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Practical plant Groups 2022-2023

المرحلة الثانية - الدراساتين الصباحية والمسائية
الفصل الدراسي الاول

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Lab.1

Practical plant group Cyanophyta (blue-green algae)

Introduction in algae

Algae is a collective term for all those chlorophyll-bearing organisms which are thalloid. The plant body of these organisms is showing no differentiation into true tissue, so it never forms true roots, stems and leaves, and thus called a **thallus**.

Main photosynthetic pigments in algae are: **chlorophylls**, **carotenoids** and **phycobilins** or **biliproteins**.

There are two main types of flagellae: **whiplash** and **tinsel**, which consider the major way for motility. These flagella may be **isokont** (same length and structure) **heterokont** (not the same). The blue-green algae (Cyanophyta) and red algae (Rhodophyta) lack flagella.

Food material in algae which accumulate and stored in the form of polysaccharides, these food storage products vary from group to another and thus provide useful data for preliminary classification of algae. For example, **cyanophycean starch** and **floridean starch** are characteristic of divisions Cyanophyta and Rhodophyta respectively.

- **General algal characteristics to primary classification:**

1. Photosynthetic pigments.
2. Type of food storage product resulted from photosynthesis.
3. Type, number, position and length of the flagella on motile algal cell.
4. Chemical composition of cell wall structure.

The details of vegetative and sexual or asexual reproductive cells are useful for algal classification only at the level of families, genera and species.

❖ Division : Cyanophyta (Cyanophycophyta)

❖ Class : Cyanophyceae

1- Order: Chroococcales

Family: Chroococcaceae

Genus: *Chroococcus* Genus: *Gloeocapsa*

2- Order: Oscillatoriales

Family: Oscillatoriaceae

Genus: *Oscillatoria*

3- Order: Nostocales

Family: Nostocaceae

Genus: *Nostoc* Genus: *Anabaena*

4- Order: Scytonematales

Family: Scytonemataceae

Genus: *Scytonema*

5- Order: Rivulariales

Family: Rivulariaceae

Genus: *Rivularia*

Genus: *Gloeotrichia*

• General Characteristics of Cyanophyta

- a. It is prokaryotic.
- b. Photosynthetic pigments are chlorophyll- a and phycobilins which are (C-phycoerythrin and C-phycoerythrin) unique to this division.
- c. The unique food-storage compounds are cyanophycean starch.
- d. Absence of flagellae even in the reproductive cells
- e. Many filamentous blue-greens possess specialized cells called the **heterocysts** (are cells with homogenous appearing surrounding by transparent walls. The roll of these cells are nitrogen fixation, it may be terminal or intercalary)
- f. Sexual reproduction is completely absent. while asexual reproduction is take place by:
 1. **Vegetative reproduction** (cell division, fragmentation, hormogonia ...etc).
 2. **Spore formation** (Akinete, Endospore, Exospore and Nannocytes).

Akinete : is a thick-walled cell with granular- looking cytoplasm; derived from the enlargement of a vegetative cell. This food storage cell serves as a survival structure under severe environmental conditions; it becomes dormant and germinated to new filament when a suitable environment available.

The form of these organism may be unicellular,colony or as a filamentous colony.

Filament consist from **trichome** and **sheath** , trichome results of repeated cell divisions in a single plane and in a single direction forming a chain of vegetative cells, it is known as the **trichome**.the trichome with its enclosing sheath is called as a **filament**.

Hormogonium: a short motile filament dislocates from the origin filament exclusively occurs in Cyanophyta, dislocation of the hormogonium takes place between two dead cells as in *Oscillatoria* or between two heterocysts as in *Nostoc*.

Microscopic Identification

1-Order: Chroococcales

Family: Chroococcaceae

Genus: *Chroococcus*: unicellular alga found almost in **colonies** comprises from 2-32 spherical, hemispherical or ovate cells surrounding by **thick hyaline sheath** .

Genus: *Gloeocapsa*: unicellular or colonial with **mucilage sheath thicker than the cell itself**.

2-Order : Oscillatoriales

Family: Oscillatoriaceae

Genus: *Oscillatoria*:

a. Trichomes unbranched, **slightly bent at apices** which marked with **calyptras**.

b. Cell is **cylindrical** in shape.

c. Biconcave discs or **dead cells** are present within trichome vegetative cells represent **strong identification feature** of *Oscillatoria*.

e. **Akinete and heterocyst are absent.**

d- Filaments showed **oscillating motion** (creeping back and forth).

3-Order: Nostocales

Family: Nostocaceae

Genus: *Nostoc*:

a. Unbranched filament, **necklace- like** in shape.

b. Vegetative cells **spherical shaped**; akinete and heterocyst (terminal and intercalary) are present.

c. Trichome **contorted**, surrounded by **copious sheath**, aggregation of these algae forming what called **star jelly**.

Genus: *Anabaena*:

a. Unbranched filament.

b. Vegetative cells **cylindrical** shaped; akinete and heterocyst (terminal and intercalary) are present.

c. Trichome straight or slightly bent **not contorted**; **sheath thin, colourless.**

4-Order: Scytonematales

Family: Scytonemataceae

Genus: *Scytonema*

a. Filaments **are variously interwoven** to form different types of thalli.

b. The Branching in *Scytonema* is peculiar called **false branching** which starts with breaking at a certain point in the trichome, both or one of ends grow out as separated trichome within same sheath.

5-Order: Rivulariales

Family: Rivulariaceae

Genus: *Gloeotrichia*

a. **Unbranched** filaments which **tapering upward.**

b. Comprise from vegetative cells and **basal heterocyst** followed by **adjacent akinete** and surrounded by **basal gelatinous sheath.**

Genus: *Rivularia* :

a. **Unbranched** filaments which **tapering upward.**

b. Comprise from vegetative cells and one basal heterocyst **without akinete and basal gelatinous sheath.**

Lab.2

Chlorophyta (green algae)

General Characteristics of Chlorophyta

- a. Eukaryotics.
- b. Photosynthetic pigments are chlorophyll a and b, chloroplast contains **pyrenoids** (which consider the center of true starch accumulation).
- c. True starch is the main photosynthetic product(similar to that produced by higher plants).
- d. Presence of flagellae.
- e. Reproduction takes place by:
 - Sexual Reproduction.
 - Asexual Reproduction.

Main types of thallus in green algae

1. Unicellular thallus

- a. Motile unicellular thallus .ex. *Chlamydomonas*.
- b. Non- Motile unicellular thalus. ex. *Chlorella*.

2. Colonial thallus: thallus consists of an assemblage of consistant number of cells which mechanically held together in a gelatinous sheath such type of colony called **coenobium**.

- a. Motile colonial thallus.*Gonium* and *Pandorina* are examples.
- b. Non- Motile colonial Thallus. ex. *Hydrodictyon*

3. Multicellular filamentous thallus

a. Unbranched filament. ex. *Ulothrix*

b. Branched filament. ex. *Cladophora*

c. **Heterotrichous filament:** Composed from two systems of branches, the basal portion of the thallus creeps horizontally along a substratum forming the prostrate system from which arises the upright filaments forming the erect system. *Stigoclonium* and *Chaetophora* are examples.

❖ Division: Chlorophyta or Chlorophycophyta

❖ Class : Chlorophyceae

1- Order : Volvocales

a. Family: Volvocaceae

Genus: *Gonium* Genus: *Pandorina*

b. Family: Chlamydomonadaceae

Genus: *Chlamydomonas*

2- Order : Chlorococcales

a. Family: Hydrodictyaceae

Genus: *Hydrodictyon*

b. Family Chlorellaceae

Genus: *Chlorella*

c. Family: Coelestraceae

Genus: *Scenedesmus*

3- Order: Ulotrichales

Family: Ulotrichaceae

Genus: *Ulothrix*

4- Order: Chaetophorales

Family: Chaetophoraceae

Genus: *Chaetophora*

Genus: *Stigeoclonium*

5- Order: Cladophorales

Family: Cladophoraceae

Genus : *Cladophora*

Microscopic Identification

❖ Division: Chlorophyta or Chlorophycophyta

❖ Class : Chlorophyceae

1- Order : Volvocales

Family (a): Chlamydomonadaceae

Genus: *Chlamydomonas* :

- a. Unicellular, biflagellate algae (V- shape).
- b. Has a single cup-shaped chloroplast.
- c. Has a pyrenoid and eye spot (stigma).

Family (b): Volvocaceae

Genus: *Gonium*:

- a. Colonial algae (coenobium) consisting from 16 cells (3 cells arranged in each side with 4 central cells) each one look like *Chlamydomonas*, cells are arranged in flat plate.
- b. The motility of the flagellae on these cells responsible for the rotating motility of the colony.

Genus: *Pandorina*

- a. Colonial algae (coenobium), consisting from 16 to 32 cells per colony.

Coenobium it is spherical.

- b. Each cell looks like *Chlamydomonas* cell in its structure, narrowed end

directed inwards and broader outwards.

2- Order : Chlorococcales

Family (a) : Hydrodictyaceae

Genus : *Hydrodictyon* :

a. Cells are elongated and **coenocytic** (multinucleat cells without cross walls), the common name of this alga is **water net**.

b. The cell has reticulate chloroplast.

Family (b): Chlorellaceae

Genus: *Chlorella* :

a. The plant body is a unicellular non motile (lacks flagella), cells are spherical.

b. It has cup-like chloroplast which may or not contin pyreniod.

c. sexual reproduction is absent.

Family (c): Coelestraceae

Genus: *Scenedesmus*:

a. Colonial (coenobium) consisting from four or more elongated cells.

b. The terminal cells have 2-4 spines.

3- Order :Ulotrichales

Family: Ulotrichaceae

Genus: *Ulothrix*:

a. Unbranched filaments attached to the substratum by basal cell called **hold fast**.

b. Chloroplast is C-shaped (collar- shaped).

4- Order :Chaetophorales

Family: Chaetophoraceae

Genus: *Stigeoclonium*:

a. Heterotrichy, has uniseriate filaments with branches that become tapered and form spiny projections.

b. Chloroplast parietal in position and girdle-shaped in form.

c.

Genus: *Chaetophora*:

a. Heterotrichy, no difference between axial and branches, the tip of each branch is slightly curved, this alga surrounding by copious gelatinous sheath forming a large clump attached on a substrate.

b. band shape chloroplast.

5- Order: Cladophorals

Family: Cladophoraceae

Genus : *Cladophora*

a. Coenocytic multicellular (**dichotomously branched**) filamentous green algae.

b. Has reticulate chloroplast.

Lab.3

Chlorophyta (green algae)

❖ Division: Chlorophyta or Chlorophycophyta

❖ Class : Chlorophyceae

6- Order: Oedogoniales

Family: Oedogoniaceae

Genus: *Oedogonium*

- Species: *macrandrous*
- Species: *nannandrous*

7- Order: Ulvales

Family: Ulvaceae

Genus: *Ulva*

8- Order: Bryopsidales

Family: Bryopsidaceae

Genus: *Bryopsis*

9- Order: Dasycladales

Family: Dasycladaceae

Genus: *Acetabularia*

10- Order: Zygnematales

a. Family: Zygnemataceae

Genus: *Spirogyra*

b. Family: Desmidiaceae

Genus: *Closterium*

❖ Microscopic identification

Order: Oedogoniales

Family: Oedogoniaceae

Genus: *Oedogonium*:

- a. Unbranched filament, the cells are cylindrical.
- b. Has parietal, **reticulate chloroplasts**.
- c. Presence of **cap cells (rings)** in this genus that is easily identified by these distinctive rings at the apical ends of a certain cell.

Depending on the distribution of sex organs, species of *Oedogonium* are grouped into categories: **macrandrous** and **nannandrous**.

1- **macrandrous species**, antheridia presence on filaments with normal size. These may be **monoecious** or **dioecious**.

- **macrandrous** monoecious: the antheridia and oogonia presence on the same filament.
- **O. macrandrous** dioecious: the antheridia and oogonia presence on separate filaments.

2- *O. nannandrous* species: always monoecious .The antheridia are produced by special, reduced male filaments (short) called the **dwarf male plants**, which grow epiphytically upon the female filaments.

Order: Ulvales

Family: Ulvaceae

Genus: *Ulva* :

- a. Body of this alga consists from two regions 1- **blade** and 2- **hold fast**. Blade is forming from thin, flat or undulate blade resembling papery expansions (large-green sheets) which grows from a discoid hold fast. This type of thallus called **membranous** or **foliaceous**.
- b. Cross section in the blade shows two layers of cells arranges irregularly.
- c. Common name of *Ulva* is **sea lettuce**.

Order: Bryopsidales

Family: Bryopsidaceae

Genus: *Bryopsis*:

- a. **Coenocytic, siphonous** uni axial algae, **pinnately branched**, feather -like in shape.
- b. *Bryopsis* species are highly opportunistic in eutrophic conditions. Often referred to as **Sea Ferns**.

Order: Dasycladales

Family: Dasycladaceae

Genus: *Acetabularia*:

- a. Is a unicellular. 0.5 -10 cm length composes from **three parts**:
(1) **rhizoid** for anchoring on substratum ; (2) **stalk** (axis); and
at the top of this unicellular alga multiple branches
(gametangia) gathering in a shape of an umbrella called (3) **cap**.
The **single nucleus** of *Acetabularia* is located **in the rhizoid**.
- b. Common name is **mermaid's wineglass or mermaid's umbrella** .

Order: Zygnemales

1- Family: Zygnemaceae

Genus: *Spirogyra*:

- a- Unbranched filaments consist of hundred similar cells attached
end to end in a single row.
- b- It has **spiral shape** chloroplasts.
- c- These algae are characterized by two special types of sexual
reproduction which are either scalariform or lateral
conjugation. **1)scalariform conjugation** occurs between cells
of two opposite filaments in gender comes closely forming
conjugational tube between the cells, follows by emptying
whole male or (+) cell into the female or(-) cell in which the
zygote is produced. While 2) **lateral conjugation** is rarely

found and takes place between two adjacent cells of the same filament.

2- Family: Desmidiaceae

Genus: *Closterium*:

- a. Unicellular consists from two symmetrical halves known as the **semi- cells** with **no constriction** (sinus) in the middle.
- b. Cells are **crescent to lance shaped**; tapering toward both ends which joined together by a connecting zone called **isthmus**.

- **General Characteristics of Charophyta**

- a- The plant body presents a great elaboration of vegetative structures (main axis, nodes and internodes).
- b- Antheridia and oogonia are large and can be seen even with the naked eye located at the nodes.
- c- Whorled branches (leaf primordia) surrounding nodes.
- d- There is no asexual reproduction
- e- Commonly called **stoneworts**.

❖ Division: Charophyta

❖ Class : Charophyceae

Order : Charales

Family:Characeae

Genus: *Chara*

Genus: *Nitella*

- ❖ **Microscopic identification**

Genus: *Chara*:

- a- The plant body consists of axis surrounded by cortical cells.
- b- The oogonium locates above the node and the antheridium below it.
- c- The coronal cells are five (found as corona on oogonium).

Genus: ***Nitella***:

- a-** The plant body consists of axis not surrounded by cortical cells.
- b-** Oogonium locates below the node and the antheridium above it.
- c-** The coronal cells are ten (in two rows of five cells each on oogonium).

Lab.5

Phaeophyta (Brown algae)

- **General Characteristics of phaeophyta**
 - a- Unlike the chlorophyta and cyanophyta which are mainly freshwater forms, the brown algae are almost exclusively **marine**.
 - b- Presence of a golden brown xanthophylls pigments (**fucoxanthin**).
 - c- **Mannitol** and **laminarin** are the reserve photosynthetic products.
 - d- The cell wall has a mucilaginous and gelatinous nature and very important component which is **alginate** absorbs water and helps these algae to avoid the desiccation.
 - e- Motile reproductive cells are pyriform or spindle-shaped and biflagellate (heterokont) inserted laterally.

❖ Division: Phaeophyta

1- Class : Isogenerateae

Order :Ectocarpales

Family: Ectocarpaceae

Genus: *Ectocarpus*

2- Class: Heterogenerateae

Order : Laminariales

Family: Laminariaceae

Genus: *Laminaria*

3- Class: Cyclospora

Order: Fucales

Family: Fucaceae

Genus: *Fucus*

Microscopic identification

Genus: *Ectocarpus*:

- a- Branched filamentous thalli, forming generally bushy plants reach to 15 cm. in length.
- b- Heterotrichous plant, the prostrate part is rhizoid-like and often penetrates the substrate and erect part .
- c- Life cycle of these algae **isomorphic**, include alternation of two similar (in size and shape) generations. Gametophyte and sporophyte .plurilocular sporangium is dominant over the unilocular.
- d- Cells have band- shaped chloroplast.

Genus: *Laminaria* :

- a- Giant algae have tough, leathery thalli which differentiate into holdfast, stipe (stalk) and blade. the sporophyte can have fronds with length reach about 100 meters.

- b-** The common name of these algae is the **kelps**.
- c-** Life cycle of these algae **heteromorphic** alternation of generations (large and long live sporophyte alternating with small filamentous gametophyte).
- d-** Cross section through the blade of sporophyte appears three different regions: **epidermis, cortex** and **central medulla**.

Genus: *Fucus*:

- a-** The thallus of these algae is leathery, flattened and dichotomously branched, supported by a short narrow stalk that is attached to a discoid hold fast.
- b-** The common name is **rock weed**.
- c-** The life cycle is **cyclospora**, because the gametophyte reduced into only male and female gametes (antheridia and oogonia) within sporophyte itself.
- d-** Sexual organs (antheridia and oogonia) appear embedded within fertile areas called (conceptacle), cross section through these conceptacles determines either these algae dioecious (male and female are separated) or monoecious (hermaphrodite) contains antheridia and oogonia within the same conceptacle.

❖ General Characteristics of Rhodophyta

- a- The pigments are chl.a and chl.d plus phycobilins the red one (**r-phycoerythrin**) and blue pigment **r-phyococyanin**.
- b- **Floridean starch** as a storage product in cytoplasm not in chloroplast.
- c- Absence of flagella.
- d- Sexual reproduction is complex and of a highly specialized type by which the red algae are distinguished from other algae. The male sex organ called **spermatangium**, the non-motile male gametes are called **spermatia**. The female sex organ called **carpogonium**.

❖ Division: Rhodophyta

❖ Class : Rhodophyceae

❖ Order : Ceramiales

Family: Rhodomelaceae

Genus:*Polysiphonia*

❖ Microscopic identification

Genus: *Polysiphonia* :

- a. It is heterotrichous.
- b. The thallus is a polysiphonous in nature.
- c. The feathery, upright portion consisting of two types of branches
(1) **ordinary branches** (similar to the main axis) bearing numerous

small branches called the (2) **trichoplast** (uniseriate, usually colorless and bear the sex organs).

- d. The trichoplast consist of two-celled stalk and fertile region called **spermatangia**.
- e. Growth in length by means of a single, dome-shaped apical cell which dividing longitudinally into central (axial) cells and pericentral cells of the same length as the central axial cell.
- f. The life cycle is triphasic (carposporophyte, tetrasporophyte and gametophyt)

Xanthophyta (Yellow green algae)

❖ **General Characteristics of Xanthophyta**

- a- Posses chl.a and chl.c plus a special type of xanthophyll called **diadinoxanthin** but **lack fucoxanthin**.
- b- Food product from photosynthesis is **chrysolaminarin**.
- c- Cell wall is often absent and if present has large amounts of pectic compounds. The cell wall has silica in a few species.

❖ Division: Xanthophyta

❖ Class : Xanthophyceae

❖ Order : Heterosiphonales (Vaucheriales)

Family: Vaucheriaceae

Genus: *Vaucheria*

❖ **Microscopic identification**

Genus: *Vaucheria* :

a- Branched filamentous algae has coenocytic axis with septa being laid down only when gametangia or sporangia are formed.

b- There are two types of *Vaucheria*:

- *Vaucheria sessilis*

The oogonium is beside the antheridium.

- *Vaucheria geminata*

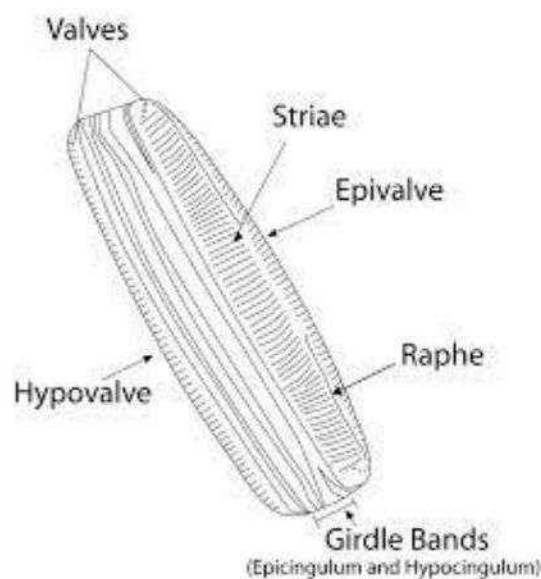
The oogonium is within or above the antheridium.

Lab.7 Bacillariophyta (Diatoms)

General Characteristics of Bacillariophyta

- a. Comprises a single class Bacillariophyceae, the members of which are popularly known as **diatoms**.
- b. Posses chl.a and chl.c and **fucoxanthin**
- c. The food as **oil** and **chrysolaminarin** or a protein-like food material called **volutin**.
- d. The cells are surrounded by a rigid cell wall–box like in shape called **Frustule**. The cell wall is **silicified**.

The frustules consist of two valves (halves) that fit into each other like petri-dish.the two overlapping halves: epivalve and epicingulum forming the **epitheca**, while a hypovalve and hypocingulum forming the hypotheca, the cigulum(connecting band).



e. The diatoms placed under two taxonomic groups:

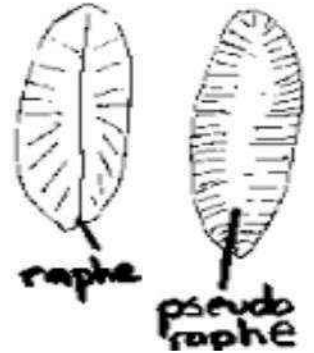
1. **Order: pennales:** are pen-shaped, the structure exhibits bilateral symmetry. The diatoms of this order called **pennate diatoms**.
2. **Order: Centrales:** are cylindrical shaped, the structure exhibits radially symmetry. The diatoms of this order called **centric diatoms**.

f. The economic importance of diatoms represented by the **diatomaceous earth**, this is a rock-like deposit, it extends hundreds and thousands of feet in depth in some locations. diatomaceous earth is mined in several parts of the world to obtain whitish powder(**diatomite**) which is put in the following uses:

- 1- The diatomite is fire proof and highly absorbent. Because of these properties it is used in :
 - As filters (sugar refineries and brewing industries).
 - Paint additives to increase the reflectivity.
 - Polish for metals.
 - Insulation for pipes and furnaces.
- 2- Sprinkling diatomaceous material on the wall of the mines reduces the dangers of dust explosion.
- 3- Used in tooth paste.

* **Raphe**: linear slit in the valve.

* **Pseudoraphe**: clear line down the middle of a diatom created by the lack of ornamentation.



Lab.8

Bryophyta

Hepatophyta (liverworts)

- **General characteristics of hepatophyta**
 - a- All hepatics are dorsiventral in structure.
 - b- Small in size never more than a few inches in length.
 - c- Gametophyte is an independent plant. It is a leafy thallus in form .
 - d- The sporangium is either differentiated into foot, seta and capsule or foot and capsule.
 - e- Has a single class **Hepatopsida (hepaticae)**.
 - f- Common name is **liverworts**,

Division: Hepatophyta

Class: Hepatopsida

Order: Marchantiales

Family: Marchantiaceae

Genus: *Marchantia*

- **Microscopic identification**

Genus: *Marchantia* :

- a- The genus usually terrestrial in habitat, moist soil.
- b- Plant body is dichotomously branched.
- c- Exhibiting the apical growth.

- d- The upper surface of the plant body is divided into polygonal air chambers each with central pore.
- e- The photosynthetic cells which surround the air chamber are rich in chloroplast (the photosynthetic dwarf filament are branched, and arise from

the base of air chamber), the remainder is made of densely arranged parenchymatous cells serve as storage cells.

- f- From the the ventral surface of thallus, rhizoid and scales are emerge. Rhizoid is two types: **smooth** and **tuberculate** (one with peg like thickening) which serve in water conduction, while **scales** serve in plant anchored.

- Reproduction in *Marchantia* it happen by:

- 1- Vegetative reproduction: (**fragmentation, formation of adventitious branches and gemmae formation**).

gemmae formation it is interesting and elegant method of vegetative reproduction in *Marchantia gemmae* (it is a type of asexual reproduction represents by lens-shaped multicellular bodies with double notched which are attached to the bottom of the gemma cup by short stalk) which released and float away from the parent plants, and undergo bipolar growth from the two apical notch, forming pairs of young plants. If gemmae was from male plants it grows into new male plants and if from female it grows into new female plants.

2- Sexual reproduction: **The Gametophyte**

Marchantia is unisexual, The gametophore is bearing the sex organs if it bears male sex organ (antheridia) then it is called **antheridiophore** (which is discoid in shape) and one bearing archegonia is called **archegoniophore** (which is umbrella like in shape) .

The antheridia occur in chamber in radiating rows in the head of the antheridiophores which is **discoid in shape**, the young and last formed near the margins.

The archegonia compose from **neck and venter** which includes the egg, these archegonia occur suspended neck downward in radiating rows located on ventral surface of the head (**umbrella like in shape**) of the archegoniophore.

Reproduction: The Sporophyte

- 1- The egg within venter of the archegonium after being fertilized by male gametes produce zygote which undergo a transverse and longitudinal divisions forming a spherical mass of diploid tissue, after maturation, differentiation is occur into three regions: **foot** (anchoring and absorptive organ), **seta** or **stalk** (short cylindrical organ) and **capsule**.
- 2- In capsule the differentiation into amphithecium and endothecium are occurring. the endothecium is differentiated into sporocytes (spherical cells)
- 3- Meiosis divisions occur to form meiospores and elaters, elater is elongated cell, slender with tapering ends characterize by their spiral thickening and sensitive to moisture(hygroscopic), help in the dispersal of spores.

4- The remains of the venter wall of the archegonium enclosed the embryonic sporophyte called calyptras then involucre and psuedoperainth.

*Amphithecium: an external layer differentiated into embryonic sporophyte.

*Endothecium: the internal layer of an embryonic sporophyte surrounded by amphithecium.

*Psuedoperainth: an envelope surrounding a single archegonium, its function preventing premature drying spores and elaters released after dehiscence.

Bryophyta

Anthoceroatophyta (Hornworts)

- **General characteristics of Anthocerotopsida(Anthocerotae)**
- g-** dorsiventral thallus shows very little internal differentiation of vegetative tissue.
- h-** The thallus is either with or without midrib.
- i-** They all have a lobed, thallose gametophyte, simple in form and without regular dichotomous growth.
- j-** Sex organs are sunken in the thallus tissue.
- k-** Common name is **hornworts**, named this group hornworts because of aciniform of sporophyte which emerges from the upper surface of the thallus (gametophyte).

Division: Bryophyta

Class: Anthocerotopsida

Order: Anthocerotales

Family: Anthocerotaceae

Genus: *Anthoceros*

- **Microscopic identification**

Genus: *Anthoceros* :

- a- Internally the thallus is very simple in structure (no differentiation into photosynthetic and storage regions). Except **ventral chambers** which consider its first difference from liverworts.

- b- Presence of fissures (stoma-like slime pores) on the lower surface of the thallus that lead to the ventral chambers. The component of chambers either with mucoid components or chamber inhabited by *Nostoc* which has the ability of nitrogen fixation.

- c- There are no scales and tuberculate rhizoids; the thallus is fixed to the substratum by smooth-walled, unicellular and unbranched rhizoids only.

- d- The sex organs are not borne on any special sexual branches, but they arise from the upper surface of the thallus then dive downward in its tissue.

- e- Gametophyte could be either monoecious or dioecious.

- f- Archegonia lack the jacket of sterile cells.

- g- The sporophyte is a long, upright and cylindrical structure surrounded at its base by a tubular sheath called the **involucre**.

- h- Sporophyte is differentiated into **foot**, **intermediate zone** composed of intercalary meristem and long, upright, cylindrical **capsule**, there is no seta. The foot which submerges inside the gametophyte tissues providing nutrients to sporophyte.

- i- The center of capsule is occupied with sterile tissue which is called **columella**.

- j-** Presence of structures with taper ends permeate or diffuse between tetrads to facilitate their dispersal, those structure called **pseudoelaters** which are composed of several sterile cells lack spiral thickening, while elaters are composed of one sterile with spiral thickening at their inner walls.
- k-** During maturity of the sporophyte, capsule valves will be opened releasing the tetrads in the aid by the twisting hygroscopic movement of the pseudoelaters **بمساعدة الحركة (الاسترطابية الالتوائية للمناثر الكاذبة)**. While the collumella still in the center, the released tetrad finally place on a soil surface then start to grow into new plants (gametophyte).

Lab.10

Sphagnopsida

- **General characteristics of sphagnopsida**

- a- Perennial plant, belong to the mosses, grow in acidic soil of pools, bogs, and around the borders of ponds and lakes, it has an economically important represented by using it as fuel, antiseptic, soil fertilizers and as a wicks in lamp.
- b- The rhizoids are multicellular , the septa between cells are oblique.
- c- Antheridia occur singly and are axillary in position.
- d- Archegonia occur in cluster and are terminal in position.

Division: Bryophyta

Class: Sphagnopsida

Order: Sphagnales

Family: Sphagnaceae

Genus: *Sphagnum*

- **Microscopic identification**

Sphagnum:

- a- This plant consist of main axis which is un limited in growth and had terminal dens tuft of apical branches (**capitulum**),this axis bearing two kinds of branches:
 - 1- **Ascendant branches** (they are horizon and project outward from the main axis)

2- **Pendulous branches** (they are twisted about the axis).

b- The leaves occur on the main axis (stem) as well as the branches, In general these leaves small, thin, scale like and sessile arranged spirally on the stem.

c- The midrib is lacking. Anatomically, the leaf is single layer of cells in thickness; consist of two kinds of cells:

1- **The hyaline capillary** cells which don't have protoplasm (dead), colorless, wide and filled with water, they have pores on either lower or upper surface, and the inner surface of wall strengthened by spiral or ring shaped thickening bands.

2- **The assimilatory cells** which are live and contain chloroplasts so they are green in color and photosynthetic in function, they are very narrow and lie between the dead hyaline cells forming a network.

d- The male and female sex organs bearing on special, short, densely leafy and modified branches, some species are monoecious and the other are dioecious.

e- Antheridia occur singly in the axial of leaf towards the tip on antheridial branch, it is consist of a globular body bearing on slender stalk usually 2 cells broad, the antheridia has a jacket layer of sterile cells it is known as antheridial wall.

f- Archegonia usually occur in groups, typically three on archegonial branch, the mature archegonia bearing on fairly long stalk, the body of archegonia consist of neck and Venter. The Venter cavity contains a small ovoid egg and ventral canal cell.

- g-** After maturity, the small globes-like capsule consist of columella and spore sac, Surrounding by the epidermis and the operculum.
- h-** The spores remain viable for six month under dry conditions; under suitable condition the spores germinate to form the protonema.
- i-** The protonema is short filament of a few cells, by cell division an growth the filament become a flat, green lobed plate of cells fixed with rhizoids. From the margin of this loped plate the gametophyte grown.