Fucus

Systematic position

Class:	Phaeophyceae
Order:	Fucales
Family:	Fucaceae
Genus:	Fucus

Occurrence

Fucus also called rockweed, genus of brown algae, common on rocky seacoasts and in salt marshes of northern temperate regions. Fucus species, along with other kelp, are an important source of alginates-colloidal extracts with many industrial uses similar to those of agar.

Vegetative Body of Fucus

The thallus, which is a sporophyte, shows the greatest complexity of form with an external differentiation comparable to that of a vascular plant. It has a disc-like holdfast from which arises a stem-like stipe that bears a broad leaf-like flattened portion, the frond. The plant as a whole is about 35-70 centimetre long, and the leafy portion of the thallus shows regular dichotomous branching. As the plant grows, the fronds may fork repeatedly.

The thalli of some species of Fucus (e.g. F. vesiculosus) contain, a little behind the apices of the branches, air-bladders, which are formed due to the accumulation of gas in large intercellular spaces, and these help the plants to keep erect when they are submerged under water.

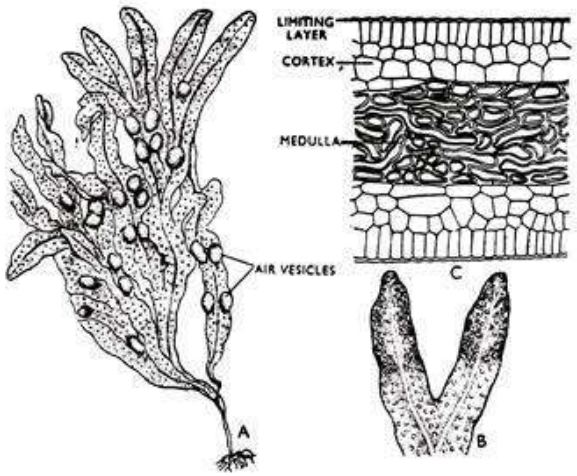

Fig. 109. *Fucus* sp. A. Habit. B. Apex of thallus. C. Portion of the thallus in section.

A cross-section of the thallus shows that it is internally differentiated into two distinct tissues:

(1) The central medulla composed of loose mass of colourless elongated cells.

(2) The surrounding cortex forming a compact dark-brown outer region, made up of more or less isodiametric cells, which contain chromatophores towards the periphery.

The protoplast of the vegetative cell is vacuolated and usually contains a single nucleus having a nuclear membrane, a nucleolus and a chromatin network. There are usually more than one chromatophores without any pyrenoid.

Reproduction in Fucus

Fucus always reproduces by the sexual method, and the gametic union is of an oogamous type. Though a sporophyte, it bears gametangia, antheridia and oogonia, within spherical chambers, called conceptacles. At maturity, the tips of the branches become swollen in which these conceptacles are embedded, and these appear as warty elevations on the surface even when viewed without a lens.

A mature conceptacle is globose and opens at the surface by a small pore, the ostiole. Numerous slender multicellular unbranched hairs, called paraphyses, grow out from the inner surface of the conceptacle; these are usually directed towards the ostiole. Some unbranched hairs may grow out through the ostiole forming cottony tufts, and are then known as periphyses.

Antheridia:

The antheridia, at the beginning, are ovoid cells, which are produced on much-branched hairs and are associated with the paraphyses within the antheridial or mixed conceptacles. Each of these ovoid cells, which are destined to develop into an antheridium, is uninucleate, and this nucleus divides and re-divides until 64 nuclei are produced, the first nuclear division being reductional.

Ultimately, each nucleus, with some amount of cytoplasm becomes more or less pear-shaped antherozoid with two laterally at flagella of unequal lengths and an eyespot. At maturity, the wall of the antheridium ruptures, and the whole mass of antherozoids within it escapes and is lodged in a considerable amount of mucilage secreted by the paraphyses for the purpose.

The Fucus plant, when exposed to air during low tide, undergoes shrinkage, and as a result, the mass of gametes, embedded in the mucilage, is extruded through the ostiole. At high tide these are washed off and the antherozoids are set free for fertilization.

Oogonia:

The oogonia are also produced among the paraphyses within the oogonia or mixed conceptacles. During the development of an oogonium, a short outgrowth develops from the layer of cells forming the wall of the conceptacle. This outgrowth divides transversely into two cells; the distal one becomes the oogonium while the basal one is called the stalk cell. The oogonial cell, densely filled with cytoplasm, is uninucleate, and as it enlarges the nucleus divides by three successive divisions forming eight daughter nuclei, the first division being always reductional.

This is followed by the division of the cytoplasm into eight uninucleate masses, each of which becomes rounded and forms an egg. The oogonial wall becomes differentiated into two relatively firm layers, separated from each other by a softer gelatinous layer. When the eggs become mature, the outer wall ruptures.

The eight eggs escape from the outer wall of the oogonium being still enclosed by the two inner walls, and are pushed outwards and finally through the ostiole. These two inner layers also rupture in succession, and the egg are finally extruded into the sea where fertilization takes place.

Fertilization:

The fertilization of the eggs outside the body of the plant is made possible by reason of the great number and motility of the antherozoids, as well as, due to the characteristic smell of a substance secreted by the egg by which the antherozoids are attracted Each fertilized egg then secretes a thin cellulose wall around it forming a zygote, and this does not become a resting spore. It soon germinates and grows into a new plant.

Alternation of Generations of Fucus

The life-history of Fucus reveals that there are no regular alternation of generations. The plant body is a sporophyte and it is diploid although it bears sex organs, i.e. antheridia and oogonia. The diploid nucleus of the sex organs divides reductionally and gives rise to the gametes, i.e, sperm and egg. These gametes represent only the gametophytic generation as they soon undergo sexual fusion forming diploid zygote, which germinates into the sporophytic plant.

According to the opinion of an eminent algologist, the sporophytic Fucus plant is heterosporous and the sex organs, i.e. antheridia and archegonia correspond to microsporangia and megasporangia. By reduction division of the nuclei of sporangia, microspores and megaspores are produced which behave as gametes.

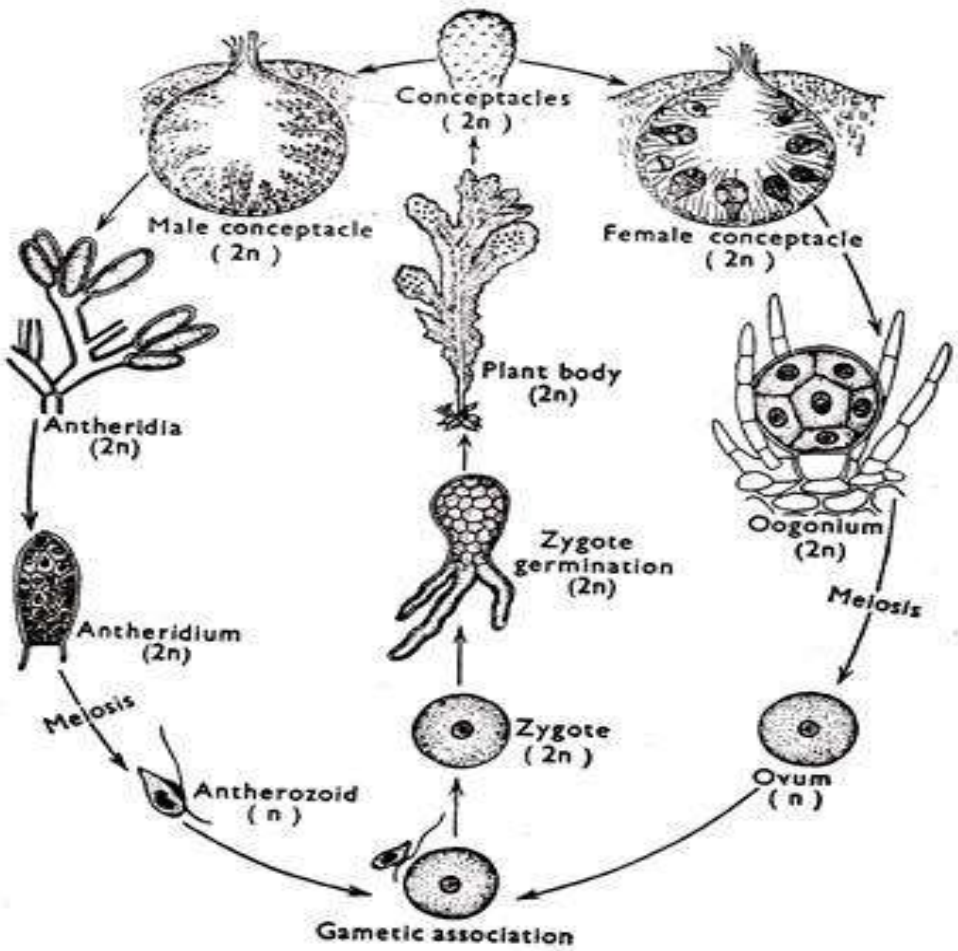

Fig. 112. Life cycle of *Fucus* sp.