

CC 1 : BIODIVERSITY (Microbes, Algae, Fungi and Archeogonate)

UNIT – 2

Algae
(Part 6)**4. Algae as bio-oil :**

A number of microalgae have been investigated to produce bio-oil via pyrolysis or thermal liquefaction. Bio-oil yields from microalgae have been reported up to 41% in case of *Spirulina* and about 24%–45% in case of the microalgae *Scenedesmus*. In macroalgal biomass *Laminaria saccharina* accounts for about 63% energy restoration and *Laminaria saccharina* yields 79% oil after hydro-thermal liquefaction. But in case of freshwater macro-algae such as *Oedogonium* and *Cladophora* yields only 26% and 20%, respectively.

5. Algae as bio- diesel :

Microalgal biodiesel is mainly composed of unsaturated fatty acids³³. The algal biomass from wastewater contains a mixture of various algae and hence different fatty acid profiles can be obtained. *Chlorella vulgaris* and *Chlorella protothecoides* are two main species; containing high oil content has been studied by many workers for the production of biodiesel. Biodiesel can be produced from algae such as *Chlorella* sp., *Euglena* sp., *Spirogyra* sp., *Scenedesmus* sp etc.

6. Algae as bio-ethanol :

Algal biomass is the potential source to produce bio-ethanol. Examples of green algae employed for bioethanol are: *Dunaliella*, *Chlorella*, *Chlamydomonas*, *Arthrospira*, *Sargassum*, *Spirulina*, *Gracilaria*, *Prymnesium parvum*, *Euglena gracilis* and *Scenedesmus*. The bioethanol from seaweed *Ulva lactuca* can be produced by fermentation with yeast.

7. Algae as source of β -carotene :

The unicellular halo tolerant alga, *Dunaliella bardawil* is found to contain high concentration of β -carotene.

8. Algae as a source of phycocolloids :

Phycocolloids are some complex polysaccharides extracted from the walls of some brown and red algae. These are mucilaginous material and hydrophilic in nature. Three principal types of phycocolloids are –

- (i) Agar-agar,
- (ii) Alginic acid and
- (iii) Carrageenan.

(i) Agar-agar :

Agar is composed of two polysaccharides – agarose and agaropectin. It is readily soluble in water. It is commercially obtained from *Gelidium nudifrons*, *Gracilaria verrucosa*.

USE :

- a. It is used as solidifying agent in various culture media because it melts at 85-100°C and become solid at low temperature.
- b. It is also used in food pharmaceutical and cosmetics industries.
- c. It is used in manufacture of cheese, pudding, creams and jellies.
- d. It is also used as laxative, leather and textile industries and to prepare some pills and ointments.
- e. Pure agarose is used in gel electrophoresis.

(ii) Carrageenan :

It is a phycocolloid, derived from the cell wall of certain red algae. Example includes *Chondrus crispus* (Irish moss), *Gigartina* sp., *Stellata* sp. It is a complex of D-galactose, 3,6-anhydro D-galactose and mono-esterified sulphuric acid which is almost similar in agar agar.

USE :

- a. It is used as stabilizer of emulsion in paints and cosmetics.
- b. It is also used as a component of deodorants, tooth pastes, paints, cosmetics etc.
- c. Physicians also used carrageenan as a blood coagulant.
- d. In alcohol and sugar industry, it is used as a clearing agent.

(iii) Alginic acid :

Alginates are salts of alginic acids, which are found in the cell wall of some brown algae *Laminaria* sp., *Fucus* sp. It is a complex polysaccharide of β -1,4 linked mannuronic

acids and α -1,4 linked L-glucorinic acid units. It is also obtained from the cells of some red algae. It is a non-toxic, insoluble in water, viscous but becomes hard when dry.

USE :

- a. About half of alginate is used for making ice-creams.
- b. In food industry, it is used in the preparation of soap, cream, sauce.
- c. In textile industry, it is used in printing pastes and cosmetics.
- d. It is used in the production of artificial fibers, plastics and rubbers.

- **Diatomite :**

After the death of diatom cells, the outer covering i.e. the silicified wall (frustules) becomes accumulated at the bottom of the water. This accumulation may be thicker during favorable condition and these deposits are called diatomaceous earth or diatomite. Diatomaceous earth may be white, firm, soft and light.

USE :

- a. It is used as filter in different industries (sugar, oil).
- b. It is used as insulators of boilers and blast furnaces for its heat resistance ability.
- c. It is used as a clearing agent in soap, toothpaste and metal polish industries.