

Algal physiology

Lab. Algal farming systems

Algaculture is a form of aquaculture involving the farming of species of algae.

algal cultivation has numerous Commercial and industrial uses, including production of food ingredients such as omega-3 fatty acids or natural food colorants and dyes, food(as protein and carbohydrates), fertilizer, bioplastics, chemical feedstock (raw material), pharmaceuticals, algal biofuel(biodiesel and bio-ethanol), and can also be used as a means of pollution control.

The cultivation systems are categorized into two types: closed system & Open systems

1- closed system(Photobioreactors)

Photobioreactors can be defined as culturing systems where the light passes through reactor walls (usually made of a transparent, UV-resistant material) to reach all the cultivated cells to obtain algal biomass.

Several types of photobioreactors are exist. They include:

1-Tubular Photobioreactors

2-Flat Panel Reactor

3-Christmas tree Photobioreactors

Photobioreactors have several advantages including:

- 1- high process control
- 2- the ability to prevent contamination of the biomass from unwanted algae, mold, yeast and bacteria
- 3-control temperature
- 3- minimize water evaporation
- 4- successfully for producing large quantities of microalgal biomass.

disadvantages:

- 1- costly
- 2- difficult to construct and operate.

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2-Open System

Open ponds are the oldest system for mass cultivation of microalgae

The most common types of open system include:

- 1-raceways
- 2-circular ponds
- 3- unstirred ponds

Advantages:

- 1-their simple construction
- 2- easy operation and maintenance
- 3- less cost as compared to bioreactors

Disadvantages:

- 1-poor light consumption by cells
- 2-water loss through evaporation losses
- 3-diffusion limitation of CO₂ from the atmosphere
- 4-large land area requirement
- 5-easy contamination by unwanted algae, mold, and bacteria
- 6-low productivity and temperature fluctuation

Algal Cultivation for Biomass and Harvesting

Procedure:

1-Prepared flask contain 100 ml suitable media for isolated algae and transfer 10 ml of isolated algae then incubated for 14 days, this culture growth transferred to 500 ml of culture media and incubated again for 14 days, then transfer this culture growth to 1000 ml of culture media.

- 3- the growth culture transmits to glass pools 4L to get biomass culture these pools were covered by piece of gauze and the air was supplied through a rubber tube ended with bubble stone .

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- 4- Harvest culture at the **end of the exponential phase**, by **gravity sedimentation method** to bring the algae are deposited to the bottom.
- 5- collect algal Sediment and wash three times with distilled water, then left in the oven at a temperature of 40 C° for a period of two days After that collect the dry product in special containers and stored in the refrigerator until use.



Flat Panel Reactor



Tubular Photobioreactors

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raceway pond



Circular pond