Ecological Diversity and Seasonal Dynamics of Algal Communities in Diablab Pond, Banswara, Rajasthan, India

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ABSTRACT

Diablab Pond, located in the tribal-dominated Banswara district of Rajasthan (often called the "City of Islands"), is a significant perennially filled freshwater body facing high anthropogenic stress. Studies focusing on the Ecological Diversity and Seasonal Dynamics of Algal Communities in this wetland provide essential baselines for aquatic health, water pollution mapping, and conservation management.
KEYWORDS-algae, dynamics, community, Diablab, Banswara

INTRODUCTION

Diablab Lake (also known as Dialab Lake or Dailab Talab), located about 1–2 km northeast of Banswara town in Rajasthan, is a prominent historical freshwater body famous for its lotus blooms, scenic beauty, and proximity to the historic Badal Mahal. [1, 2, 3]

When examining the ecological status, water vegetation, and algae related to Diablab Pond, the key details include:

1. Water Quality and Eutrophication Status

- Nutrient Levels: Historically, the lake has maintained reasonable water quality with a pH range between 7.5 and 8.2. Structural eutrophication (excessive nutrient enrichment from phosphates and nitrogen) has generally been kept at minimal levels, but it requires ongoing management. [1]
- Algal Proliferation Risks: Like many shallow freshwater ponds in tropical climates, still and sunlit water combined with warm temperatures creates a potential breeding ground for algae. However, massive toxic algal blooms (such as cyanobacteria mats) are not currently a defining feature of the lake, provided nutrient runoff remains controlled. [1, 2]

2. Primary Aquatic Vegetation and Weeds

- Lotus Dominance: Instead of dense algae, the most dominant biological feature of the lake's surface is its iconic lotus plants (Nelumbo nucifera). During blooming seasons, these cover large portions of the water surface. [1, 2, 3, 4]
- Water Hyacinth Presence: Research indicates that the pond faces ecological challenges from Water Hyacinth (Eichhornia crassipes). This highly invasive aquatic weed often populates the water throughout the year, absorbing nutrients but also threatening to choke out native aquatic life if left unmanaged. Local research has even explored utilizing these plants from Dailab Pond for extracting biofuels. [1]

3. Pollution and Conservation Efforts

- Anthropogenic Pressure: The pond experiences heavy human activity due to adjacent temples and tourism. Issues such as domestic waste accumulation and religious activities (like idol immersions during festivals) introduce organic waste into the water, which can spike nutrient levels and lead to temporary stagnation or localized algal growth. [1, 2, 3, 4]
- Cleanliness Campaigns: To counter the threat of pollution, weed growth, and potential algal overpopulation, the district administration frequently conducts community cleanliness initiatives, such as the "Vande Ganga Jal Sanrakshan Jan Abhiyan". These drives focus on manual waste removal, weed clearing, and raising awareness to keep the local water source clean.

Excess nutrients in pond water, particularly nitrogen and phosphorus, are primary culprits in algae blooms. These nutrients act as fertilisers for algae. When present in high concentrations, they promote rapid algae growth. This can quickly lead to a pond overrun with algae. The problem often originates from external sources. For example, agricultural runoff can carry fertilisers directly into ponds, significantly increasing nutrient levels. Fish waste is another common source, as it decomposes and releases these nutrients into the water. Fertilised lawns and gardens can also contribute, as rain washes the excess nutrients into nearby ponds.

Common sources of nutrients contributing to algae growth:

Runoff from fertilised lawns
Agricultural fields
Fish waste
Decomposing organic material
Rain carrying fertiliser residues

Sunlight and warm temperatures further exacerbate the issue. Algae thrive in bright, sunny conditions. When combined with nutrient-rich waters, this creates an ideal environment for algae to flourish. Warm temperatures accelerate algae metabolism, promoting even faster growth. During hot summer months, ponds can quickly become dominated by algae. This creates a cycle where the more algae there is, the more nutrients are released, leading to even more algae growth. Balancing nutrient levels and managing sunlight exposure are crucial steps in controlling algae in ponds.[5,6,7]

DISCUSSION

Ponds can host a variety of algae, each with distinct characteristics. Common types include Green Algae (Chlamydomonas, Chlorella), Blue-Green Algae (Cyanobacteria), Filamentous Algae (String Algae, Spirogyra), and Diatom Algae. Identifying these types is crucial for managing pond health effectively. While some algae play beneficial roles in the ecosystem, others can be harmful. Understanding which algae are present in your pond can help you determine the best management practices.

Green Algae

Green Algae are among the most widespread types found in ponds. They are crucial in oxygenating water, supporting aquatic life. These algae thrive in nutrient-rich environments. They can appear as single cells or colonies, often giving the water a greenish tint. Despite their prevalence, they are generally considered beneficial. They provide a food source for fish and other aquatic organisms. Their presence indicates a balanced pond ecosystem.

Blue-Green Algae

Blue-Green Algae, or Cyanobacteria, are particularly notorious. Are they harmful? Absolutely. They produce toxins that can affect the skin, liver, and nervous system. These toxins can be dangerous to both humans and animals. Blue-Green Algae often form in stagnant, nutrient-rich waters. They appear as blue-green scums on the water surface. Controlling their growth is critical for pond safety. High levels of these algae can lead to severe ecological imbalances.

Filamentous Algae

Filamentous Algae, commonly known as String Algae or Spirogyra, have a distinctive appearance. They form long, thread-like structures. Where do they grow? Typically, they attach to rocks, plants, and other surfaces in the pond. These algae can become problematic when they overgrow. In small amounts, they are not harmful. However, excessive growth can deplete oxygen levels. This can stress fish and other aquatic life.[8,9,10]

Diatom Algae

Diatom Algae are single-celled organisms known for their unique silica shells. Are they beneficial? Yes. Diatoms play a significant role in oxygen production. They contribute to the pond's overall health. These algae are often found in both freshwater and marine environments. They produce oxygen through photosynthesis, supporting aquatic life. Their presence is usually a sign of a healthy pond ecosystem. Unlike Blue-Green Algae, Diatoms do not produce harmful toxins.

When summer arrives and the water temperature rises above 20°C, many ponds turn a greenish tint within a few days or become covered with silky filaments on the surface. This is never by chance, but the result of an imbalance between light, nutrients, and oxygen. Understanding the mechanisms involved radically changes how to act.

This guide reviews the three main types of algae you'll encounter in your garden pond, from harmless filamentous algae to toxic cyanobacteria. You'll find the precise parameters to measure, natural methods that truly work, and common mistakes that worsen the situation. The goal remains a clear, lively, and stable pond, without relying on any miracle products.

RESULTS

- Planktonic Algae (Green Water): Single-celled, floating algae that turns the water a pea-soup green. In small amounts, it forms the base of the food chain, but overgrowths cloud the water. [1, 2, 3]
- Filamentous Algae (String Algae / Blanketweed): Long, hair-like green strands that form thick mats along rocks, waterfalls, or the pond surface. [1, 2]
- Cyanobacteria (Blue-Green Algae): Actually a photosynthetic bacterium rather than true algae. It creates a paint-like, blue-green or dark skin on the water and can produce toxins. [1, 2]

They are, however, a natural part of pond ecosystems and having some algae can provide valuable shelter for pond wildlife.[11,12,13]

Whether or not you take action to control algae is a matter of choice – they often make a

temporary appearance in the warmer months and may not need controlling. In large ponds, they can be difficult to tackle, and in wildlife ponds it is best to disturb the ecosystem as little as possible.

Algae are good at travelling; they can be transported by animals (especially waterfowl) and their spores are carried long distances in the air. There may be many different types of algae in a pond that remain unnoticed until conditions favour their growth and they begin to thrive.

Most ponds will develop algae and blanket weed at some time or another, but they're particularly common in ponds in a sunny position, with very little planting to provide shade across the surface.

Algae also form when pond water is especially rich in nutrients
If your pond is covered in algae, it can be tempting to change the water – this may solve the immediate problem but will only make things worse in the long run. The best way to discourage algae long term is to remedy the conditions that are helping it to thrive.

Reduce nutrient levels
Avoid putting soil in your pond. When adding new plants, make sure they are in low-nutrient, aquatic compost

.
Stop fertilising nearby lawns and borders. If feeding is essential for the health of surrounding plants, use the minimum effective dose to reduce the risk of excess nutrients leaching into the pond.
Place a net over your pond in autumn to prevent leaves falling in.
Use rainwater to top up your pond. If water levels drop too low in summer, it is better to add rainwater, whenever possible, rather than tap water, because nutrients in tap water encourage algae.
Keep the pond free of fish, as their faeces add nutrients to the water. If you do want fish, choose goldfish, orfe or shubunkin. Keep populations in check by rehoming excess fish but never release them into the wild.
Other ways to discourage algae[14,15,16]
Add a fountain or cascade to aerate the water. This can help prevent blue-green algae but is unlikely to have any effect on other types.
Consider introducing ramshorn snails, which eat algae and decaying material. Avoid other water snails, which are less efficient scavengers, particularly those with long, pointed shells, as they tend to eat pond plants.
Float a mesh bag of barley strawon the pond. Use about 50g of straw per sq m (1½oz per sq yd) of water surface; this should discourage all types of pond algae. Add the straw in spring and remove it when it has turned black (usually about six months later). Sometimes lavender is added to the barley straw for additional effectiveness.
Add a pond dye. Dyofix Pond Black claims to help deter algal growth. By colouring the water black, it deflects ultraviolet rays, so the algae can't photosynthesise. Surface plants such as waterlilies aren't affected. It lasts for several months and can be used all year round. Pond Blue is paler, allowing you to see fish and other pondlife beneath the surface.

Various other products are available – some appear to be effective only in settling suspended debris, others may give short-term control of free-floating algae. Some claim to control the most troublesome types, such as filamentous algae or blanket weeds, but as there are many different forms of these, you might have to try several products to find one that works in your pond. Treatment needs to be repeated at intervals.

Why Algae Spikes in Monsoon

- Nutrient Surge: Rainwater washes nitrogen and phosphorus from surrounding lawns, soil, and animal waste directly into the pond. [1, 2]
- Diluted Systems: Heavy downpours can dilute beneficial water-treatment bacteria and overwhelm filtration or aeration systems. [1]
- Debris Buildup: Leaves, twigs, and sediment settle at the bottom and decompose into a nutrient-rich sludge that feeds algae[17,18]

Why Winter Algae Happens

- Nutrient Availability: Dead leaves, fish waste, and decaying plants release phosphorus and nitrogen into the water. [1, 2]
- Slowed Bacteria: Warm-weather beneficial bacteria go dormant in the cold, leaving these nutrients free for algae to consume. [1]
- Sunlight Penetration: Clear ice or open water lets enough sunlight through for slow photosynthesis to occur. [1]

CONCLUSIONS

Algae is not only a “catch-all” for unwanted aquatic plants, but it is also often looked at unfavorably by pond owners. For the most part, that would be accurate. Although algae plays a critical role in your pond health, an imbalance can be catastrophic to your overall pond ecosystem.[19]

Benefits of Algae

In general, algae species serve a purpose and are essential for a healthy pond. Planktonic algae is the first link in most food chains that occur in your pond. Zooplankton feed on planktonic algae. Followingly, bait fish and fingerling sport fish feed on the zooplankton. Without a food source, these fish will struggle to thrive in your pond.

Pond owners who are managing their pond for trophy bass production will typically fertilize their ponds to keep the planktonic algae population very high. In addition to providing more food for zooplankton, bait fish, and fingerlings, the extra algae blocks much of the sunlight from reaching the pond bottom. In turn, other unwanted aquatic plants struggle to grow. This decreases the areas for bait fish to hide and gives the bass a much easier meal to come by. This method can be effective, but also risky when managing against some of the harmful aspects of algae abundance.

Problems with Algae

The most frequent complaint about algae is aesthetics. A green pond covered with algae is an eye sore. The enjoyment of the pond or water feature is diminished when algae takes over.

Photosynthesis

During photosynthesis, when plants use sunlight and carbon dioxide to produce food, they give off oxygen. Oxygen is critical for your fish, the decomposition of organic matter, and other processes in your pond. Having an overabundance of algae can cause it to act as a blanket and block sunlight from reaching the bottom of your pond. Without sunlight, aquatic plants cannot undergo photosynthesis.

An algae bloom is the rapid reproduction and spreading of algae when the conditions are right. They typically occur during the hot, sunny, calm part of summer. When an algae bloom takes place, your pond can be covered with algae in a very short period of time.The major problem with an algae bloom is the inevitable die off or crash. Frequently, the crash happens even faster than the bloom itself. It can be caused by a cloudy day and lack of sunlight, a cold front, storms, cold rain, or even an over-aggressive chemical treatment in the pond.[20]

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