# SEASONAL VARIATIONS IN IONIC COMPOSITION IN THE WATER OF KUNDAVADA LAKE, DAVANGERE DISTRICT, KARNATAKA

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## ABSTRACT

In the present study, seasonal variations in the ionic levels such as phosphate, nitrate, carbonate, bicarbonate and chloride in relation to few physico-chemical parameters in the surface water samples of Kundavada lake of Davangere district (Karnataka) of the study area caused by natural and human anthropogenic activities are studied during 2016-2017. The analysis showed that the lake is included under mesotrophic category and needs certain degree of treatment and it also protected from the possible source of contamination.

**Keywords**: Kundavada lake, Ionic concentration, Davangere district, mesotrophic, water quality.

## Introduction

Wetlands are particular ecosystems which perform significant natural functions and have numerous environmental, socio-economical and communal qualities. Wetlands are known to be the most gainful and differing biological systems on earth since they give immediate and backhanded advantages to individuals as wellsprings of food, recharge of aquifers, controlling water quality, regular cleaning of waste water, decreasing silt load, water energize, reusing of bio-genic salts as a wellspring of farming water, animal cultivation, aquaculture and furthermore as a refuse for uncommon and imperiled types of plants and animals (Hosetti, 2002; Harisha et al.,2011).

Water bodies are the essential resources abused for inland fisheries and perception of fish faunal grouped assortment which is a huge perspective for its improvement and the

sustainable management. Wetlands in India bolster rich variety of fish species, which in this manner support the business capacity of the fisheries (Krishna and Piska, 2006;Thirumala and Kiran,2020)

The effluent domestic sewage from urban catchment area brings about considerable change in ionic composition of inland water. Study of ionic composition of weed-invaded water bodies is an important aspect of limnological studies (Lund 1965). Notable contribution in this field are those by Rao (1969), Sharma *et.al.,* (1978) and Das *et.al.,* (2003). The present study aims to know the seasonal variations in few physico-chemical parameters of Kundavada Lake, Davanagere since recently no studies are carried out on this aspect prevailing in this area.

## Materials and Methods

### Study area

The Kundavada lake (Figure 1) is located between latitude of N 14º 27' 30" and longitude of E 75º 53' 39". This water body provides water for drinking to Davanagere township. The lake is about 243.27 acres and just near to the Pune-Bangalore highway. The lake is an attracting many wetland birds as the lake supports good nesting habit and habitats with aquatic flora. The lake receives water from Tunga Bhadra channel. Lake is free from sewage and agricultural run off. It is also a good re-creational place and the place is used for commercial game fishing also to avoid the disturbances for birds.



Figure 1: Views of Kunduvada lake (Source: www.tripadvisor.in)

## Methodology

Water samples were collected from different spots of the lake in polyethylene bottles every month and carried to the laboratory. Water analysis was done according to APHA (1998) and Trivedi and Goel (1986). The air and water temperatures were measured with mercury thermometer with an accuracy of 0.1°C. pH was measured on the spot by pH pen. The remaining parameters were analyzed as per the methods described in standard methods. The WHO and BIS standards for drinking water quantity were used for comparison.

## Results and Discussion

The depth of the lake varied between 2.7m and 4.9m in ideal depth range for sustenance of life (Jhingran,1977). Water temperature ranged between 18.4° and 28.7°C and 21.9° and 28.5°C during the study period and that is within the tolerance limit for lake - inhibiting animals. Irregular fluctuations were observed in pH of the water body during the study period. Positive correlation existed between air, phone and water temperatures (Table 1). pH ranged from 7.2 to 8.56 throughout the study period. Dissolved Oxygen (DO) and $CO_2$ ions were observed 4.9 - 7.4 and 0.0 - 4.0 mg/l respectively. Total alkalinity was 102.2 to 171.7 mg/l which is suitable for fish culture. Chloride ions ranged from 61.6 to 85.5 mg/l. $NO_3$ and $PO_4$ ions were observed as 0.46 - 0.79 and 0.15 - 0.53 mg/l respectively (Table 1).

Ionic composition of the lake was found to vary from spot to spot during the study period. Water contained carbon dioxide in two forms viz. (i) as half bound ($HCO_3$) and (ii) as bound ($CO_3$). Both forms together constitute $CO_2$ (Gaur and Singh ,1978).

An inverse relationship was observed between carbonate and bicarbonate as reported by Singh (1991) for Bela dhar reservoir. Range of dissolved oxygen during different seasons showed inverse relationship was also observed between dissolved oxygen and free carbon dioxide as reported by Pearsall (1930) for English lakes.

This could be due to decomposition of organic matters. Thresh *et.al.,* (1944) have pointed out that higher concentration of chloride ions is indicative of higher amount of organic matter. Chloride ions ranged from 61.6 to 25.0 mg/l in different seasons at different spots as Figure 2 shows. Occurrence of nitrates (0.46 - 0.79 mg/l) indicated moderate pollution in the lake.

On the basis of Shannon - Weaver diversity index, the lake might be referred as moderately polluted as the diversity index ranged between 1 and 3 during the study increasing trend of pollution was experienced as the index was found to have decreased during the second year of study. However, very little changes in overall water chemistry of the lake during the years of study indicate that nutrient absorbing capacity of aquatic plants probably is a way out to offset the continuous input of nutrient containing effluent of the sewage.

## Conclusion

In nutshell, we can concluded that the Kundavada lake is moderately polluted. The main reason for the ionic input into this lake can be attributed due to surface runoff from surrounding agricultural lands which are fed by chemical fertilizers, animal wastes and night soil. In the light of standard of water quality recommended by WHO and BIS,  the  lake water should be used by human beings for consumption and cooking.

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**Table 1:Seasonal variations in the ionic composition of Kundavada lake of Davangere district, Karnataka**

| Parameters | 2016 | | | 2017 | | |
|---|---|---|---|---|---|---|
| | Rainy | Winter | Summer | Rainy | Winter | Summer |
| Air temperature (°C) | 29.5 | 24.5 | 30.5 | 29.0 | 25.0 | 31.0 |
| Water temperature (°C) | 27.5 | 19.0 | 28.0 | 27.0 | 21.0 | 29.0 |
| pH | 8.0 | 8.5 | 8.4 | 7.9 | 8.4 | 8.1 |
| Dissolved oxygen (mg/l) | 6.48 | 7.45 | 5.40 | 7.40 | 5.58 | 4.48 |
| Total alkalinity (mg/l) | 150.5 | 145.0 | 181.7 | 148.6 | 149.0 | 179.8 |
| Chloride (mg/l) | 90.6 | 74.2 | 82.0 | 95.5 | 84.3 | 89.0 |
| Phosphate (mg/l) | 0.25 | 0.40 | 0.45 | 0.30 | 0.45 | 0.50 |
| Nitrate (mg/l) | 0.90 | 0.75 | 0.64 | 0.94 | 0.78 | 0.68 |
| Carbonate (mg/l) | 4.2 | 3.60 | 20.0 | 4.5 | 4.2 | 29.0 |
| Bicarbonate (mg/l) | 142.5 | 118.5 | 148.5 | 150.2 | 120.5 | 151.5 |
| Free $CO_2$ (mg/l) | 24.0 | 4.0 | 2.0 | 3.0 | 6.0 | 26.0 |
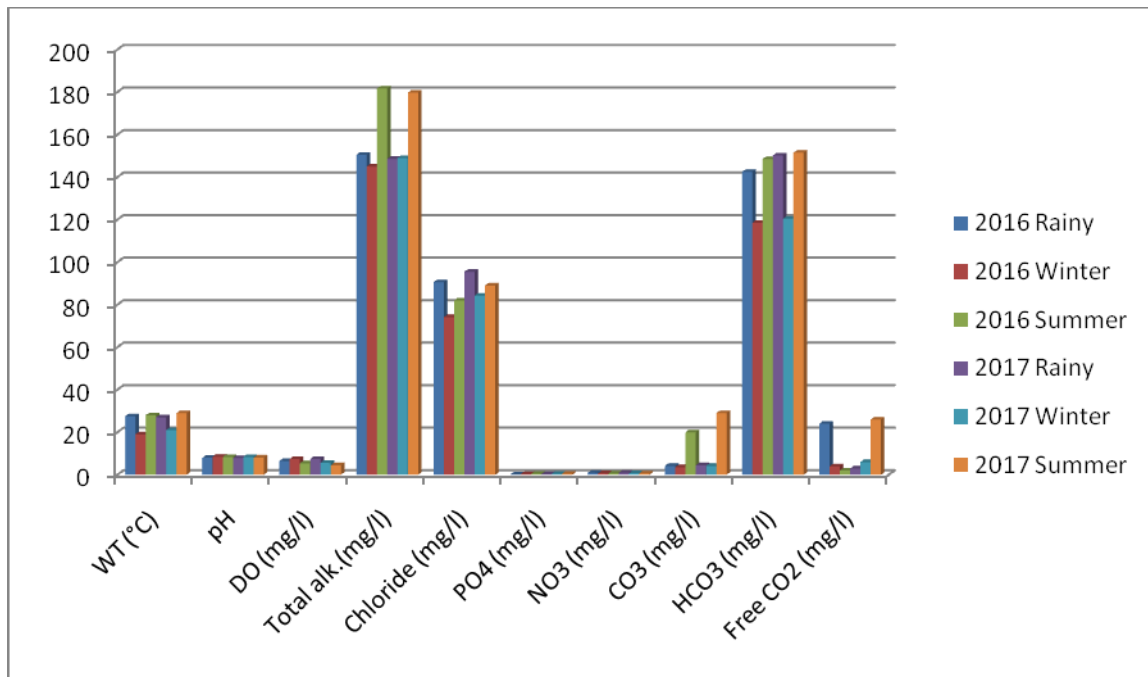
**Figure 2:Seasonal fluctuations in the ionic composition of Kundavada lake, Davangere district, Karnataka**