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# Chlorophyll-*a* and Dissolved Oxygen concentration of Lake Varhala

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**ABSTRACT**

*The Present study was done to evaluate chlorophyll-a and dissolved oxygen concentrations in Varhala Lake. The parameters which determine the concentration of chlorophyll-a and do like pH, temperature, and nitrate were also estimated. These findings could help to understand the ecosystem of the lake and help predict the limnology of the lake.*

**Keywords**: Chlorophyll-a, Dissolved oxygen, Varhala lake

## INTRODUCTION

Predictions in aquatic systems are required to determine the temporal dynamics, spatial dynamics and also to determine new altered circumstance of the ecosystem [1]. The various abiotic factors create environmental gradients which help for predicting and shaping the dynamics of ecosystems.

Chlorophyll-a and dissolved oxygen are parameters which play important role in tropical water bodies. Chlorophyll-a is the major photosynthetic pigment in a lot of phytoplankton and acts as a trophy index in aquatic ecosystems [2-4]. The phytoplankton which is a source of carbon, and its abundance can be determined through chlorophyll-*a* concentration [5-9]. Dissolved oxygen is an important abiotic factor which determines the fauna of the aquatic system [10,11]. The present study, was done to find parameters which determine the chlorophyll-*a* and dissolved oxygen concentrations and a relationship study of these could help to improve the conditions of the lake and give an insight on the limitations and its management.

## STUDY AREA

Varhala Devi Lake (Figure 1) with an area of 135 hectares located in the southern part of the Bhiwandi town. The average depth of the lake is 3.68 meters with water holding capacity of 1.65 million cubic meters. The water body has tendency to shrink during summer and the highest water level is attained between July and Sept. The water level is completely dependent on rain. The area witnesses an annual rainfall of 2000-3000 mm.

## MATERIALS AND METHODS

Samples of water were collected monthly from May 2014 to April 2015. Samples were collected in 5-liter capacity acid washed plastic cans. All the samples were collected at a fixed time, from 9 am to 2 pm. The methods of instrumentation and procedures for the analysis of the water samples were carried out as per the standard methods [12,13]. Sub-samples were filtered and used to quantify chlorophyll-*a* [14].

## RESULT AND DISCUSSION

The results of the present study are shown in Table 1. Small lakes are influenced by margins and organic matter and this tends to decrease the dissolved oxygen concentrations [8]. Dissolved oxygen concentration in lakes determines the fauna [15,16]. Also, when the water levels are high, low oxygen concentration in the water column can affect aquatic biota [8,10,17].

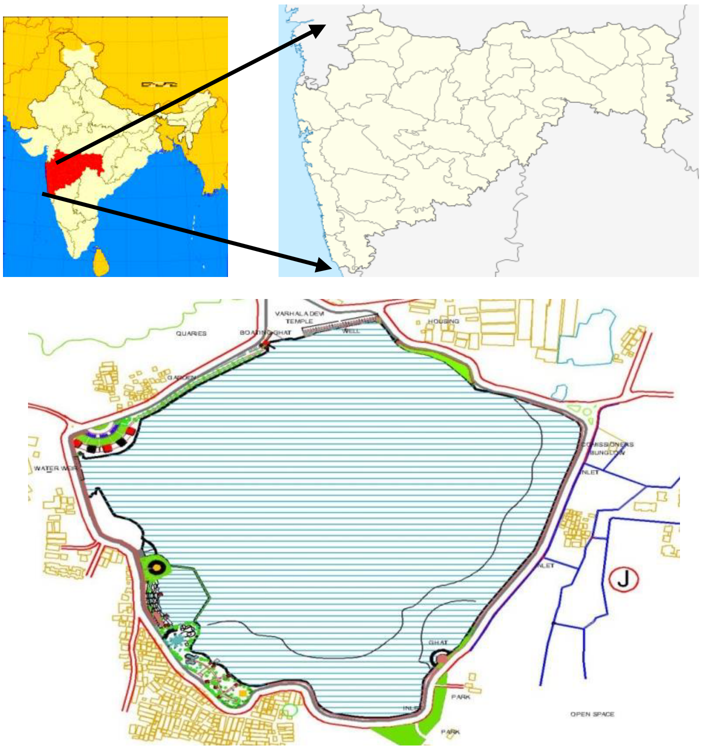

**Figure 1: Varhala Lake**

**Table 1: Values of variables obtained in Varhala Lake**

| Parameters | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **May** | **June** | **July** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **March** | **April** |
| Temperature (°C) | 31.1 | 29.3 | 28.4 | 27.3 | 27 | 26.7 | 25.8 | 25.2 | 24 | 24.8 | 26.7 | 28.5 |
| pH | 8.5 | 8.1 | 7.6 | 7.4 | 7.6 | 7.6 | 7.4 | 7.2 | 7.1 | 7.4 | 7.8 | 8.2 |
| DO (mg/L) | 5.4 | 5.5 | 6.10 | 6.9 | 7.42 | 8.1 | 8.92 | 9.6 | 7.73 | 8.5 | 8.2 | 6.1 |
| Nitrate (mg/L) | 0.16 | 0.26 | 0.29 | 0.33 | 0.39 | 0.42 | 0.31 | 0.25 | 0.18 | 0.12 | 0.22 | 0.13 |
| Chlorophyll a (µg/L) | 20 | 20 | 25 | 30 | 38 | 42 | 38 | 30 | 23 | 31 | 21 | 20 |

Temperature affects the solubility of dissolved oxygen as its effects on decomposition rates due to microbial activity in tropical and subtropical aquatic ecosystems [12]. Van T' Hoff rule also shows that, an increase in temperature can cause a two-to three-fold increase in bacterial activity, and subsequently decrease dissolved oxygen concentrations [16,12]. The water temperature varied from 24ºC to 31.1ºC. Water temperature was low during the month of January and recorded high value during summer.

The maximum pH of 8.5 was in the month of May while minimum of 7.1 was recorded in the month of January. The recorded high summer pH might be due to the high biological activity [17] and evaporation of water [18].

Photosynthetic rates can also effects pH and dissolved oxygen concentration. Thus, the relationship between oxygen and pH is also an indirect effect of phytoplankton photosynthesis [16]. Variation in pH is generally endorsed factors like removal of $CO_2$ by photosynthesis during bicarbonate degradation, low primary productivity, reduction of salinity and temperature, and decomposition of organic matter [19,20].

Absorption of nitrate by phytoplankton is affected by light [21,22]. The nitrate content ranges between 0.42 mg/L in October to 0.12 mg/L in March. The positive relationship between nitrate and dissolved oxygen can be explained by the dependence of the nitrification process on oxygen supply [16].

The result of the present study shows that prediction in aquatic ecosystem would help to identify useful patterns in the system and help in the management of the ecosystem during disturbances.

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