

## **Analysis of Katraj Lake Water in Pune Region of Maharashtra, India**

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### **Abstract**

Lake Water samples were collected during summer and winter season. The physico-chemical parameters such as Temperature, pH, Dissolved Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand, Phosphate, Nitrate, Chloride, Total Hardness, Total Alkalinity, Total Dissolved Solids, Turbidity and Electrical Conductivity were analyzed to know the present status of the lakewater quality. We represent the data graphically and interpreted the data analysis of variance.

**Keywords:** Katraj Lake, Rajiv Gandhi Zoological Park, Analysis of Variance.

### **INTRODUCTION:**

Katraj Lake is one of the important lakes of Pune Maharashtra which has a historical importance, and it is located in the south Pune. It is a artificial lake built at the time of peshwas in south Pune covering 82 hectares of land. In 1749 the water supplies system which was authorised from “Ambil Odha” that approaching towards Katraj ghat. The Lake subsists of two division system that is dams and canals. The first lake acts as cleaner and the water from the first lake flows into the Katraj Lake. In 19th century the Katraj lake water used to supply water through an underground canal to the old city of Pune. Separate fountains, tanks, baths, wells, pipelines were created to supply of water from the Katraj Lake to the local resident for domestic use and drinking purpose. In 1879, the Pune municipality corporations have to look over the

city's water supply system. Katraj Lake is acutely vulgarized due to present effluent coming from local resident and rapid development of many societies surrounding of Rajiv Gandhi zoological park seem to have got their drainage pipelines linked to the Katraj lake. This may cause the annihilation of some species or ecosystem types and cause imperishable ecological damage as well as insufficiency of water to nearby areas. The purpose was to assess the major source that degraded the quality of water by doing the physico chemical analysis of lake water in the month from July 2018 to January 2019.

The study of Katraj Lake is done to find out how a beach or bay covered by a water hyacinth affected the life of a lake community and ecosystem.

Analysis of variance(see [6], pp. 256-258) is very useful technique concerning researches in the fields of economics, biology, education, psychology, sociology, and industry. The ANOVA technique enables us to perform simultaneous test and as such is considered to be an important tool of analysis in the hands of a researcher. Using this technique, one can draw inferences about whether the samples have been drawn from populations having the same mean.

The ANOVA technique is very useful in the context of all those situations where we want to analyze more than two populations such as in comparing the yield of crop from several varieties of seeds, the gasoline mileage of four automobiles, the smoking habits of five groups of university students and so on. In such situation one generally does not want to consider all possible combinations of two populations at a time for that would require a great number of tests before we would be able to arrive at a decision. This would also expend lot of time and money, and even then certain relationships may be left unidentified (particularly the interaction effects). Therefore, one quite often utilizes the ANOVA technique and through it investigates the differences among the means of all the populations simultaneously.

### **STUDY AREA:**

The area of Katraj is in the southern part of Pune Metropolitan Area. The lake is having very less human intervention. Katraj Lake is positioned in the southern part of the Pune city. The lower Katraj Lake is positioned in the Rajiv Gandhi Zoological Park. The total surface area of Katraj Lake is around 165000 square meters. The lower Katraj Lake and the upper lake lay one below the other. The area of Katraj Lake is beautiful enveloped by trees and it has a natural slope and mountain oysters, which seems the beauty of lake.

**Location map of Study Area**



**SAMPLE COLLECTION:**

The sampling locations consist of Katraj lake area. Lake water samples were collected during summer and winter season. Samples were collected in plastic container to avoid unpredictable changes in characteristic as per standard procedure (APHA, 1998).

**PHYSICO-CHEMICAL ANALYSIS OF UPPER LAKE WATER:**

The collected samples were analyzed for different physico-chemical parameters such as Temperature, pH, Dissolved Oxygen, Biological Oxygen Demand, Chemical

Oxygen Demand, Phosphate, Nitrate, Chloride, Total Hardness, Total Alkalinity, Total Dissolved Solids, Turbidity and Electrical Conductivity as per the standard methods (APHA, 1998).

## RESULTS AND DISCUSSION:

Lake Water samples were collected during summer and winter season. The physico-chemical parameters such as Temperature, pH, Dissolved Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand, Phosphate, Nitrate, Chloride, Total Hardness, Total Alkalinity, Total Dissolved Solids, Turbidity and Electrical Conductivity were analyzed to know the present status of the lakewater quality. The status of water quality of these lake water sources is presented in Table 1 and 2 and two way analysis of variance is presented in Table 3.

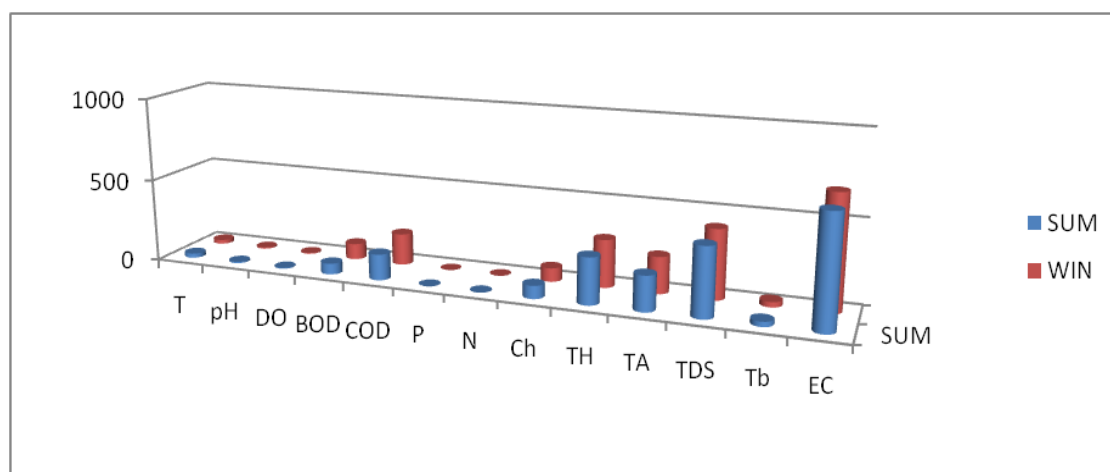
The results revealed that there is significant seasonal variation in the attributes. Also the attributes are dependent to each other.

**Table 1.** Water Quality at different locations of Katraj Lake in summer season (Laboratory Analysis)

Sr. No	Parameters	Unit	Values of parameters
1	Temperature	<sup>0</sup> C	26
2	pH	-----	8.25
3	Dissolved Oxygen	mg/l	5.2
4	Biological Oxygen Demand	mg/l	66
5	Chemical Oxygen Demand	mg/l	156
6	Phosphate	mg/l	0.024
7	Nitrate	mg/l	0.75
8	Chloride	mg/l	78.02
9	Total Hardness	mg/l	278.0
10	Total Alkalinity	mg/l	210.0
11	Total Dissolved Solids	mg/l	410.0
12	Turbidity	NTU	30
13	Electrical Conductivity	mil/cm <sup>2</sup>	660

**Table 2.** Water Quality at different locations of Katraj Lake in winter season (Laboratory Analysis)

Sr. No	Parameters	Unit	Values of parameters
1	Temperature	°C	24
2	pH	-----	7.95
3	Dissolved Oxygen	mg/l	5.1
4	Biological Oxygen Demand	mg/l	96
5	Chemical Oxygen Demand	mg/l	190
6	Phosphate	mg/l	0.022
7	Nitrate	mg/l	0.55
8	Chloride	mg/l	82.02
9	Total Hardness	mg/l	286.0
10	Total Alkalinity	mg/l	220.0
11	Total Dissolved Solids	mg/l	415.0
12	Turbidity	NTU	31
13	Electrical Conductivity	mil/cm <sup>2</sup>	680



**Fig 1:** Graphical representation of data

T: Temperature, pH: pH, DO: Dissolved Oxygen, BOD: Biological Oxygen Demand, COD: Chemical Oxygen Demand, P: Phosphate, N: Nitrate, Ch: Chloride, TH: Total Hardness, TA: Total Alkalinity, TDS: Total Dissolved Solids, Tb: Turbidity, EC: Electrical Conductivity.

**Table 3.** Analysis the Data using two way Anova

<i>SUMMARY</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
SUM	13	1928.244	148.3265	39627.1
WIN	13	2037.642	156.7417	41592.28
T	2	50	25	2
pH	2	16.2	8.1	0.045
DO	2	10.3	5.15	0.005
BOD	2	162	81	450
COD	2	346	173	578
P	2	0.046	0.023	0.000002
N	2	1.3	0.65	0.02
Ch	2	160.04	80.02	8
TH	2	564	282	32
TA	2	430	215	50
TDS	2	825	412.5	12.5
Tb	2	61	30.5	0.5
EC	2	1340	670	200

## ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Rows	460.3047	1	460.3047	6.328914	0.027121	4.747225
Columns	973759.8	12	81146.65	1115.718	2.37E-16	2.686637
Error	872.7653	12	72.73044			
Total	975092.8	25				

## **CONCLUSIONS:**

Water quality standard having a significant variation due to its different environmental conditions sometimes either it is positive or negative with an unbalance ecosystem. It is concluded from the present study that the pH of the Katraj Lake exceeds the desirable range of BIS and MPCB standards which means the present water in Katraj Lake is in alkaline condition. Dissolve Oxygen was found very less as it was analyzed by the standard procedure of APHA (American Public Health Association) standards and the Biochemical Oxygen Demand (BOD) concentration are found very high in Lake Water samples and it is vice-versa process if DO decreases then the concentration BOD increases. But the same difference was seen in the both seasons. COD values are also not in the limit as per BIS and MPCB standards. In general the attributes are dependent to each other and also it is affected by the season.

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