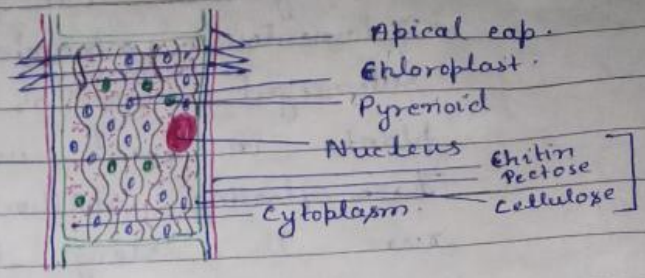
Oedogonium

Oedogonium, with some 298 species, is a filamentous unbranched green alga found in submerged stage as epiphytes on aquatic plants in fresh water ponds and ditches. Free floating condition is not also very rare. It belongs to —

Chlorophyceae.
Oedogoniales.
Oedogoniaceae.

Structure:- The filament consists of elongated cylindrical cells, arranged end to end, with a more or less round upper end in some sps where as the basal cell flattens into a disc like structure forming a holdfast — an organ of attachment to the substratum.

Cell Structure:- The vegetative cell consists of a thick rigid cell wall enclosing the protoplast. The cell wall is differentiated into outer pectose layer and inner cellulose layer. Exeternal to the pectic layer in oedogonium is a surface investement of chitin - often referred as the third layer. Each of the vegetative cell contains a single chloroplast extending from pole to pole with several pyrenoids. Each cell contains a single large nucleus which lies near the middle of the cell remaining embeded in the cytoplasm just within the chloroplast. Certain cell in every filament has one or more ring like markings of hemicellulose i.e. caps.



Reproduction :-

It takes place by the following method - vegetative, Asexual and sexual.

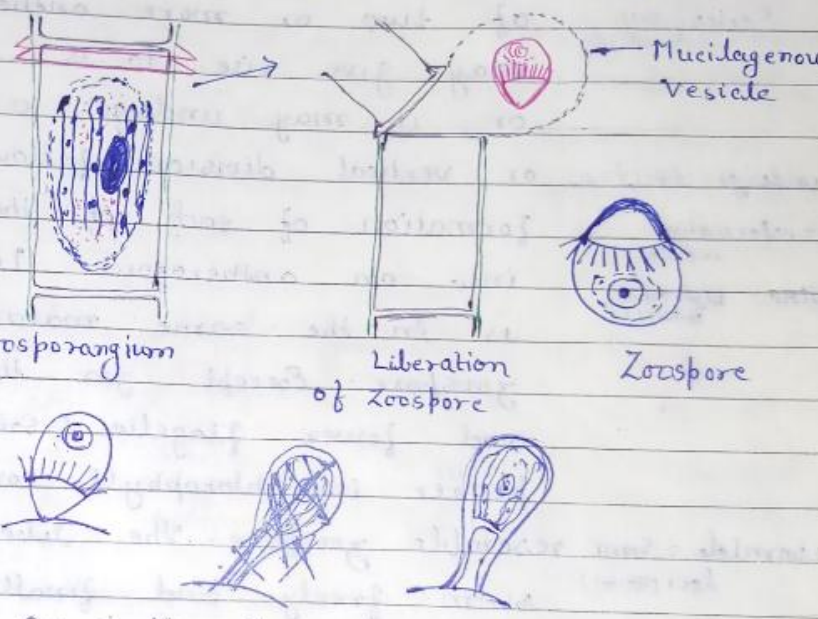
1. Vegetative - Oedogonium reproduces vegetatively by fragmentation.
2. Asexual - It takes place by zoospore and akinites.

a) By zoospore →

In favourable condition, any cap cell may functions as zoosporangium and forms a multiflagellate, single large, pear shaped zoospore. During their formation, the cell contents contract slightly and develop a semicircular hyaline area on one side of the protoplast. A ring of basal granules appears at the base of hyaline area and from each emerges a single flagellum; thus a ring of flagella is formed around the base of the hyaline area. The basal granule remain connected by fibrous strands. Such a zoospore is termed stephanokont zoospore. The zoospore possesses an eye spot and a chloroplast.

After the development of zoospore, the cell wall near the cap region opens apart and the single zoospore

moves out of the cell in a mucilagenous vesicle which soon gets dissolved, liberating the zoospore. The liberated zoospore remains motile for about an hour and then comes to rest by its colourless end. Thereafter, the flagella are withdrawn and the resting quiescent zoospore elongates considerably and divides to form a new filament.



Germination of zoospore.

Akinite -

According to Wille (1885) & Honda (1928) akinites are formed in chain which produces directly a new plant.

Sexual reproduction - Sexual reproduction is an advanced oogamous and it is of two kinds. i) macrandrous and nannandrous.

Macrandrous forms may be monoecious eg- O. nodulosum or dioecious eg.- O. crassum. In nannandrous forms, the sexual plants are dimorphic - the oogonia being formed in filaments of normal size whereas antheridia are produced in filaments, known

as dwarf male or nannandria.

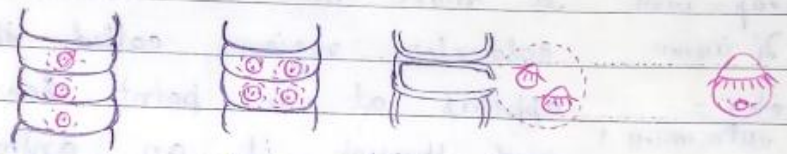
Macrandrous forms → Antheridia are produced regular sized filaments. The antheridial mother cell may be terminal or intercalary. In either case it divides vegetatively into an upper antheridial cell and a lower sister cell. The latter undergoes a series of vegetative divisions to produce a row of two or more antheridia. An antheridium may give rise to a single antherozoid or it may undergo a single transverse or vertical division followed by the transformation of each of the two daughter cells into an antherozoid. Liberation of antherozoids is in the same manner as that of zoospore. Except for the smaller size and fewer flagella (Smith) and relatively poorer (cont) in chlorophyll content the antherozoid resemble zoospore. The liberated antherozoids swim freely and finally reach the oogonia.

Nannandrous sp. →

The antheridia are produced on dwarf male plant i.e. nannandrium which is produced by the germination of special zoospore — androspore. It may be gynandrosporous e.g. O. concatenatum or idioandrosporous e.g. O. confertum. The androspores are produced in androsporangia which are formed by repeated transverse divisions of the ordinary vegetative cells of the filament. The contents of each of these androsporangia are transformed into a single androspore. In structure, androspore is just like a zoospore. It is yellowish in colour. Its size is

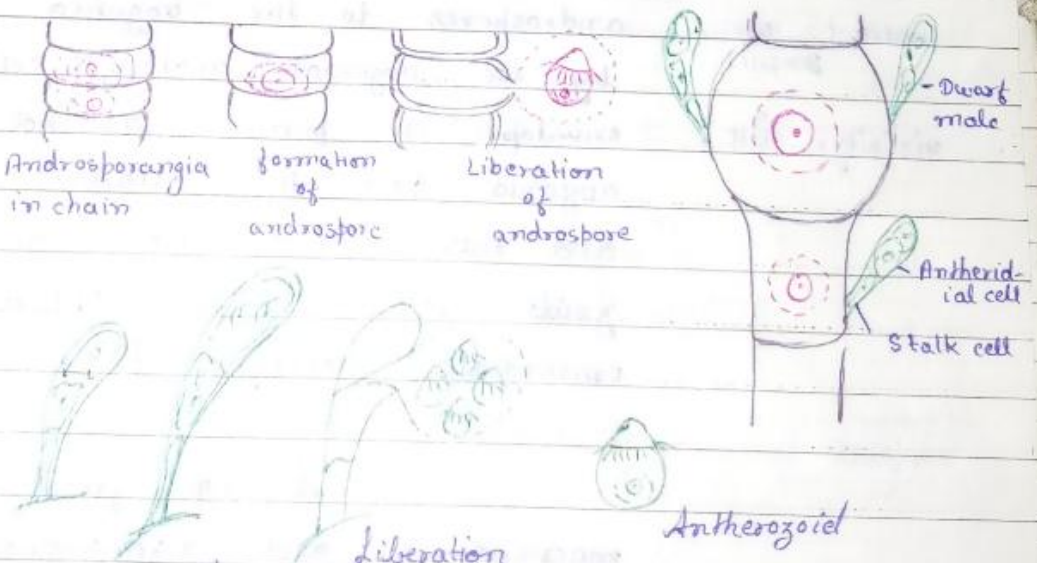
intermediate between the zoospore and an antherozoid. On liberation it swims for sometimes and attaches itself on the wall of oogonium or supporting cell eg. O. concatenatum. It germinates to form a few-celled filament with a basal stalk cell and two to three antheridial cells. Each antheridium produces two antherozoids, each with characteristics crown of flagella. The antherozoids escape by a lid-like opening of the antheridium and make their way to oogonial aperture.

MACRANDROUS TYPE —



Antheridium in chain | Development of antherozoid | Liberation of antherozoid | Liberated antherozoid.

NANNANDROUS TYPE —



Oogonia — Its structure and development is identical in both macrandrous type

and nannandrous type. The oogonia are produced from vegetative cells that act as oogonial mother cell. Each of these cells divides into an upper cap cell functioning as oogonium proper and a lower supporting cell. The latter may again behave as an oogonial mother cell, thus forming a row of two or more consecutive oogonia. or it may remain vegetative in which case the oogonia are solitary. The oogonium, which is filled with reserve food, enlarges to some extent and assumes a more or less spherical shape. A colourless region, called the receptive spot, appears at one point near the side wall and through it an antherozoid finds its way into the egg.

In certain heterothallic nannandrous forms, some hormone that attracts the androspores to the oogonia is extracted by the oogonial mother cells. A gelatinous envelope is formed around the developing oogonia and the attached dwarf male, and this serves to trap the spermatozoids so that the sperms remain in the immediate vicinity of the oogonium.

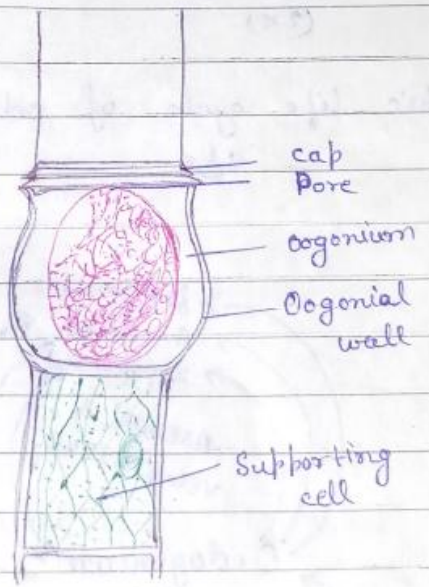
Fertilization

During fertilization in both macrandrous and nannandrous sps, the antherozoid enters into the oogonium through the oogonial beak and fuses with egg to form zygote. Oospore secretes thick wall and appears red in colour

due to accumulation of reddish oil.

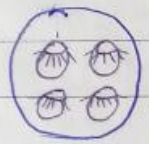
Germination of oospore

The oospore is liberated by the decay of oogonial wall. After remaining dormant for sometime it germinates and its nucleus divides by meiosis to produce four protoplasts each of which forms a multiflagellate zoospore which grows into a new haploid oedogonium plant. In some heterothallic spp, two of the four zoospores develop into male filaments whereas the other two develop into female filaments.



Oogenium.

Oospore

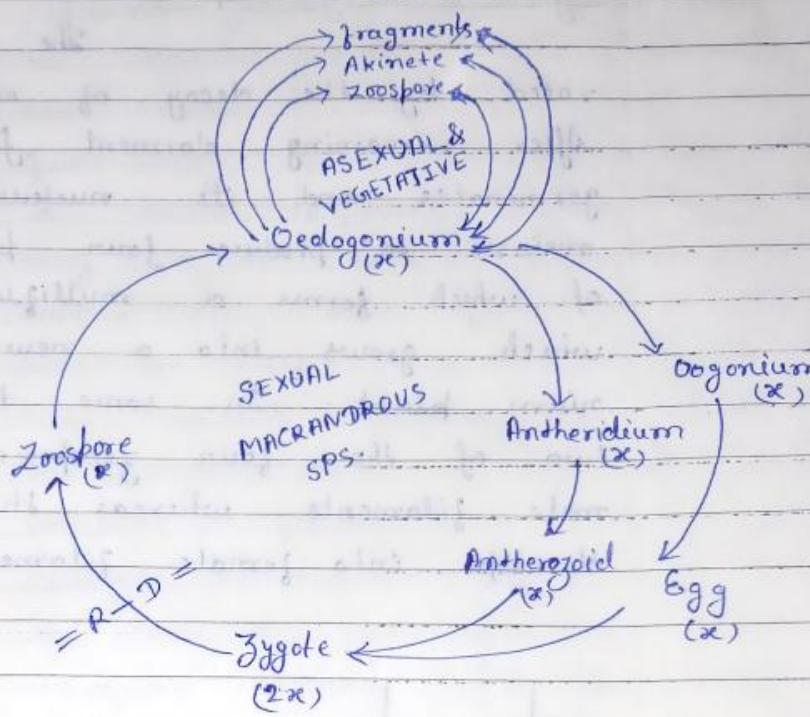


Zoospore formation

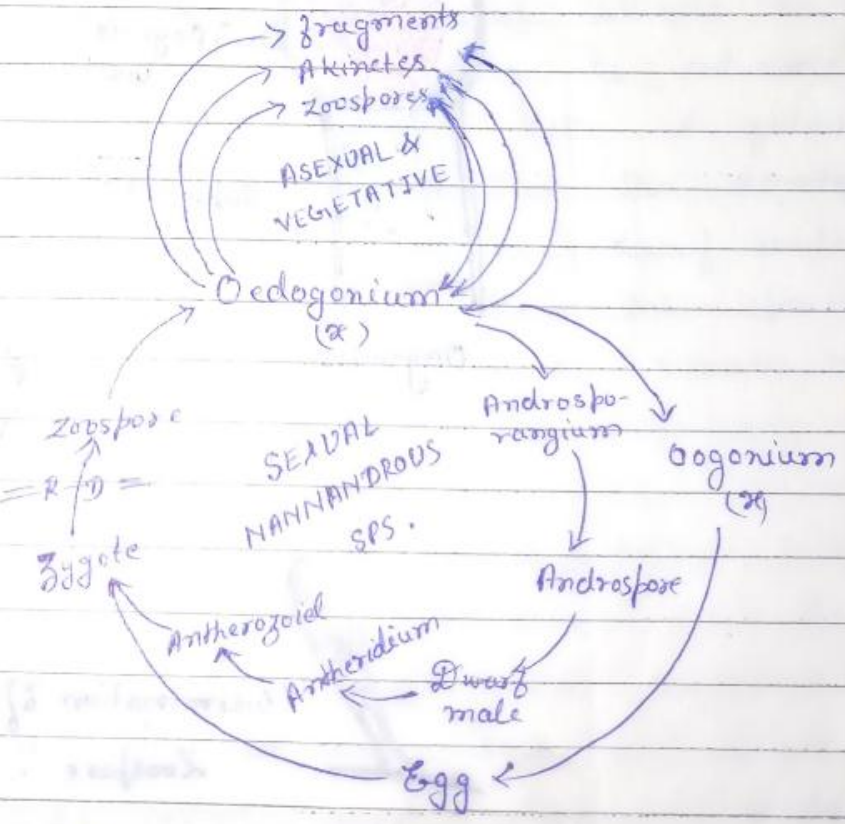
Liberation of Zoospore.

Germination of Zoospore.

Graphic life cycle →



Graphic life cycle of oedogonium macrandrous sps.



Graphic life cycle of oedogonium nannandrous sps.

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