pyriformis* are shown in Table 1.

Table 1. Station wise variations of *Tetrahymena pyriformis* in peddacheruvu lake at four stations

Station	n	Mean ± Standard Deviation
S1	24	37250±1359.34
S2	24	36250±737.20
S3	24	26541.66±1215.09
S4	24	26416.66±653.86

Note: The values are expressed in organisms/litre.

3.2 *Keratella quadrata*

The range of *Keratella quadrata* observed was from 14,000 at S4 in September 2012 to 25,000 at S1 in April 2011.

The station-wise maximum and minimum values of *Keratella quadrata* at S1 were 25,000 in April 2011 & 19,000 in November 2012,S2 were 23,000 in May 2012 & 15,000 in November 2011,S3 were 21,000 in May 2011 & 16,000 in September 2011 and S4 were 19,000 in March 2011 & 14,000 in September 2012.

The monthly station wise variations of *Keratella quadrata* are shown in Table 2.

Table 2. Station wise variations of *Keratella quadrata* in peddacheruvu lake at four stations

Station	N	Mean ± Standard Deviation
S1	24	21958.33±1301.47
S2	24	20458.33±2484.37
S3	24	18291.66±1041.70
S4	24	17041.66±1160.17

Note: The values are expressed in organisms/liter.

4. CONCLUSION

In the present findings it is established that the hardness of water as expressed by the amounts of calcium and magnesium is directly related with the population dynamics of *Tetrahymena and Keratella*. *Keratella* blooms have been found with the increase in quantities of calcium and magnesium.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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