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# FRESH WATER PHYTOPLANKTONIC DIVERSITY IN MAHIL POND, JALAUN, U.P., INDIA

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## Abstract

Present study deals with the analysis of phytoplankton from fresh water body Mahil pond situated in Orai of Jalaun district, Uttar Pradesh India. The study revealed that total 31 species find out during investigation, belonging mainly from 3 families Cyanophyceae, Chlorophyceae and Bcillariophyceae. Our investigation showed that the water Mahil pond is highly eutrophic and organically polluted.

***Key words :*** Phytoplankton, diversity, pollution, freshwater pond.

## Introduction

Phytoplankton occurs in all-natural water as well as in man-made water ecosystem like pond, tanks, reservoirs etc. The planktonic study is a very useful tool for the valuation of water quality in any type of water body. As we know ponds an vital freshwater habitat which play an important role in maintaining biodiversity. Phytoplankton is of great importance as a major source of organic carbon located at the base (Gaikwad, *et al*., 2004).

Phytoplankton plays a vital role in ecosystem (Saha *et al.,* 2000). Habitat, quality specificity of the different members of phytoplankton is seems to be reflected in their distribution and occurrence in relation to water quality (Bhatt *et al.,*1999). In our country many ponds in their vicinity called as temple ponds which are polluted by human activity like dumping of waste materials, washing and bathing (Sridhar *et al.,* 2006). These condition effects the development of phytoplankton of ponds and leads towards the eutrophication.

Mahil pond is surrounded by a number of temples which is the major cause of pollution and effects the ecology of ponds. The purpose of the present study is to determine the distribution and density of phytoplankton population in the Mahil pond.

## Materials and Methods

### Study Area

The present study was carried out in Mahil pond of Orai district Jalaun, Uttar Pradesh, India. Orai is located between 25° 592 N latitudes and 79° 262 E longitudes on an average altitudes of 139 meters above mean sea level. The pond located on the south east part of Orai.

### Phytoplankton sampling and analysis

Sampling of water from the pond taken under study for phytoplankton analysis will be done in 1 litre glass from different stations of the study site. For preparation of the sample 10 ml Lugol's iodine will be added and to be allowed it to stand for 24 hrs. to ensure complete sedimentation and supernatant siphoned with the help of pipette to 10 ml (Adoni *et al.,* 1985).

The Phytoplankton will be enumerated by using drop count method. The concentrated sample to be shaken and one drop of the same to be put on a clean micro slide with the help of standard calibrated dropper. The drop is covered with a cover glass. The phytoplankton will then be counted under microscope and identified up to the genus level with the help of keys and monographs.

The number of organisms will be calculated per litre by using following formula:

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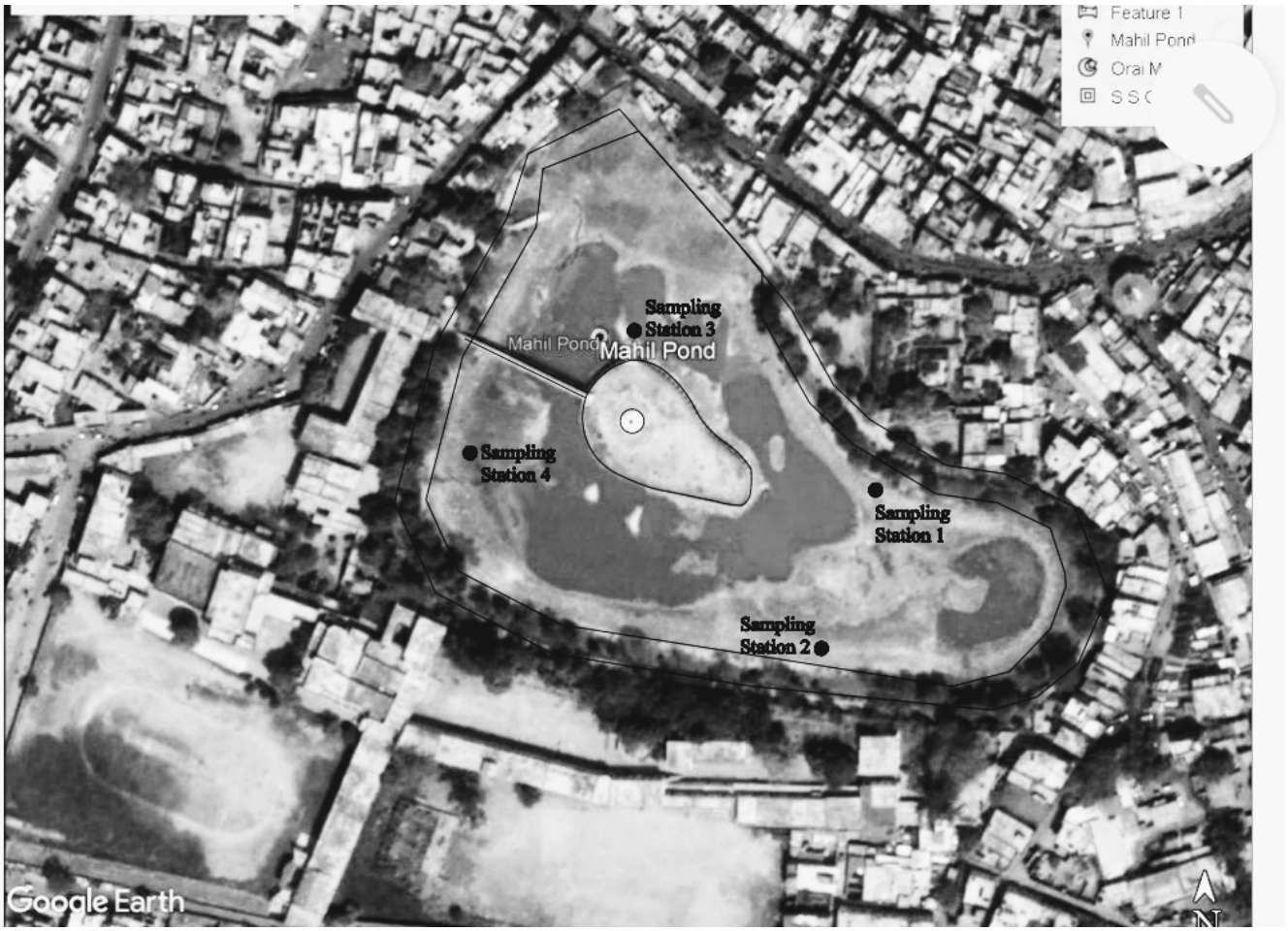



**Study area**

$$\text{Organisms } I^{-1} = A \times \frac{1}{L} \times \frac{n}{v}$$

Where A= Number of organisms per drop
v= Volume of one drop (ml)
n= Total volume of the concentrated sample
L= Volume of original sample (l)

## Results and Discussion

A study was made to find out the existence and abundance of algae population in different study sites of Mahil pond. The algal community in Mahil pond was represented by the members of Chlorophyceae, Cyanophyceae, Bacillariophyceae, Euglenophyceae and Dinophyceae. In this pond 31 genera were recognized during the investigation. Among the total phytoplankton, Chlorophyceae contributed 47.76 %, of the total population during study period. The next dominant group was cyanophyceae comprise 32.11 %, Bacillariophyceae 19.83 %, Euglenophyceae 0.21% and Dinophyceae 0.074 % during the study period respectively.

The degree and period of maximum abundance and the periodicity of occurrence of cyanophycean algal species are presented in (Table 1). Maximum density of cyanophytes occurred from March to May during the study period. The density was gradually decreased during winter months, but the maximum diversity among these group occurred in the month of December and January. Cyanophytes showed their peak value in the month of May. The phytoplankton belonging to cyanophyceae were *Spirulina, Oscillotoria, Merismopedia, Anabaena, Anacystis, Coelospharium and Nodularia.* The simple correlation coefficient test revealed that the cyanophytes numbers was positive significant correlation with Bcillariophyceae ($r = .671 < p\ 0.05$).

Chlorophyceae were found to be main algal population at all the sampling station in the pond and representative of this group occurred during study period with fluctuations in numbers. This was the first dominant group constituting 47.76% of the annual total phytoplankton

during the study period. Seasonally this group represent high density in rainy and low in summer period. This group was represented by Chlorella, *Scanedesmus, Chlorococcum, Microspora, Draphandila, Hyrodictyon, Tetradendron, Tetraspora, Volvox, Ulothrix, Spirogyra, Mougeotia* (tab.). *Chlorella, Scanedesmus, Chlorococcum* was found throughout the years dominantly. Chlorophyceae represent negative significant correlation with Bacillariophyceae ($r = -.645 < p\ 0.05$) and euglenophyceae ($r = -.677 < p\ 0.05$).

Bacillariophyceae were found to be third main algal population at all the sampling stations in the pond. This group constituting 19.83 % of the annual total phytoplankton during study period. Seasonally this group was more abundant in summer and enumerated a very low number in monsoon period. This group was characterized by *Navicula, Cyclotella, Cocconies, Melosira, Synendra, Nitzchia, Diatoma, Fragillaria, Asterionella, Tabellaria* (tab.1). Bacillariophyceae are positively correlated with cayanophyceae ($r = .671\ p < 0.05$), but negatively co-related with chlorophyceae ($r = -.645\ p < 0.05$). Euglenophyceae is another group of phytoplankton encountered less contribution to the phytoplankton community. The distribution and seasonal fluctuations of desmids occurs throughout the year, this group was represented by only genus *Euglena* throughout the study period. Euglenophyceae showed positive correlation with Dinophyceae ($r = .670\ p < 0.05$) and negatively correlated with Chlorophyceae ($r = -.677\ p < 0.05$). The last group of phytoplankton Dinophyceae is rarely observed in the reservoir during the investigation. This group was represented by only genus *Ceratium,* with less density. Dinophyceae showed positive correlation with euglenophyceae ($r = .670\ p < 0.05$).

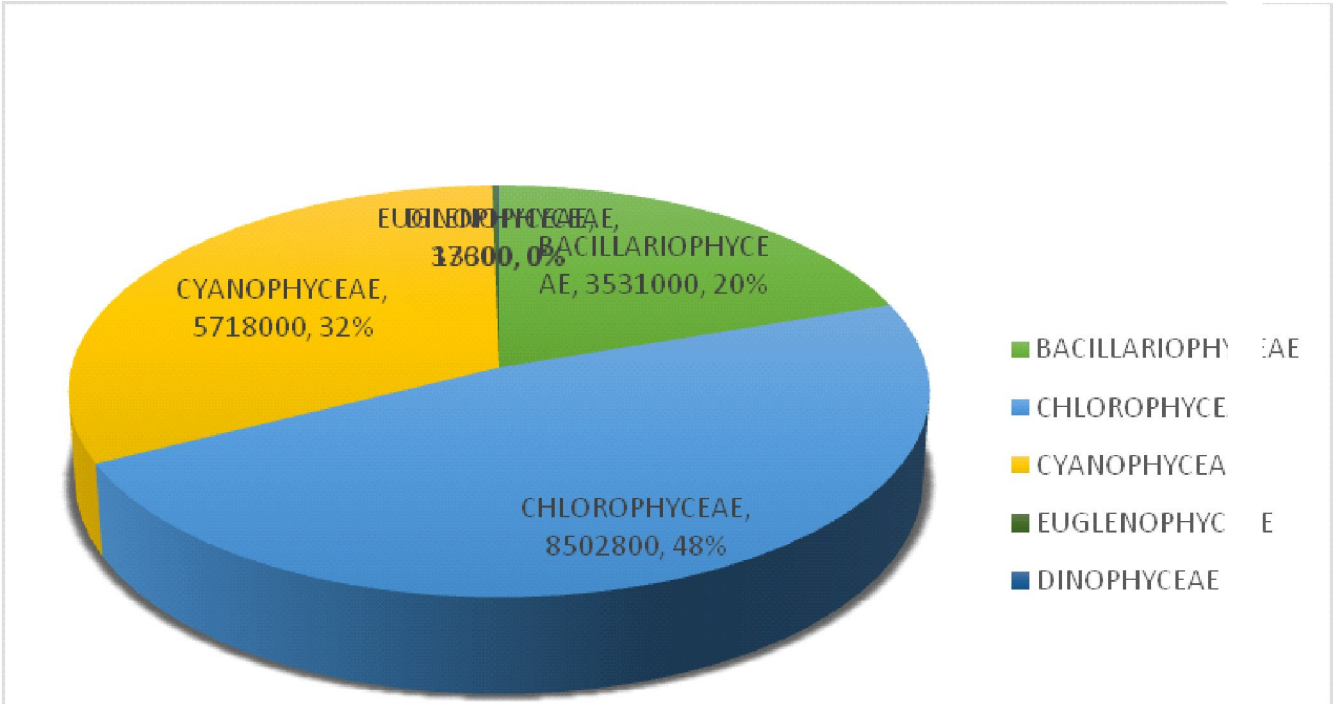
**Percentage composition of phytoplankton in Mahil Pond during study period**

As we know phytoplankton species composition and diversity changes with environmental conditions. Parallel outcomes have been made in different studies. In the condition of high nutrient level or eutrophication, the algal blooms (BGA) appears in freshwater environments. The BGA *Spirulina* and *Oscillatoria* present during the study period in maximum % from the total phytoplankton. Species of *Chlorella, Nitzchia, Diatoms, Ulotrix* also occur abundantly throughout the year. Maximum diversity present in the early winter month which show that these months having favourable condition for algal growth. Appearance of Bacilariophyceae are considered for water quality and organic pollution occurs in pond (Palmer, 1969). The total phytoplankton population in the Mahil pond was found to be maximum in early winter and minimum during monsoon due to heavy rain. Similar observations have been reported by Mustaf and Ahemad (1997), Sunkad (2000); Hujare (2005), Odelu (2006), Sasikala *et al.,* (2017). The appearance of *Anabena* and *Oscillotoria* presenting that the water body is highly polluted in which *Oscillotoria* appears throughout the years which are the conformation of that. Pravatesam and Mishra (1993) have observed maximum chlorophyceae diversity during early winter as occurs in study period. This observation is an agreement with our findings. The phytoplankton analysis is an important tool for the assessment of water quality and their trophic status also its basic nature (Pawar *et al.,*2006).

In the present study Bacillariophyceae constitute major part of phytoplankton in mahil pond, these species were found maximum during summer. Similar observations made by Hujare (2005) in Vadagaon reservoir. Several studies on phytoplankton diversity made in India and other nations in relation to pond, lakes and reservoir (Panigrahi *et al.,* 2001; Nandan and Mahajan, 2006; Tiwari and Chauhan, 2006; Tas, B. and A. Gonulol (2007) their work

**Table 1:** Occrance of phytoplanton species at Mahil Pond

| Bacillariophyceae | Chlorophyceae | Cyanophyceae | Euglenophyceae | Dinophyceae |
|---|---|---|---|---|
| *Asterionella* | *Chlorella* | *Anabaena* | *Euglena* | *Ceratium* |
| *Cocconies* | *Chlorococcum* | *Anacystis* | | |
| *Cyclotella* | *Draphandila* | *Coelospharium* | | |
| *Diatoma* | *Hyrodictyon* | *Merismopedia* | | |
| *Fragillaria* | *Microspora* | *Nodularia* | | |
| *Melosira* | *Mougeotia* | *Oscillotoria* | | |
| *Navicula* | *Scanedesmus* | *Spirulina* | | |
| *Nitzchia* | *Spirogyra* | | | |
| *Synendra* | *Tetradendron* | | | |
| *Tabellaria* | *Tetraspora* | | | |
| | *Ulothrix* | | | |
| | *Volvox* | | | |




revealed the importance in the area of phytoplankton studies of fresh water bodies. In this paper an effort has been made to study the seasonal variation of phytoplankton diversity. Phytoplanktonic study thus presented that water quality of the pond has reached at maximum level and therefore, it needs some corrective measure to maintain the water chemistry of the pond to save that historical site heritage from further deterioration. Similar studies have been made by various workers in India Sukumaran and Das, 2001; Mahajan and Nandan, 2005; Sekhar *et al.,*2008; Baruah and Kakti, 2009; Bhosale *et al.,*, 2010.

## Conclusion

The Mahil pond is one of the important water bodies of Bundelkhand region in India yet to be polluted. It has varied diversity of phytoplankton, the water quality of pond is decreasing day by day due to anthropogenic activities, domestic wastes and other factors. Due to its great religious importance, efforts should be made to conserve the biodiversity and purity of this sacred pond. During the present study the great diversity of phytoplankton were recorded. When the previous literature was consulted and compared with present study, the outcomes revealed that the water body deterioration day by day and become highly eutrophic. The various preventive polices should be undertaken to conserve the Mahil Pond. As we know the phytoplankton works as an important link in the pond ecological cycle and the food source of other organism, efforts should be made for their biodiversity conservation.

In conclusion we can say that the distribution and density of phytoplankton species depends on the physic-chemical quality of water. The results representing that the abundance of BGA and Bacillariophyceae species is the direct indication of eutrophication and organic pollution, there is an urgent need to take correct actions to save this pond to pollution.

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