

COMMERCIALY IMPORTANT MICRO ALGAE

Isochrysis galbana is a microalga. It is an outstanding feed for various bivalve larvae and is now widely cultured for use in the bivalve aquaculture industry. This unicellular alga is investigated for its high amount of Fucoxanthin. Size is 3-6 μm .

Chaetoceros calcitrans is a marine diatom widely used in aquaculture industries, as its nutritional value is suitable for most marine filter feeders. Cells are more or less rectangular in girdle view and elliptical in valve view. Size is 4-6 μm .

Chlorella sp is a single-cell green algae belonging to the phylum Chlorophyta. It is spherical in shape, about 2 to 10 μm in diameter, and is without flagella. It contains the green photosynthetic pigments chlorophyll-a and-b in its chloroplast.

MICRO ALGAE MAINTAINED IN TUTICORIN RESEARCH CENTRE



Dunaliella salina is a type of halophile green micro-algae. It is well known for its antioxidant activity due to the presence of large amount of carotenoids. Size is 4-5 μm .

Nannochloropsis sp. by the way of providing nutrition and improving water quality can effectively promote the growth of rotifer, shrimp and crab larvae etc., and can obviously raise survival rate. Size is 2-4 μm .

UTILITY OF MICROALGAE

Marine microalgae has been used not only as feed for marine organisms but also for emerging fields such as biofuel, bioremediation, commercial and research applications. More than 15000 novel compounds have been extracted and identified from microalgae for diverse purposes. The active compounds isolated from microalgae are potential in anticancer, antioxidant, antidiabetic, antiinflammatory and antibacterial activities. Some important products derived from microalgae are EPS (Exopolysaccharides), highly unsaturated fatty acids (DHA - Docosahexanoic acid, EPA-Eicosapentanoic acid), several enzymes and supplementary proteins etc. These products are significantly used in aquaculture, nutraceutical, pharmaceutical and various other commercial industries.

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MARINE MICROALGAL CULTURE



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MARINE MICROALGAL CULTURE

Microalgae are the primary producers of the marine food chain synthesizing food using solar energy, inorganic nutrients and carbon dioxide (CO₂). They provide basic food to all the zooplankton and larval forms of crustaceans, mollusks, echinoderms and fin fishes. Algae have recently received a lot of attention for its enormous uses, a new biomass source for the production of renewable energy, production of food, fertilizer, bioplastics, dyes and colorants, chemical feed stock, pharmaceuticals and can also be used as a means of pollution control. Earlier marine micro algal studies were focused mainly for providing suitable feed to the hatchery systems. Microalgae could become the potential ingredient of fish feed particularly during early stages of life due to its high nutritive value.

The isolation of pure culture from the innumerable organisms from the seawater and its maintenance is a difficult task. It needs specific physical and chemical requirements for its optimum growth. Tuticorin Research Centre of CMFRI has a pioneer marine phytoplankton laboratory started in 1980's in the country. It conserved fifteen different species of marine microalgae. Recently new strains of microalgae were isolated from Gulf of Mannar and added to the repository. The stock cultures were benefited by the students, researchers and farmers for their research and hatchery purpose.

METHODS OF ISOLATION

Pipette method: The inoculum is obtained by selecting single cells of the desired species by means of a micropipette under a microscope.

Centrifugation method: Centrifugation will be performed repeatedly for six times to expel most of the microorganisms presented in algal sample and the cells will be then streaked on to agar plates.

By exploiting the phototactic movements: The phytoflagellates will move to one direction where light source is present and can be isolated.

Agar plating method : The isolated species can be picked up by sterile needle or sterile loop under microscope and streaked on the surface of 1.5% of agar plate. Once, it has grown into a colony in an agar plate, removed by sterile loop and transferred to culture flasks (250 ml) and larger flasks and subsequently the algae can be cultured on a mass scale.



Different species of microalgae grown on agar plate

Dilution culture method: Aseptically add 1 ml of enrichment sample to the first tube (10⁻¹) and mix gently. Take 1 ml of this dilution and add to the next tube (10⁻²) mix gently. Likewise it can be serially diluted up to 10⁻⁶ - 10⁻¹⁰ to get a unialgal culture.

ALGAL CULTURE

Algae can be cultured using a wide variety of methods, ranging from closely-controlled laboratory methods to outdoor mass culture methods.

Indoor : Indoor culture allows control over illumination, temperature, nutrient level and prevent contamination. It is a closed culture system using culture vessels such as tubes, flasks, carboys, bags etc.

Outdoor : Outdoor algal systems make it very difficult to grow specific algal cultures for extended periods. It is an open culture system practiced in uncovered ponds and tanks.

Algal culture can be done by Batch, Continuous and Semi-Continuous culture methods.

Batch culture : This method employs single inoculation of algal cells into a container of fertilized seawater followed by a growing period of several days and harvesting when reaches its maximum density. The batch culture is generally done in the series of test tubes, 2 L flasks, 5 and 20 L carboys, 150 L cylinders, 500 L indoor tanks, 5,000 L to 25,000 L outdoor tanks. The volume of the inoculum is generally 2-10% of volume of the preceding stage in the upscaling process.

Continuous culture: Supply of fertilized seawater is continuously pumped into a growth chamber and the excess culture is simultaneously washed out that permits the maintenance of cultures very close to the maximum growth rate. Two categories of continuous cultures are turbidostat and chemostat culture.

Semi-continuous: In this method partial periodic harvesting is practiced and immediately the volume of culture is maintained to original volume by the addition of seawater and supplementing with nutrients to achieve the original level of enrichment.

Nutrients & Culture Media : Concentrations of cells in phytoplankton cultures are generally higher than those found in nature. Algal cultures must therefore be enriched with nutrients to make up for the deficiencies in the seawater in algal culture laboratory. Macronutrients such as nitrate, phosphate (in an approximate ratio of 6:1), and silicate are essential for algal culture. Micronutrients consist of various trace metals and the vitamins thiamin (B1), cyanocobalamin (B12) and sometimes biotin is required for micro algal culture. During the first stages of the isolation procedure Conway' or Walne's medium, modified Guillard's f/2 medium and TMRL medium are commonly used.