



Physico-Chemical Characteristics of Pakhal and Ramappa Lakes, A.P, India

B. Chinnaiah and B. Digamber Rao

Department of Botany, Kakatiya University, Warangal-506 009, A.P., India

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ABSTRACT

The present study deals with the water quality of Pakhal and Ramappa lakes of Warangal district, Andhra Pradesh for a period of one year from 1999 (September) to 2000 (August). The parameters studied comprised temperature, pH, total hardness, total dissolved solids, dissolved oxygen, chemical oxygen demand, biochemical oxygen demand and total alkalinity. Algal growth in the water bodies was also correlated to the physico-chemical characteristics.

INTRODUCTION

The Pakhal and Ramappa lakes are located between the latitude of 17°19' and 18°36' north and longitudes of 78°48' and 80° 43' east in Warangal district of Andhra Pradesh. The lakes were constructed during the period of 11th century by Kakatiya Kings. The lakes are main source of drinking water and also for irrigation purposes, which are surrounded by forests with rocky hills and paddy fields. The present investigation attempts to find out the seasonal variations in the physico-chemical parameters and also focus on water quality.

MATERIALS AND METHODS

Monthly collections of water samples were made at two different sampling stations for one complete year (from September 1999 to August 2000). All the sample collections and field observations were conducted between 9.00 a.m. to 12.00 noon throughout the study period. The water samples collected from the lakes in bottles were brought to the laboratory for analysis as per the standard methods described by APHA (1995) and Trivedy et al. (1995). The observed parameters were temperature, pH, total hardness, total dissolved solids, dissolved oxygen, chemical oxygen demand, biochemical oxygen demand and total alkalinity.

RESULTS AND DISCUSSION

The results of the physico-chemical properties of Pakhal and Ramappa lakes water are given in Tables 1 and 2. Temperature of water was found to be in the range of 22.3°C to 25.61°C. The temperature was maximum (25.61°C) in summer and minimum (22.3°C) in the winter in Pakhal lake. The range of temperature was found in Ramappa lake was 23.81°C to 24.51°C with maximum temperature of 24.51°C in summer and minimum of 23.81°C in the winter. During the investigation, pH value ranged from 7.3 to 7.9 in Pakhal,

with maximum (7.9) in summer, and minimum (7.3) in winter. In Ramappa lake, the pH ranged from 7.1 (winter) to 7.4 (summer). The high pH value during summer may be due to high photosynthetic activity of micro and macrovegetation resulting in high production of free carbon dioxide shifting the equilibrium towards alkaline (Suchi Tiwari et al. 2004). Factors like temperature influence the pH of water. Dhembare (2007) has observed a direct relationship between water temperature and pH. The total hardness of water in the Pakhal lake was 358 mg/L in winter, and 370 mg/L in summer. In Ramappa lake it was 341mg/L in winter, and 367mg/L in summer. Hiwari & Jadhav (2001) observed maximum hardness in summer and minimum in rainy season. According to Kannan (1991) the water is classified as very hard if the value exceed 180 ppm. The total dissolved solids ranged from 487 mg/L to 565mg/L in Pakhal lake. Maximum (565mg/L) and minimum (487mg/L) were observed in summer and monsoon seasons. In Ramappa lake, the maximum dissolved solids were in summer (498 mg/L), and minimum in monsoon (479mg/L).

In the present study COD values in Pakhal lake varied from minimum (12.11 mg/L) in monsoon to maximum (38.10mg/L) in summer. Whereas in the Ramappa lake, the COD varied from 26.14mg/L to 28.10mg/L in monsoon and summer, respectively. The five-day BOD indicates the amount of organic load in waters (Hosetti et al. 1985). The study showed that BOD ranged from 12.11mg/L to 15.14 mg/L, i.e., minimum (12.11 mg/L) in monsoon and maximum (15.14mg/L) in summer seasons in Pakhal lake. In Ramappa lake it varied from 11.01mg/L to 13.11mg/L with minimum in winter, and maximum in summer. Alkalinity values ranged from 230mg/L to 256mg/L in Pakhal lake. Maximum and minimum were seen in the summer and monsoon respectively. In Ramappa, it varied from 221 mg/L to 248 mg/L, with minimum in winter and maximum in summer. According to Hutchinson (1957) a skillful limnologist

Table 1: Physico-chemical properties of Pakhal lake during September 1999 to August 2000.

Properties	Summer (Feb.-May)	Monsoon (June-Sep.)	Winter (Oct.-Jan.)
Temperature (°C)	25.61 ± 1.78	24.16 ± 0.78	22.3 ± 0.75
pH	7.9 ± 0.24	7.4 ± 0.11	7.3 ± 0.17
Total hardness (mg/L)	370 ± 5.42	364 ± 4.73	358 ± 3.41
TDS (mg/L)	565 ± 0.14	487 ± 1.23	501 ± 1.24
COD (mg/L)	38.10 ± 1.81	32.14 ± 0.14	32.88 ± 0.74
BOD (mg/L)	15.14 ± 2.14	12.11 ± 1.70	13.0 ± 1.21
Total alkalinity (mg/L)	256.25 ± 7.12	226 ± 15.1	230 ± 3.40
DO (mg/L)	8.88 ± 0.14	9.11 ± 0.17	9.40 ± 1.10

can probably learn more about the lake from a series of oxygen determinations than from any other kind of chemical rate. In the present study dissolved oxygen varied from 8.88mg/L to 9.40 mg/L in Pakhal lake and from 7.79mg/L to 9.01mg/L in Ramappa lake. Minimum DO was found in summer (8.88mg/L), and maximum in winter (9.40 mg/L) in Pakhal lake. Maximum (9.01mg/L) in monsoon and minimum (7.79mg/L) in summer were found in Ramappa lake. Low oxygen in summer is due to high organic content, which leads to oxygen depletion (Rana & Palria 1998). During monsoon and the winter, the level of DO was quite satisfactory, perhaps due to good aeration caused by rain water as reported earlier by Rekha Rani et al. (2004) and Latha & Ramachandra Mohan (2010).

Just after the rain, abundant growth of *Microcystis aeruginosa* was found as a result of abundance of nutrients in both the lakes. Blooming has a direct correlation with pH and temperature. DO and other nutrients contributed by sewage and sedimentary cycle (Kodarkar et al. 1991). The water quality of these water bodies has to be maintained for the sake of human health, because a large number of people use these sources of water for drinking and recreational purposes. From now public awareness has to be created to develop a safeguard against any type of contamination and pollution of these water bodies. To achieve these goals the foremost prerequisite is to study the water bodies limnologically. Thus, it requires a continuous monitoring and study of algae existing in waters of various quality in order to determine what controls, what changes, or what uses can be instituted for benefit of man and for the conservation of waters and desirable aquatic life.

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Table 2: Physico-chemical properties of Ramappa lake during September 1999 to August 2000.

Properties	Summer (Feb.-May)	Monsoon (June-Sep.)	Winter (Oct.-Jan.)
Temperature (°C)	24.51 ± 2.14	23.96 ± 0.15	23.81 ± 0.74
pH	7.4 ± 0.42	7.2 ± 0.21	7.1 ± 0.14
Total hardness (mg/L)	367 ± 1.42	346 ± 1.74	341 ± 2.14
TDS (mg/L)	498 ± 0.72	479 ± 1.74	488 ± 1.74
COD (mg/L)	28.10 ± 2.40	26.14 ± 0.31	27.12 ± 0.54
BOD (mg/L)	13.11 ± 1.01	11.91 ± 1.20	11.01 ± 1.24
Total alkalinity (mg/L)	248.11 ± 5.01	240 ± 2.10	221 ± 1.40
DO (mg/L)	7.794 ± 1.14	9.01 ± 1.0	8.9 ± 0.21

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