(b)Indirect development: It occurs during extreme desiccating

conditions or in low temperature. Sometimes, thin wall divides the contents of aplanospore in to many parts. Each part develops cysts or hypnospores. This stage of Vaucheria is called Gongrosira stage as it resembles the alga Gongrosira. The cyst ruptures in favourable conditions and protoplast comes out by amoeboid movement. This protoplast become spherical and secretes new wall. It germinates to form new filament.

Sexual reproduction

Vaucheria has advanced type of sexual reproduction. It is oogamous. Vaucheria is homothallic. The male reproductive organ is antheridia and female reproductive organ is 00gonia. The oogonia are larger in size. It may be sessile or stalked. It is produced on special reproductive branches.

Antheridium

Mature antheridium is stalked. It is cylindrical, tubular and hook shaped. The development of Oogonium starts before the development of oogonim. The antheridium is club shaped. It is produced in the apex of short branches. A septum separates it from remaining filament. Antheridium forms a hook. The protoplast of antheridium is divided into many uninucleate parts. Each part develops two lateral flagella and becomes antherozoid. The flagella are unequal in size. They are laterally inserted and pointed in opposite directions. An apical pore is developed at the tip of antheridium.

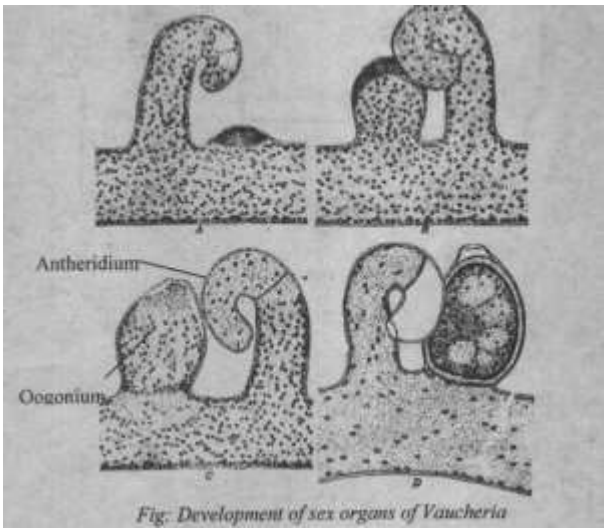

Fig: Development of sex organs of Vaucheria

New protuberances formed on carpogonium. Remaining nuclei migrate to them. These protuberances divide and form gonimoblast filament. The carpogonium with gonimoblast P laments are called cystocarp.

2. **Formation of carpospores**: The terminal cell of gonimoblast Hament produces non-motile carpospore. The carpospore is formed in the form of naked mass of protoplast.

3. **Formation of chantransia stage**: Carpospore separates from the filaments and secretes cell wall. It settles on suitable environment. Then it becomes a pod of parenchymatous tissues. A small outgrowth is formed from one side of carpospore. The outgrowth is cut off by the formation of septum. It divides transversely for many times to form prostrate filaments. This sage of thallus resemble to another alga called chantransia. Therefore, this stage of Batrachospermum is called Chantransia stage. It is juvenile stage. This stage reproduces by for ation of monospores.

4. **Formation of monospores**: The terminal cells of filaments form monospore. Monospores are non-motile and uninucleate. They are produced in monosporangia. Some cells of the Chantransia stage become swollen. They become spherical and oblong to form monosporangia. The content of each monosporangium develops into single uninucleate spore called monospore. These spores liberates and again develop chantransia stage. The terminal cells of

the lower branches of chantransia functions as apical cell. They ive rise to adult plant. It is generally believed that chantransia filament forms the prostate system and filament proper form the eret system.

.**Alternation of generation**

‘Batrachospermum plant is free living haploid gametophyte It cevelops spermatangia and carpogonia which produce male and :einale gametes. These gametes unite to form diploid zygote. 1. “I he zygote nucleus divides meiotically and gonimoblast nuclei ,ire formed. The terminal cells of gonimoblast act as iirposporangia. These develop carpospores this plant is called Ca rposporopbyte.

3. The carpospores germinate to produce Chantransia stage. The miniature plant arises from the filament of Chantransia stage.

2. Fodder:

The sea weeds as fodder have been widely used in Norway, Sweden, Denmark, Scotland, America, China and New-Zealand. In Norway, Rhodymenia palmate has come to be known as 'Sheep's weed'since sheep are very fond of this particular alga. *Laminaria saccharine*, *Ascophyllum* sp., *Sargassum* sp. and *Fucus* sp., are equally liked by the catties.

In many countries factories have been established to process the seaweed into suitable cattle-feed. Eggs, from hens fed on sea weed meal, have an increased iodine content while increased butter-fat content of milk is reported from cattle whose diet is supplemented with sea-weed meal.

3. Pisciculture:

Algae, both floating and attached forms, marine as well as fresh water, provide the primary food for fish and other aquatic animals. The great fishing grounds of the seas are found where these are present in large numbers. In many countries pond culture for fishes has been taken up and they are fed with various forms of algae.

Judged by the works carried out by various investigators in India on the food and feeding habits of fishes (Singh, 1956), it appears that the Green algae, the Diatoms and some Blue-greens are most widely eaten up by the fishes. Fish food is mainly the planktons (the floating forms), phytoplankton's and zooplanktons. Zooplankton's develop by feeding upon the phytoplankton's.

It is now known that several vitamins found in fish can ultimately be traced to the phytoplankton's on which they feed. So, directly or indirectly, the algae form the source of food for fishes. At the same time, these algae keep the water habitable for fishes by absorbing the carbon dioxide and enriching water with oxygen by the photosynthetic activity.

4. Fertilizers:

The large Brown and Red algae are used as organic fertilizers, especially on land close to the sea. The weed is used either directly or as a seaweed meal. A concentrated extract of seaweed is also sold as a liquid fertilizer. Coralline algae Lithothamnion calcareum and Lithophyllum sp. are used profusely for liming the soil. Similar is the use of Chara which becomes encrusted with calcium carbonate.

However, the greatest utility of the algae, as a friend to the farmers, is seen in some common forms belonging to Cyanophyceae for their capacity to fix atmospheric nitrogen and thus enriching the soil. In the paddy fields they have been seen to produce an effect almost similar to that of manuring with 30 kg. of ammonium sulphate per acre (Watanabe, 1959).

The harvesting of the weed depends upon the genera used and their habitat. Species of *Laminaria, Ascophyllum, Macrocystis, Nereocystis, Ecklonia, Durvillea* and *Sargassum* are the chief sources of commercial algin.

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 lamanarin sulphate are used as 'blood anticoagulant'. Digenia simplex, a Rhodophycean alga, provides an antihelmnitic drug. Agar-agar, for its absorptive and lubricating action, is used medicinally in the prevention of constipation.

12. Antibiotics:

The antibacterial product chlorellin, obtained from Chlorella is well known. The antibacterial effects are more pronounced against coliforms and other related intestinal bacteria.

Extracts from Rhodomela larix and Ascophyllum nodosum are effective against both gram positive and gram negative bacteria. Several algae, e.g., Halidrys, Pelvetia, Laminaria, Polysiphonia, Nitzschia and Hapalosiphon, have been reported to possess antibiotic or antibacterial properties which, however, need further confirmation.

13. Sewage Disposal:

Sewage disposal is one of our main defences against those diseases which are spread by the agency of human waste. There is only one way of sewage disposal and that is into water, streams, rivers, lakes or the sea. Sea side towns can dispose the sewage directly into the sea but in other cases the sewage should be treated before disposal.

Essentially, there are two phases of sewage treatment—the physical and biological. The most important and common physical processes are straining and tedious. The biological process i.e., sewage disposal is simple and less expensive.

Sewage disposal treatment is essentially a process of biochemical oxidation and its basic requirement is oxygen. The parts or amount of oxygen needed for the purification of 100,000 parts of sewage by weight is called the Biochemical Oxygen Demand (B. O. D.).

In other words, we may say that the ever present bacteria break down the sewage into its components complex organic compounds into such simple inorganic compounds as ammonia, carbon dioxide etc. and water with the needed amount of oxygen.