

Contd.

8. Commercial products :

Many forms of marine algae, Phaeophyceae and Rhodophyceae, are highly valuable for certain commercial products, chiefly agar-agar, alginic acid and carrageenin.

i. Agar-Agar (Agar):

Agar-agar is obtained from various members of red algae for e.g., *Gelidium*, *Gracilaria* and species of *Chondrus*, *Gigartina* etc. It is a non-nitrogenous extract obtained almost in a pure mucilaginous form. The chief constituent of agar is a carbohydrate galactan. The purified agar is sold in the form of flakes, or granules which are brittle when dry but become tough and resistant when moist.

The important use of agar is in microbiology and tissue culture (in the preparation of as culture media gelling agent for growing algae, fungi and bacteria in the laboratories).

Other uses are in the cosmetics, paper and silk industries, in dentistry for making impressions and in the preparations of ice-cream, jellies, sweets and baking.

ii. Carrageenin:

This is a metabolic product similar to agar, obtained from *Chondrus crispus*, *Gigartina stellata* and *Iridaea laminaroides*.

The mucilage has several important industrial applications, e.g., in textile industry, in paper making, in the manufacture of straw and felt hats as a stiffening agent; as an ingredient in cosmetics, shoe-polishes, hand lotions, tooth paste etc., as an emulsifying and suspending agent, in the baking, dairy industries and in clarifying liquors.

iii. Algin and Alginates:

Algin is a calcium magnesium salt of alginic acid present in the intercellular substance of the Phaeophyceae. Because of its special colloidal properties alginic acid and its derivatives find considerable use in industry. Its salts are

used in the manufacture of variety of goods ranging from ice-cream, salad cream, custard and jams to cosmetics, films, fabrics, ceramics, textiles, polishes and paints.

They are also used as a suspending agent in compounding drugs, lotions and emulsions; in the rubber industry in latex production; as an insulating material and as dental impression powder.

Species of *Laminaria*, *Fucus*, *Ascophyllum*, *Macrocystis*, *Nereocystis*, *Ecklonia*, and *Sargassum* are the chief sources of commercial algin.

iv. Diatomite :

Fossil forms of diatoms in some regions are found in large deposits which are called 'Diatomaceous earth'. Silica, the basic constituent of glass and granite rock, is deposited on the cell walls of the diatoms. Because the silica walls are hard and chemically inert, the sediments accumulate in marine and fresh water basins.

Deposits of fossil marine diatoms over 1,200 feet thick are known. Once these were used as an absorbent of nitro-glycerine in the manufacture of dynamite.

Now-a-days, for its hard and chemically inert nature, it is mainly used in insulation, as a filtering agent and as an abrasive, in the industrial filtration processes of sugar refining, brewing and wine making, in the recovery of chemicals and for removing waste mycelium in the production of antibiotics.

11. Medicinal use:

Alaria was once used for strengthening the stomach and restoring the appetite after sickness. Alginates are used for their haemostatic nature; fucoidin and sodium laminarin sulphate are used as 'blood anticoagulant'. *Digenia simplex*, a Rhodophycean alga, provides an antihelmintic drug. Agar-agar, for its absorptive and lubricating action, is used medicinally in the prevention of constipation.

The antibacterial product chlorellin, obtained from *Chlorella* acts as antibiotic. The antibacterial effects are more pronounced against coliforms

and other related intestinal bacteria. Extracts of *Cladophora*, *Lyngbya* and certain other algae kill strains of *Pseudomonas* and *Mycobacterium* and exhibit antiviral activity.

13. Sewage Disposal:

Sewage consists of water borne domestic and industrial waste which is rich in dissolved or suspended organic and inorganic constituents but very poor in oxygen. Species of *Chlamydomonas*, *Scenedesmus*, *Chlorella* and *Euglena* are used in sewage treatment plants for providing through photosynthesis the oxygen necessary for rapid decomposition of the sewage by bacteria.

Bacteria break down the sewage component of complex organic compounds into such simple inorganic compounds as ammonia, carbon dioxide etc. and water with the needed amount of oxygen. Oxygen required may be supplied artificially which is quite expensive or through the agency of the photosynthetic algae which grow in sewage disposal ponds.

The most common algal species present in the sewage oxidation ponds are *Chlamydomonas*, *Scenedesmus*, *Chlorella*, *Euglena*, *Eudorina* and *Pandorina*.

Tests have shown that the algae recovered from sewage ponds can be used as animal food and in certain regions it may be a valuable source of fodder.

16. Other Products:

From members of *Phaeophyceae*, two important products mannitol and fucoidin are obtained. Mannitol is used in food and medicinal products, inks and plastics etc. and fucoidin is used as a mucilage and in medicines.

The burnt 'ash' of larger Brown algae, specially the Kelp belonging to *Laminariales*, has been used for the extraction of minerals iodine and bromine. It is also used as a source of soda in the manufacture of soaps, glassware and alum.

Negative Importance

1. Toxicity and parasitism:

Gymnodinium veneficum, Prymnesium parvum and species of Microcystis cause mortality in fish and in domestic animals that drink water infested with these algae. Some species such as Gonyaulax produce endotoxins which accumulate in the digestive glands of shellfishes feeding on them. If such shellfishes are consumed by other animals including humans, paralysis and even death may result.

Bloom forming blue green algae such as Microcystis aeruginosa, and Anabaena flos-aquae have been found to cause animal poisoning in temperate countries.

If some of the toxic planktonic algae happen to be ingested, they may cause various disease syndromes. For example, some Anabaena and Microcystis species cause gastric trouble; Gymnodinium brevis produces respiratory disorders, and Lyngbya and Chlorella are responsible for certain skin infections.

Species of parasitic green algae Cephleuros cause 'red rust of tea' and cause heavy economic losses by seriously affecting the yield of tea.

The excessive growth of certain algae such as Microcystis aeruginosa in a body of water often results in severe depletion of oxygen in the habitat. This leads to mass mortality of fish due to suffocation. Sometimes, high temperature and bright sunlight result in massive disintegration of algal blooms which releases their noxious compounds into the medium. Choking of the mouth or gills of fish by these algae is also partly responsible for their death.

2. Fouling of marine vessels :

Some sea weeds may grow on the metal hulls and woodwork of ships and boats producing a corroding and destructing effect. Thick growth of weeds sometimes results in considerable increase in friction between hull and water thereby accentuating wear and tear and shortening the life of the vessel.

3. Importance in municipal water supplies :

The problems associated directly or indirectly with algal growths in water reservoirs and water supplies are:

- i. loss of recreational and fishing values of pools, ponds and lakes due to excessive growth of *Microcystis*, *Spirogyra*, *Cladophora* and *Pithophora*
- ii. imparting abnormal tastes and odours by the metabolic or decomposition products of organisms such as *Symura*, *Synedra*, *Anabaena*, *Microcystis* and *Dinobryon*.
- iii. Clogging of water filters by *Oscillatoria*, *Spirogyra* and certain diatoms.
- iv. Colouration of raw and finished waters due to the presence of planktonic algae such as *Chlorella*, *Chlamydomonas*, *Euglena* and *Oscillatoria*
- v. Production of toxic substances
- vi. Corrosion of concrete and metallic walls of pipes and boilers by carbonic, oxalic and silicic acids excreted by certain algae, e.g., *Anacystis* and *Chaetophora*
- vii. Changes in pH, CO₂, bicarbonate and oxygen contents of water.

However, they serve useful purpose by maintaining of aerobic conditions by checking putrefaction of organic substances and reduction of total hardness of water by consuming bicarbonates and insoluble carbonates.
