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Study of Physicochemical Parameters to Determine the Limnology of Lake, Located in Thane

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Abstract:

Study was done to determine the levels of chlorophyll-*a* and dissolved oxygen in lake Varhala of Thane district. The parameters that determine the levels of chlorophyll-*a* and DO like pH, temperature, and nitrate were also estimated. These results could help to understand the lake ecosystem and help predict the lake limnology.

Keywords: *C*hlorophyll-*a*, Dissolved Oxygen, Varhala lake

1.0 Introduction:

Predictions in aquatic systems are required to determine the dynamics of the ecosystem, and also to determine new altered circumstance of the ecosystem (Pace, 2001). The different abiotic factors create environmental gradients which help for predicting and shaping the dynamics of ecosystems. Both Chlorophyll-a and dissolved oxygen play an important role in tropical water bodies. Chlorophyll-a, a major photosynthetic pigment in a lot of phytoplankton, acts as a trophy index in aquatic ecosystems (Hecky and Kilham, 1988; Bao-Zhu Pan *et al*., 2009; Dillon. and Rjgler, 1974).The phytoplankton, the source of carbon, and its abundance can be determined through chlorophyll-*a* concentration (Stanley, *et al.,* 2003;Lopes *et al.,* 2007; Balali *et al.,* 2013; Carvalho *et al.,*2003; Edmondson 1991). Dissolved oxygen an abiotic factor determines the fauna of the aquatic system (Crampton, 1998; Soares *et al*., 2006). This study, was done to evaluate the parameters which determine chlorophyll-*a* and dissolved oxygen concentrations. Relationship study of these parameters would help to improve the lake conditions and give an insight into its limitations and management.

Lake Varhala occupies an area of 135 hectares and is located in Bhiwandi city of Thane District. Average depth of the lake is 3.68 meters and has a water holding capacity of 1.65 million cubic meters. The water body tends to shrink in summer and highest water level is attained during monsoon. Rain is the only source of water and the region receives an annual rainfall of 2000 to 3000 mm.

2.0 Materials and Methods:

Samples were collected at a fixed time, during the sampling period. Samples were collected in plastic cans. The water samples were processed and the analysis of the water samples was carried out as per the standard methods (APHA, 1995; Trivedy and Goel, 1986; Jeffrey and Humphrey, 1975).

3.0 Result and Discussion:

Results of the study are shown in Table 1. Small lakes are influenced by margins and organic matter which decreases the dissolved oxygen concentrations of the water bodies (Carvalho *et al.,* 2001). The fauna of the system is determined by the Dissolved oxygen concentration of the lake, the biota (Carvalho, *et al*., 2001; Crampton, 1998; De Melo *et al.,* 2004) and also by water level (Hamilton *et al*, 1997). Effect of temperature on the solubility of dissolved oxygen is due the decomposition rates of microbes in tropical and subtropical aquatic ecosystems (Rocha *et al.,* 2004). An increase in temperature causes a two-to three-fold increase in bacterial activity, and decreases dissolved oxygen concentrations (Wetzel, 2001, Rochaand Thomaz, 2004).Water temperature was low during the month of January and recorded high value during May.

Table 1: Values of each variable in Lake Varhala

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

Maximum pH of 8.5 and minimum of 7.1 was recorded during the study period. High summer pH is due to the high biological activity (Govindasamy, *et al.,* 2000) and evaporation of water (Santhanm, *et al.,* 2012). The rate of Photosynthesis affects the pH and dissolved oxygen concentration. Hence a relationship between pH and oxygen could be an indirect effect of phytoplankton photosynthesis (Wetzel, 2001). Changes in pH is generally due to factors like removal of CO_2 by photosynthesis, low primary productivity, red uction of salinity and temperature, and decomposition of organic matter (Sridhar *et al*., 2006; Munawar 1970). Nitrate absorption by phytoplankton is affected by light (Meeuwig *et al.,* 1998; Yolanda *et al.,* 1997).The nitrate content ranges between 0.42 mg/L to 0.12 mg/L. A positive relationship between nitrate and dissolved oxygen explains the dependence of the nitrification process on oxygen supply (Wetzel, 2001). Result of the study shows that prediction in aquatic ecosystem would help in identifying different useful patterns in the system and help in its management.

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