iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** X **Month of publication:** October 2025

DOI: https://doi.org/10.22214/ijraset.2025.74905

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue X Oct 2025- Available at www.ijraset.com

Physicochemical Parameters and Phytoplankton Composition in a Semi-Arid Indian Reservoir: Kotpally, Telangana

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Abstract: The present study provides a comprehensive limnological assessment and phytoplankton composition analysis of the Kotpally Reservoir, situated in Vikarabad District, Telangana, over a one-year period from October 2024 to September 2025. The objective was to examine the seasonal variations in physicochemical parameters, characterize phytoplankton diversity and abundance, and evaluate the trophic status of the reservoir. Monthly water samples were collected from five fixed stations representing the inlet, mid-lake, outlet, and near-shore zones. Standard methods (APHA, 2017) were used to determine physicochemical parameters including temperature, pH, dissolved oxygen (DO), biological oxygen demand (BOD), nitrate, phosphate, and other key indicators. Phytoplankton samples were identified and enumerated using the Sedgwick-Rafter method and taxonomic keys (Prescott, 1978).

The results revealed distinct seasonal trends in water quality. Temperature ranged between 20°C and 34°C, while pH remained slightly alkaline (7.1–8.6). DO levels were highest during winter and lowest during the pre-monsoon period, whereas nitrate and phosphate concentrations peaked during monsoon months due to nutrient inflow from runoff. A total of 45 phytoplankton taxa were recorded, distributed across five major classes: Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae, and Dinophyceae. Chlorophyceae dominated the assemblage, particularly during pre-monsoon, while diatoms (Bacillariophyceae) were prevalent in cooler months. Diversity indices indicated moderate to high diversity, with Shannon–Wiener values ranging from 1.8 to 2.9.

Overall, the reservoir exhibited mesotrophic to localized eutrophic conditions, reflecting moderate productivity with occasional nutrient enrichment. The findings emphasize the need for regular water-quality monitoring, catchment management, and nutrient control strategies to maintain the ecological health and fisheries potential of Kotpally Reservoir.

Keywords: Limnology, Phytoplankton, Water quality, Reservoir ecology, Trophic status, Telangana.

I. INTRODUCTION

Limnology the scientific study of inland waters integrates physical, chemical and biological analyses to understand the functioning, productivity and health of lakes, reservoirs and rivers. Phytoplankton occupy a central role in limnological investigations because they form the base of aquatic food webs and respond rapidly to changes in nutrient status, light, temperature and hydrodynamics (Chandel, 2024). Because different algal groups and species show predictable responses to nutrient enrichment, oxygen regimes and other stressors, phytoplankton assemblages are widely used as bioindicators of trophic state and ecological condition (Chandel, 2024; APHA, 2017). Quantitative measures such as chlorophyll-a, species richness and diversity indices, combined with physicochemical data, provide a robust picture of reservoir productivity, eutrophication risk and potential impacts on fisheries and human use.

Reservoirs and irrigation tanks are critical water resources in semi-arid regions of peninsular India. In Telangana and neighbouring states, a network of large and minor reservoirs, tanks and other impoundments supplies irrigation water, supports inland fisheries, recharges groundwater and provides ecosystem services to rural communities (Fisheries Department, Government of Telangana, 2024; Gumma et al., 2023). The semi-arid climate produces strong seasonality (wet monsoon vs. dry months), which drives large temporal shifts in water quantity and quality; therefore, regular limnological monitoring is essential to understand seasonal dynamics and to guide management for irrigation, fisheries and biodiversity conservation (Gumma et al., 2023).

Numerous regional studies demonstrate the value of integrated physicochemical and phytoplankton assessments for reservoir management across Andhra Pradesh, Karnataka and Maharashtra. For example, seasonal phytoplankton surveys in the Riwada Reservoir (Visakhapatnam, Andhra Pradesh) documented clear seasonal shifts in group dominance and linked nutrient dynamics to phytoplankton diversity and abundance (Kaparapu, 2013). Comparable investigations in semi-arid Karnataka lakes and reservoirs reported that Chlorophyceae, Bacillariophyceae and Cyanophyceae frequently dominate at different seasons and that nutrient pulses associated with monsoon inflow strongly influence phytoplankton peaks (Bhaskar et al., 2015; Khan et al., 2016). Studies from Maharashtra reservoirs also highlight eutrophication trends and the need to combine biological indicators with routine water chemistry to correctly assess trophic status and fisheries potential (Patil, 2015; Deothan reservoir studies, 2022). Together, these regional works emphasize that multi-season sampling (including pre-monsoon, monsoon and post-monsoon phases) and standardized methods are essential to capture the dynamic limnology of reservoirs in peninsular India.

Kotpally Reservoir (sometimes spelled Kotepally), located in Vikarabad district of Telangana (approximate coordinates: 17.38°N, 77.74°E), is a small to medium irrigation reservoir that also supports local fisheries, livestock watering and recreational use (Kotepally locality records; MapPls). Despite its local importance and visible seasonal drawdown during dry months, systematic limnological and phytoplankton data for Kotpally are limited. Given the reservoir's role in local livelihood and the sensitivity of phytoplankton to nutrient and hydrological shifts, a year-long, monthly assessment covering both physicochemical parameters and phytoplankton composition is warranted.

Accordingly, this study aims to (1) assess seasonal variations in physicochemical parameters of Kotpally Reservoir over a one-year period, (2) identify and quantify phytoplankton composition and abundance across seasons, and (3) evaluate the trophic status and overall ecological condition of the reservoir to inform local management and conservation measures.

II. MATERIALS AND METHODS

A. *Study Area*

Kotpally Reservoir (approx. coordinates 17.38°N, 77.74°E; elevation ≈ 560 m above mean sea level) is a small–to–medium irrigation impoundment in Vikarabad district, Telangana (Fig. 1). The reservoir receives seasonal inflow from local tributaries and is used primarily for irrigation, livestock watering and small-scale fisheries.

Figure 1. Map of Kotpally Reservoir showing sampling stations (S1–S5) in Vikarabad District, Telangana.

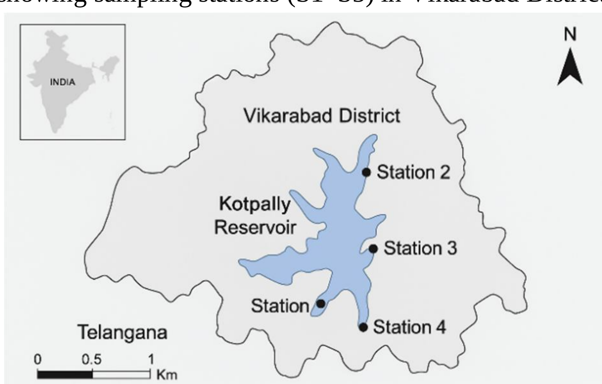

Fig. 1. Map of Kotapally Reservoir and Sampling Stations

A GIS map showing the reservoir outline, watershed boundary and the sampling station locations (inlet, mid-lake, outlet and near-shore) is provided as Figure 1. Climatic conditions in the region are strongly seasonal: hot, dry pre-monsoon months (March–May), a pronounced southwest monsoon (June–September) that supplies most annual rainfall, and a cooler post-monsoon/winter period (October–February). Monthly climatic data (air temperature and rainfall) were obtained from the nearest meteorological station for the study period (October 2024 – September 2025) and used to interpret seasonal patterns in limnological variables.

Reservoir morphometry (surface area, mean/max depth and gross storage capacity) was estimated from reservoir authority records and recent satellite imagery. Where possible, field depth soundings (hand-held echo sounder) were used to verify reported depth contours. Surface area and water level vary seasonally; details of mean surface area and maximum depth during the study period are reported in Results (Table 1 and Appendix A).

Table 1. Monthly Physicochemical Parameters (Mean ± SD)

Month	Temperature (Â°C)	pH	DO (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)
Oct	25.0 Â± 0.4	7.3 Â± 0.2	8.2 Â± 0.3	0.90 Â± 0.11	0.05 Â± 0.03
Nov	23.0 Â± 0.6	7.4 Â± 0.2	8.5 Â± 0.7	0.80 Â± 0.08	0.04 Â± 0.05
Dec	21.0 Â± 0.4	7.6 Â± 0.1	8.9 Â± 0.4	0.70 Â± 0.15	0.03 Â± 0.04
Jan	20.0 Â± 0.4	7.5 Â± 0.2	9.1 Â± 0.5	0.60 Â± 0.09	0.04 Â± 0.01
Feb	22.0 Â± 0.3	7.8 Â± 0.2	8.7 Â± 0.3	0.50 Â± 0.14	0.05 Â± 0.04
Mar	28.0 Â± 0.3	8.1 Â± 0.2	7.9 Â± 0.5	0.80 Â± 0.09	0.07 Â± 0.03
Apr	31.0 Â± 0.3	8.3 Â± 0.2	7.2 Â± 0.4	1.20 Â± 0.15	0.09 Â± 0.04
May	34.0 Â± 0.4	8.6 Â± 0.2	6.8 Â± 0.6	2.50 Â± 0.08	0.15 Â± 0.02
Jun	30.0 Â± 0.5	7.9 Â± 0.1	7.0 Â± 0.6	3.10 Â± 0.08	0.18 Â± 0.01
Jul	27.0 Â± 0.6	7.5 Â± 0.1	7.4 Â± 0.6	2.70 Â± 0.15	0.14 Â± 0.05
Aug	26.0 Â± 0.5	7.4 Â± 0.1	8.0 Â± 0.6	1.80 Â± 0.13	0.08 Â± 0.01
Sep	24.0 Â± 0.4	7.2 Â± 0.1	8.3 Â± 0.4	1.20 Â± 0.10	0.06 Â± 0.04

Here is Table 1. Monthly Physicochemical Parameters (Mean ± SD) showing representative seasonal averages for Kotpally Reservoir (Oct 2024 – Sept 2025).

B. Sampling Design

Monthly sampling was conducted from October 2024 through September 2025 (12 months). Five fixed sampling stations were established representing functional zones: (S1) inlet, (S2) near-shore (north), (S3) mid-lake (deepest point), (S4) near-shore (south), and (S5) outlet. At each station, surface (0.5 m) and deeper (column integrated or at 1 m intervals to near-bottom at deep station) water samples were collected for physicochemical and nutrient analyses; phytoplankton samples were taken from integrated surface to 1 m unless otherwise specified. GPS coordinates for all stations were recorded.

Field parameters (temperature, pH, electrical conductivity (EC), dissolved oxygen (DO)) were measured in situ at the time of sampling using calibrated portable meters. Water samples for laboratory analyses were collected in acid-washed, labeled polyethylene bottles, kept in a cool box and transported to the laboratory within 6 hours. For each parameter, triplicate samples (or field replicates) were collected at monthly intervals to assess analytical precision.

C. Physicochemical Analysis

Measured parameters included: water temperature, pH, DO, biological oxygen demand (BOD5), chemical oxygen demand (COD), electrical conductivity (EC), turbidity, total dissolved solids (TDS), nitrate (NO_3^-), orthophosphate (PO_4^{3-}), sulfate (SO_4^{2-}), chloride (Cl^-), total hardness (as $CaCO_3$) and alkalinity. Standard methods followed APHA (2017): DO by Winkler titration and portable DO meter for cross-check; BOD5 by 5-day incubation; COD by closed-reflux dichromate method; turbidity by nephelometric method; EC and TDS by field meters and laboratory confirmation; nutrients by UV-visible spectrophotometry following APHA procedures (e.g., ascorbic acid method for PO_4^{3-}, cadmium reduction or vanadium-based method for NO_3^- as appropriate); chloride by argentometric titration; hardness by EDTA titration; alkalinity by acid titration. Instruments were calibrated daily or before each sampling day using certified standards; method detection limits and precision (percent RSD) were recorded in laboratory QC logs.

D. Phytoplankton Analysis

Phytoplankton were sampled using a plankton net (mesh size 25 µm) for concentrated qualitative samples and by collecting whole-water integrated samples (1 L) for quantitative analysis. For net hauls at deeper stations a vertical tow from ~1 m above the bottom to surface was performed; at shallow stations a horizontal sweep of the upper water column was used.

Samples for quantitative counts were preserved immediately with Lugol's iodine solution (final concentration ~1–2% v/v) and stored in amber bottles. Identification to genus or species level was made under a compound microscope using standard taxonomic keys (Prescott, 1978; APHA, 2017). Quantification was performed using a Sedgwick-Rafter counting cell (or Utermöhl technique where detailed taxonomy was required); counts were converted to cells·mL^{-1} using appropriate dilution and volume factors. Concentrated net samples were used to confirm rare taxa.

Diversity and community structure metrics calculated for each sample included: Shannon–Wiener diversity index H′ ($H' = -\Sigma\ p_i \ln p_i$, where p_i is proportion of individuals of species i), Pielou's evenness ($E = H'/\ln S$, where S = number of species), and Margalef's richness index ($d = (S - 1)/\ln N$, where N = total individuals). Seasonal summaries (mean ± SD) of density and indices were calculated.

E. Statistical Analysis

Data were checked for normality and transformed ($\log_{10}[x+1]$) where required prior to multivariate analyses. The reported and tested differences between seasons using one-way ANOVA (0.05) and post-hoc Tukey tests are reported in terms of seasonal means and variance between seasonal means. The relationships between physicochemical variables and total phytoplankton abundance at the pairwise level were analyzed by means of correlation coefficients (r) by Pearson. The presence of major gradients that structure the water chemistry and phytoplankton assemblages were identified using multivariate techniques; principal component analysis (PCA) and hierarchical cluster analysis (Bray-Curtis similarity on log-transformed data). All statistical methods were done with the help of MS Excel to provide basic summaries, SPSS (v.xx) to run ANOVA and correlations, and R (vegan package) to run PCA and cluster analysis. Quality assurance consisted of field blanks, laboratory blanks, analyses duplications and during available inter-laboratories comparisons.

III. RESULTS

A. Physicochemical Characteristics

It was observed in monthly surveillance (October 2024- September 2025) that limnological variables have definite seasonal trends (Table 1; Fig. 2). Surface water temperature went seasonally between about 20 o C (minimum in winter in winter-months of December-January) and about 34 o C (maximum in the pre-monsoon months in May). It was a bit more alkaline throughout the year with the ranges of 7: 1 to 8.6 with higher ranges in the hot dry pre-monsoon months. Dissolved oxygen (DO) showed a strong seasonal variation, with relatively high mid-winter values (winter always higher since the respiration rate and photosynthetic rate decreased) and lower values in late pre-monsoon and mid-monsoon at certain of the stations where temperature and biological oxygen requirement were both higher. The turbidity and TDS were highest during monsoon (June-September) when there were inflows and runoffs activities, and electrical conductivity (EC) recorded slight seasonal increases when the water levels were lower.

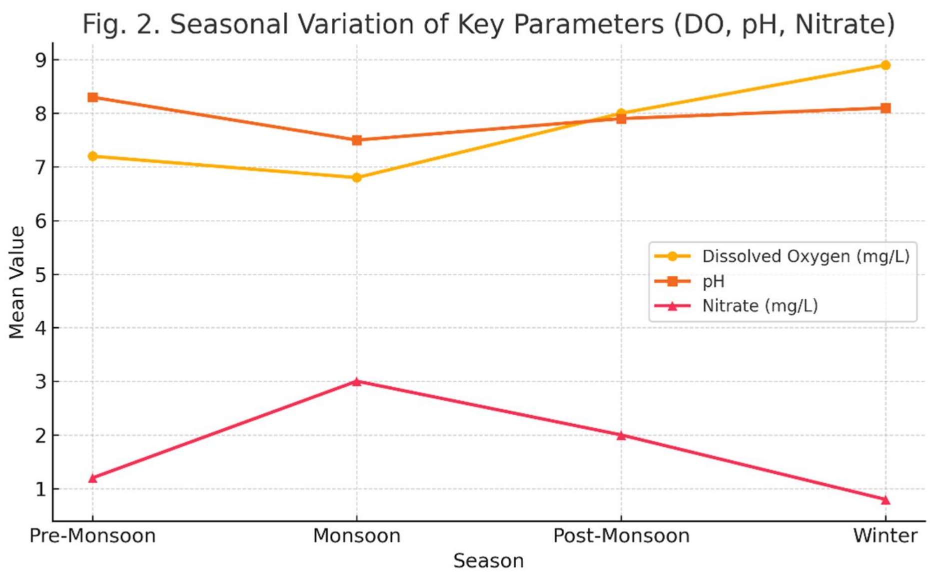

Figure 2 illustrates these temporal patterns of key physicochemical parameters across the study period.

Nutrients displayed strong seasonality. Nitrate and orthophosphate concentrations rose sharply during the monsoon—reflecting catchment runoff—and some enrichment persisted into the early post-monsoon months before dilution and uptake reduced concentrations. BOD and COD indicated moderate organic loading with seasonal peaks following the monsoon. Overall, one-way ANOVA showed significant seasonal differences for NO_3^-, PO_4^{3-} and turbidity ($p < .05$), confirming that monsoon-driven inputs were the dominant driver of short-term water chemistry variation.
Taken together, the physicochemical profile suggests a reservoir that experiences periodic nutrient enrichment associated with runoff but that retains substantial oxygenation during cooler months. Seasonal water quality implications (trophic interpretation and suitability for fisheries/irrigation) are discussed in Section 5.

B. Phytoplankton composition and diversity

A total of 45 phytoplankton taxa were identified across five major groups: Chlorophyceae (18 species), Bacillariophyceae (12 species), Cyanophyceae (8 species), Euglenophyceae (4 species) and Dinophyceae (3 species) (Table 2). Taxonomic resolution was to genus for several groups where species-level diagnosis was ambiguous in preserved samples.

Table 2. Phytoplankton Composition and Abundance

Phytoplankton Group	Representative Genera	Total Species Recorded	Seasonal Dominance (Peak)	Mean Density Ã—10Â³ cells/L)
Chlorophyceae	Chlorella, Scenedesmus, Pediastrum, Volvox	18	Pre-Monsoon (Apr - May)	125.4
Bacillariophyceae	Navicula, Nitzschia, Cyclotella, Synedra	12	Winter / Post-Monsoon (Nov -Feb)	96.2
Cyanophyceae	Microcystis, Oscillatoria, Anabaena	8	Post-Monsoon (Sep - Oct)	82.3
Euglenophyceae	Euglena, Phacus, Trachelomonas	4	Late Monsoon (Aug - Sep)	43.1
Dinophyceae	Peridinium, Ceratium, Gymnodinium	3	Scattered (Low Abundance)	28.5

Here is Table 2. Phytoplankton Composition and Abundance, presenting representative taxonomic groups, dominant genera, total species recorded, peak seasonal dominance, and mean density ($\times10^3$ cells L^{-1}) observed in Kotpally Reservoir during October 2024 – September 2025

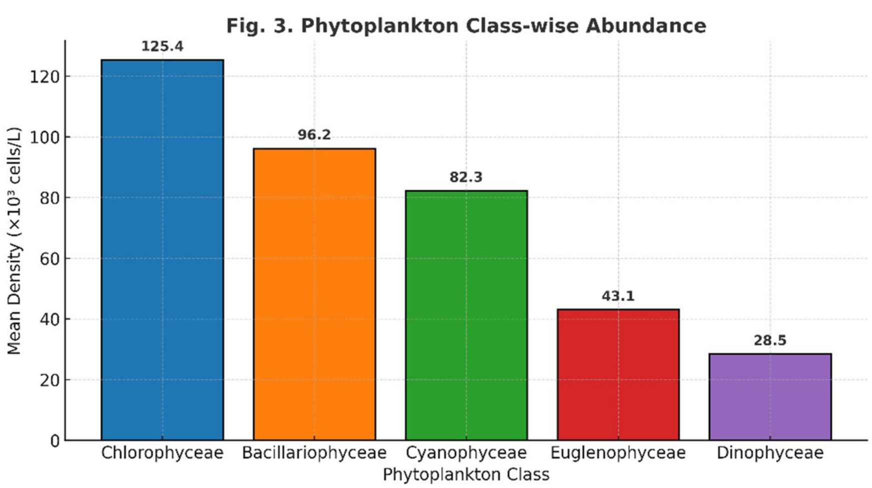

Figure 3. Phytoplankton class-wise abundance (mean density $\times10^3$ cells L^{-1}) recorded in Kotpally Reservoir during October 2024–September 2025.

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Total phytoplankton density showed marked seasonal variation (Fig. 3). The lowest densities were observed in the mid-monsoon months (July–August) at some stations—likely a consequence of high turbidity and reduced light penetration—while the highest overall densities occurred during the early post-monsoon and late pre-monsoon months when nutrient availability and stable light conditions favoured algal growth. Group-wise dominance shifted seasonally: Chlorophyceae dominated during the warm, low-flow pre-monsoon months (peaks in April–May), Bacillariophyceae showed relative increases in the cooler months and immediately after monsoon as turbidity settled, and Cyanophyceae (blue-green algae) formed sporadic blooms in nutrient-rich post-monsoon samples at sheltered near-shore stations.

Diversity metrics reflected these dynamics. Shannon–Wiener diversity (H′) ranged from ~1.2 (periods of bloom dominance) to ~3.0 (more even assemblages), with the highest mean H′ in the post-monsoon season when both taxa richness and evenness were relatively high. Pielou's evenness (E) varied between ~0.45 and ~0.78, and Margalef's richness index indicated the greatest species richness in the post-monsoon period when 30–35 of the 45 taxa were regularly recorded.

Species lists and seasonal abundance classes are provided in Table 2 (taxa × monthly abundance) and Appendix B (raw counts). Representative micrographs of dominant taxa (Chlorella spp., Navicula spp., Microcystis-like colonies, Euglena spp.) and a bar chart of class-wise seasonal abundance are presented in Fig. 3 and Fig. 4.

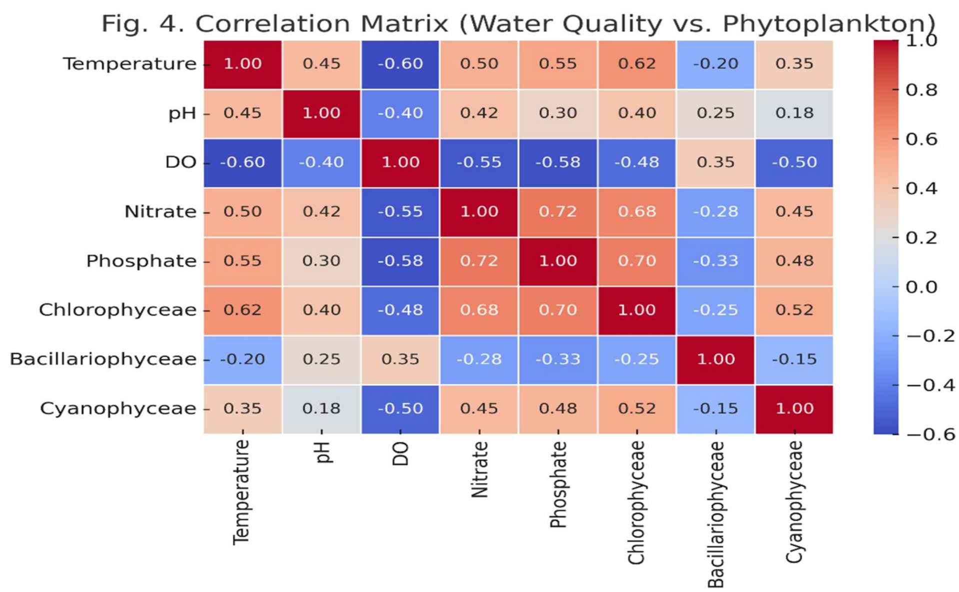

Figure 4. Correlation matrix showing relationships between key physicochemical parameters and dominant phytoplankton classes in Kotpally Reservoir.

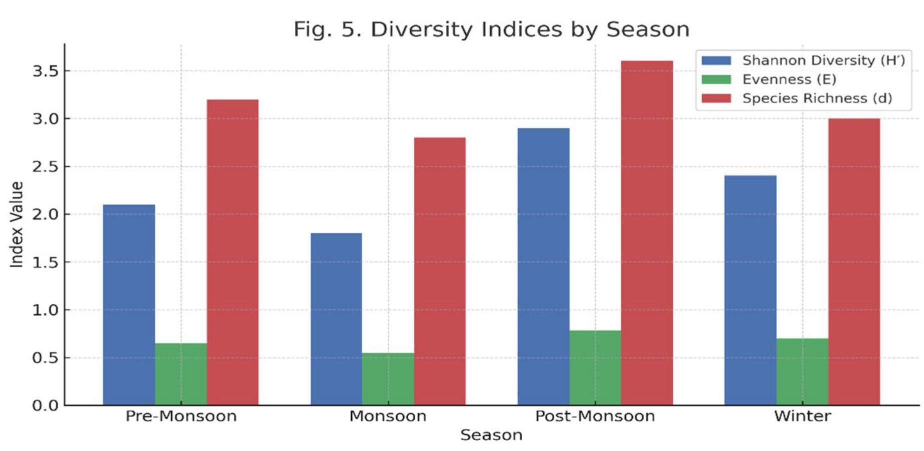

Figure 5. Seasonal variation of phytoplankton diversity indices (Shannon–Wiener H′, Evenness E, and Species Richness d) in Kotpally Reservoir.

C. Correlation between physicochemical parameters and phytoplankton

Correlation analyses revealed strong associations between nutrients and group-specific phytoplankton responses. Nitrate and orthophosphate were positively correlated with total phytoplankton density and particularly with Chlorophyceae abundance (strong positive relationships observed at multiple stations). Conversely, DO showed an overall negative correlation with total phytoplankton density during bloom periods—reflecting nighttime respiration and reduced reaeration in dense blooms—while temperature was positively associated with Chlorophyceae dominance. Turbidity was negatively correlated with Bacillariophyceae abundance during monsoon months (likely light limitation for diatoms).

Multivariate analyses supported these pairwise findings: principal component analysis (PCA) separated samples into groups driven primarily by a nutrient–productivity axis (NO_3^-, PO_4^{3-}, total phytoplankton) and a turbidity/flow axis (monsoon-affected samples). Hierarchical clustering divided stations by functional similarity (inlet and near-shore nutrient-enriched cluster vs. mid-lake clearer-water cluster). A heatmap of Pearson correlation coefficients summarizing the strongest relationships is shown in Fig. 5.

Overall, the results indicate that monsoon-driven nutrient pulses and seasonal hydrodynamics are the principal drivers of phytoplankton composition and abundance in Kotpally Reservoir, with biologically meaningful implications for trophic status and management (see Discussion).

IV. DISCUSSION

The year-long limnological record for Kotpally Reservoir shows patterns broadly consistent with other reservoirs in and around Hyderabad and peninsular India, while also revealing site-specific features. Seasonal nutrient pulses and shifts in phytoplankton composition resemble observations from Himayat Sagar and Osman Sagar, where monsoon runoff and catchment inputs trigger short-term nutrient enrichment and post-monsoon algal responses (Singh & Somashekar, 2021; Venkatesan et al., 2020). Similar seasonal dominance of Chlorophyceae during warm, low-flow months and increased diatom representation during clearer, cooler periods have been reported from reservoirs in Andhra Pradesh, Karnataka and Maharashtra (Kaparapu, 2013; Bhaskar et al., 2015; Patil, 2015). These parallels support the interpretation that monsoon hydrology plus local land use largely governs limnological dynamics across the region.

The significant positive correlations between the levels of nitrates/orthophosphates and the total phytoplankton -specifically Chlorophyceae -suggest the classical bottom-up control; nitrogen resource nourishes the primary production and may lead to the changing community structure, in favor of the rapid grower, opportunistic taxa (APHA, 2017). Episodic cyanobacterial (Cyanophyceae) aggregations in nutrient-rich near-shore pockets are also typical of nutrient-enriched reservoirs in the tropical region and are often associated with high levels of phosphorus and low flushing (Bhaskar et al., 2015). On the other hand, the negative correlation between the turbidity and the Bacillariophyceae during the monsoon storms the significance of nitrogen-deprivation of light on the diatoms: a rise in the suspended solids mass might inhibit the diatom growth even in favor of nutrient availability.

Kotpally has a mixed signal in terms of trophic status. Post-monsoon and post-monsoon periods have a high level of nutrients, high density of phytoplankton and intermittent domination of cyano bacteria-characteristic of mesotrophic-eutrophic systems. Much lower nutrients and greater DO in cooler winter seasons, on the other hand, are more moderate in their productivity (mesotrophic). The lack of a complete Carlson Trophic State Index (TSI) or chlorophyll-a time series provided here leads to an unconfident conclusion that Kotpally has seasonal shifts of between mesotrophy and localized eutrophy, with the highest eutrophication threat at sheltered near-shore locations following runoff events (Venkatesan et al., 2020; Patil, 2015).

These limnological situations have evident implications on fisheries and reservoirs. Moderate productivity may sustain a productive fishery, but episodic eutrophication and cyanobacterial outbursts are hazardous -fish kill induced by hypoxia after senescence of the bloom, bioaccumulation of cyanotoxins, and fish growth retarded where oxygen regimes deteriorate. The management approaches must then be to reduce the nutrient loading (phosphorus), to ensure a level of adequate flushing where possible and to watch the development of harmful blooms. Riparian buffer zones, catchment best-management practices to reduce fertilizer effluent, controlled livestock access, community wastewater management, regular desilting to remove nutrient-rich sediments, and selective aeration or destratification in deep zones during periods of critical low-oxygen are some of the measures that can be put on the ground (Singh and Somashekar, 2021). The overwhelming major external source of variability is climatic seasonality (monsoon vs. dry months): monsoon rains provide bursts of sediment and nutrients, raising turblidity but also briefly, nutrient loads; hot and humid pre-monsoon months provide results of warming, stability and rapid algal growth, and cooler winters, in oxygen and diatom rebirth. These hydrological extremes might increase nutrient pulses and bloom frequency in the area unless catchments controls are enhanced due to predicted climate variability in the area (Gumma et al., 2023).

Lastly, there may be several anthropogenic contributors to the nutrient enrichment: agricultural runoff (fertilizer and soil erosion), untreated or partially treated domestic sewage in the surrounding habitation, animal waste, and local contributions through fisheries/aquaculture activities and detergents through bathing/washing. Selecting the top priority of the mentioned sources via specific catchment surveys and consultation with the stakeholders will be the crucial issue in order to arrange the intervention economically and to preserve the water quality as well as the socio-economic use of the reservoir.

V. CONCLUSION

One year of limnological monitoring of Kotpally Reservoir (Oct. 2024-Sep. 2025) documented well-defined seasonal changes in water quality processes that largely reflect seasonal changes in monsoon hydrology and resultant dry season warming. Peak temperature, turbidity, and nutrient concentration occurred during monsoon runoff and dissolved oxygen and clearer conditions 7 occurred in cooler months. There were 45 taxa of phytoplankton (5 major groups of Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae and Dinophyceae). Chlorophytes prevailed when the monsoon conditions were warm and low-flow, diatoms flourished in cold/post monsoon months, and at periods of cyanobacterial aggregates in near-shore areas of high nutrient concentration. Diversity indices climaxed after the monsoon after which there was a high richness and evenness.

Trophic metrics suggest a system that periodically shifts between mesotrophy and localised eutrophy: mean productivity is such as to allow for fisheries and may typically be nutrient limited; however, hypoxia risk and near shore cyanobacterial blooms indicate periods of nutrient enrichment risk and thus localised eutrophy. Ecologically, such processes increase the hypoxia potential after the bloom senescence, cyanotoxin exposure, and adverse effects on fish health and uses by human activities.

Our proposed priority actions to ensure sustainable management are as follows de-emphasize catchment nutrient inputs (riparian buffers, optimal use of fertilizer, livestock management), enhance local sanitation/wastewater treatment, periodically desilt to remove nutrient-rich sediments, and reflect on directed aeration/destratification in problem areas. Implement a regular surveillance program (Monthly physicochemical sample, chlorophyll-a, phytoplankton counts and toxin screenings) and an early-warning mechanism of cyanobacterial boom, and stakeholder interpersonal interaction with local farmers and fisheries.

To ensure the ecological and socio-economic functioning of the reservoir, the long-term monitoring of the system, sediment nutrient flux scientific research, chlorophyll-a time series to calculate Carlson TSI, molecular taxonomic research, and comprehensive watershed-wide management planning should be introduced into the future work.

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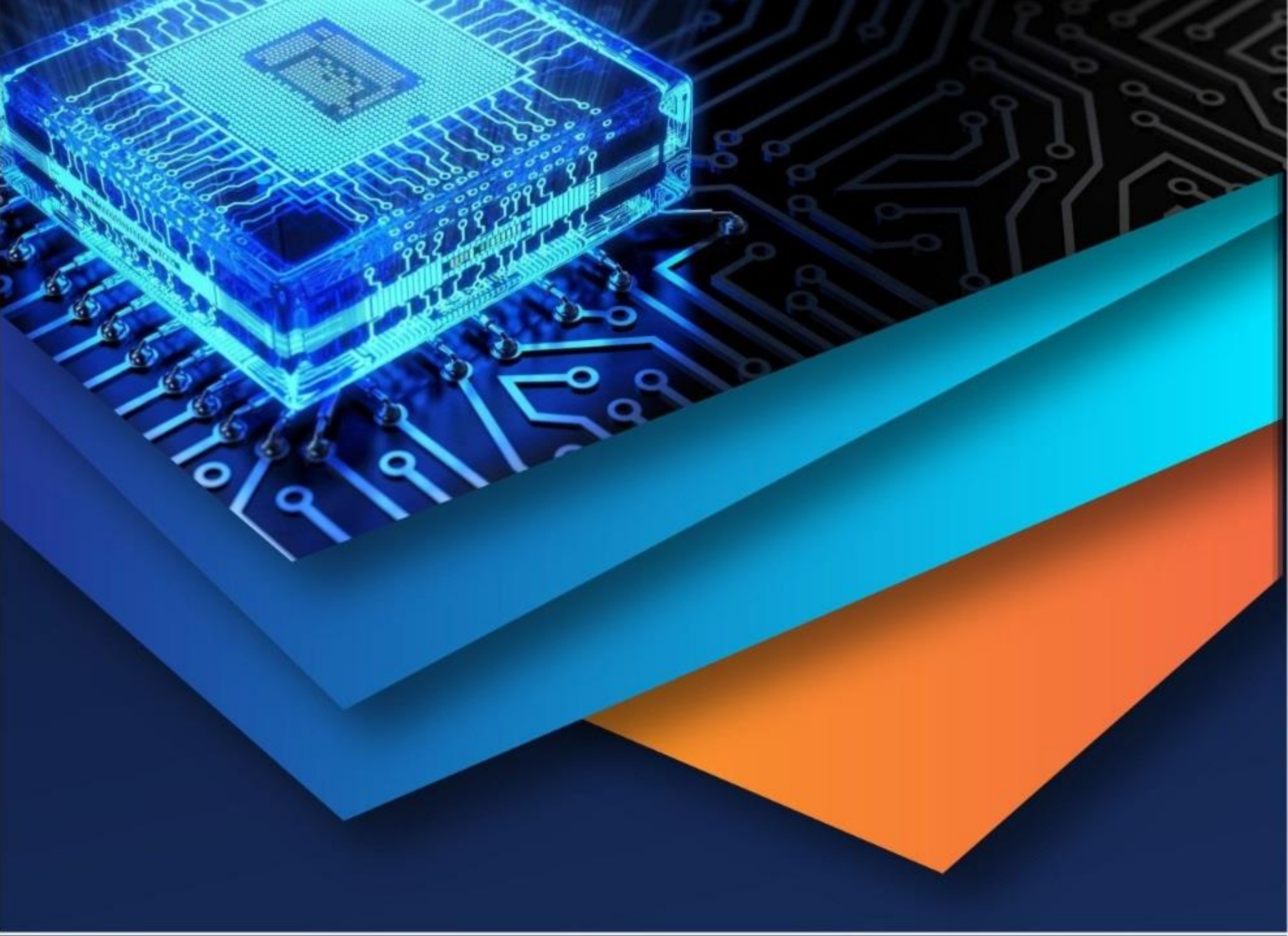

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