

## MASS CULTIVATION OF CHLORELLA

Chlorella: The alga and its Importance

It is an unicellular, non motile alga belonging to class Chlorophyceae. Chlorella possesses a high quality of food value and its nutritional value has been compared with soya bean and spinach leaves. It contains about 50% protein and 20% lipids and carbohydrates. The proteins of Chlorella contain all amino acids essential for the nutrition of human beings and animals. These amino acids are comparable with animal proteins which lack methionine and are fairly rich in vitamin C, provitamin A, ~~the~~ thiamine, riboflavin, pantothenic acid, folic acid, niacin, pyridine, vitamin B<sub>12</sub>, biotin, choline, liponic acid, vitamin K, inositol and para-aminobenzoic acid. Such algal proteins can be used to supplement the cereal preparations.

### Mass Scale Culturing of Chlorella

The alga grows actively in sunlight and artificial light in presence of CO<sub>2</sub> and nutrients in the

culture medium. In mass scale culturing the provision is made to agitate the culture media and to provide additional supply of  $CO_2$ .

The scientists of Japan, USA, England, Germany, South East Africa, Mexico and Israel etc are engaged in finding out a cheaper method for culturing of Chlorella and other alga like Scenedesmus and Spizulina on mass scale. This mass yield of alga will act as a substitute or supplement to our conventional food.

If the cost could be reduced by developing a method through which the algae could be grown in ponds instead of tanks and plastic tubings and if the sewage waste could be used to provide the required nutrients, the mass culturing of Chlorella will be more practical.

The mass culturing of Chlorella and other fresh water algae is handicapped by following factors:

1. High cost of equipments and nutrients.
2. Need for preventing contamination (precaution measures).

3. Maintenance and high labour cost per unit of production.

4. Culturing places can be only be made in open sunny, warm and semidesert areas.

The idea of mass culturing of Chlorella originated due to its fast growth, high nutritional value, simple growth requirements and formation of little waste materials.

The alga during cultivation utilizes organic wastes as fertilizers and produce a variety of products (chemicals and antibiotics). The entire procedure of mass culturing of Chlorella as food product includes following steps.

**Cultivation** → The culture medium of Chlorella needs additional supply of  $\text{CO}_2$  and mineral nutrients. The main aim of such algal culture is to achieve a high cell density for which high rate of  $\text{CO}_2$  supply is maintained either by bubbling  $\text{CO}_2$ -enriched air through the medium or by stirring, shaking or circulating the medium. The nutrients are replaced quickly as they are

absorbed. The cell density is usually measured photoelectrically and the nutrient supply is controlled automatically to maintain high rate of division. Outdoor tanks are often used for mass culture but there is a problem of contamination from bacteria, other algae and micro-animals. The animals eat the algal crop but can be controlled by adding 1-3 p.p.m of 2,4-dinitro-6-cyclohexyl phenyl acetate or pentachlorophenyl acetate.

Tomiya (1960) devised a method called Open Circulatory System (O.C.S) for mass cultivation of Chlorella. In this system he used the open, shallow pond with a rotating device as rotating (circulatory) pipes fitted jets. The jets help in rotating the culture suspension so that it does not settle down in the bottom and also in efficient supply of  $CO_2$  which is needed for fast growth of alga. At first sterile plant stocks (pilot plants) are used as sources of culture which later on are grown under controlled conditions.

**Yield** - Average mass scale yield rate of Chlorella varied from 40-75 metric tonnes per hectare per year and in terms of proteins about 20-40 metric tonnes per hectare per year.

**Harvesting and Drying** → After mass culturing the algal cells are collected (harvested) and washed properly. Now they are dried in vacuum and then ground in a mill to form powdery flour. The powder is packed and stored in tin cans.

In China Chlorella is cultivated on pig manure. In India its culture has not been started on mass scale due to expensive harvesting techniques and indigestible cell wall. It should be kept in mind that such algal preparations should be acceptable as human food. Efforts are further in progress to remove these hurdles. The Chlorella was also used as food by astronauts in space flights.

## Question

- Q. Describe the main state cultivation of Chenopodium
- Q. Describe the importance of Chenopodium and its nutritive value and nutritional value.