B.Sc. FIRST BOTANY
PAPER SECOND

# *CHARA*

BY

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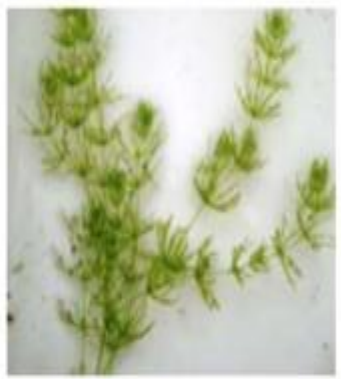
SOURCE:Slideshare

# CHARA

| | |
|---|---|
| **Division** | **Chlorophyta** |
| **Class** | **Chlorophyceae** |
| **Order** | **Charales** |
| **Family** | **Characeae** |
| **Genus** | **Chara** |



## Occurance

- Chara is a fresh water, green alga found submerged in shallow water ponds, tanks, lakes and slow running water.
- *C. baltica* is found growing is brackish water and *C. fragilis* is found in hot springs.
- Chara is found mostly in hard fresh water, rich in organic matter, calcium and deficient in oxygen.
- Chara plants are often encrusted with calcium carbonate and hence are commonly called **stone wort.**
- Chara often emits disagreeable onion like odour due to presence of sulphur compounds.
- In India Chara is represented by about 30 species of which common Indian species are: *C. zeylanica, C. braunii, C. gracilis, C. hatei,* etc.

**Vegetative structure**

Multicellular, macrosopic

filamentous, branched

Main axis , rhizoids

**Rhizoids**

- lower end, branched, multicellular,

uniseriate, obliquely septate,

no nodes and internodes,

Arise from rhizoidal plates

fixation

**Main axis**

Erect, branched

Differentiated into nodes and internodes

Internodes – long, single celled, enveloped by corticating threads

Nodes – short, regularly arranged cells

Bears branches

- Branches of limited growth (short laterals)
- Branches of unlimited growth (long laterals)

**Branches of limited growth (short laterals)**

primary laterals, leaves or branchlets

Arise from peripheral cell of the node

Limited growth

Limited number of nodes and internodes

Arise shorter, unicellular branches from nodes -

--**secondary laterals**

**bear stipules**

**Branches of unlimited growth (long laterals)**

arise from axils of primary laterals

Arise singly

unlimited growth/indefinitely

nodes and internodes, cortication

bears primary laterals

# Rhizoids

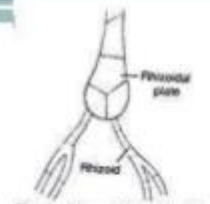


Fig. 2. *Chara*. Rhizoids with rhizoidal plate.

- The rhizoids are white, thread like, multicellular, uniseriate and branched structures.
- The rhizoids arise from rhizoidal plates which are formed at the base of main axis or from peripheral cells of lower nodes.
- The rhizoids are characterized by presence of oblique septa.
- Rhizoids help in attachment of plant to substratum i.e., mud or sand, in absorption of minerals
- And in vegetative multiplication of plants by forming bulbils and secondary protonema.

# Main axis

- The main axis is erect, long, branched and differentiated into nodes and internodes.
- The internode consists of single, much elongated or oblong cell.
- The inter-nodal cells in some species may be surrounded by one celled thick layer called cortex and such species are called as **corticate** species.
- The species in which cortical layer is absent are called **ecorticate** species
- The node consists of a pair of central small cells surrounded by 6-20 peripheral cells.
- The central cells and peripheral cells arise from a single nodal initial cell.

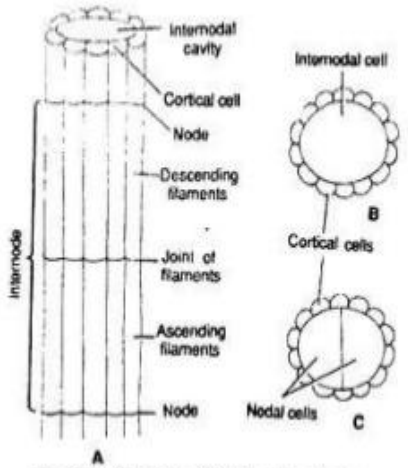


Fig. 3. (A–C). *Chara*. (A) Main axis showing cortication. (B) Transverse section through internode; (C) Transverse section through node.

## Cell structure

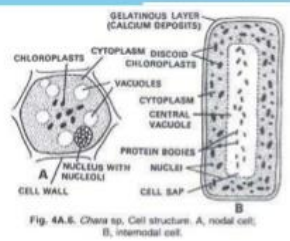


Fig. 4A.6. *Chara* sp. Cell structure. A, nodal cell; B, internodal cell.

### Two types of cells

At the apex- & at the nodes

- Small & isodiametric
- Central nucleus
- Granular cytoplasm
- Chloroplst- numerous, discoid, evenly distributed, no pyrenoids

## Cell structure

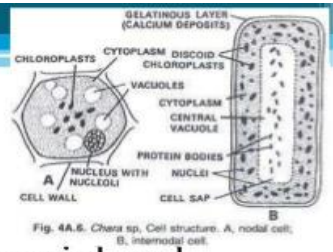


Fig. 4A.6. *Chara* sp. Cell structure. A, nodal cell; B, internodal cell.

Internodal cells

- elongated
- large vacuole, cytoplasm & nuclei- peripheral
- Chloroplast- discoid, numerous, longitudinally
- Cytoplsm – peripheral stationary layer-exoplasm
  inner fluidy endoplasm
- Movement- cyclosis

**Cell wall** – cellulose, hemicellulose, lignin, pectin
Mucilage covering, Calcium carbonate

## Cortication

Internodal cell ensheathed by elongated corticating threads

Thread consist of smaller cells

Hlf of corticating arise from uppernode, others from lower node

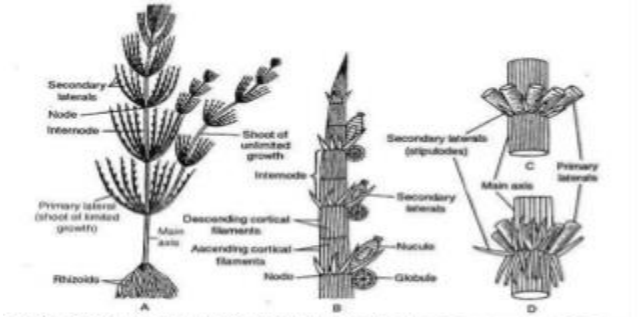


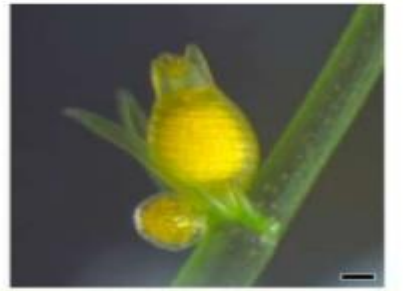
Fig. 3.91 : *Chara* sp. : A. External morphology, B. Shoot (branch) of limited growth or primary lateral, C-D. Appendages on node (C. Haplostephanous and D. Diplostephanous type)

**Stipulodes:**

- The basal node of the branches of limited growth develops short, oval, pointed single cell outgrowths called stipulodes.
- In most of the species of Chara e.g., C. burmanica, the number of stipulodes at each node is twice the number of primary laterals, such species are called as **bi-stipulate.**
- In some species of Chara e.g., C. nuda and C. braunii, the number of stipulodes at each node, is equal to number of primary laterals at that node, such species are called unistipulate.
- When stipulodes are present in one whorl at each node the species are called as haplostephanous and with two whorls on each node are called diplostephanous.

## Cortex

- Many species of Chara e.g., C. aspera, C. inferma have inter-nodal cells of main axis en-sheathed by cortex cells. Such species are called corticated species.
- The cortex consists of vertically elongated narrow cells.
- The internode up to half of its length by corticating filaments developed from upper node called descending the lower half of internode is covered by filaments developed from lower node called filaments.
- The ascending and descending filaments meet at the middle of internode. T species without cortex e.g., C. corallina are called **ecorticated** species.



# Reproduction

1. Vegetative
   a) Amylum stars – *C. stelligera*
   b) Bulbils
   c) Amorphous bulbils
   d) Tubers
   e) Secondary protonema

- **(a) Bulbils:**
- The bulbils are spherical or oval tube like structures which develop on rhizoids.
- The bulbils on detachment from plants germinate into new thallus. Eg:- C. aspora
- **(b) Amylum Stars:**
- In some species of Chara e.g., C. stelligna, on the lower nodes of main axis develop multicellular star shape aggregates of cells.
- These cells are full of amylum starch and hence are called Amylum stars.
- The amylum stars do detachment from plants develops into new Chara thalli.

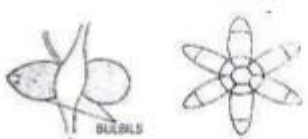
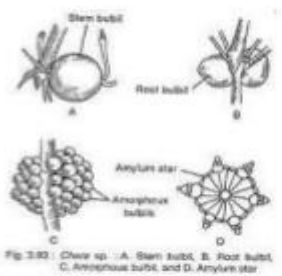


Fig. 6. (A, B). Chara. Vegetative reproduction.

- **(c) Amorphous bulbils:**
- The amoiphous bulbils are group, many cells, irregular in shape which develop on lower node main axis e.g., C. delicatula or on rhizoids e.g., C. fragifera and C. baltica.
- The amorphous bulbils are perennating structures, when the main plant dies under unfavorable conditions; these bulbils survive and make Chara plants on return of favourable conditions.
- **(d) Secondary Protonema:**
- These are tubular or filamentous structure which develops from primary protonema or the basal cells of the rhizoids.
- The secondary protonema like primary protonema form Chara plants.



# 2. Sexual

- Oogamous
- Sterile envelop

- Most of the Chara species are homothallic e.g., C. zeylanica.

- Some species e.g., C. wallichii are heterothallic

- The sex organs arise on the branches of limited or primary laterals, the **nucule above the gl**

- The development of globule and nucule takes p simultaneously but globule matures before nuc

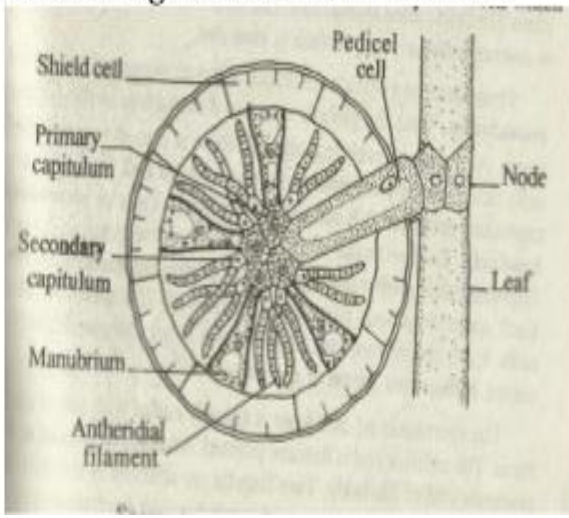
## Globule/ antheridium / spermatogema

➢The globule is large, spherical, red or yellow structure.

➢The mature globule is made up of 8 curved shield cells, 8 elongated manubrial cells, 8 centrally located primary capitulum cells and 48 secondary capitulum cells.

➢The secondary capitulum cells give rise to many antheridial filaments. Each sperm mother cell forms a single bi-flagellated antherozoid.

➢At maturity the shield cells of antheridium separate from each other exposing antheridial filaments in water. The sperm mother cell gelatinizes to liberate the antherozoids.



# Nucule

- The nucule of Chara is large, green, oval structure with short stalk.
- It is borne at the node of the primary lateral.
- It lies just above the globule in homothallic species.
- The mature nucule is attached to the node by the pedicel cell.
- The nucule is surrounded by five tube cells.
- The tips of tube cells from corona at the top of nucule.
- The oogonial cell possesses a single large egg or ovum.
- The nucule contains large amount of starch and oil.
- The receptive spot is present at the upper part of nucule.

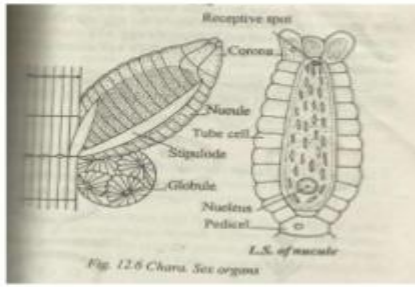


Fig. 12.6 Chara. Sex organs

# Fertilization

- When the oogonium is mature, the five tube cells get separated from each other forming narrow slits between them.
- Antherozoids are chemotactically attracted towards ovum.
- The antherozoids enter through these slits and penetrate gelatinized wall of the oogonium.
- Many antherozoids enter oogonium but one of those fertilizes the egg to make a diploid zygote.
- The zygote secretes a thick wall around itself to make oospore.

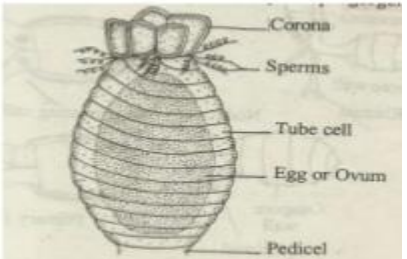


Fig. 12.7 Chara. Fertilization.

# Germination of Zygote

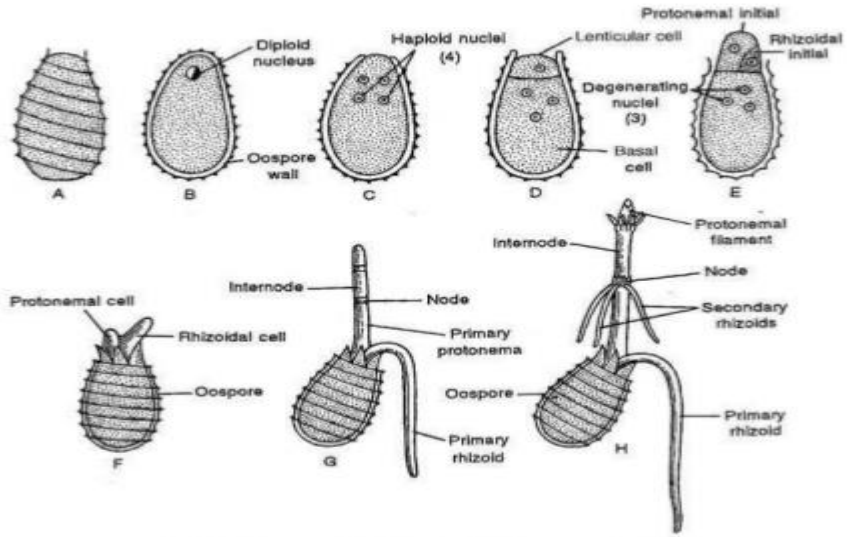


Fig. 3.97 : *Chara* sp. : A-H. Succesive stages in oospore germination

# Germination

- **Four haploid nucleus**
- **3 Lower dgenerates**
- **Protonemal initial**
- **Rhizoidal initial**

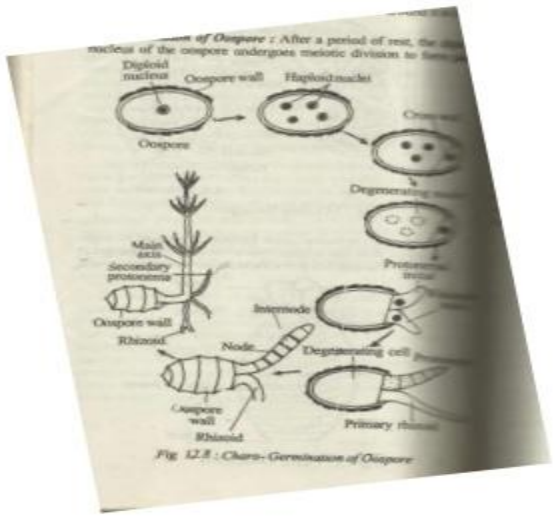


Fig. 12.8 : Chara- Germination of Oospore


Thank you!