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Biodiversity of Freshwater Algae from Temple Tank

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ABSTRACT: The study aims to find the diversity of freshwater algae present in the temple tank of Adikesava Perumal temple, Korattur, Chennai. The samples were collected in plastic bottles from various sites in the temple tank. The samples were checked for their pH and temperature. The samples were brought to the laboratory and maintained in an open tank under direct sunlight for 4 weeks. The observation and documentation of the algae were done using the LABOMED VISION 2000 Binocular microscopic unit. Many different varieties of algal species were found from the samples collected. From this, we can conclude that temple tanks act as the best source of a sustainable environment for the growth of algae with diversity and can also be used to monitor the pollution level.

KEYWORDS: Algae, Diversity, Pollution Level, Temple Tank

INTRODUCTION:

"Biodiversity" is the variability in life forms in different levels within a specified ecosystem. The different levels of biodiversity work together to form life on earth. Algae are ubiquitous, diverse eukaryotic, photosynthetic lifeforms (B. Sankaran and E. Thiruneelagandan, 2015). They act as the primary producers and they occur in freshwater lakes, ponds, streams, oceans and can also be seen in soil, rocks, also in more exotic conditions. About 40% of global photosynthesis is contributed by Algae (Andersen, R.A. 1992). The diversity of Algae ranges from microscopic blue-green algae to long, complex kelps. In some cases, Algae grows in association with other organisms such as "Lichens". Algae are grouped generally based on the pigment composition, storage compounds, and various ultrastructural features. Within the aquatic habitats of algae, some grow for a few hundred micrometres on the surface, whereas others grow in the sub-surface, and a few thrive to grow at 200-300 m below the surface which is the photic zone. The freshwater ecosystem is a suitable ecosystem with low salt content making itself a sustainable environment for organisms. The freshwater ecosystem also differs based on its movement and it has three zones, namely: Littoral, Limnetic and Profundal zones. The littoral is the topmost, shallow and warmest zone that receives direct sunlight and allows the algae to grow on the surface. The limnetic is the zone that is surrounded by the littoral zone, it is well-lighted and dominated by the Phytoplankton. The profundal is the deepest zone with less light and it's denser and colder than the other two zones. There is an interface between these two zones where there is a sudden fall in temperature called the thermocline. The level of both oxygen and light varies according to the zones and the freshwater ecosystem also varies depending on the bottom of the shore, whether, rocky or sandy. Freshwater algae are ubiquitous and highly diverse with 8-12 evolutionary lineages. The freshwater algae can be found in different forms such as unicellular, colonial forms, pseudo filaments, filaments, pseudoparenchymatous structures, parenchymatous forms, coenocytic or siphonous forms. They can be free-floating or forms associated with a substrate.

In India, temple architecture has always included the system of building a temple tank (Tadgell Christopher, 1990) where the main source of water is rain. These temple tanks act as a water reservoir and it helps in recharging the groundwaters (S. Palanivel et.al., 2017). The water from the rituals performed was also channelized to reach the temple tank. As this temple tank water contains both organic and inorganic substances, it is also open ambient and supplied with direct sunlight, the temple tank acts as a suitable place for the growth of the algae. The algae present in the tank water acts as a primary producer of the food chain. The phytoplankton present in the tank waters is the best source of biological indicators to measure the amount of pollution in the water (Maya, S. 2003). The more diversity of algae present, the higher the nutrition level present in the water with less or no eutrophication. There are prior works carried out to study the diversity of algae present in the temple tanks of AdhikesavaPerumal temple (Chindaripet), Dhandeeswarar temple (Velachery), Jaganatha Perumal temple (Thirumalisai), Kabaleeshwarar temple (Mylapore), Kandhakottam (Parrys), Karuneeshwarar Temple (Saidapet), Marutheeswarar temple (Thiruvanmiyur), Parthasarathy temple (Triplecane) (Sankaran. B 2015), Thiruneermalai temple (Pallavaram) (Anuja J, 2012), Vaidheeswarar temple (Poonamalle) and Velveshwarar

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temple (Valasarawakkam) around the Chennai city. The current study is focused to the know about the diversity of algae present in the temple tank of Adikesava Perumal Temple (Korattur).

MATERIALS AND METHODS

➢ SAMPLE COLLECTION SITE:

The algal samples were collected from the Adikesava Perumal temple tank, Korattur located in the western part of Chennai. Figure 1 the geographical location coordinates of the collection site is 13°06'14.2"N 80°10'54.4" E

Figure 1. Temple tank

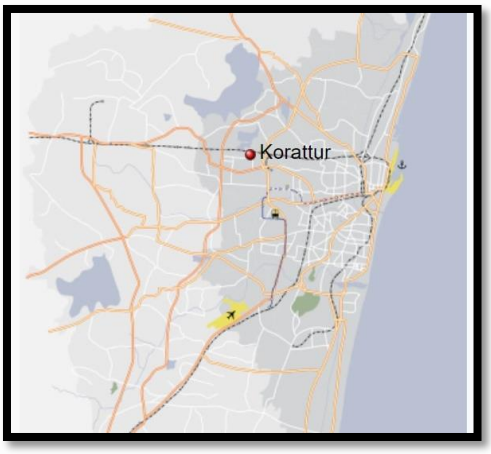

Figure 2

Figure 2 A

➢ COLLECTION, OBSERV**Figure 2 & 2A Area of Study**:

The water samples were collected in plastic bottles from different sites of the tank in (December- 2021). The pH and temperature of the samples collected were recorded. The level of was moderate in the tank. Samples were brought to the laboratory and allowed to grow in an open tank under direct sun light for 4 weeks for further studies. The observation and documentation of the algae were done using Labomed VISION 2000 Binocular Microscopic Unit. Identification of algae was done using various research articles.

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RESULTS AND DISCUSSION

- **COLLECTION OF SAMPLES**

Figure 3A

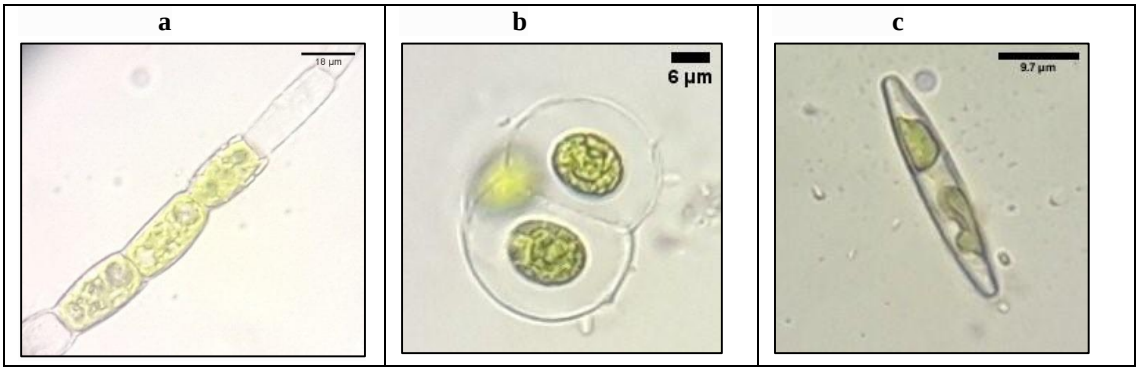
Figure 3B

Figure 3 .A&B Collection of Samples

Figure 4. Growth of algae under direct sun light

The temperature and pH of the samples were recorded as 7.2 and 26℃

- **Identification of Algae:**



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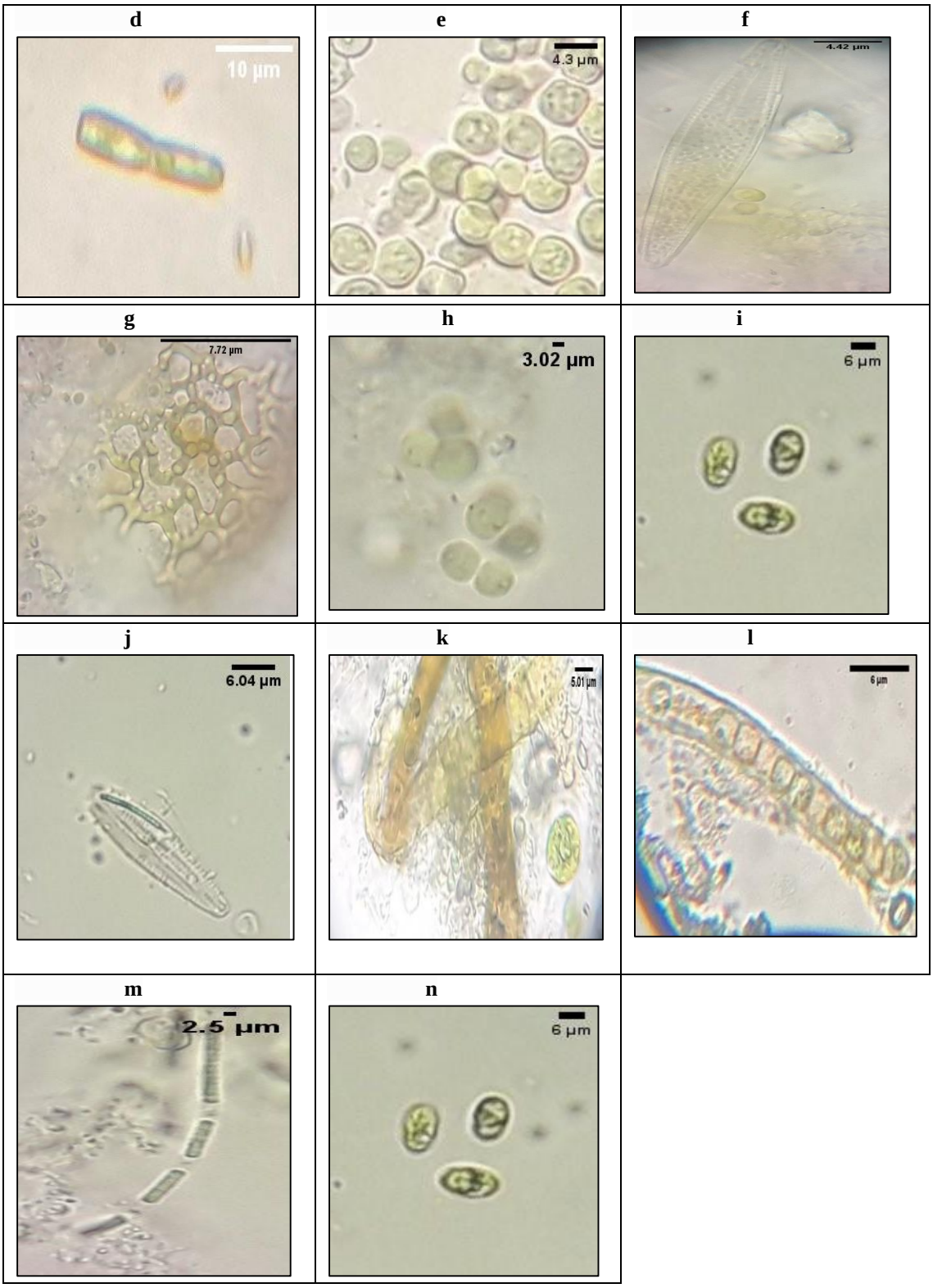

Figure 5 Identification of Algae: a- *Tribonema sp-* filamentous yellow green algae, **b-** *Chlamydomonas sp (Macrococcus/Asterococcus)*, **c-** Diatom *(Frustilia sp)*, **d-** Diatom (*Pinnularia Sp*), **e-** Chlorella, **f-** Diatoms (class:

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Bacillariophyceae), **g-** Netted Algae *(Hydrodicton sp),* **h-** Cyanobacteria (Genus: *Chroococcus /Gleocapsa),* **i-** *Chlorella sp,* **j-** Diatoms (class: Bacillariophyceae), **k-** Unicellular algae with Diatoms (Class: Chrysophyceae), **l-** *Oedogonium*, **m-** *Phormidium*, **n-** *Chlorella Sp*

Based on the identification, the algae of classes: Xanthophyceae, Chlorophyceae, Bacillariophyceae, Cyanophyceae were found to be higher in number.

- **Class: Xanthophyceae**

  This class of algae is commonly known as yellow-green algae. They majorly habitat in freshwater, although some species survive in marine and soil. They store their photosynthate as oils. They occur in coccoid or filamentous forms, but some are siphonous (composed of multiple tubular cells with several nuclei). They can habitat even in low pH and higher iron content (U. Elaya Perumal 2017). Many of them are found in floating mats of algae during winter.

- **Class: Chlorophyceae**

  This class falls under the class of green algae and is distinguished mainly on the basis of its ultrastructural morphology. The green colour of the algae is due to the presence of chlorophyll a, chlorophyll b, and beta-carotene. The members of class generally habitat in freshwater (about 90%) and the rest in saline water, terrestrial environment, etc. The high diversity of Chlorophyceae indicates good health of the water and most members of the class are economically important.

- **Class: Bacillariophyceae**

  The class includes unicellular algae, generally occurring singly, can also be colonial or filamentous. The size of the algae ranges from 5 to 2000 µm. The cell wall is impregnated with silica and has two valves, where one overlaps the other. They are known as the dominant member of phytoplankton in nutrient-rich waters and they can divide more rapidly than other groups of phytoplankton. Many habitat pelagically in open water, whereas some live at surface films at the water-sediment interface. The presence of diatoms helps to know the water quality. The study of assemblage of diatoms helps to predict environmental changes.

- **Class: Cyanophyceae**

  This class includes the primitive stage of algae. They are commonly known as blue-green algae due to the dominant presence of the pigment Phycocyanin-c. Many are habitants of freshwater; some are marine and terrestrial. The members of the class are common in freshwater bodies, where nitrogen (N) fixed by these organisms helps to maintain phosphorus (P) limitation of primary productivity.

Biomass of phytoplankton present is important to understand the dynamics of an ecosystem. The present study was focused to explore the algal diversity of the temple tank of Adikesava Perumal temple, Korattur, Chennai. The results proclaim that the study area has maximum diversity of algae. A clean freshwater ecosystem supports immense diversity of algae, whereas polluted water allows only the fittest to survive. Higher the species diversity lowers the level of pollution. The temple tank of Adikesava Perumal Temple has a higher diversity of algae with low pollution in the water.

CONCLUSION

The temple tank of Adikesava Perumal temple was studied for algal diversity. Algae from the classes: Xanthophyceae, Chlorophyceae, Bacillariophyceae, Cyanophyceae are present and class Bacillariophyceae showed in abundance.

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