

CULTURE OF MICRO-ALGAE

Culture Method

Mass cultivation of microalgae takes place by the following methods:-

1. Indoor Culture
2. Open Culture
3. Axenic culture
4. Batch, Continuous and Semi-continuous

1. Indoor culture

Indoor culture allows over illumination, temperature, nutrition level, contamination with predators and competing algae.

2. Outdoor Culture

Outdoor culture such as uncovered ponds and tanks are more readily contaminated than closed vessels such as tubes, flasks, carboys, bags etc.

3. Axenic culture.

axenic cultures are free of any foreign organisms such as bacteria but this cultivation is expensive and difficult because it requires a strict sterilization of all glassware, culture media and vessels to avoid contamination.

4. Batch, Semi-continuous and Serial Continuous Cultures :-

a. The most common culture is the batch culture, due to its simplicity and ease of use. The batch culture consists of a single inoculation of cells into a container of fertilized seawater followed by a growing period of several days and finally harvesting when the algal population reaches its maximum or near density.

b. In continuous culture, cultures are maintained at a chosen point on the growth curve by the regulated addition of fresh culture medium.

c. In a semi-continuous system the fresh medium is delivered to the culture all at once by simply opening a valve in the medium delivery line. Fresh medium flows into the culture vessels and spent culture flows out into a collecting vessel.

Commercial - Scale Culture

1. Mass culture of microalgae for commercial purpose is presently carried out with only in open systems.
2. The main reason for this is that large open ponds are easier and less expensive to build and operate.
3. A number of types of ponds are easier and less expensive designed and experimented with for microalgae cultivation.
4. They vary in shape, size, material used for construction, type of agitation and inclination.
5. Often the construction design is essentially dictated by local conditions and available material.
6. Only three major designs have been developed and operated at a relatively large scale.

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1. Inclined System
 2. Circular Ponds
 3. Raceway Ponds

1. Inclined Systems: —

In inclined systems, mixing or turbulence is achieved through pumping the culture suspension and gravity flow from the top to the bottom on a sloping surface.



Inclined Systems

2. Circular Ponds: —

Circular ponds are not favoured in commercial plants since they require expensive concrete construction and high energy input for mixing. In circular ponds, agitation is provided by a rotating arm.



Circular Pond

3. Raceway Ponds: —

- a. The most simple example of raceway pond consists of a shallow ditch dug into the ground and covered with plastic sheets.
- b. This construction is relatively inexpensive but its cost is strongly influenced by the characteristics of the ground.
- c. The lining must be fixed very carefully to the ground to avoid displacement by winds.
- d. In raceway ponds 1000-5000 m² string is accomplished by one large paddle wheel per pond.

The nutrient medium for Outdoor culture

a. The nutrient medium for outdoor culture is based on that used indoors, but agricultural-grade fertilizers are used (nitrate and phosphate fertilizers and a few other micronutrients) instead of laboratory-grade reagents.

b. Culture depths are typically 0.21-1 m.

c. Culture from indoor may serve as inoculum for monospecific culture.

Advantages of Outdoor culture
Algal production in outdoor ponds is relatively inexpensive.

Disadvantages

a. Algae cannot be maintained for prolonged period.

b. Outdoor production is often characterized by a poor batch to batch consistency.

c. Outdoor culture is only suitable for a few, fast growing species due to problems with contamination by predators, parasites and more opportunistic algae that tends to dominate regardless of the species used as inoculum inoculum.

d. Unpredictable culture ~~crashes~~ crashes could be caused by change in weather, sunlight or water quality.