Seasonal Evaluation of Phytoplankton Diversity in Kalki Cheruvu, Kamareddy District, Telangana, India

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ABSTRACT

Kalki Cheruvu, a freshwater lake in Kamareddy district of Telangana, exhibits a diverse community of phytoplankton. The present investigation was carried out to assess seasonal variation in phytoplankton diversity and to examine how environmental parameters influence their distribution. Sampling was conducted at four different sites across the summer, rainy and winter seasons. The analysis revealed 27 phytoplankton species, categorized into four major taxonomic classes: Chlorophyceae, Cyanophyceae, Bacillariophyceae, and Euglenophyceae. Seasonal dominance varied: Cyanophyceae prevailed in winter, Chlorophyceae and Euglenophyceae were more prominent in summer, while Bacillariophyceae dominated during the rainy season. Environmental parameters such as temperature, pH, and alkalinity played a significant role in determining the community structure.

Keywords: Phytoplankton, Seasonal variation, Water quality, Kalki Cheruvu, Biodiversity.

1. Introduction

Freshwater bodies such as lakes and reservoirs are dynamic systems influenced by multiple environmental factors. (1) Phytoplankton, being primary producers, are essential components of aquatic ecosystems. Their composition and abundance are sensitive indicators of environmental changes and water quality Alterations in the physical, chemical, and biological characteristics of the aquatic environment are shown in the variations of phytoplankton populations. (2) This study examines the phytoplankton diversity of Kalki Cheruvu throughout the year and analyzes how environmental variables affect their abundance.

2. Materials and Methods

2.1 Study Area

Kalki Cheruvu is located in Banswada town of Kamareddy district, Telangana (17° 25 '15.8"N, 78° 5' 16.2" E). It is a key freshwater resource for the local population.

2.2 Sampling Protocol

At regular intervals throughout the year, beginning at around 8:30 a.m., clean 1-liter polythene containers were used to collect water samples. During the summer, rainy, and winter seasons, samples were taken from surface and subsurface strata at four specific sites. Over the course of a year, from 2023 to 2024, samples were taken.

2.3 Phytoplankton Collection and Preservation

Plankton nets with mesh size of 105 μm were used to concentrate phytoplankton from the collected water samples. After settling for 24 hours, the concentrated samples were stored with 5 ml of formalin. We kept the amount of sediment (~10 ml) for examination and decanted the supernatant.

2.4 Identification and Enumeration

Species identification was carried out using standard taxonomic literature including works by Desikachary. (3,4,5,6) Enumeration was performed using Sedgwick-Rafter counting cells, and phytoplankton density was estimated using the drop count method described by Pearsall (7).

3. Results and Discussion

Chlorophyceae, Cyanophyceae, Bacillariophyceae, and Euglenophyceae are the four groups of algae that were identified in this study. Every single observation belongs to the chlorophyceae class. The Cyanophyceae were second, the Bacillariophyceae were third, and the very small number of algal members found in the Euglenophyceae group made them the least prominent.

3.1 Seasonal Distribution

Cyanophyceae and *Chlorophyceae* dominate in summer. *Bacillariophyceae* and *Euglenophyceae* were prevalent during winter.

3.2 Trends in Population Fluctuation

A progressive increase in phytoplankton count was noted from April , reaching a peak in May, followed by a decline towards July. *Cyanophyceae* and *Chlorophyceae* peaked in May, *Bacillariophyceae* and *Euglenophyceae peaked in January* . These fluctuations highlight the influence of seasonal climatic and nutrient conditions, supporting(8,9,10,11) model of periodic dominance.

Identified algal list during one year investigation period as shown below
Identified genera and species belong to chlorophyceae.

- *Ankistrodesmus spiralis Ralfs, Chara vulgaris*
- *Chlamydomonas globosa J.w. Snow, C. polypyrenoideum Prescott*
- *Chlorella ellipsoida Gerneck,C. vulgarisM.W.Beijerinck*
- *Cladophora oligoclona Kuetz, C. glomerata (L.)Kutz*
- *Closterium acutum (Lyngby) Bb, & Ralf,C. decorum Breb*
- *Coleochaete orbicularis Prindsheium*
- *Cosmarium portianum W.Archer, C. depressum P.Lundell,C. cucumis Corda*
- *Cylindrocystis brebissonii Menegh,*
- *Cylindrocapsa geminelle var. minor Hansgirg*
- *Dactylococcus bicaudatus* A.Br. *West*
- *Eudorina elegans Her,E. illinoinensis Pascher*
- *Golenkinia paucispina West&West*
- *Gonium sociale Warming D.*
- *Hydrodictyon reticulatum L.*
- *Microspora tumidula Hazen*
- *Oedogonium gigantinum Kutzing, O. globosum Nordstedt, O .princeps Wittrock*
- *Oocystis solitaria Wittr*
- *Pediastrum angulosum(Her) Menegh, P. duplex Meyen, P. Simplex Meyen*
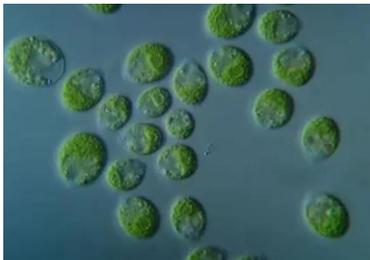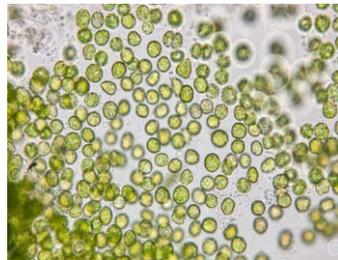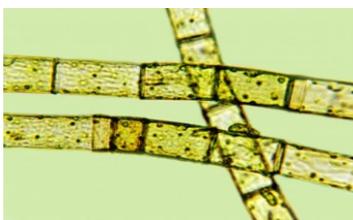

1. Chlamidomonas globosa   *2. Chlorella ellipsoida*
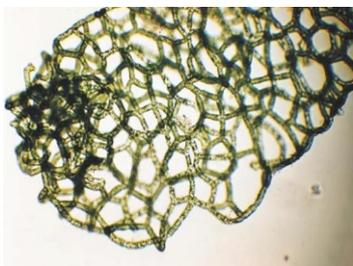
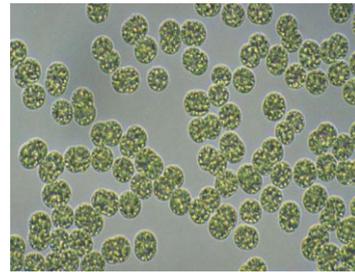*3. Hydrodictyon reticulatum*   *4. Microspora tumidula*


5. Oedogonium gigantinum   *6. Oocystis solitaria*
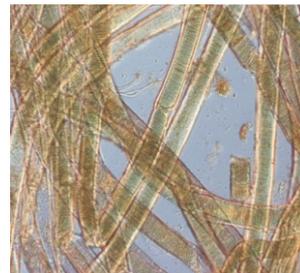
Identified Genera and Species belongs to Cyanophyceae

- *Aphanocapsa grevillei Rabenth,*
- *Aphanothece clathrata West&West,A.microscopica Nag.*
- *Chroococcus micrococcus Rabenhorst*
- *Gloecapsa atrata Kutz, G.punctata Nag*
- *Gloeotrichia ghosei Singh,G.natans Ag.*
- *Hydrococcus rivularis Kutzing*
- *Lyngbya majuscula (Dilwyn) Harvey*
- *Microcystis aeruginosa Kutz, M.robusta (Clark) Nygaard*
- *Nostoc sphaericum voucher,N.comminutum Kuetzing, N.punctiforme (Kuetz) Hariot*
- *N.spongiforme C.Agardh*
- *Oscillatoria acuta Bruhl, O.chalybea Mertens,*
- *O.limnosa Ag,O. princeps Vaucher*
- *Phormidium inundatum Kutz*
- *Scytonema subtie .simplex (Kutz)*
- *Spirulina gigantean Schmidle*
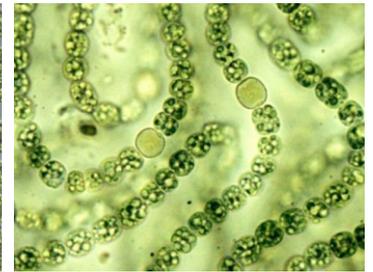
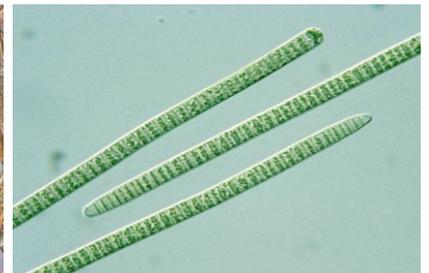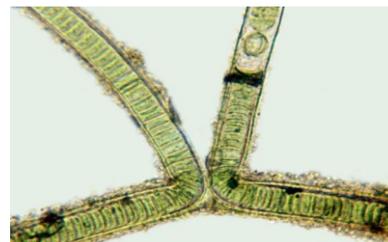*1. Microcystis aeruginosa*   *2. Nostoc sphaericum*

3. Lyngbya majuscula   *4. Oscillatoria acuta*


5. Scytonema subtie   *6. Spirulina gigantean*

Identified genera and species belong to Bacillariophyceae

- *Acanthes exigua Grun*
- *Amphora coffoeformis (Ag)Kustz*
- *Cyclotella meneghiniana Kutz*
- *Cymbella affinis Kutz,C.microcephala Grun*
- *Fragillaria crotonensis Kitton,F.ramboidis Ehrenb*
- *Gomphonema constructum Her,G.lanceolatum Ehr*
- *Melosera verians Ag.*
- *Navicula capitatoradiata Germain,.N.cuspidata Kutz,N.cryptocephala Kuetz*
- *N.radiosa Kutz*
- *Pinnularia abaujensis(Pant) Ross,P.biceps Greg.var.amphcephala*
- *Rhopalodia gibba (Ehrenb) O.Muller*
- *Synedra acus Kutzing*

1. Navicula capitatoradiata
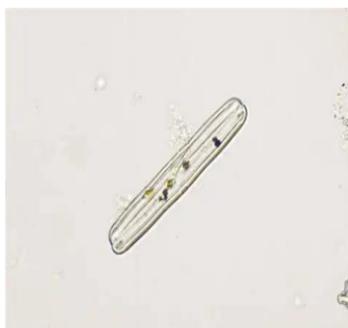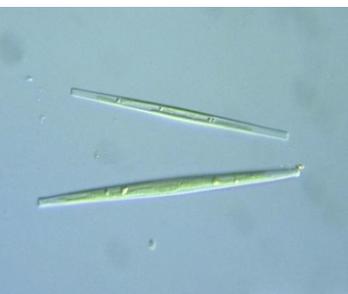

2. Pinnularia abaujensis

3. Amphora coffeaeformis

4. Cyclotella meneghiniana

5. Rhopalodia gibba

6. Synedra acus

Identified Species belongs to Euglenophyceae

- *Euglena acus Ehrenberg*
- *E. polymorpha Dangeard*

1. Euglena acus

2. Euglena polymorpha

4. Conclusion

The substantial seasonal change in Kalki Cheruvu's phytoplankton populations is highlighted by this research. The most prevalent class was Chlorophyceae, which was followed by Cyanophyceae and Bacillariophyceae. Euglenophyceae were less common. (12,13,14) The existence of taxa that are sensitive to contamination suggests that the lake is still comparatively clean and appropriate for aquaculture, agriculture, and residential use. Additionally, the research highlights how useful phytoplankton are as bioindicators for determining the ecological health of freshwater environments.

Identified Genera and Species belongs to Cyanophyceae

- *Aphanocapsa grevillei Rabenth,*
- *Aphanothece clathrata West &West,A.microscopica Nag.*
- *Chroococcus micrococcus Rabenhorst*
- *Gloecapsa atrata Kutz, G.punctata Nag*
- *Gloeotrichia ghosei Singh,G.natans Ag.*
- *Hydrococcus rivularis Kutzing*
- *Lyngbya majuscula (Dilwyn) Harvey*
- *Microcystis aeruginosa Kutz, M.robusta (Clark) Nygaard*
- *Nostoc sphaericum voucher,N.comminutum Kuetzing, N.punctiforme (Kuetz) Hariot*
- *N.spongiforme C.Agardh*
- *Oscillatoria acuta Bruhl, O.chalybea Mertens,*
- *O.limnosa Ag,O. princeps Vaucher*
- *Phormidium inundatum Kutz*
- *Scytonema subtie .simplex (Kutz)*
- *Spirulina gigantean Schmidle*

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