



MICROBIOLOGICAL STUDY OF ALGAE FROM KAWAR LAKE OF BEGUSARAI, BIHAR, INDIA

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ABSTRACT: Water is a ubiquitous solvent used by nearly all living things to complete their biological activities. Algae, which are frequently seen in lakes, are among the many microorganisms that may thrive on the nutrients contained in fresh water. Nitrates and phosphorus are the two main types of nutrients that algae need. The foundation of the food chain in the aquatic ecosystem is algae. They contribute significantly to water contamination in a variety of other ways as well. The nutrients that algae need to develop may be selectively stimulated by pollution, which can lead to an algal bloom and a subsequent decline in water quality. Very few workers in Bihar have given limnological aspects any thought. In the current inquiry, Kawar Lake in the Begusarai area was chosen to conduct a limnological examination of algae. Samples of water and algae were taken from three locations in S. Kawar Lake every month. The goal of the current study was to determine how the physico-chemical characteristics of Kawar Lake in the Begusarai region of Bihar relate to the algal populations there.

Keywords: Microbiology, Physico-chemical parameters, Algae, Kawar lake.

INTRODUCTION

Water is a necessary component of protoplasm and establishes the conditions necessary for efficient metabolic processes. Not to mention the thousands of microorganisms that travel through and dwell in water. Microorganisms are absorbed by water from many sources such as the air, soil, organic waste, dead plants, and animals. Microbiological research is crucial for both optimal use of added and accessible nutrients for fish production as well as for monitoring and maintaining a healthy aquatic environment. Mane (2007) asserts that the microbiological analysis of water is important for research on pollution.

It is widely accepted that every body of water has the ability to self-purify and naturally cycle through biological processes, which allows it to withstand a minimal level of pollution without negatively affecting its own quality. Pollution is caused by any unwanted alteration to the properties of water, and this may be determined by examining the biological traits of the aquatic biota.

In any ecosystem, studying the variety of all creatures, including microbes, is crucial. One of the eukaryotic microorganisms that are frequently seen in water is algae. Phosphorus and nitrates are the two main nutrients used by algae, and they are brought into water bodies by rainwater, sewage, industrial runoff, and agricultural runoff. The study of biodiversity is the fastest-growing area in biology. Numerous researchers have focused on various forms of variety, which highlights the significance of biodiversity research.

In India the pioneer works are those of Iyengar (1940) on the algal flora of some muddy rainwater pools, Ganapati (1940) on the ecology of temple tank, Gonzalves and Joshi (1946) and Singh (1960) on the phytoplankton ecology, Nandan & Patel (1985) on Pollution of Wishwamitri river algal flora in Baroda, Madal, O.P. (2002) on primary productivity in relation to nutrient status of Kawar wetland, Shah et.al. (2011) on seasonal variation in plankton community of Sama Pond, Vadodara, Vijayan et al. (2014) on depiction of microalgal diversity in Gundur lake, Srivastava et al., (2014) on algal biodiversity in fresh water reservoir of Durg, Ramesh and Aruna, (2015) on diversity of fresh water algae in Trivenisangamam of Nizamabad, Shantilal, Hari and Nanabhau (2017) Studied algae from sonvad Dam of Dhule, Venkateshappa and Krishna (2022) on algal diversity of a freshwater lake of Tumkur City, Karnataka.

Very few workers in Bihar have focused on studying the limnology of lakes. As a result, the current study was conducted to limnologically examine the microalgal flora from three potential point locations in the Begusarai region of Bihar's Kawar Lake.

MATERIALS AND METHODS

Study Area: The heavily meandering Burhi Gandak river that formerly ran through these areas is likely what nourished the oxbow lakes that are now known as the Kawar lake and its surrounding lakes. These lakes are only depressions that receive water from the Burhi Gandak river during the monsoon season and from the rainfall in the catchment areas. The lake's natural and legal zones are very different. The lake's spread area grows significantly during the rainy season, but in the summer, water is only found in a few lowland pockets. This swamp is nearly level. Depression is present in certain settings, though. There are parts of this lake that are always submerged in water.

In central Bihar, North of Begusarai lies a small natural park called Kawar Lake. It's a verdant space spanning over 14 hectares where one may enjoy a day in the great outdoors strolling around, having a picnic, playing sports, and other activities. In the park are two ancient temples that get a large number of pilgrims throughout the holiday season.

Collection of Sample: In January 2023 to December, 2023, a monthly sample of water and plankton was taken from each of the three locations of Kawar Lake in Begusarai, Bihar. Using a plankton net with a mesh size of 25 and a pore width of 60 μ , the plankton samples were collected and placed in sterile plastic bottles (APHA, 2005). At the collecting location, phytoplankton material was preserved in a 4% formalin solution. By staining them with 1% Ligol's Iodine solution and examining them under compound microscopes, the phytoplanktons were identified. Phytoplankton was quantitatively analysed using the drop count method. Standards works (Needham and Needham, 1966; Sanjer and Sharma, 1995; Ward and Whipple, 1959) were used to identify phytoplankton. The number of organisms per litre was noted in the acquired findings.

The Whitton (1969) approach was used to determine the population density of four kinds of algae. The APHA (2005) standard procedures were used to examine water samples in order to determine its physico-chemical analysis.

RESULTS AND DISCUSSION

Table 1 presents the physico-chemical parameter minimum and maximum values for the three lake stations. Table 2 presents the range and average population of four kinds of algae for three lake locations. Four kinds of algae's algal periodicity provided a consistent image throughout the study. Three stations in the research region include data on the populations of four different kinds of algae.

Table 1: Physico-Chemical parameter at 3 sites of Kawar Lake during to January 2023 to December, 2023.

| Sr. No | Physico Chemical Parameters | Stations | | |
|--------|-----------------------------|--------------|--------------|--------------|
| | | A | B | C |
| 1 | Water Temperature | 19.1-29.6°c | 19.0-29.5°c | 19.0-29.5°c |
| 2 | PH | 6.30-7.12 | 6.31-7.12 | 6.12-7.12 |
| 3 | Conductivity | 220-490 | 216-485 | 218-483 |
| 4 | Total Alkalinity | 0.32-1.29 | 0.20-1.21 | 0.28-1.28 |
| 5 | Dissolve Oxygen | 3.28-7.00 | 3.84-7.73 | 3.30-7.12 |
| 6 | Free CO ₂ | 0.00-3.00 | 0.00-4.36 | 0.00-4.46 |
| 7 | Carbonate | 0.00-15.64 | 0.00-16.32 | 0.00-15.93 |
| 8 | Bicarbonate | 98.00-208.43 | 96.33-207.41 | 96.41-208.40 |
| 9 | Total Hardness | 68.30-180.40 | 67.30-177.40 | 68.40-176.20 |
| 10 | Sulphate | 33.90-44.40 | 32.30-43.40 | 34.40-44.00 |
| 11 | Calcium | 25.41-42.47 | 23.41-42.47 | 24.41-43.41 |
| 12 | Magnesium | 14.34-24.41 | 12.44-22.44 | 14.00-23.47 |
| 13 | Sodium | 26.41-41.00 | 24.32-39.41 | 25.41-40.12 |
| 14 | Potassium | 1.69-2.26 | 1.64-2.21 | 1.68-2.24 |
| 15 | Silicate | 64.32-110.32 | 61.32-108.34 | 62.41-106.42 |
| 16 | Chloride | 9.12-27.32 | 8.76-27.00 | 7.74-24.38 |
| 17 | Phosphate | 0.004-0.028 | 0.001-0.116 | 0.002-0.025 |
| 18 | Nitrate | 0.88-2.41 | 0.77-2.40 | 0.77-2.43 |
| 19 | Ammonical Nitrogen | 0.58-1.95 | 0.55-1.94 | 0.56-1.98 |

Note: All parameters are expressed in mg/l except pH, Water Temperature (°C) and Conductivity (μ S/cm)

Previous research (Singh, 1960; Nazneen, 1980) shown the significant influence that water temperature has in regulating the development and quantity of algal flora. In the current study, this opinion was reached. As the current investigation confirms, George (1961) said that higher pH values encouraged the development of algae. All three stations had higher dissolved oxygen concentrations, which supported the growth of green and blue-green algae and were consistent with the findings of previous researchers (Singh, 1960; Nandan and Patel, 1985; Patil and Nandan, 1994). In line with the findings of Hosmani and Bharati (1980), Munawar (1970) showed that increased concentrations of carbonate, dissolved oxygen, and total alkalinity encouraged the development of blue-green algae. It also held true for the current study. In the current experiment, the increased temperature and dissolved oxygen content shown a combined impact on the growth of green and blue-green algae, which is consistent with the findings of Hosmani and Bharati (1975) and Patil and Nandan (1994).

At all three lake locations, there was a rather consistent and smaller number of euglenoids. This might be because, as Hosmani and Bharati (1975) suggested, there is less organic stuff in the dam. Numerous previous studies (Atkin, 1926; Pearsall, 1930; Pringsheim, 1946; Gonzalves and Joshi, 1946; Zafar, 1964) shown an inverse association between pH and Free CO₂. In contrast, CO₂ was completely absent from the current research, with the exception of station three, and pH concentration was higher at all stations.

Table 2: The range and average population of 4 groups of algal from 3 sites of Kawar Lake during January 2023 to December, 2023.

| Algal Groups | | Stations | | |
|-------------------|------------------|----------|---------|---------|
| | | A | B | C |
| Myxophyceae | Range | 11-210 | 10- 190 | 11-210 |
| | Average | 67.83 | 78.00 | 71.33 |
| | Total population | 814 | 936 | 856 |
| Chlorophyceae | Range | 10-189 | 10- 172 | 12- 190 |
| | Average | 68.83 | 62.00 | 69.67 |
| | Total population | 826 | 744 | 836 |
| Bacillariophyceae | Range | 30-230 | 30- 230 | 32-245 |
| | Average | 89.67 | 84.17 | 92.75 |
| | Total population | 1076 | 1010 | 1113 |
| Euglenophyceae | Range | 0-11 | 0-10 | 0-12 |
| | Average | 3.00 | 1.83 | 2.92 |
| | Total population | 36 | 22 | 35 |

Note: All figures in cell no/ml $\times 10^6$.

The current study found that the populations of Bacillariophyceae was larger than those of diatoms and euglenoids among the four types of algae compared. In comparison to other groupings, the Bacillariophyceae population was abundant and dominating at all three locations.

CONCLUSION

The water from Kawar Lake has all of its chemical and physical characteristics within acceptable bounds. The current investigation's findings will be helpful for reservoir management in the future. The reservoir's physicochemical properties. Water indicated that it is appropriate for aquatic life and irrigation. Researchers may utilise the biodiversity survey and reservoir management to increase their understanding of algae and Kawar Lake.

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