

**Physico-Chemical Analysis of Markand Pimpri Lake of  
Kalwan, Nasik District, Maharashtra (India)  
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**Abstract:**

Water quality analysis of Markand Pimpri Lake of Kalwan tehsil of Nasik District of Maharashtra was carried out monthly for the year Jan. to Dec. 2014. Monthly variation in physicochemical parameters such as Water Temperature, pH, Turbidity, Hardness, E.C., TDS, DO, Free CO<sub>2</sub>, BOD, Total Alkalinity, Cl, CO<sub>3</sub>, HCO<sub>3</sub>, NO<sub>3</sub>, S, Ca, Mg, K, Na.

**Key Words:** Physico-chemical analysis, Monthly variation, Markand Pimpri Lake, Kalwan, Nasik.

**Introduction:**

Markand Pimpri lake situated near Markand Pimpri village and Saptshrungi temple. The Pimpri reservoir constructed about 25 years ago. Its storage capacity is 39.25 sq. m. in 236 hect. The water samples collected from two different sites. The phytoplanktons and angiospermic vegetation is very less in Markand Pimpri lake.

Humans have constructed lakes to stop runoff water for various uses like drinking, irrigation and recreation during the day period. The life on the earth would be impossible without water. Water of good quality is required for living organisms. It is used in various biological activities by plants and animals. Over use of chemical fertilizers and pesticides in agriculture are causing heavy pollution in aquatic ecosystem has resulted in high impact on quality and quantity of water. According to different survey 70-80% of Indian water resources are severally polluted. Therefore raw water from the water bodies is being analyzed for its utilities like drinking, agriculture, irrigation, aqua culture and industrial purpose.

### **Materials and Method:**

Markand Pimpri lake was selected for the present study. The water samples collected from two different corners of lake **M<sub>1</sub>** and **M<sub>2</sub>**. The **M<sub>1</sub>** site is shallow and **M<sub>2</sub>** site is considerably deep.

The water samples were collected monthly intervals during the year 2014. The samples were collected during morning hours between 9.00 am to 11.00 am. The water parameters like Water Temperature, pH, Turbidity, Hardness, Electrical Conductivity, Total Dissolved Solids, Demand of Oxygen, Total Alkalinity, Calcium, Magnesium, Potassium, Sodium, Chlorides, Sulphates, Nitrate, Carbonate, Bicarbonate were analyzed according to standard methods prescribed by APHA (1985), (Trivedy and Goel,1986).

### **Result and Discussion:**

The variations in physicochemical parameters of the water reservoir have been summarized in Table-1.

1. **Water Temperature:** The temperature recorded maximum in the month of May as 22.60°C and minimum in the month of December as 18.00°C in 2014. It is very important physical parameter. Many physical, biological and chemical characteristics of water reservoir are affected by the temperature. Temperature affects the aquatic life. Many workers have shown that the temperature is an important factor promoting the growth of water blooms (Prescott 1938; Gonzalves and Joshi 1946; Philipose 1959).
2. **pH:** The pH value recorded maximum as 7.75 in May and minimum as 7.18 in the month of December in year 2014. pH is important parameter to decide the water quality. Ganpati (1940) observed an association of blooms with high pH, organic matter, free ammonia, small quantities of phosphates and traces or no nitrates. At extremely high or low pH values (9.6 or 4.5) the water becomes unsuitable for most organisms.
3. **Turbidity:** The turbidity recorded maximum as 9.21 Nephelometric Turbidity Unit (NTU) in May and minimum as 3.21 NTU in December in 2014. Turbidity is a measure of the relative clarity of water. The maximum turbidity was recorded during summer and winter season Verma *et al.*, (1978a). AT the higher levels of

turbidity water loses its ability to support a diversity of aquatic organisms. Results compared with Deore *et al.*, (2005).

4. **Hardness:** The hardness of water recorded maximum as 60mg/L in May and minimum as 48 mg/L in August 2014. Calcium and Magnesium are the principal cations causing hardness of water results observed by Course Manual, NEERI, (1979), Ganesh *et al.*, (2002).
5. **Electrical Conductivity:** The electrical conductivity was recorded maximum as 0.451Siemens per meter ( $\text{sm}^{-1}$ ) in August and minimum in the month of May as 0.125  $\text{sm}^{-1}$ . Conductivity is proportional of the dissolved solids and both showed analogous trends in seasonal variation.
6. **Total Dissolved Solids (TDS):** The TDS recorded maximum as 142 mg/L in September and minimum as 52 mg/L in May. Higher TDS value during rainy season due to runoff water reaching the ponds.
7. **Dissolved Oxygen:** The dissolved oxygen recorded maximum in the month of December as 6.20 mg/L and minimum in the month of May as 3.98 mg/L. Solubility of oxygen depends on temperature, pressure and salinity of water.
8. **Free Carbon Dioxide (Free CO<sub>2</sub>):** The free CO<sub>2</sub> recorded maximum in the month of May as 8.09mg/L and minimum in the month of January as 1.48 mg/L. Munnawar (1970) high values of free CO<sub>2</sub> favoured the growth of Euglenineae.
9. **Biological Oxygen Demand (BOD):** The BOD recorded maximum in the month May as 16.80mg/L and minimum value in month of November as 6.20 mg/L in the year 2014. Biological oxygen demand is a measure of the quantity of oxygen used by microorganisms in aerobic oxidation of organic matter, Trivedy *et al.*, (1987).
10. **Alkalinity:** The alkalinity recorded maximum in the month of February as 45.60 mg/L and minimum in July as 20.06 mg/L. Vass *et al.*, (1977) have suggested that total alkalinity value of 60 mg/L or more indicates hard waters. High values of alkalinity may be attributed to increase inorganic decomposition during which carbon dioxide is liberated Airsang and Lakshman, (2013).

11. **Chloride:** The chloride recorded maximum in the month of September as 15.96 mg/L and minimum in the month of May as 8.04 mg/L. Presence of high chlorides in water indicates pollution due to domestic waste, Trivedy and Kulkarni (1988).
12. **Carbonate:** The carbonate recorded maximum in the month of September as 0.40 mg/L and minimum in the month of February as 0.02 mg/L. Carbonate and bicarbonate act as buffers in stabilizing the pH of water.
13. **Bicarbonate:** The bicarbonate recorded maximum in the month of May as 20.09 mg/L and minimum in the month of December as 10.25 mg/L in 2014.
14. **Nitrate:** The Nitrate recorded maximum in the month of September as 5.35 mg/L and minimum in the month of May 0.25 mg/L. Concentration of Nitrates in fresh water bodies is very low.
15. **Sulphate:** The sulphate recorded maximum in the month of November as 2.15 mg/L and minimum in the month of June as 0.64 mg/L.
16. **Calcium:** The calcium recorded maximum in the month of May as 17.25 mg/L and minimum in the month of December as 7.10 mg/L. Pearsall (1932) suggests that calcium deficient lake support rich growth of desmids. Pearsall and Lind (1942) have established that calcium is one of the most important element influencing the distribution of diatoms in water bodies. Concentration of calcium also causes the richness of bicarbonates Richard (1968).
17. **Magnesium:** The magnesium recorded maximum in the month of June as 10.05 mg/L and minimum in the month of November as 4.16 mg/L. Magnesium play important role in antagonizing the toxic effect of various irons in neutralizing excess acid produced, Munnawar (1970).
18. **Potassium:** The potassium recorded maximum in the month of May as 0.92 mg/L and minimum in the month of August as 0.26 mg/L. It is an essential nutritional element.
19. **Sodium:** The sodium recorded maximum in the month of May as 26.99 mg/L and minimum in the month of August as 11.52 mg/L. The highest amount of sodium, potassium and chloride make water sour to taste.

**Conclusion:**

Present study of physicochemical parameters concluded that, the values of all the parameters were observed in permissible limits as per standard proposed by WHO. Both sites of Markand Pimpri lake unpolluted. Which revealed that water is perfectly suitable for irrigation, pisciculture and the normal treatment at filtration unit makes the dam water potable for drinking.

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**Table-1: Monthly variation of water samples at Markand Pimpri Lake, Kalwan, District Nasik (2014)**

Parameters	January	February	March	April	May	June	July	August	September	October	November	December
Water Temp.	19.00	19.04	20.06	20.75	<b>22.60</b>	20.16	20.14	20.06	19.76	19.38	18.08	<b>18.00</b>
pH	7.31	7.35	7.51	7.55	<b>7.75</b>	7.73	7.48	7.36	7.33	7.27	7.24	<b>7.18</b>
Turbidity	4.05	4.38	5.15	7.28	<b>9.21</b>	9.16	5.75	5.98	4.02	3.91	3.57	<b>3.21</b>
Hardness	51.75	52.09	52.98	53.09	<b>60</b>	57.76	50.25	<b>48</b>	49.04	49.38	50.06	51.00
EC	0.201	0.196	0.138	0.128	<b>0.125</b>	0.145	0.249	<b>0.451</b>	0.311	0.305	0.271	0.209
TDS	105	78	66	59	<b>52</b>	54	109	116	<b>142</b>	138	129	126
DO	5.75	5.02	4.75	4.28	<b>3.98</b>	4.23	4.51	4.68	4.90	5.05	5.78	<b>6.20</b>
Free CO <sub>2</sub>	<b>1.48</b>	2.12	2.98	4.05	<b>8.09</b>	7.35	7.02	5.75	4.33	3.28	2.21	2.03
BOD	10.21	11.04	13.60	14.65	<b>16.80</b>	15.40	15.05	14.38	13.70	8.32	<b>6.20</b>	7.98
Alkalinity	42.60	<b>45.60</b>	38.40	35.19	33.17	21.04	<b>20.06</b>	22.40	23.96	23.06	24.00	38.76
Chloride	8.17	9.15	9.76	8.75	<b>8.04</b>	9.38	11.26	13.29	<b>15.96</b>	15.05	14.32	12.92
Carbonate	0.04	<b>0.02</b>	0.03	0.05	0.06	0.05	0.09	0.22	<b>0.40</b>	0.38	0.12	0.08
Bicarbonate	11.20	11.66	13.25	15.60	<b>20.09</b>	19.88	15.35	14.65	13.15	13.76	11.09	<b>10.25</b>
Nitrates	0.98	0.70	0.63	0.46	<b>0.25</b>	0.51	0.69	3.19	<b>5.35</b>	3.15	2.41	1.05
Sulphate	0.99	0.84	0.80	0.72	0.66	<b>0.64</b>	0.69	0.78	1.02	1.98	<b>2.15</b>	1.16
Calcium	7.27	9.26	11.60	15.40	<b>17.25</b>	16.20	11.09	10.70	9.96	8.86	8.15	<b>7.10</b>
Magnesium	6.26	7.15	9.36	9.92	10.02	<b>10.05</b>	7.11	6.05	5.95	4.02	<b>4.16</b>	4.96
Potassium	0.56	0.64	0.79	0.86	<b>0.92</b>	0.81	0.47	<b>0.26</b>	0.27	0.30	0.33	0.43
Sodium	24.12	25.92	26.06	26.65	<b>26.99</b>	24.41	16.74	11.52	12.60	17.44	19.32	<b>23.26</b>

Unit: Water Temp in °C and rest are in mg/L.

