STUDIES ON PERIODICITY OF CHLOROPHYCEAE OF MAHI BAJAJ SAGAR DAM, BANSWARA (RAJ.)

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Abstract:
The present study was undertaken to study the seasonal algal diversity of Mahi Bajaj Sagar Dam at Borkheda village of Banswara district of Rajasthan state. From January to December 2023, the periodicity of Chlorophyceae algae of Mahi bajaj Sagar Dam,was investigated.In this study 29 species in all, representing 17 genera in the Chlorophyceae class, were found. The Chlorophyceae of Mahi Bajaj Sagar Dam included several common genera, including Scenedesmus, Closterium, Spirogyra, Cosmarium, and Pediastrum. In different study areas and during different months, the amount of algae varied. Scenedesmus displayed the highest population. While some species were represented only during a specific season, others were common throughout the year. It was discovered that the algal population peaked in the summer and declined in the winter. Between May and October, the population of microalgae like Pediastrum, Scenedesmus, Cosmarium, and Closterium causes the water to turn green. Seasonal ecological influences have a significant impact on phytoplankton seasonal successions. High pH and temperature were found to be conducive to the Chlorophycean algae's fast development in the current study.

Keywords: Algae, Chlorophyceae, Seasonal variation, Diversity.

1. INTRODUCTION:

Algae are a very diverse group of photosynthetic organisms that can be found in a wide range of habitats, from aquatic to harsh terrestrial settings like polar regions and deserts. Their estimated species count ranges from 70,000 to over 10 million, and they are categorized under both the Bacteria and Eukarya domains. Algae contribute roughly 45% of atmospheric oxygen and are involved in vital biogeochemical cycles, making them vital to global ecosystems. They are useful for biotechnological applications, such as the production of biofuel, which provides a sustainable substitute for fossil fuels and helps to lower CO2 emissions, due to their exceptional metabolic versatility and adaptability.

Chlorophyceae, a diverse class within the Chlorophyta, encompasses a wide range of morphologies, from unicellular forms to complex filamentous structures. This class is characterized by biflagellate and quadriflagellate motile cells, with phylogenetic studies revealing five major monophyletic groups: Chlamydomonadales, Sphaeropleales, Oedogoniales, Chaetophorales, and Chaetopeltidales (Turmel et al., 2008). Furthermore, the classification of Chlorophyceae remains dynamic, with ongoing debates regarding the ordinal-level relationships, suggesting a potential shift towards a less formal clade system to accommodate emerging data (Fučíková et al., 2019). Overall, the Chlorophyceae represent a crucial component of freshwater ecosystems, as evidenced by studies documenting their diversity in specific habitats (Rana, 2020). Chlorophyceae, commonly known as green algae, are a diverse group of photosynthetic organisms that play a vital role in aquatic ecosystems and contribute significantly to global carbon fixation. They are primarily found in freshwater environments, although some species can thrive in marine and terrestrial habitats, showcasing their adaptability and ecological importance. These algae exhibit a wide range of morphological forms, from unicellular to multicellular structures, and are characterized by their green pigment chlorophyll, which enables them to harness sunlight for energy through photosynthesis.

The Mahi Bajaj reservoir is situated at 23°37\'40\" N Latitude 74°32\'45\" E Altitude 15 Km from Banswara, Rajasthan. The catchment area of Dam is 13500 ha. Length of Dam is 3065 m. and width of Dam is 20 m.,

Height of Dam is 43 meters. This resorvior plays a crucial role in the region's socio-economic development, ecological balance, and fisheries management. This dam not only supports irrigation and drinking water supply but also influences local biodiversity and fish farming practices. The following sections elaborate on its various impacts. The dam has significantly affected the tribal communities in Banswara, particularly the Adivasi groups such as Bheel and Garasia, by altering their livelihoods and social structures (Jayaraj & Flats, 2014).The dam supports a diverse phytoplankton community, with 19 species identified, indicating a productive aquatic ecosystem suitable for fisheries (Yadav et al., 2018).The primary productivity metrics show a gross primary productivity (GPP) of 0.37 g C m² h and a net primary productivity (NPP) of 0.21 g C m² h, highlighting the dam's ecological significance (Yadav et al., 2018). Despite these benefits, the dam faces challenges from climate change and human activities, which have led to decreased stream flow and altered hydrological patterns, impacting both water availability and ecological health (Fagerstrøm, 2023).

2. MATERIAL AND MATHODS:

Samples for the study of algal species were gathered from various locations in Mahi Dam, Banswara, (Rajasthan), India. Micro/unicellular algae were collected using a phytoplanktonic net, while the major algae were collected using forceps. The collected samples were preserved and kept in plastic bottles with labels. Following collection, the sediment portion and other major algal forms were preserved in 4% formaldehyde after the phytoplankton were centrifuged and the liquid supernatant was siphoned off. The temporary slides were prepared from collected algal samples and observed under Labomade microscope at 40X and 100X. The algal representatives were identified on the basis of morphological feature like size and shape of thallus, number of chloroplast in the cell. Number and arrangement of pyranoid etc. Using the standard works (Fritsch, 1935; Randhawa, 1959; Prescott, 1962), the algae were systematically identified. Palmer, 1980; Bold and Wynne, 1978; APHA, 1989).

3 RESULT:

In the present study which was conducted from January 2023 to December 2023, a total of 29 species of Chlorophyceae were obtained from 17 genera, the species obtained in different months of the year are marked in the table below

Algal Species	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Summer*	*Winter*	*Rainy*
Ankistrodesmus convolutes	+	+	-	+	+	-	-	-	-	-	+	+	+	+	-
Cladophora glomerata	-	-	-	-	+	+	+	+	+	-	-	-	+	-	+
Characium acuminatum	-	-	-	-	+	+	+	+	-	-	-	-	+	+	-
Closterium venus	-	-	-	+	+	+	+	+	+	-		-	+	-	+
C. acutum	-	-	+	+	-	-	-	-	-	-	+	+	+	+	+
C. acerosum	-	-	+	+	+	+	-	-	-	-	-	-	+	-	-
Chorococcum infusionum	-	-	+	+	+	+	-	-	-		-	-	+	-	-
Cosmarium impressulum	-	-	+	+	+	+	-	-	+	+	-	-	+	-	+
C. granatum	+	+	+	+	-	-	-	-	-	-	+	+	+	+	+
Euastrum bidentatum	+	+	+	+	+	+	+	+	-	-	-	-	+	+	-
Oedogonium areoliforum	-	-	+	+	-	-	+	+	+	+	-	-	+	-	+
Oedogonium sp.	-	-	-	-	+	+	+	-	-	+	+	+	+	-	+

Closterium	_	_	+	+	+	+	+	+	+	+	_	-	+	-	+
Euastrum	+	+	+	+	+	+	-	-	-	-	-	-	+	+	-
Staurastrum	-	-	-	-	+	+	-	-	-	-	-	-	+	-	-
Staurastrum cuspidatum	-	-	-	+	+	+	-	-	-	-	-	-	+	-	-
S. setigerum	+	+	-	-	-	-	+	+	+	-	+	+	-	+	+
Spirogyra salina	-	-	-	-	-	-	+	+	+	+	+	+	-	+	+
Actinotaenium	-	-	-	+	+	+	+	-	-	+	-	-	+	-	+
Actinastrum	-	-	+	+	+	+	-	-	-	-	-	-	+	-	-
Chaetophora elegans	-	-	-	-	+	+	+	-	-	-	-	-	+	-	+
S. dimorphus forma tortus	-	-	-	-	+	+	+	-	-	-	-	-	+	-	+
S. acutiformis	+	+	-	-	-	-	-	+	+	+	+	+	-	+	+
S. bijugatus	-	-	-	-	+	+	+	-	-	-	-	-	+	-	-
S. quadricauda	+	+	+	+	+	+	-	-	-	-	-	-	+	+	-
Monoraphidium	-	-	-	+	+	+	-	+	+	+	-	-	+	-	+
Salanastrum	+	+	+	-	-	-	-	-	-	-	+	+	+	+	-
Gonium	-	-	-	-	+	+	-	+	+	+	-	-	+	-	+
Tetrasporidium	+	+	-	-	-	-	+	+	-	-	-	-	-	+	+
Total Species	9	9	12	13	21	20	14	11	10	9	8	8	25	12	17

Table: Periodicity of Chlorophyceae of Mahi Bajaj Sagar Dam during Jan 2023 to Dec 2023. (+ present; - absent)

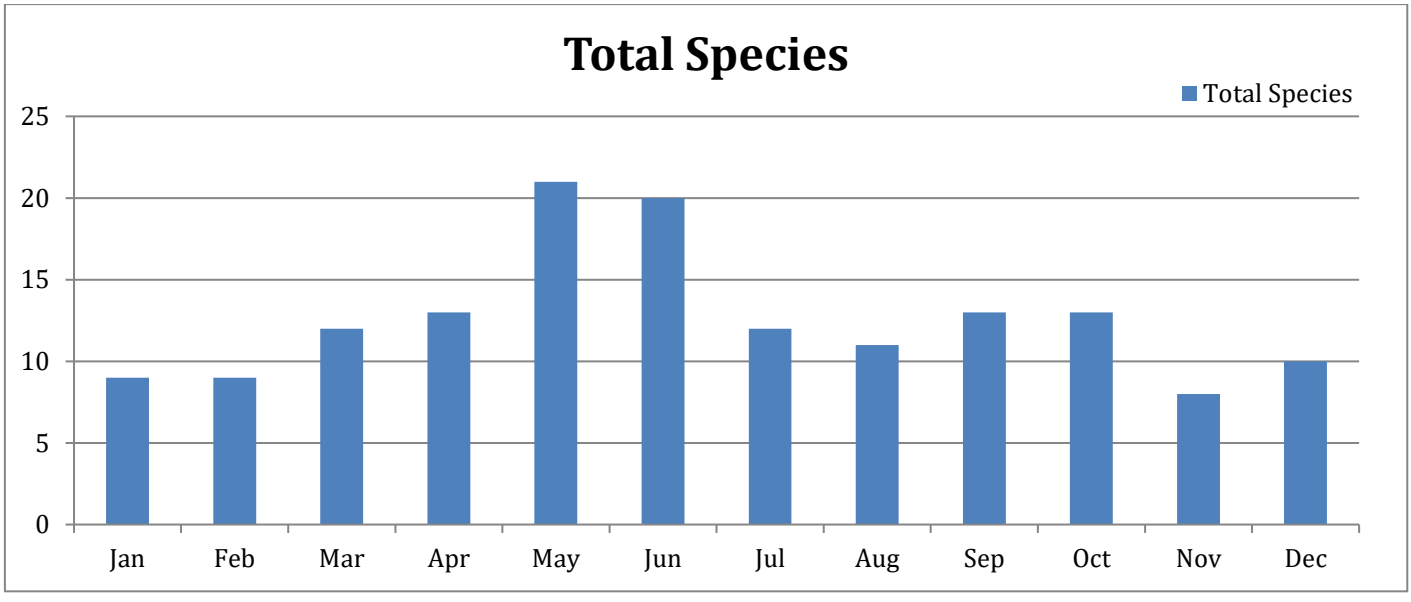

Figure 1: Graph showing total number of Chlorophycean species in different months of year from January 2023 to December 2023.

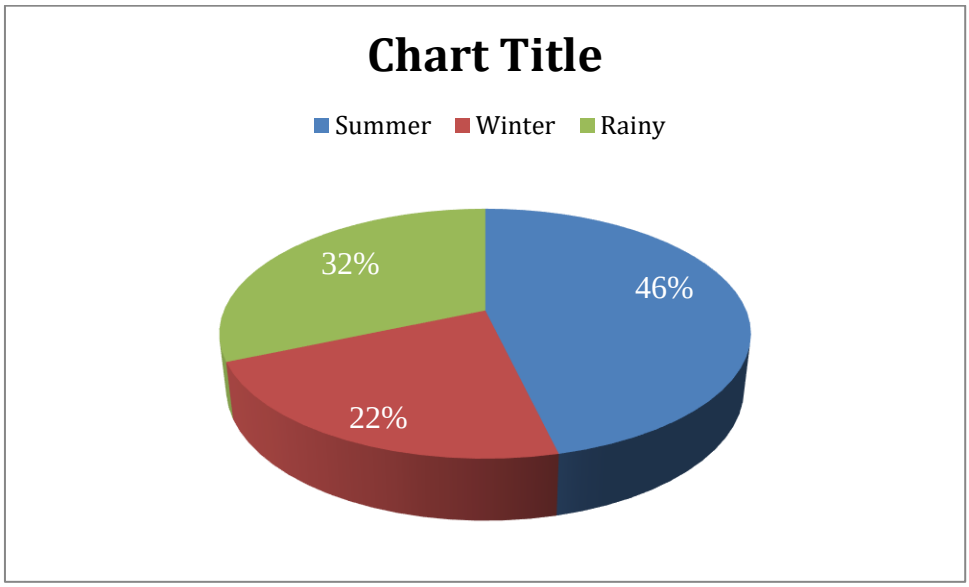

Figure 2: Pie chart Showing diversity of chlorophycean species in different season of year (From January 2023 to December 2023

Population of Chlorophyceae shows seasonal variation, peaking in the summer and falling off in the winter. Summer time has been reported to have the highest population of chlorophyceae because of the ideal pH and temperature conditions for their quick growth. Data show that total number of chlorophyceae species recorded highest number in month of May and June.

Syndesmus species were identified as the dominant algae in the chlorophyceae group in the current study. The summer season had the highest recorded population during May through October, the population of microalgae like Pediastrum, Scendesmus, cosmarium and Closterium Causes the water to turn greenish. Throughout the study period many species were identified during summer and rainy season. Ankinstrodesmus sps., Cosmarium granatum, Euasrtum, Salanastrum sps., were found only in winter and summer season whereas Oedogonium, Closterium, Actinoaenium, Cheatophota elegans, syndesmus bijugatus, Monoraphidium and Gonium sps. were found in summer and rainy season. Species found in winter and rains are Tetrasporidium, salanastrum caspidatum, Causmarium granatum. Some species like oedogunium aereoliforum, salanastrum and Tetrasporidium sps. were found in winter and summer season.

During the yearlong study a total of 29 genera belong to 17 species were found. Out of which Syndesmus was found almostn throughout the year.

4 DISCUSSION AND CONCLUSIONS:

The study will help us to understand that the seasonal ecological factors have a significant impact on growth of algae. The current study found that the high pH and temperature were favorable to chlorophyceae algae's rapid growth. The growth of these algal species facilitated during summer months by high temperature and maximum nutrient concentrations. As the water temperature rises, the number of chlorophyceae members gradually increases in the early summer and reaches its maximum late summer and early monsoon season. In summer time algal abundance was observed and during the rainy season it declined as a result of turbidity, current velocity, water runoff that cause dilution of nutrients, fluctuating water levels. Many physical, chemical and biological factor affect algal growth along with seasonal changes.

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