Third DIVISION: CHAROPHYTA
(The Stonewort)

Introduction: in the old classification systems Charophyta group has been treated as a class within the green algae (Division Chlorophyta) because of their involvement in some characteristics , but in modern classification systems this group was isolated in a special division because the rest algal in many characteristics they are quite unlike the green algae divisions.

Common properties with the green algae:

1-Representative pigments are chlorophyll (a).

2- Food stored as starch.

Many Characters of charophyta:

1. The body is consists of main base axis, distinctive to nods and internodes.
2. The reproductive organs are complex and surrounded by sterile of tissue.
3. Male gametes differ in the shape from that of the green algae. They have spiral form with two flagella.
4. Zygote developed to protonimal stage, which in turern develop to mature plants.

1- Genus: *Chara*

The main characters of the family are similar with those of order, class and division. This is because the division consists of only one class and the class consists of only one order which consists of only one family. Algae that belong to this family is characterized by thallus formed from stem which divided to nods and internodes.

Category:

Division Charophyta

Class Charophyceae

Order Charales

Family Characeae

***Chara* spp.**

Thallus is main axis and branched, connected with the substrate (substratum) by rhizoids. Rhizoids are filamentous structures and branching .The main stem distinct to nodes and internodes, consisting in all of *Chara* spp. and *Nitella* spp. The node in all of *Chara* spp. and *Nitella* spp consists of many small cells with equal size which organized to the two central cells become surrounded by (6-20) pericentral cells. In the genus (*Nitella*) the internodes consists of one cell which is much greater in length than width, but in some species of the genus (*Chara*) it is surrounded by one layer of longitudinal cells, this layer of cells called the cortex.

some of the cortex cell originate from the top node and the other part originates from the lower node. The number of these cells is important for classification a type of algae. Each node has several branches of limited growth (leaves) mounting outline around it. These leaves may be simple or partially divided to nodes and internodes, and from these leaves grow branches of unlimited growth .

Methods of reproduction:

Charophyta reproduce in two ways:

1. **Vegetative reproduction:**

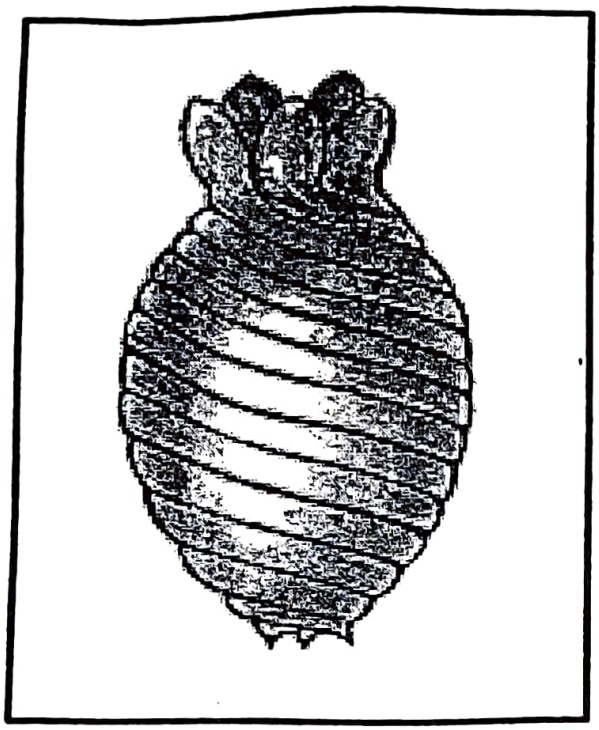
Fragments of the charophyta plant body are able to produce rhizoids and adventitious shoots from their nodes and become established.

2. **Sexual reproduction:**

It is a type of reproduction (oogamous), which achieved in a complex way, where it is not found in other division of algae.

Globule: (male organ)

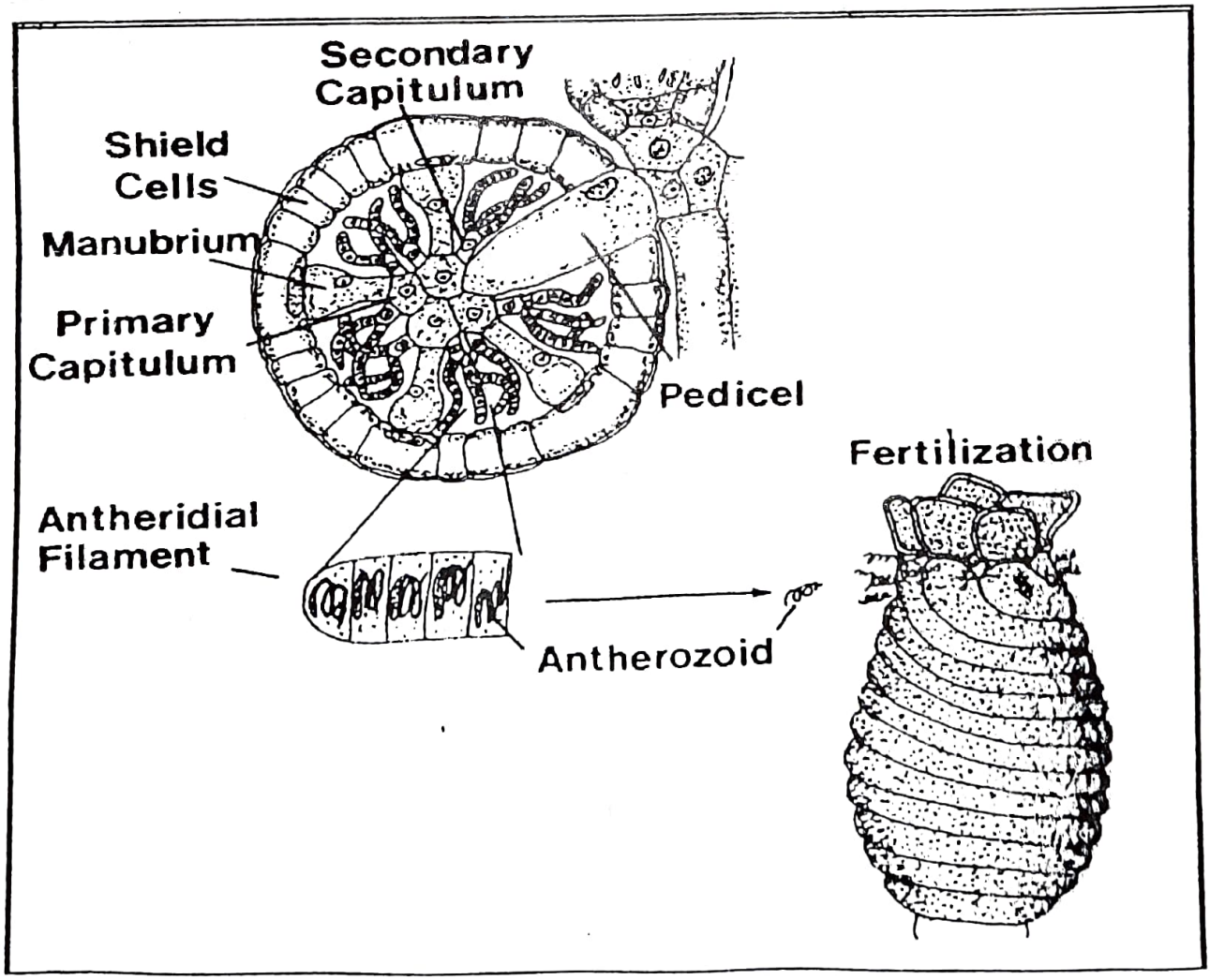
The globose antheridia are green when they are young but become orange-red as the chloroplasts of their wall cells, **the shield cells**, (figure).This shield cells consists of eight cells which form the wall of male organ. Each cell is divided into incomplete transverse septa .



Nucule: (Female organ)

It is consists of oval body installed on the neck. The body consists of an egg oval for two leg (stalk cells)are surrounded by a wall consisting of five cells long helical pipe and coated cells are called (enveloping cells) topped with five short contiguous cells called (corona cell). There is a gelatin on top female organ between corona and the egg cells.

At maturity the helical tube cells develops intercellular slits at the level just under the corona and thus provide a pathway for sperms to inter the oogonium. Only one male nucleus successful to fertilized the egg nucleus.



Fertilization in *Chara* algae

2- Genus: *Nitella*

Category

Division Charophyta

Class Charophyceae

Order Charales

Family Characeae

***Nitella* spp.**

Description:

Nitella looks like *Chara*, and between them there is some differences that distinguish one from the other.

Some differences between algae (*Nitella* and Chara):

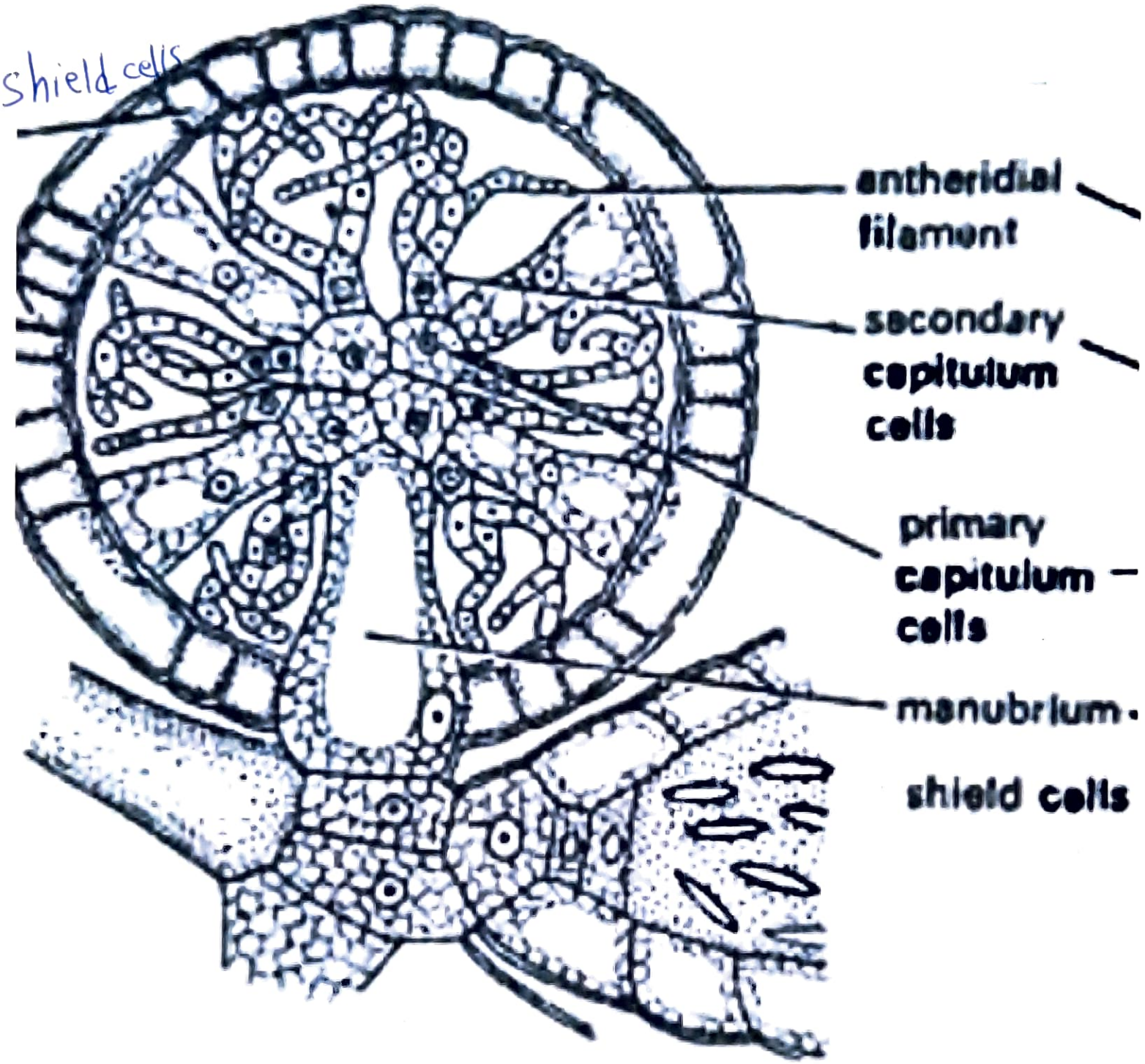
1. Stems, in some species of *Chara* spp. are corticated which surrounded by a cortex cell, and in others are non-corticoid . In *Nitella* spp. the stems in all types are non-corticoid.
2- In *Chara* spp. on the nodes there are cells like spines arranged in a spiral arrangement. In *Nitella* spp. there is no cells like spines.
3. Corona cells (nucule) in *Chara* spp. are five arranged in a row, but in *Nitella* spp. corona cells (nucule) are 10 arranged in two rows.
4. The female organ is mounted above the male organ in *Chara* spp. , but in *Nitella* spp. male organ reproduction is mounted above female organ.

Chara sp.

Nitella sp.

Sex organs in Chara sp

Sex organs in Nitella sp



Cross section in Globule during Fertilization in Chara sp

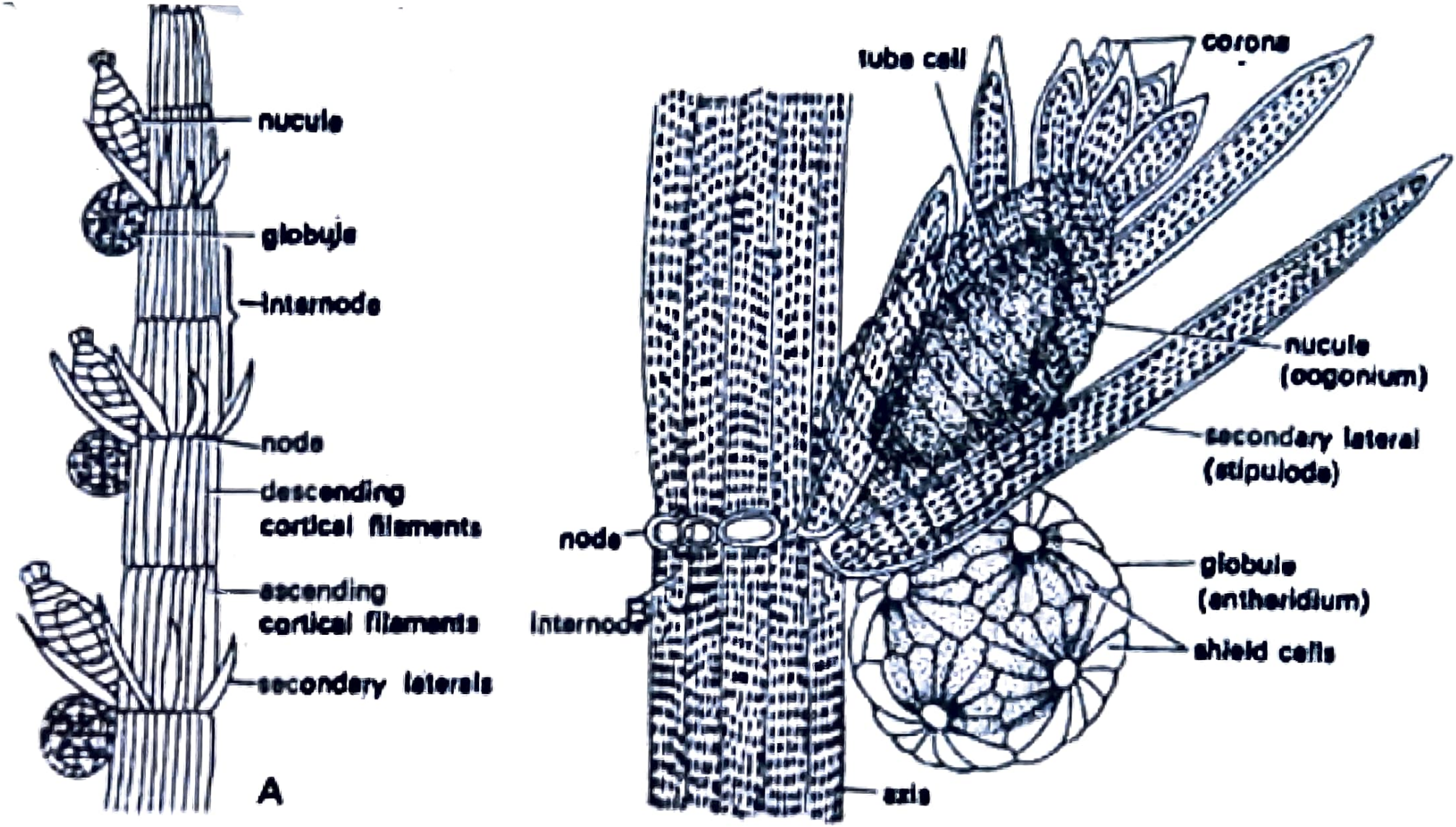


Fig. 7. (A, B). *Chara*. Sexual reproduction. (A) A branch of limited growth with sex organs on its node (B) Mature nucule (above), globule (below).