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## Chemical and bacteriological status of Yeoti Lake of Mohol (Maharashtra)

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### ABSTRACT

*The present study deals with the assessment of physico-chemical characteristics of Yeoti lake, Solapur. The physico-chemical characteristics of Yeoti lake were studied and analyzed for a period of one year, during June 2009 – May 2010. Seasonal variations from two sampling stations of the reservoir were observed. Various parameters including pH, dissolved oxygen, chloride, phosphate, nitrate, calcium, magnesium MPN, Zinc, Iron and Manganese were analyzed. The results revealed that there were significant seasonal variations in some physico-chemical parameters and most of the parameters were in the normal range but higher MPN indicates that the water requires some treatment before using this water for drinking purpose.*

**Key Words:** Yeoti lake, Mohol, chemical parameters, Bacteriological status, trace metals.

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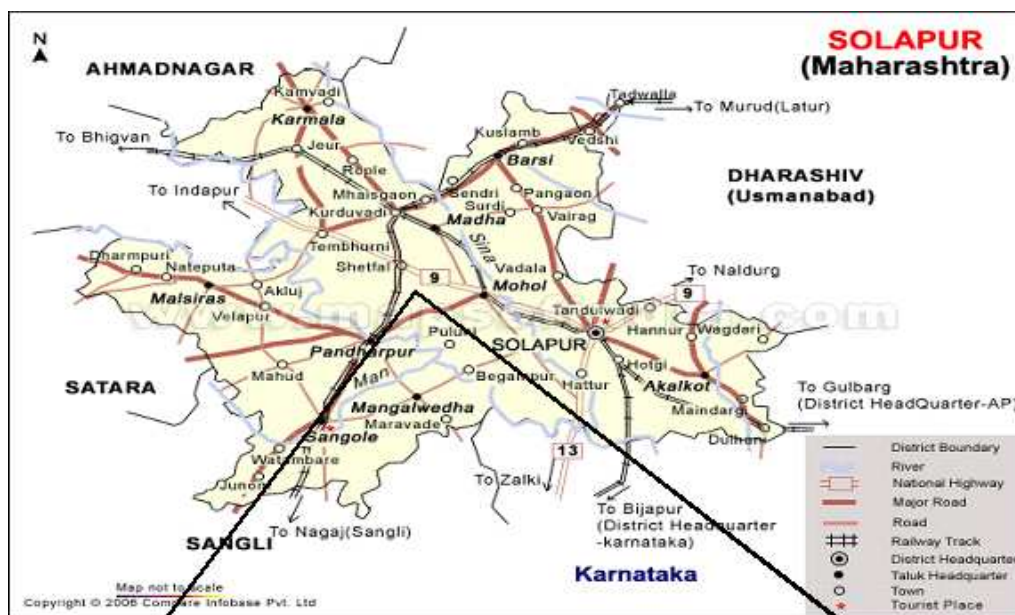
### INTRODUCTION

Water is essential for the survival of any form of life. The three percent of global fresh water is large enough to meet the requirements of man for million of years etc., Water pollution is a phenomenon that is characterized by the deterioration of its quality as a result of various human activities. In India only 12% of people get good drinking water [Kudesia, 1980]. Inadequate management of water resources as directly or indirectly resulted in the degradation of hydrological environment [Karanth, 1989]. Therefore, a continuous periodical monitoring of water quality is necessary so that appropriate steps may be taken for water resource management practices. The present investigation was carried out to assess the suitability of water collected from two sites of Yeoti lake.

### MATERIALS AND METHODS

Water samples collected from two sampling stations selected for the analysis were given below: S1 - Near wall of the reservoir S2 –two km from the wall. (Samples for analysis were collected

in sterilized bottles using the standard procedure for grab (or) catch samples in accordance with standard methods of [APHA 1995]. The analysis of various parameters namely PH, Calcium, Magnesium, Chloride, Phosphate, Nitrate, DO, MPN etc., were carried out as per the methods described in [APHA 1995]. Zinc, Iron and Manganese were analyzed by Dithiozone, Thiocyanate and Persulphate methods resp. using spectrophotometer. All the chemicals and reagents used were of analytical grade. D.D water was used for the preparation of solutions.



**Study Area**

Yeoti Lake is located in the town of Mohol, District of Solapur The Lake is constructed for irrigation purpose and was started to use for agricultural irrigation in 1979. The Yeoti lake is situated between 17° – 46" N and 75° – 28" E.

**Table 1. Monthly mean values of selected parameters of Yeoti Lake during Jul. 2009 to Dec. 2009.**

Months	Jul		Aug		Sept		Oct		Nov		Dec	
	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>
p <sup>H</sup>	7.2	7.2	7.4	7.2	7.5	7.6	7.2	7.2	7.3	7.5	7.4	7.4
DO	4.8	4.12	4.28	4.20	7.68	7.66	9.28	9.26	6.11	6.13	5.13	5.12
Chlorides	72.19	72.78	56.72	56.72	40.72	42.16	17.48	17.28	21.40	21.48	31.62	32.52
Calcium	49.13	49.28	51.28	52.20	68.13	69.87	36.18	37.28	31.28	31.37	28.21	28.93
Magnesium	192.87	214.72	128.72	131.80	65.87	78.13	155.82	132.72	118.72	116.63	129.79	125.07
Nitrate	20.2	20.2	20.8	20.8	19.4	19.4	20.8	20.4	18.6	18.6	18.2	17.8
Phosphate	1.9	2.1	2.2	2.1	1.8	1.8	2.2	2.2	1.8	1.7	1.8	1.9
MPN	540	540	540	540	540	540	540	540	540	540	540	540
Zinc	5.52	5.52	5.27	5.41	5.18	5.10	5.62	5.33	5.40	5.31	6.0	5.91
Iron	0.50	0.81	1.19	1.23	1.82	1.76	1.57	1.67	1.63	1.50	1.71	1.34
Manganese	0.44	0.42	0.43	0.41	0.46	0.42	0.49	0.45	0.48	0.43	0.51	0.49

*All the values are mean of three readings. Except p<sup>H</sup> and MPN all values are in mg/L.*

**Table 2. Monthly mean values of selected parameters of Yeoti Lake during Jan. 2010 to Jun. 2010.**

Months	Jan		Feb		Mar		Apr		May		Jun	
	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>
p <sup>H</sup>	7.4	7.5	7.6	7.4	7.8	7.6	7.4	7.4	7.9	7.9	7.6	7.5
DO	7.16	6.20	6.12	6.28	4.20	4.22	4.16	4.64	4.02	4.12	2.20	2.20
Chlorides	48.13	47.12	52.21	41.16	42.17	40.21	54.53	52.89	52.21	53.83	59.98	60.76
Calcium	28.87	22.82	26.72	27.87	26.96	27.83	33.87	34.82	41.12	35.66	36.96	39.91
Magnesium	132.13	130.18	140.28	146.13	138.04	140.17	137.13	138.18	145.88	148.34	158.04	154.09
Nitrate	19.2	20.6	20.1	20.4	18.6	18.8	18.3	17.8	17.6	17.2	18.6	18.2
Phosphate	2.3	2.1	2.0	2.1	1.9	1.8	1.9	1.8	2.0	1.8	1.9	1.6
MPN	540	540	540	540	540	540	540	540	540	540	540	540
Zinc	4.35	4.1	4.48	4.23	5.18	4.58	5.71	4.87	5.47	5.83	6.15	6.05
Iron	1.45	1.61	1.31	1.82	1.26	1.11	1.57	1.43	0.99	0.76	0.93	0.93
Manganese	0.48	0.45	0.43	0.41	0.47	0.44	0.49	0.47	0.52	0.49	0.54	0.52

*All the values are mean of three readings. Except p<sup>H</sup> and MPN all values are in mg/L.*

**Hydrogen ion concentration (pH)**

The pH values of the water ponds were found in the alkaline side (pH > 7.0), [Goldman and Horne, 1983]. Therefore, the water of Yeoti lake was on the alkaline side during the investigation period. The higher values of pH were recorded during hot period 7.4 – 7.9, while the lower values were found in the cold period 7.1 – 7.4. The decrease in pH values during cold period, especially in autumn, is mainly related to the high bicarbonate content, while the uptake of CO<sub>2</sub>

by phytoplankton decreasing as a result of increasing in the concentration of  $\text{HCO}_3^-$  [El- Wakeel and Wahby, 1970 and Abdel-Satar, 2005]. The pH slightly low in winter and slightly high in summer, but throughout the year (1999) it remained alkaline in Makroda reservoir of M.P. [Yadav et. al. 2003 & Sharma, 2000] studied the ecology of a pond at Fatehpursikri, Agra. They found pH in the range between 7.1 - 7.6.

### **Dissolved oxygen (DO)**

It is an important parameter which is essential to the metabolism of all aquatic organisms that possess aerobic respiration [Wetzel, 2000]. Presence of DO in water may be due to direct diffusion from air and photosynthetic activity of autotrophs [Shanti et al., 2002]. Oxygen can be rapidly removed from the waters by discharge of oxygen demanding wastes. The DO values obtained in the present study are within the range of 2.20 – 9.28. The distribution of DO is affected by the solubility of many inorganic nutrients, which are governed by seasonal shifts from aerobic to anaerobic environments in some regions of the three ponds [Benson and Krause, 1980]. Also, the solubility of DO decreases when salinity increases, if other factors are kept constant [Ezz El-Din, 1990]. The water of Anjanapura reservoir, Karnataka during a period of one year November 2005 to October 2006 [Narayana et al 2008]. The dissolved oxygen level recorded in the range of 4.71-8.28mg/L. The higher dissolved oxygen in winter season and rainy season at different four stations.

### **Chloride**

Chloride occurs in all types of natural waters. The high concentration of chloride is considered to be an indication of pollution due to high organic waste of animal origin [Singh, 2005]. Chloride values obtained in the study are found in the range between 17.28 -72.78 mg / lt. The chloride content in an average 102.34ppm from Khnop reservoir in 1997 which is lesser than values prescribed by WHO & ICMR. [Vijayakumara et. al.2005 & Jain, 2000] observed a minimum & maximum concentration of chloride in surface water was 45.5 & 150.5mg/l in sub-surface water was 75 and 178mg/l during June to December 2002 of Bhadra river basin near Bhadravathi river. The major sources of chloride were sewage, industrial effluents & leaching of saline residues.

### **Major cations**

#### **Calcium and magnesium**

The distributions of calcium and magnesium concentrations in the water of Yeoti lake were highly fluctuations during different periods. Calcium and magnesium values obtained in the study are found in the range between 22.82 – 69.87 mg /L and 65.87 – 214.72 mg/L resp. The studied water quality at rural areas of Sheopukalan, M.P. during 1998 – 1999. [Prajapati and Mathur, 2005]. The observed range of calcium hardness varied from 26 – 421 mg/L in various seasons. The calcium ranged from 8.60 – 94.10 mg/L 75.25 – 124 mg/L in surface and sub-surface water of Bhadra river resp [Vijayakumara et. al. 2005].

#### **Nitrate**

Nitrate is the most important nutrients in an ecosystem. Generally water bodies polluted by organic matter exhibit higher values of nitrate. The results of the nitrate present in Tables (1 & 2) revealed that the higher values recorded during cold period (20.4 – 20.8 mg/L). This may be attributed to the oxidation of ammonia by nitrifying bacteria and biological nitrification [Seike *et al.*, 1990]. The lower values recorded during summer season (17.2 – 18.6 mg/L) may be related



to the denitrification of NO<sub>3</sub> - into NO<sub>2</sub> - and NH<sub>3</sub> by denitrifying bacteria [Merck, 1980]. The water quality of Bhadra river during the period of June-December 2002. They found nitrate concentrations ranged from 0.29-36.1mg/l & 0.64-48mg/l from surface & sub-surface water respectively. The higher concentration of nitrate causes Methaemoglobinemia in infants [Vijayakumara et. al. 2005].

### Phosphate

The cycling of phosphorus within lakes and river is dynamic and complex, involving adsorption and precipitation reactions, interchange with sediments and uptake by aquatic biota [Borberg and Persson, 1988]. The seasonal variations of PO<sub>4</sub> concentration were found to be from 1.6 – 2.3 mg/L during the study period. The phosphate from Ahar river, during post monsoon found Udaipur [Sharma et. al. 2000]. The maximum concentration of phosphate 2.74 mg/L which was due to disposal of city nutrient rich sewage containing organic matter, soap and detergents. The water quality of Sular pond at Coimbatore during October 2001 – September 2002 showed the phosphate concentration between 1.30 – 1.90 mg/L [Dhanalakshmi et. al.2008].

### MPN

From the results, it was found that the samples of Yeoti lake contain higher coliform number. The MPN of all the water samples was 540/100ml throughout the study period. This reveals that the water may be contaminated with sewage.

### Trace metals

#### Zinc, Iron & Manganese

Occurrence of Zn , Fe and Mn metals in surface water has drawn world wide attention due to its considerable impact on human physiology. In this view, metals contamination study of zinc and Iron along with other physical and chemical parameter has been carried out to determine the status of drinking water from Yeoti lake, Mohol Taluka of Solapur Dist. Maharashtra State. From the results we found that the values of zinc, iron and manganese varied from 4.1 – 6.15 mg/L, 0.50 – 1.82 mg/L and 0.41 - 0.54 mg/L resp. From table 1 & 2 it is concluded that there is not much variation in manganese concentration but the values of zinc and iron shows variations throughout our study period.

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