Seasonal Variation and Determinants of Water Quality in Thorapalli Lake, Hosur, Tamil Nadu

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***Abstract*—Thorapalli Lake in Hosur, Tamil Nadu, is an important freshwater body used for domestic, agricultural, and aquaculture purposes. This study evaluated seasonal changes in its physicochemical water quality during January–December 2016. Monthly samples were analyzed for temperature, pH, electrical conductivity, turbidity, total dissolved solids, calcium, chloride, total alkalinity, sulphate, nitrate, phosphate, dissolved oxygen, biological oxygen demand, and chemical oxygen demand using standard methods. The data show marked seasonal fluctuations, with several values exceeding desirable limits for drinking-water quality in different months. Elevated conductivity, dissolved solids, nutrient concentrations, and oxygen demand, together with occasional low dissolved oxygen, indicate intermittent pollution stress in the lake. The findings suggest influence from runoff, domestic discharge, and other anthropogenic inputs. Continuous monitoring and catchment-level management are necessary to protect the lake ecosystem and its utility.**

***Index Terms*—Thorapalli Lake, water quality, physicochemical parameters, seasonal variation, eutrophication, pollution.**

I. INTRODUCTION

Freshwater lakes are critical resources for drinking, irrigation, aquaculture, and biodiversity support, but they are also among the most vulnerable aquatic systems to pollution. Changes in land use, population growth, agricultural runoff, and untreated wastewater can rapidly alter lake chemistry and ecological condition. Water quality assessment is therefore essential for evaluating whether a lake is suitable for human use and for identifying early signs of degradation.

Thorapalli Lake is located in Thorapalli Agraharam village, Hosur Taluk, Krishnagiri District, Tamil Nadu. According to the original draft, the lake serves domestic and agricultural needs and is influenced by nearby settlement and industrial activity. Because of these pressures, seasonal monitoring of water quality is important for understanding pollutant loading and ecological response. This revised manuscript presents the original study in a clearer journal format while preserving the main findings and improving scientific presentation.

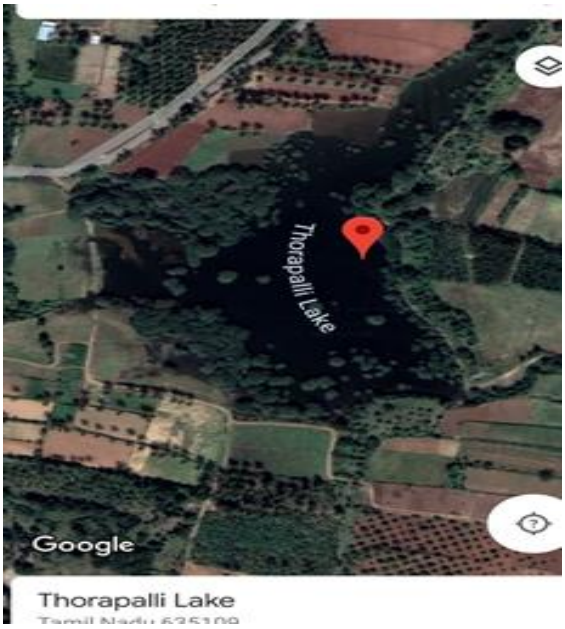

Figure 1. Study area map and lake photograph.

II. MATERIALS AND METHODS

Study area

Thorapalli or Thorapalli Agraharam is a village in Hosur Taluk, Krishnagiri District, Tamil Nadu. It lies on the banks of the Ponnaiyar River, about 6 km southeast of Hosur, near the Hosur–Krishnagiri road. The lake within the village boundary supports domestic, agricultural, and aquaculture uses. The original draft notes that the surrounding area includes human settlement and nearby industries, which may contribute to lake pollution.

Sampling and analysis

Water samples were collected monthly from January 2016 to December 2016 in the early morning hours using clean polythene bottles. Field observations were recorded on site, and the samples were transported to the laboratory for physicochemical analysis. Standard analytical procedures described by APHA (2005) and Trivedy and Goel (1986) were followed for the measurements.

The parameters analyzed included temperature, pH, electrical conductivity, turbidity, total dissolved solids, calcium, chloride, total alkalinity, sulphate, nitrate, phosphate, dissolved oxygen, biological oxygen demand, and chemical oxygen demand. The monthly values were compared with standard guideline values where applicable to assess suitability for drinking and other uses.

III. RESULTS

Monthly water quality pattern

The monthly data show clear seasonal variation in lake water quality. Temperature ranged from 25.6 C in December to 32.1 C in May. pH values ranged from 6.8 to 9.4, showing that the lake was neutral to strongly alkaline during different periods of the year. Electrical conductivity ranged from 441 in July to 1492 in August, while total dissolved solids ranged from 234 in July to 988 in August, indicating considerable changes in dissolved ionic load.

Dissolved oxygen showed strong temporal variation, falling to very low levels in some months and increasing in others. BOD and COD also fluctuated substantially, with high values during certain months suggesting organic and chemical pollution loads. Nitrate and phosphate levels varied across the year, showing seasonal nutrient enrichment likely linked to runoff and wastewater influence.

Table 1. Physicochemical parameter values of Thorapalli Lake water from January 2016 to December 2016.

	TEMP	PH	COND	TURB	TDS	CA	CHL	TA	SULPH	NIT	PHOS	DO	BOD	COD
WHO STD	-	6.5 - 8.5	1400	25	500	75	200 - 500	200 - 500	--	<1	--	5-10	6	10
JA NJ JAN	26.9	7.8	1310	0.5	845	180	146	348	38	2.8	10.2	5.8	4.0	42.1
FEB	27.4	6.8	1306	12.8	843	286	198	268	28	3.1	5.0	1.4	44.0	58
MAR	28.9	8.8	1308	13.3	768	308	215	460	28	3.8	6.0	1.7	48.0	88
APRIL	31.4	9.4	1467	15.6	965	244	165	315	21	4.1	4.0	4.8	8.0	48
MAY	32.1	8.2	1428	14.8	884	98	158	296	5.1	3.4	3.0	3.8	6.9	44
JUNE	29.0	9.1	782	3.1	513	240	55	188	21.1	4.4	0.3	3.5	44.0	172
JULY	27.4	7.8	441	11.4	234	98	74	186	25.1	3.9	3.1	0.9	5.2	8.9
AUG	27.8	7.2	1492	9.0	988	237	212	284	19.4	5.1	3.8	6.0	5.8	36.0
SEP	27.4	7.1	1148	2.8	758	88	178	296	22.2	4.9	5.1	0.2	6.0	34
OCT	28.1	7.5	1158	3.0	753	167	181	304	20.1	5.8	6.0	1.8	6.0	24.0

NOV	26.8	7.1	1156	3.4	756	149	175	302	30.4	2.9	5.9	5.9	6.3	21
DEC	25.6	6.8	1328	0.4	846	176	180	324	27	3.1	14.8	5.6	4.4	34.0

Correlation pattern

The original correlation matrix suggests that conductivity, chloride, total alkalinity, COD, and BOD are interrelated, while dissolved oxygen is negatively related to several pollution indicators. This pattern indicates that as dissolved salts and organic pollution increase, oxygen availability tends to decline. Such relationships support the interpretation of anthropogenic contamination and nutrient enrichment in the lake.

Table 2. Correlation matrix of physicochemical parameters of Thorapalli Lake for 2016.

	TEMP	PH	COND.	TURB	TDS	CA	CHL	TA	SUL	NIT	PHOS	DO	COD	BOD
TEMP	1	.733	.242	.398	.335	.067	-.089	.002	-.718	.155	-.593	-.049	.262	.114
PH		1	-.082	.552	.196	.309	-.393	-.040	-.235	.104	-.478	.000	.581	.331
COND.			1	.269	.009	.343	.805	.749	-.126	-.101	.340	.465	-.142	-.096
TURBIDITY				1	-.116	.087	-.163	.266	.006	-.123	-.068	.353	.359	-.010
TOTAL HARDNESS						1	.316	.245	.273	-.033	-.043	.125	.526	.727
CHLORIDE							1	.778	.050	.034	.393	.113	-.386	-.034
TA								1	.247	-.197	.588	.245	-.253	-.078
SULPHATE									1	-.419	.512	.143	-.065	.116
NITRATES										1	-.403	-.359	.047	-.093
PHOSPHATE											1	.350	-.390	-.320
COD													1	.766
BOD														1

IV. DISCUSSION

The observed variation reflects both natural seasonal cycles and human-induced disturbance. Higher conductivity and TDS in several months suggest concentration of dissolved ions during dry periods and contamination from runoff or wastewater inputs. Elevated alkalinity and chloride are also consistent with catchment influence from domestic and agricultural sources. These changes indicate that the lake is not functioning as a stable, uncontaminated freshwater system.

Low dissolved oxygen values in certain months are ecologically important because oxygen depletion often signals organic pollution and eutrophication. The simultaneous presence of elevated BOD and COD in some months supports this interpretation. Phosphate enrichment is especially concerning because phosphorus can stimulate algal growth and accelerate degradation of lake health. Together, these results suggest moderate pollution stress and reduced ecological resilience.

The draft's correlation matrix further supports this interpretation, particularly the negative relationship between dissolved oxygen and several pollution-related variables. Such patterns are typical of water bodies affected by untreated sewage, runoff, and decomposing organic matter. The lake may still support limited uses such as irrigation or aquaculture under proper management, but it is not appropriate for direct drinking without treatment.

V. CONCLUSION

Thorapalli Lake showed significant seasonal variation in water quality during 2016, with several indicators reflecting pollution stress. Elevated conductivity, TDS, nutrients, BOD, and COD, together with

episodically low dissolved oxygen, suggest influence from runoff and anthropogenic discharge. The lake should be monitored regularly, and pollution-control measures should be implemented to reduce nutrient loading and protect ecological function.

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