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**Research Paper**

# Diversity of Phytoplanktons in Undasa Wetland with reference to indicator organisms

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**Abstract:** Wetlands are vital for human survival. They are among the world's most productive environments. The phytoplanktonic diversity is very important for the conservation of freshwater ecosystem. A total of 30 species out of which 13 species belongs to chlorophyceae, 3 to Euglenophyceae, 8 to Bacillariophyceae, 6 to Cyanophyceae. The result indicates that the maximum number of genera occurred during summer (11-17) followed by winter (5-18) and monsoon season (6-9) respectively. *Ankistrodesmus, Euglena, Navicula, Nitzschia, Oscillatoria, Ceratium, Closterium, Synedra, Cymbella, Spirulina and Microcystis* as identified as eutrophic pollution indicator organisms.
**Keywords :** Phytoplanktons, Wetland, Indicator organism, Pollution, Eutrophication.

## INTRODUCTION:

Wetlands are indispensable for the countless benefits or "ecosystem services" that they provide humanity, ranging from freshwater supply, food and building materials, and biodiversity, to flood control, groundwater recharge, and climate change mitigation. The discovery of plankton by (Victor Hanson, 1887) was an outstanding event in the field of Limnology. The term Phytoplankton comes from the greek term, phyto means plants and planktons means drifter. Planktons are composed of tiny plant called phytoplankton. Phytoplankton is often an important link in the transformation of energy in ecosystem. Phytoplankton is indicator to pioneer community. Phytoplankton encountered in a water body reflects the average ecological condition of water and hence may be used as indicator of water quality. Phytoplankton form good indicators of water quality as they have rapid turnover time and are sensitive indicators of environmental stress. Phytoplankton survey thus helps to find out the trophic status and the organic pollution in the ecosystem. Algae as indicators of organic pollution showed that species of algae at top of the pollution list were *Euglena* and *Scendesmus* (Hosmani and Bharathi, 1980).

### Aim of the Study:

The aim of the present study is to contribute of phytoplanktonic diversity and identify the

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phytoplanktonic organism as bioindicator of Undasa wetland Ujjain (M.P.).

**Study Area:**

Undasa wetland is located just outside the municipal limits of Ujjain city in M.P. This is situated at 75° 50' and 23° 13' on Ujjain – Maksi road along the Pingleshwar nala. The catchment area of this wetland extends up to 11.25 sq. miles with an average storage capacity of 186.668 mcft. Its live capacity 5.32 mq., and its dead storage capacity 0.09 mq. It has a water speed area 183.30 hectare. and its length is 2.6 km. It is used for drinking water supplies, irrigation and bathing. This is considered as a holy waterbody and several thousands of pilgrims take holy bath.

## MATERIALS AND METHODS:

The present study has been conducted for a period of one year from July 2017 to June 2018. Planktons samples have been collected by filtering 40 liters of water through plankton net made up of bolting silk number 14 and 25 with the help of Plankton water sampler (20 liter capacity). The samples have been preserved in 10% formalin and Lugol's solution. Quantitative estimation are being made by Sedwick Rafter cell and by using Lackey's microtransect method. The morphometric and physiographic details have been recorded from the Irrigation Departments, Govt. of M.P. The species of zooplanktons were made by consulting standard keys of the respective groups of organisms.

## RESULTS AND DISCUSSION:

In the present investigations phytoplanktonic diversity of Undasa wetland is represented by 30 species out of which 13 species belongs to Chlorophyceae, 3 to Euglenophyceae, 8 to Bacillariophyceae, 6 to Cyanophyceae (Table-1), The result indicates that the maximum number of genera occurred during summer (11-17) followed by winter (5-18) and monsoon season (6-9) respectively. Maximum phytoplanktonic diversity during summer (march-June) may be due to presence of food substances in large proportions requisite for their growth. However, minimum diversity is reported in rainy season which may be due to the low temperature, and higher water current. Rawat and Trivedi (2018) also observed that phytoplanktonic diversity of Dholawad dam has been low during monsoon season and high diversity during summer and winter season. Summer is the most suitable season for the growth of phytoplankton in the waterbody because of long duration of sunshine period, increased salinity, and pH. Sharma *et al.,* (2014) also observed that phytoplankton grow and multiply best during summer season when the temperature is high, depends on the nutrients and having longer photoperiod. The annual percentage composition of different groups of phytoplanktons revealed 48.12 % Chlorophyceae followed by 27.81 % Bacillariophyceae, 15.03 % Cyanophyceae and 9.02 % Euglenophyceae. Annual average percentage of phytoplankton from Undasa wetland showed different forms in their diversity attributed to water quality. However, this patterns of annual percentage composition of phytoplankton in this wetland is influenced by climatic conditions. Remarkable seasonal variation is observed on the occurrence of phytoplanktonic diversity. During summer season the maximum contribution was made by Chlorophyceae (49.12%) Chlorophyceae is the most dominant group followed by Bacillariophyceae (28.07%), Cyanophyceae (12.28%), and Euglenophyceae (10.52%) (Fig 1A). During winter season Chlorophyceae (47.91%), followed by Bacillariophyceae (29.16%), Cyanophyceae

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(16.66%) and Euglenophyceae (6.25%) (Fig. 1B). Similarly , in the rainy season Chlorophyceae (46.42%) followed by Bacillariophyceae (25%), Cyanophyceae (17.85%) and Euglenophyceae (10.71%) (Fig 1C). Similar variable characterstics of Phytoplanktonic diversity has been recorded by Shinde *et al.,* 2012, Das and Panda (2010), Rawat and Trivedi (2018), Summarwar *et al.,* (2012) and Dixit and Sharma (2019).

During summer season water quality of Undasa wetland water detoriate due to anthropogenic activities which is responsible for the diversity change of phytoplankton and indicate water quality. Total 57 phytoplanktons (42.85 %) were recorded out of which 25 sps reported during summer season. In summer season the most dominant sps were *Zygnema, Closterium, Cosmarium, Peridinium, Diatoma, Fragilaria, Gomphonema, Scenedesmus, Spirogyra, Euglena, Synedra, Cymbella, Gomphosphaeria, Microcystis*, *Pediastrum, Navicula* were observed. These are identified as eutrophic pollution indicator organisms and other organism like *Ankistrodesmus, Ceratium, Oscillatoria* indicated high pollution load. During winter season 48 phytoplanktons (36.09 %) were recorded out of which 27 sps. were most dominant which include were *Spirogyra, Spirulina*, *Pediastrum, Fragilaria, Asterionella, Synechocystis sps.* and during rainy season total 28 phytoplanktons (21.05 %) were recorded out of which 17 sps. *Closterium, Pediastrum, Spirogyra, Spirulina, Fragilaria, Hydrodictyon, Microcystis* were dominant which indicate moderate pollution status of these wetland. Maximum number of total phytoplankton during summer indicate sufficient nutrient level. Chlorophyceae is most dominant in summer followed by winter and rainy. Chlorophyceae are large and important group of fresh water algae, (Ven Den Hoeck *et al*., 1995). This bimodal pattern of peak population was also reported (Velecha and Bhatnagar 1988; Guru 2008). Low dissolved oxygen (DO). High turbidity; better organic load and high chemical oxygen demand (COD) have been reported to be associate with high organic matter content and sewage disposal in summer season. Similar observation were recorded by (Kant and Kachroo 1977, Ven Den Hoeck *et al*., 1995, Velecha and Bhatnagar 1988; Guru 2008, Rai 1974; Mishra 1996; Mishra and Ram 2007, Das and Panda 2010 and Bhasin *et al.,* 2016).

Diversity of phytoplankton shows wide variations because of the differential effect on phytoplanktonic sps. and they serve as indicators of water quality and pollution (Gouda *et al*., 1996) Green algae Chlorophyceae have been also to be the indicator of highly polluted water (Rama, Rao *et al.,* 1978). Atici and Alas (2012) reported Scendesmus sps. as pollution indicator at Mamasin Dam lake. Phytoplanktons are of great importance in biomonitoring of pollution ( Davies *et al*., 2009). We concluded that this observation clearly indicate that water quality of summer season have been highly polluted when compared to Winter season and Rainy season. *Ankistrodesmus, Euglena, Navicula, Nitzschia, Oscillatoria, Ceratium, Closterium, Synedra, Cymbella, Spirulina* and *Microcystis sps*. as identified as pollution indicator organisms. *Nitzehia, Navicula and Cymbella* which are known as pollution indicator species were observed predominantly in summer along with other phytoplanktonic species Kulkarni and Zade (2018). Similar trend have been observed by Jindal and Sharma (2011) from river Sutlaj where bioindicators of pollution like *Ankistrodesmus falcatus, Chlorella vulgaris, Chlamydomonas, Closterium acerosum,*

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*Euglena viridis, Navicula cryptocephala, Nitzschia palea, Oscillatoria brevis, Spirulina* sp., *Stigeoclonium tenue* and *Synedra ulna* were recordred.

**Table 1: Diversity of Phytoplanktons at Undasa Pond July 2017 - June 2018**

| S no. | Genera | July | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Chlorophyceae:** | | | | | | | | | | | | |
| **1.** | *Ankistrodesmus* | - | - | - | - | - | - | + | - | - | - | + | + |
| **2.** | *Closterium acerosum* | - | + | + | - | - | + | + | - | + | + | + | + |
| **3.** | *Closterium acutum* | - | + | - | - | + | + | - | - | - | + | + | + |
| **4.** | *Cosmarium* | - | - | + | - | - | - | + | + | + | + | + | + |
| **5.** | *Hydrodictyon* | + | - | + | - | - | + | - | - | - | - | - | - |
| **6.** | *Microspora* | - | - | - | - | - | - | + | - | + | - | - | + |
| **7.** | *Pediastrum duplex* | - | - | - | + | + | + | - | - | - | - | - | - |
| **8.** | *Pediastrum simplex* | - | - | + | + | + | + | + | + | + | + | - | - |
| **9.** | *Scenedesmus* | - | - | - | - | - | - | - | + | + | - | + | - |
| **10.** | *Spirogyra* | - | - | + | + | + | + | + | + | + | + | - | - |
| **11.** | *Ulothrix* | + | + | - | - | - | - | - | + | + | - | + | - |
| **12.** | *Volvox* | - | - | - | - | - | - | + | - | - | + | - | - |
| **13** | *Zygnema* | - | - | - | - | - | - | + | - | + | + | + | + |
| | **Euglenophyceae:** | | | | | | | | | | | | |
| **1.** | *Ceratium* | - | - | - | - | - | - | - | - | + | - | - | - |
| **2.** | *Euglena* | - | - | - | - | - | - | + | - | - | + | + | - |
| **3.** | *Peridinium* | - | + | + | + | - | + | - | + | + | - | + | + |
| | **Bacillariophyta:** | | | | | | | | | | | | |
| **1.** | *Asterionella* | - | - | - | - | - | - | + | - | - | - | - | - |
| **2.** | *Cymbella* | - | - | - | - | - | - | - | - | - | + | + | - |
| **3.** | *Diatoma* | - | - | - | - | - | - | + | + | - | + | + | + |
| **4.** | *Fragilaria* | + | + | + | - | - | + | + | + | + | + | + | - |
| **5.** | *Gomphonema* | + | - | - | - | - | - | + | + | - | + | + | + |
| **6.** | *Navicula* | + | - | - | - | - | + | + | - | - | - | + | - |
| **7.** | *Nitzschia* | - | - | - | - | - | + | + | - | + | - | + | - |
| **8.** | *Synedra* | + | - | - | + | - | + | + | - | - | + | - | + |
| | **Cyanophyta:** | | | | | | | | | | | | |
| **1.** | *Gomphosphaeria* | - | + | - | - | - | - | - | - | - | - | + | + |
| **2.** | *Microcystis a.* | + | + | - | - | - | + | + | - | + | - | - | + |
| **3.** | *Nostoc sps.* | - | - | - | - | - | - | - | + | - | + | - | - |
| **4.** | *Oscillatoria* | + | - | - | - | - | + | + | - | - | - | + | + |
| **5.** | *Spirulina* | - | - | - | + | + | + | - | - | - | - | - | - |
| **6.** | *Synechocystis* | - | - | - | - | - | - | - | + | - | - | - | - |
| | | 9 | 7 | 6 | 6 | 5 | 14 | 18 | 11 | 11 | 14 | 17 | 15 |

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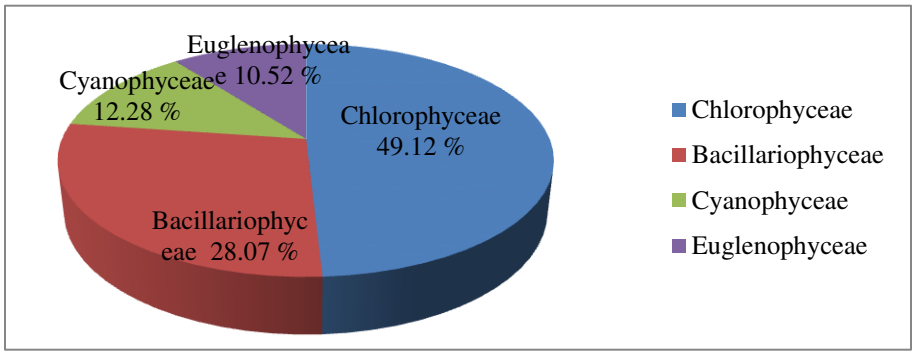
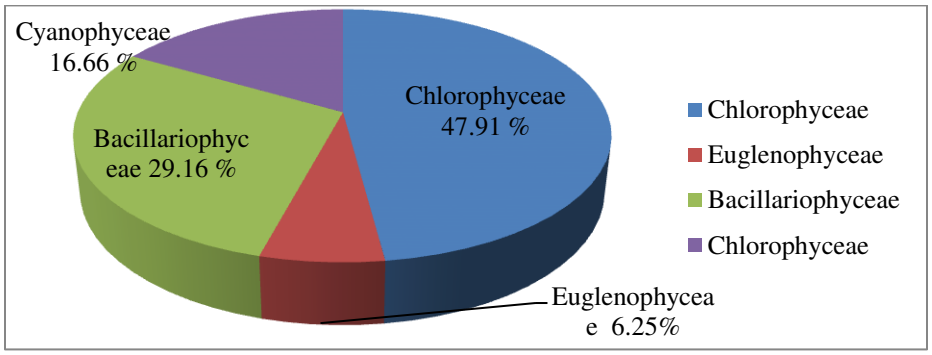
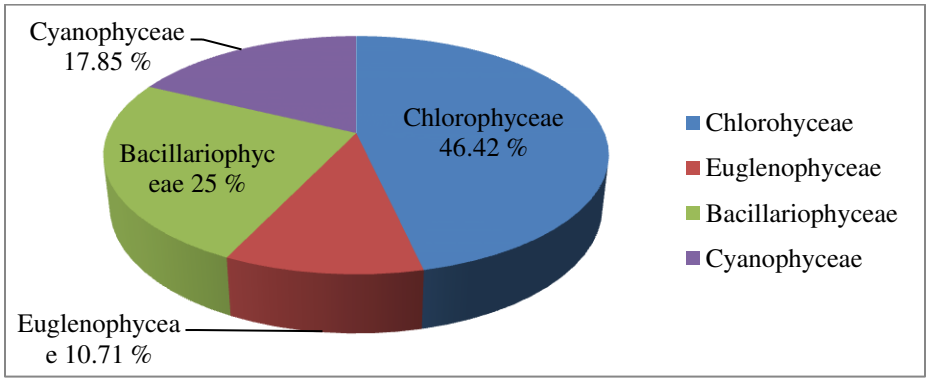



A- Summer season




B- Winter season




B- Rainy season

Figure 1: Seasonal composition of phytoplanktonic diversity in Undasa wetland.

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