Collection and Study of Algal Pigment in Nashik District, Mharashtra

Pallavi.C.Khapare, Shivaji. B. Andhale
Department of Botany, K.T.H.M. College, Nashik -422002 M.S)

Abstract- As previously noted, macroalgae, commonly referred to as seaweeds, lack roots, stems, leaves, and flowers. Kelp, which thrives in underwater forests, may seem to feature these structures, but they are not classified as plants. Instead, they possess similar structures called holdfasts, stipes, and blades that perform the same roles as roots, stems, and leaves in true plants. Like microalgae, different types of macroalgae include red (Rhodophyta), green (Chlorophyta, which is also a form of microalgae), and brown (Phaeophyta) algae. They can grow as much as 30 times faster than terrestrial species and do not contain lignin. This rapid growth allows them to produce substantial biomass for commercial use in a much smaller area compared to land-based plants. Sea farms can cultivate them inexpensively, without the need for additional nutrients or pesticides, making them suitable for food and biofuel production. Both brown and red algae have numerous commercial applications. They are rich in carbohydrates, which can be utilized for bioethanol production, and contain triacylglycerols for biodiesel. Their carbohydrate profile includes mannitols and cell wall components that can also be fermented. Unlike current petroleum sources, the biodiesel derived from macroalgae is free of sulfu.

INTRODUCTION

Algae are thalloid organisms that contain chlorophyll. They hold a significant place in the plant kingdom. Their structure does not feature true tissue differentiation. As such, they do not develop true roots, stems, or leaves. This body structure is referred to as the thallus. The thallus lacks vascular elements, which means it has no specialized system for fluid transport. Algae primarily thrive in specific environments.

Algae consist of a diverse range of organisms that exhibit various reproductive strategies. Their division methods can be as simple as binary fission, akin to yeast, where one cell divides into two, or as complex as multiple fission, where one cell can produce up to several thousand daughter cells in a single cycle, particularly in green algae. In some species, both binary and multiple fission occur within the same organism, dependent on different growth conditions or stages of their life cycle.

Additionally, algae demonstrate diverse body structures, from unicellular forms (microalgae) to multicellular varieties resembling higher plants (macroalgae), characterized by complex body shapes composed of morphologically distinct cells performing different physiological functions. This section will focus on the vegetative cell cycle of unicellular green algae, which can exist as single entities or in groups like coenobia (where daughter cells from one mother cell remain attached), colonies, or filaments, yet operate independently. Although six decades have passed since the first explorations of algal cell cycles, the potential for algae to advance understanding in cell biology remains vast. The relatively limited group of these organisms showcases a remarkable variety of reproductive mechanisms that continue to pose intriguing questions for future cell cycle biology researchers.

MATERIAL METHODOLOGY

Study area

Nasik District is situated in north western part of Maharashtra. It lies between 19°35’ and 20°50’ north latitude and between 73°16’ and 74°56’ east longitude and falls in parts of Survey of India degree sheets 46-H, 46-L and 47-E and 47-I. The district has a geographical area of 15530 sq. km. It is surrounded by Dhule district in the north, Dangs and Surat district of Gujarat State in the northwest, Jalgaon in the east and northeast, Ahmednagar in the south, Aurangabad in the southeast and Thane in the west and southwest. The district headquarters is located at Nasik Town. For administrative purpose four divisions have been formed namely Nasik, Niphad, Malegaon and Peth. The district is further subdivided in to 15 talukas viz.,

Nashik, Igatpuri, Dindori, Peint, Surgana, Deola, Satana, Kalwan, Chandwad, Niphad, Sinnar, Yeola, Malegaon, Nandgaon and Trimbakeshwar. As per 2001 census, the population of the district is 61,09,052. The district has 18 towns and 1931 villages. Nashik is one of the largest district in Maharashtra in terms of area and population. The district forms part of Godavari basin (southern part) and Tapi basin (northern part). Godavari and Girna are the main rivers flowing through the district.

June to September is the south-west monsoon season, whereas October and November constitute the post-monsoon season. The maximum temperature in summer is 42.5°C and minimum temperature in winter is less than 5.0°C. Relative humidity ranges from 43% to 62%. The normal annual rainfall in the district varies from about 500 mm to 3400 mm. It is minimum in the north eastern part of the district and increases towards west and reaches a maximum around Igatpuri in the western ghat. The chances of receiving normal rainfall are maximum (50 to 55%) in the north eastern part around Malegaon and Nandgaon and minimum in the central part of the district. The study of negative departures of the annual rainfall over normal reveals that major part of the district (about 75%) falling east of Western Ghats comprising almost entire Sinnar, Niphad, Surgana, Kalvan, Satana, Chandwad, Yeola talukas and parts of Dindori, Peint and Malegaon talukas can be categorized as drought area.

Trimbakeshwar is arranged in the Nashik District of Maharashtra, India. It is committed to Lord Shiva and is one of the twelve Jyotirlingas. The remarkable component of the Jyotirlinga situated here is the Linga in the sanctuary is as a three-colored typifying Tridev, Lord Brahma, Lord Vishnu, and Lord Shiva.

Geographic Location

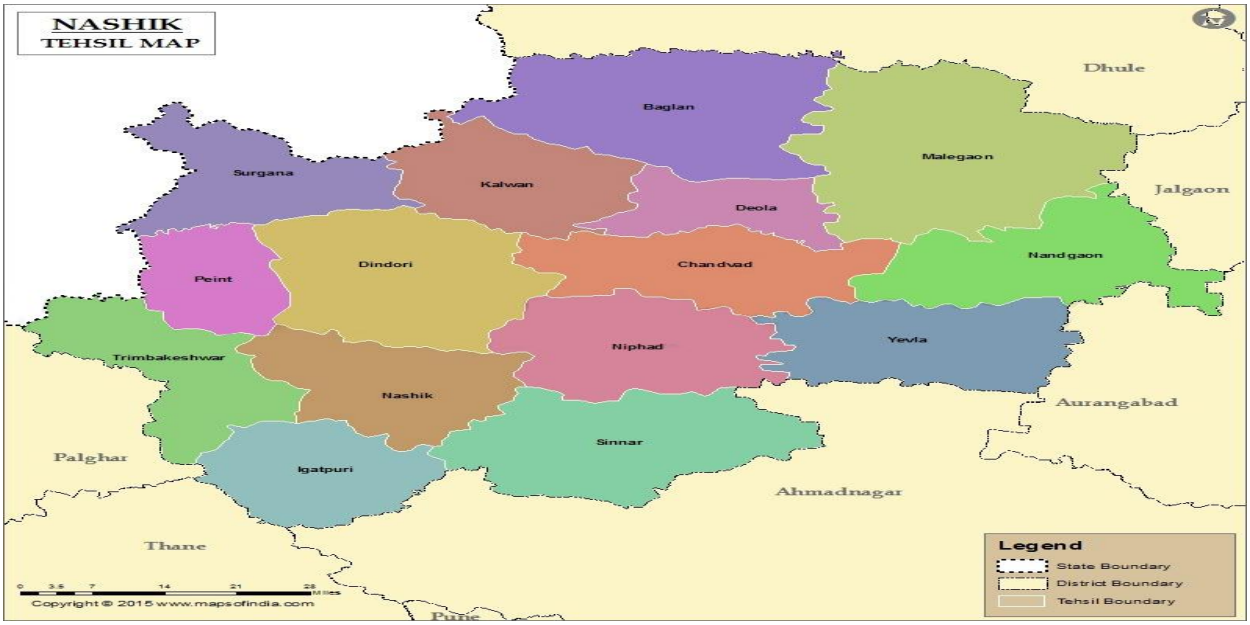
Topography

The range lies on a west to east pivot southwest of Nashik laying on the western edge of the Deccan Plateau. The range comprises of flood basalt and exists in the locale which is known as the Deccan Traps. Trimbakeshwar Range is a mountain extend in the Western Ghats of Maharashtra completely arranged in Nashik District. The range lies 30 km southwest to the locale headquarters Nashik. The seat molded discouragement of the Brahmagiri Mountain ensures Trimbakeshwar, a town considered blessed by Hindus Devotees crowd to this town to visit the holy Trimbakeshwar Shiva Temple.

location

Trimbakeshwar taluka share boundary with three taluka's of Nashik on north site Peint, on east side Nashik, on southern east side Igatpuri taluka. Two district boundary share on complete west side to trimbakeshwar taluka which content Mokhada taluka and Jawhar taluka, on northern side Gujarat state boundary also a joint with trimbakeshwar taluka.

Study area profile



Photosynthetic Pigments:

1. Chlorophyll a: Present in all photosynthesizing algae and is crucial for the process of photosynthesis.
2. Chlorophyll b: Located in green algae and a few other groups, it assists in photosynthesis.
3. Carotenoids: Found in various types of algae, such as green, brown, and red, these pigments help shield against excessive light energy.

Accessory Pigments:

1. Phycobiliproteins: Located in cyanobacteria, red algae, and cryptomonads, these pigments aid in capturing light and transferring energy.
2. Fucoxanthin: Found in brown algae, this pigment has a key role in light absorption and energy distribution.
3. Lutein: Present in green algae, it serves as an antioxidant and guards against too much light energy.

Other Pigments:

1. Astaxanthin: Found in certain green algae, it possesses antioxidant qualities and is utilized as a natural food dye.
2. Canthaxanthin: Located in some species of green algae, this pigment also has antioxidant benefits and is used as a natural coloring agent.

Environmental Benefits:

1. Carbon sequestration: Algae absorb CO2 from the atmosphere, helping to mitigate climate change.
2. Water purification: Algae can remove pollutants and excess nutrients from water, improving water quality.
3. Soil erosion prevention: Algae can help stabilize soil and prevent erosion.

Nutritional Benefits:

1. High protein content: Algae are a rich source of protein, making them a potential alternative to traditional protein sources.
2. Rich in vitamins and minerals: Algae are a good source of vitamins A, B, and E, as well as minerals like calcium, iron, and potassium.
3. Antioxidant properties: Algae contain antioxidants that can help protect against cell damage and oxidative stress.

Industrial Applications:

1. Biofuels: Algae can be converted into biofuels, providing a sustainable alternative to fossil fuels.
2. Animal feed: Algae can be used as a nutritious feed supplement for animals, particularly in aquaculture.
3. Cosmetics and skincare: Algae extracts are used in some cosmetics and skincare products due to their antioxidant and moisturizing properties.

Health Benefits:

1. Anti-inflammatory properties: Some algae have been shown to have anti-inflammatory properties, which may help reduce inflammation.
2. Antiviral and antibacterial properties: Certain algae have been found to have antiviral and antibacterial properties, which may help prevent infections.
3. Supports immune system: Algae contain compounds that may help support the immune system and prevent diseases.

Other Benefits:

1. Space exploration: Algae can be used as a food source and oxygen producer in space exploration.
2. Bioremediation: Algae can be used to clean up contaminated soil and water.
3. Sustainable agriculture: Algae can be used as a natural fertilizer and soil conditioner, promoting sustainable agriculture practices.

RESULT AND DISCUSSION

In this studya thirty –four species of epiphytic algae were identified and described. These speciesbelonged to twenty three genera, four classes and three divisions. All these epiphytic algae is non diatomicspecies. The diatomic species were alreadydescribed by authors in the same marshes. The morphotaxonomicdescription listedwitheach identified taxon in addition of their photography.

1. Class: Xanthophyceae (Yellow green algae)

• Occurrence: Most formsare fresh water but a feware marine.
• Pigments: Yellow
xanthophyll is foundabundantly.
• Reserve food: oil
• Structure: Unicellular motile to simple filamentous. Cellwall rich in pectic compounds and composed of two equalpieces overlapping at their edges. Motile cells have twovery unequal flagella. Pyrenoids absent.
• Reproduction: Sexual reproduction is rare and always isogamous.
• Example: Vaucheria

2. Class: Bacillariophyceae (Diatoms)
• Occurrence: In all kindof fresh water, sea, soil and terrestrial habitats.
• Pigments:Chromatophoresareyellow or golden brown.
Nature of accessory pigments is not very definite.
• Reserve food: Fat and volutin.
• Structure: All the members are unicellular or colonial. Cell wall is partly composed of silica and partly of pectic substances. It consists of two halves and each has two or more pieces. Cell wall is richly ornamental
• Reproduction: Forms are diploid. Sexual reproduction is
special type, occurs by fusion of protoplasts of the ordinary
individuals.
• Example: Pinnularia

3. Class: Euglenineae
• Occurrence: Only freshwater forms are known
• Pigments:Chromatophores are puregreen. Each cell hasseveralchromatophores.
• Reserve food:Polysaccharide and Paramylon
• Structure: Motile flagellates, flagella may be one or twoarising from the base of canal like invagination at the frontend. Complex vacuolar system and a large and prominent nucleus.
• Reproduction: Sexual reproduction is not substantially known. It is isogamous type.
• Example: Euglena

4. Class: Myxophyceae (Cyanophyceae or Blue greenalgae)
• Occurrence: Foundin sea and freshwater,
• Pigments:Chlorophyll,carotenes,xanthophylls, and phycocyain and phycoerythrin. The ratio of last two pigments exhibits colour variation, commonly blue green.
• Reserve food: Sugars and Glycogen
• Structure: Simple type of cell to filamentous, some of the filamentous forms show false or true branching, very rudimentary nucleus, no proper chromatophores, the photosynthetic pigments being diffused throughout the peripheral position. No motile stages.
• Reproduction: There is no sexual reproduction.
• Example: Oscillatoria, Nostoc

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