Effect of nutrients on the water quality of Chakki Talab, Bodhan, Telangana

Vasudha Lingampally*, V.R.Solanki and Sabita Raja

Department of Zoology, Nizam College, Osmania University, Hyderabad
*Corresponding author

Abstract
In the present study an attempt has been made to evaluate the effect of nutrients on the water quality of Chakki talab for a period of one year, October 2015 to September 2016. A few water quality parameters such as dissolved oxygen, biological oxygen demand, phosphates and nitrates are presented here to understand the trophic status of the lake. The results obtained indicate that lake is transforming into nutrient rich water body.

Keywords: Chakki Talab, Monthly Variation, Nutrients, Eutrophication, Bodhan.

INTRODUCTION
Nutrient pollution is a growing global environmental challenge leading to deterioration of water quality of the water bodies worldwide. The nutrient level of many lakes and rivers has increased dramatically over the past 50 years in response to increased discharge of domestic wastes and non-point pollution from agricultural practices and urban development (Mainstone and Parr, 2002). Most of the lakes in India are under threat from nutrient overloading, which is responsible for their eutrophication and subsequent choking up from the weeds proliferating in the nutrient-rich water (Kazmi et al., 2013).

Small water bodies are abundant (Downing et al., 2006) and have disproportionately high hydrologic and nutrient processing rates (Smith et al., 2002). Eutrophication is most often the result of an elevated supply of nutrients, particularly nitrogen and phosphorus, to surface waters that results in enhanced production of primary
producers, particularly phytoplankton and aquatic plants. The effects of eutrophication can be highly detrimental to lake water quality and severely limit the uses of a lake (WHO, 1992). In this regard the present work has been carried out to study the effect of nutrients on Chakki Talab of Bodhan.

**MATERIAL AND METHODS**

Bodhan town is spread 21.36 km². The town Bodhan is located at latitude 18°39’36” N and longitude 77°52’47” E. The present Chakki talab is a lake located on the south side of Bodhan town near residential localities (Figs. 1 and 2). Sampling and physicochemical investigation was carried out according to standard methods. Dissolved oxygen in water was determined by the Winkler’s iodometric method and biological oxygen demand determined by 5-day biochemical oxygen demand (BOD) test method. Phosphates in water were determined by the molybdophosphoric acid method and nitrates were determined by Brucine method APHA (1989).

![Fig1. Satellite view of Chakki Talab](image1)

![Fig2. Toposheet of Bodhan showing Chakki Talab](image2)
RESULTS AND DISCUSSION

Temperature

The surface temperature in the Chakki talab ranged from 21 ºC to 35 ºC. High temperature was well marked in summer months while low in winter months. This was in accordance with the seasonal atmospheric temperature. The variation in temperature is smaller as any change occurs more slowly in water than in air (Solanki et al., 2006).

pH

The water of Chakki talab was found to be alkaline in entire study period. The pH ranged between 7.8 to 8.6. Minimum pH was observed in the month of July while the maximum in April (Graph 1).

Dissolved Oxygen (D.O.)

Dissolved oxygen is regarded as one of the best indicator of water quality (Shib Abir 2014). In the present study the dissolved oxygen of Chakki talab varied from 4.1 to 6.8 mg/L with an average of 5.40 ± 0.96 mg/L (Graph 1). Dissolved oxygen levels varied from 4.40 to 13.70 mg/L in Bellal Lake with an average of 8.41±3.05 mg/L (Solanki et al., 2014) and the dissolved oxygen varied from 1.70 to 7.60 mg/L with an average 3.17±1.52 mg/L in Pandu lake of Bodhan (Solanki et al., 2010). This lack of oxygen reflects the trophic state of the lake, which is over loaded with organic matter primarily due to sewage runoff and could gradually transform into eutrophic lake if preventive measures are not taken.

Biological Oxygen Demand (BOD)

Biological oxygen Demand is a direct measure of Oxygen requirement and indirect measure of biodegradable organic matter. During the study period BOD in Chakki talab varied from 24.3 to 42.40 mg/L with an average of 31.71 ± 5.27 mg/L. This increase in BOD can be attributed to the high bacterial activity and heavy input of the organic matter into the water of Chakki talab.

Phosphates

Phosphate is considered to be the most significant among the nutrients responsible for eutrophication of lakes, as it is the primary indicating factor. Phosphates enter the lakes through domestic wastewater, accounting for the condition of eutrophication (Solanki et al., 2010). In the present study the phosphate values varied from 0.178 to 0.37 mg/L with an average value of 0.23±0.070 mg/L. Phosphates showed inverse relationship with dissolved oxygen and positive correlation with biological oxygen demand (Graph 3&4).
Nitrates

In Chakki talab the amount of nitrates recorded in monthly samples varied from 1.44mg/L to 1.85mg/L (Graph 1) with an average value of 1.60± 0.12 mg/L. The values obtained during the present study were enough to cause eutrophication and weed growth. The important source of nitrates in the Chakki talab is domestic sewage and rapid urbanization in the surrounding areas. Nitrates showed negative correlation with dissolved oxygen and positive correlation with biological oxygen demand (Graph 4&5).

Graph 1. Monthly variations of physicochemical parameters of Chakki Talab during 2015-16 (Temperature in °C , except P^H all parameters are in mg/L)

Graph 2. Correlation of DO vs Phosphates
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Graph 3. Correlation of BOD vs Phosphates

Graph 4 Correlation of DO vs Nitrates

Graph 5 Correlation of BOD vs Nitrates
CONCLUSION

Depleting dissolved oxygen and elevated biological oxygen demand, nutrient level in the Chakki talab are contributing to eutrophication. The untreated domestic sewage runoff may be a primary reason for rapid input of limiting nutrients into the water body leading to eutrophication, resulting in severe reduction in water quality making the water unfit for irrigation and domestic usage. As the raising nutrient level is alarming regular monitoring and restoration measures are required.

REFERENCES