LIFE HISTORY OF OEDOGONIUM

Classification

Class – Chlorophyceae
Order – Oedogoniales
Family –Oedogoniaceae
Genus – *Oedogonium*

Distribution

There are more than 285 species found everywhere, but only in fresh water. In India, more than 114 species are found. The more common Indian species are *O. elegans*, *O. undulatum*, *O. areolatum* etc.

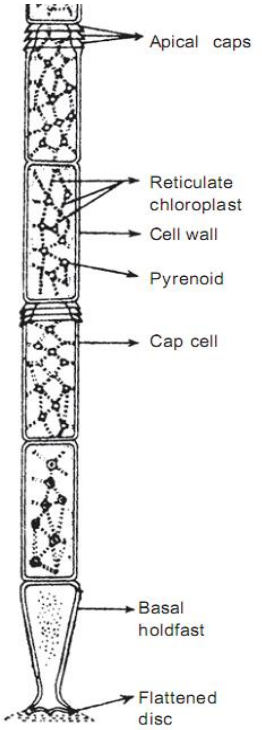
Habit and habitat

It is a freshwater alga found in fresh water bodies like ponds, tanks, ditches, quiet areas of rivers. Some species are epiphytic on aquatic plants. while, one species, *O. terrestris* is found on moist soil.

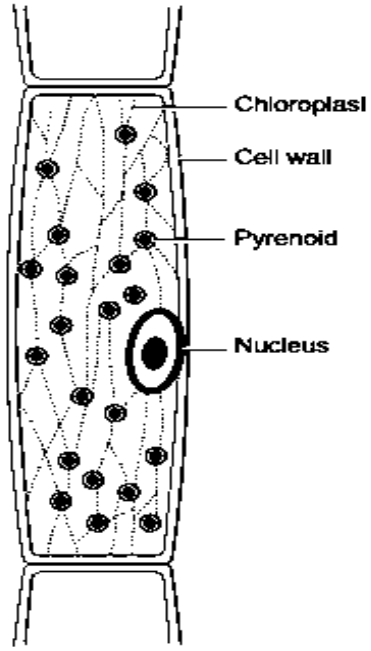
The plant body is thalloid, green, filamentous, unbranched with basal cell as holdfast which attaches the plant with substratum.

Thallus structure

The thallus is filamentous, multicellular and unbranched. All the cells of the filament are cylindrical except the basal and apical cell. The basal cell is colourless and forms holdfast. The proximal end of the hold fast extends to produce finger like projections which help the filament to attach on the substratum. The apical cell is rounded or elongated in



a) A part of filament



b) A cell enlarged

Shape. The vegetative cell is cylindrical and possesses a thick cell wall. The inner layer is cellulosic and the outer layer is made up of pectin. A thin layer of chitin is present above the pectin layer. The protoplasm contains reticulate, parietal chloroplast and it extends from one end of the cell to the other. It is made up of microtubules. A single nucleus and many pyrenoids are present. There is one large central vacuole. The pigmentation is typical chlorophycean type having chlorophyll a, b, β-carotene and xanthophyll.

The terminal cell is rounded. Some cells below the terminal cell possess apical caps which are ring like markings on their upper part called apical caps. Such cells are known as cap cells. The presence of cap cell is characteristic feature of *Oedogonium*.

Reproduction

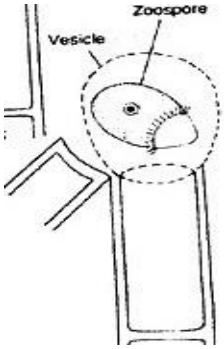
Oedogonium reproduces by vegetative, asexual and sexual methods.

Vegetative reproduction

It takes place by fragmentation and akinete formation.

Asexual reproduction

During favourable conditions, some of the vegetative cells function as zoosporangia and a single zoospore is produced per zoosporangium. A ring of short flagella is found at the base of colourless, beak like anterior end of the zoospore.The zoospore is released from the zoosporangium and swims in water. If it reaches a suitable substratum, it divides into two cells. The lower cell forms holdfast. The green upper cell divides and produces the filament.



Liberation of zoospore

A single zoospore

Sexual reproduction

The sexual reproduction in *Oedogonium* is of advanced oogamous type. Sexual reproduction is more frequent in still waters than in running water. The male gametes are produced in antheridia and the female gametes are produced in oogonia. Depending upon the nature of antheridia producing plants, *Oedogonium* species are of two types:

(i) Macrandrous:

Here, antheridia are produced on normal size plant. Macrandrous species may be monoecious or dioecious. Monoecious macrandrous species are *O. fragile, O. hirnii, O. kurzii and O. nodulosum*. In dioecious macrandrous species antheridia and oogonia are produced on separate male and female plants of normal size.

(ii) Nannandrous:

The oogonia are normal. The antheridia are produced on special type of dwarf plants, known as Dwarf male. Dwarf males are formed by androspores which are produced in androsporangia. If androsporangia and oogonia are formed on same plant, they are called gynandrosporous e.g., *O. concatinatum*. If androsporangia and oogonia are formed on different plants, then called idioandrosporous e.g., *O. confertum*.

Antheridia:

(i) In macrandrous forms:

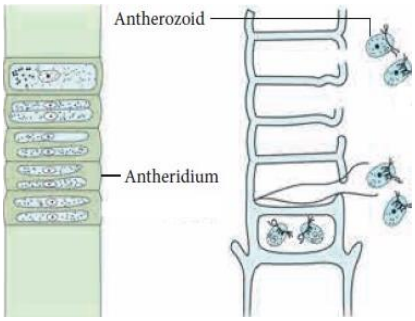
Normally a cap cell forms one antheridial mother cell which divides to forms a row of 2-40 antheridia. The antheridia are broad, flat, short and cylindrical. The contents of an antheridial cells divide longitudinally into two antherozoids. The antherozoids are liberated in the same fashion as zoospores.

The liberated antherozoids are pale green or yellow green, oval or pear shaped. The antherozoids are motile about 30 sub-apical flagella present at the base of beak or hyaline spot. The antherozoids swim freely in water before they reach oogonia. The antherozoids are similar to zoospores in structure but these are smaller than zoospores.

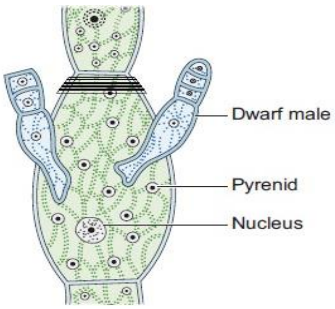
(ii) In nannandrous forms:

The antheridia are formed on dwarf males or nannandria. The dwarf male filament is produced by the germination of a special type of spore known as androspore. The androspore is produced singly within an androsporangium.

The androsporangia are flat, discoid cells slightly larger than antheridia. Each androsporangium produces a single androspore just as in the case of zoospore. Liberation of androspore is similar to that of



Antherozoid formation and liberation



Dwarf male on oogonial wall

zoospore. The androspores look similar to zoospore except for the smaller size.

After swimming about for some time, the androspore settles on oogonial wall e.g., *O. ciliatum* or on the supporting cell e.g., O. *concatenatum*. The androspore germinates into a dwarf male. The nannandria are 2-4 celled long. It has a basal attaching cell, the stipe and all others cells are antheridial cells.

Here, antheridia and their further developments are same as in macrandrous form. The antherozoids are released by disorganization of antheridial cell or through the opening.

Oogonia:

In Oedogonium the oogonia are highly differentiated. The structure and development of oogonium is identical in macrandrous and nannandrous species. Like antheridia, any freely divided or actively growing cap cell functions as the oogonial mother cell. The oogonial mother cell divides by transverse division into two unequal cells. The upper larger cell contains more cytoplasm, food and enlarges into spherical or flask shaped oogonium and the lower smaller cell function as supporting cell or suffultory cell. When supporting cells divide again, many oogonia are formed in chain.

The protoplast in oogonium transforms into a single egg or oosphere. The oosphere is non-motile, green due to chlorophyll and has

a central nucleus. As the ovum matures, the nucleus moves to periphery, the oosphere retracts slightly from the oogonial wall and develops a hyaline or receptive spot just outside the nucleus. The receptive spot receives antherozoids for fertilization.

Fertilization:

The antherozoids swim through the opening of oogonial wall and enter the egg through hyaline receptive spot. Only one male antherozoid is able to fuse with ovum. After fusion the diploid zygote secretes a thick wall around itself and forms oospore. The colour of the oospore changes from green to reddish brown. The oospore is liberated by the disintegration of oogonial wall.

Oospore and its germination

The oospore is spherical and reddish brown in colour. It is three layered and contains a diploid nucleus and dense cytoplasm. Oospore is a resting spore and it may become dormant for a year or more. The diploid oospore divides meiotically to form four haploid daughter protoplasts. Each daughter protoplast metamorphosises into a zoospore, known as meiozoospore. The meiozoospores are liberated in a vesicle. Soon the vesicle breaks and meiozoospores come in water. Each spore germinates and forms a new plant.