



Bhagalpur National College, Bhagalpur

(A Constituent unit of Tilka Manjhi Bhagalpur University, Bhagalpur)

PPT Presentation for B.Sc. I- Life Cycle of Funaria

Funaria



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Systematic position of *Funaria*

Kingdom: [Plantae](#)
Division: [Bryophyta](#)
Class: [Bryopsida](#)
Subclass: [Funariidae](#)
Order: [Funariales](#)
Family: [Funariaceae](#)
Genus: ***Funaria***

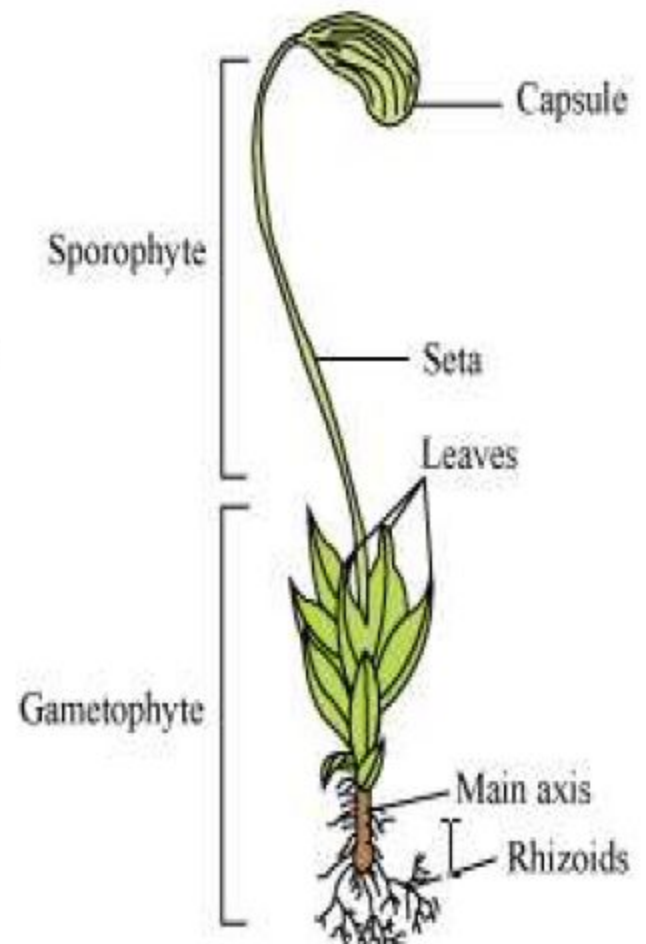


General characters

- ***Funaria*** is a genus of approximately 210 species of moss and 18 species reported from India.
- *Funaria hygrometrica* is the most common species. *Funaria hygrometrica* is called “cord moss” because of the twisted seta.
- The name is derived from Latin word “funis” meaning a rope



- Moss plant *Funaria* grows in dense patches or cushions in moist shady and cool places during the rainy seasons.
- It has a height of 3–5 cm, a radial symmetry with a differentiation of an axis or stem, leaves or phylloids and multicellular colorless branched rhizoids
- These are primitive multicellular, autotrophic, shade loving, amphibious plants.
- They reproduce by spore formation.
- They have no vascular system.
- Root like structures called rhizoids are present.
- They show alternation of generation i.e. the gametophytic stage alternates with the sporophytic stage

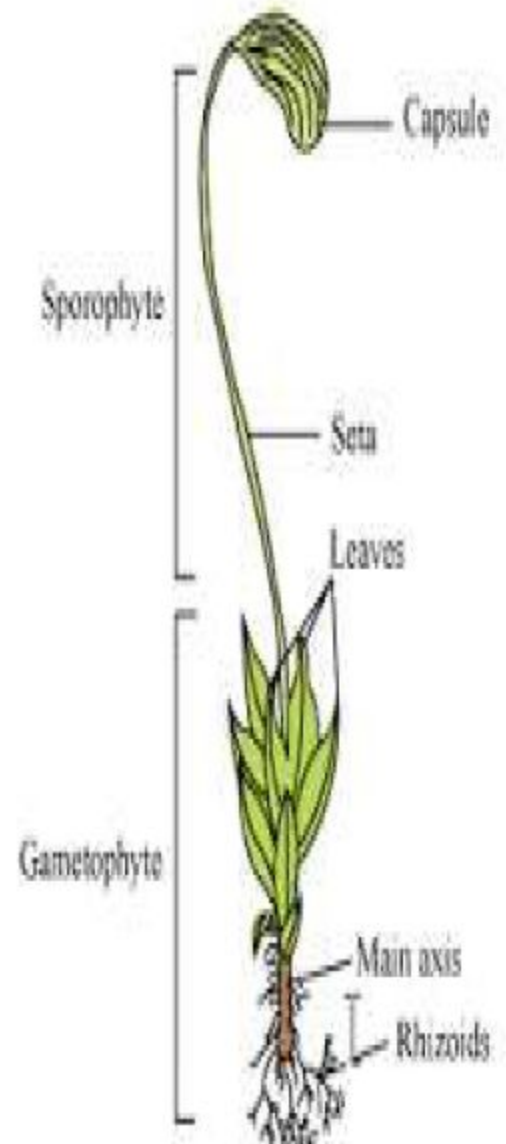


GAMETOPHYTIC PHASE

❖ This phase in the life cycle of *Funaria* consists of two growth stages:

(i) Juvenile stage

(ii) The leafy gametophore



JUVENILE STAGE

- ❁ It results from the germinating meiospore.
- ❁ It consists of a slender, green, branching system of filaments called protonema.

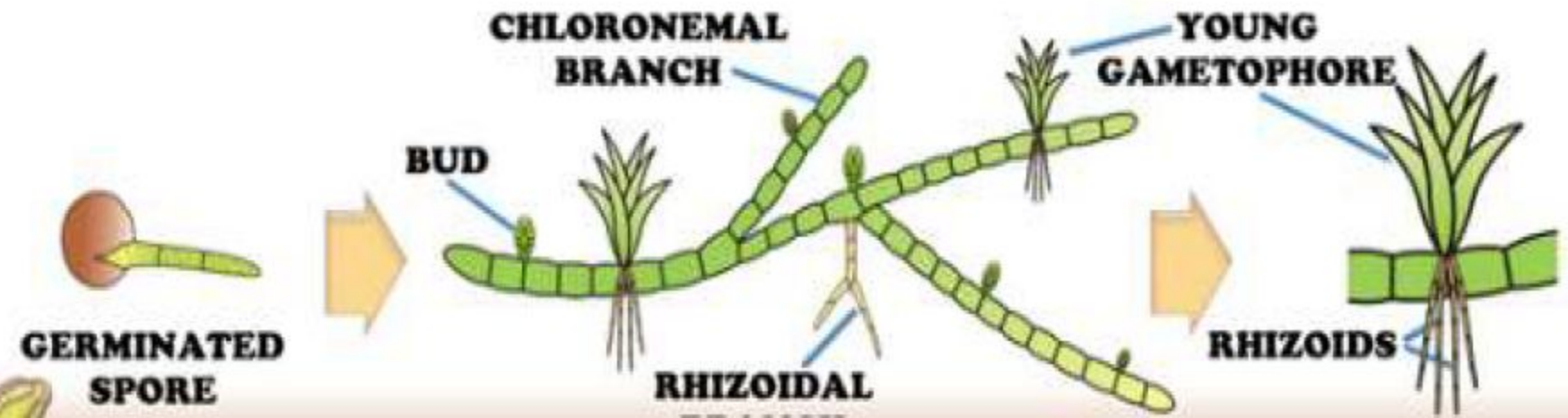
PROTONEMA

CHLORONEMAL BRANCH

Green & branched spread over the moist soil

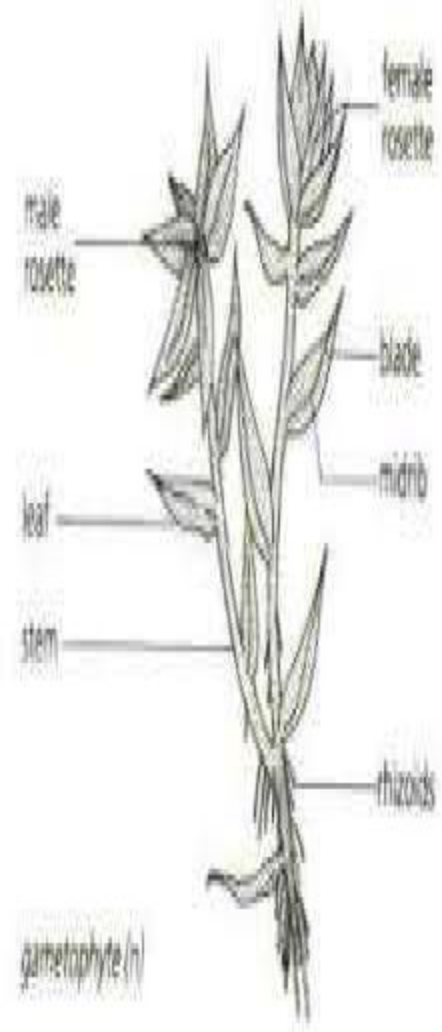
RHIZOIDAL BRANCH

Colourless/Brown branches with oblique septa, penetrate in the soil



GAMETOPHORE STAGE

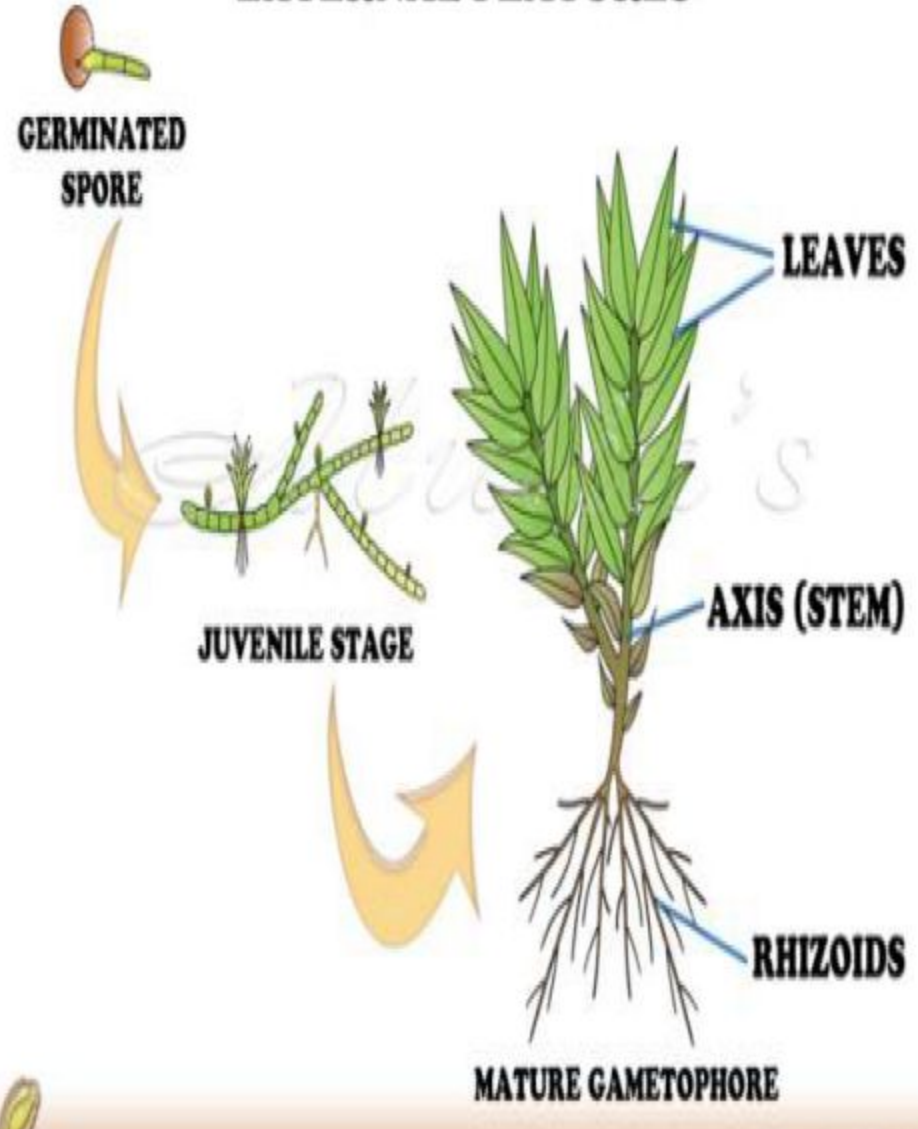
- Gametophore is the **dominant stage in the life cycle**.
- It is **erect, leafy structure** that reaches upto 3 cm height.
- It has **slender, cylindrical upright central axis known as cauloid** on which the **flat, green, lateral expansions phylloids** are present.
- **Cauloid and phylloids** are structurally **not similar to stem and leaves** because these are **without vascular tissues** and **gametophytic in origin**.



MATURE GAMETOPHORE

EXTERNAL FEATURES

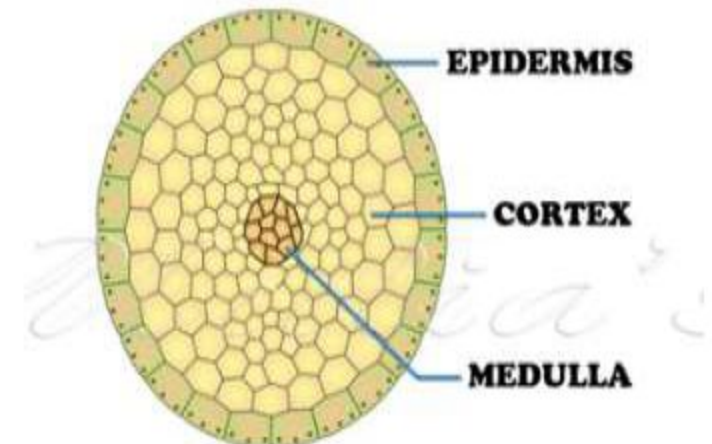
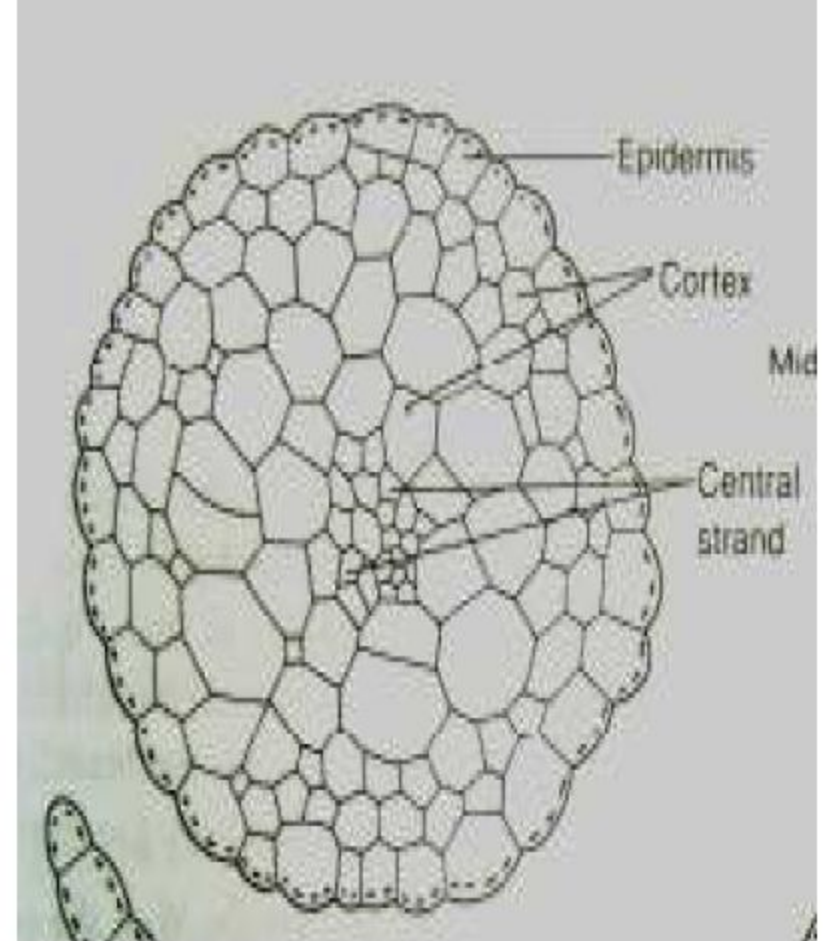
- Plant is small about 1-3 cm long, stem is erect and branched.
- It is differentiated into rhizoids, axis, and leaves.
- The rhizoids are multicellular and branched.
- The axis is aerial, erect, and branched.
- The leaves are simple, small, and spirally arranged.
- The upper leaves are large and lower leaves are crowded.



Internal structure

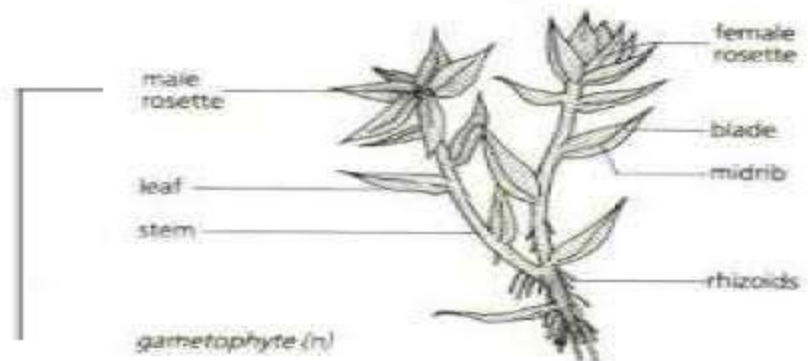
Stem:

- i. *Epidermis*: it is outer most single layered. It is made up of thick walled cells.
- ii. *Cortex*: it is multilayered zone situated just below the epidermis and consists of parenchymatous cells.
- iii. *Central cylinder*: it forms the central core of the axis and consists of vertically elongated, thin walled cell. The central cylinder provides mechanical strength to plant and help in conduction of water and mineral.



. Leaves: leaves are arranged on the axis in spiral fashion. The leaves are sessile, simple, green and distinct mid rib.

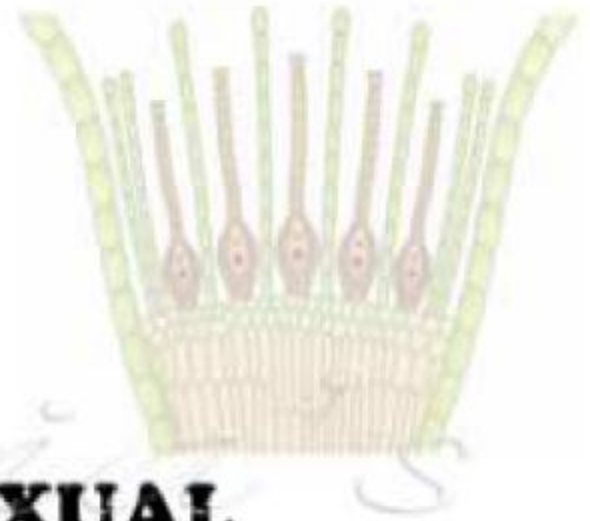
The leaf is single layered thick except for the mid-rib. The central part is similar to the central cylinder of the axis.



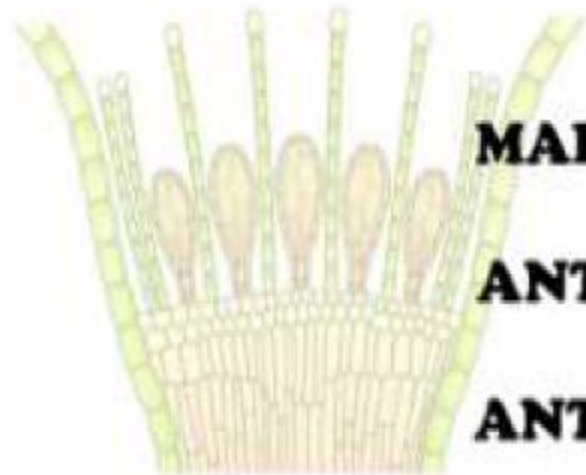
REPRODUCTION

(A) VEGETATIVE

1. FRAGMENTATION
2. SECONDARY PROTONEMA
3. GEMMAE
4. BULBILS
5. AOSPORY



(B) SEXUAL



MALE BRANCH

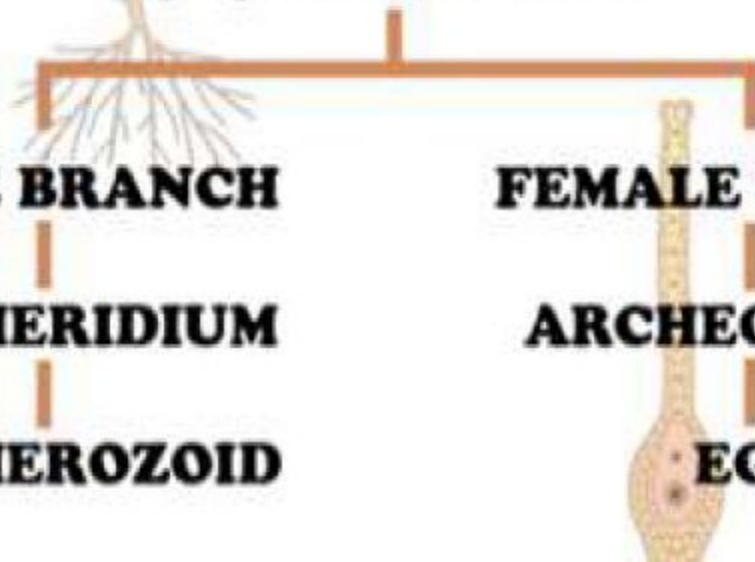
ANTHERIDIUM

ANTHEROZOID

FEMALE BRANCH

ARCHEGONIUM

EGG

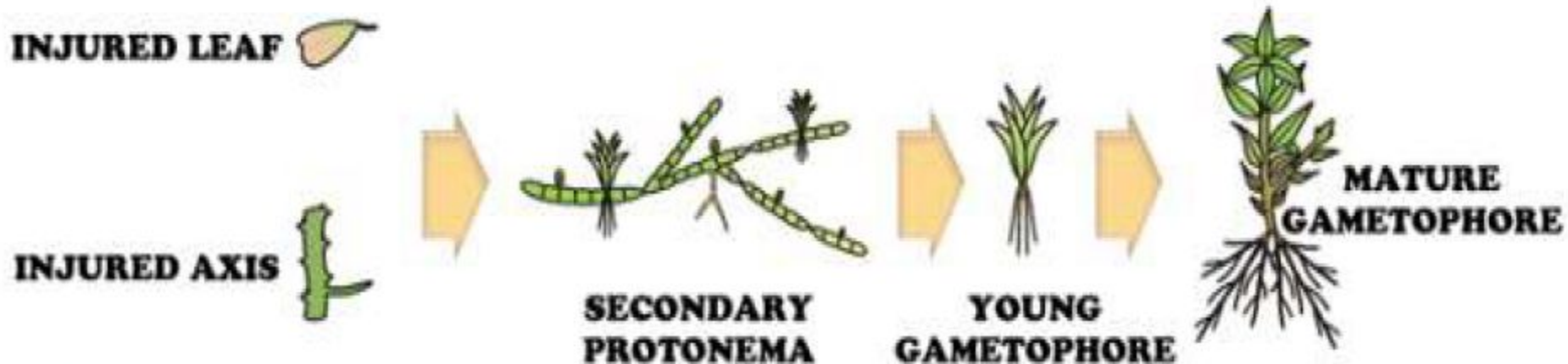


VEGETATIVE REPRODUCTION

1. FRAGMENTATION (PRIMARY PROTONEMA)

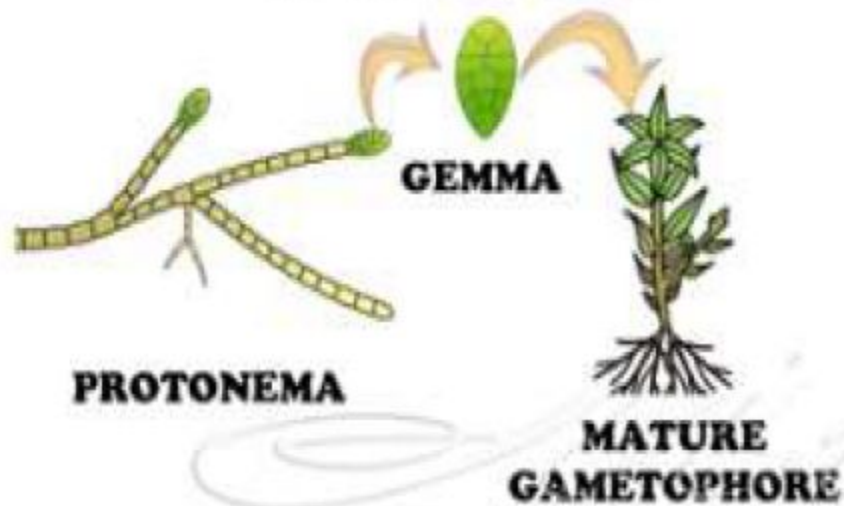


2. SECONDARY PROTONEMA



VEGETATIVE REPRODUCTION

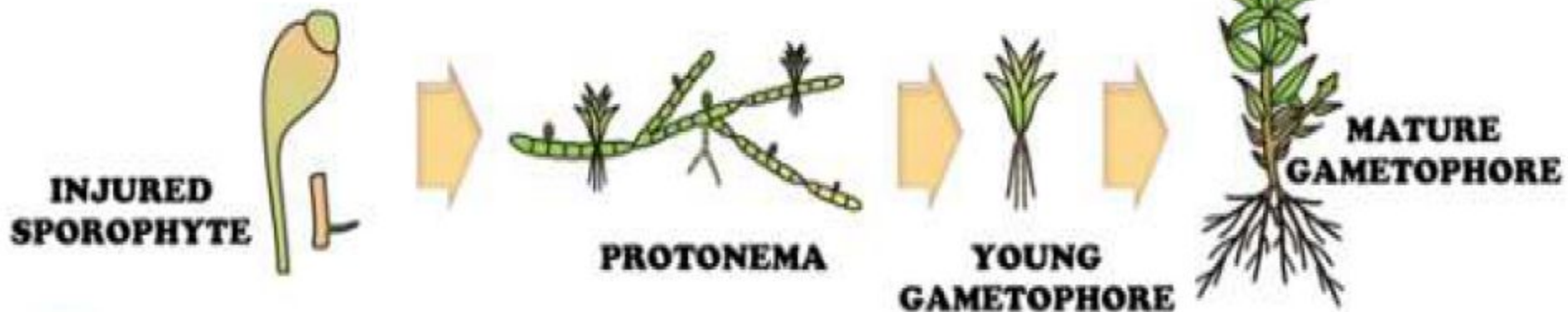
3. GEMMAE



4. BULBILS

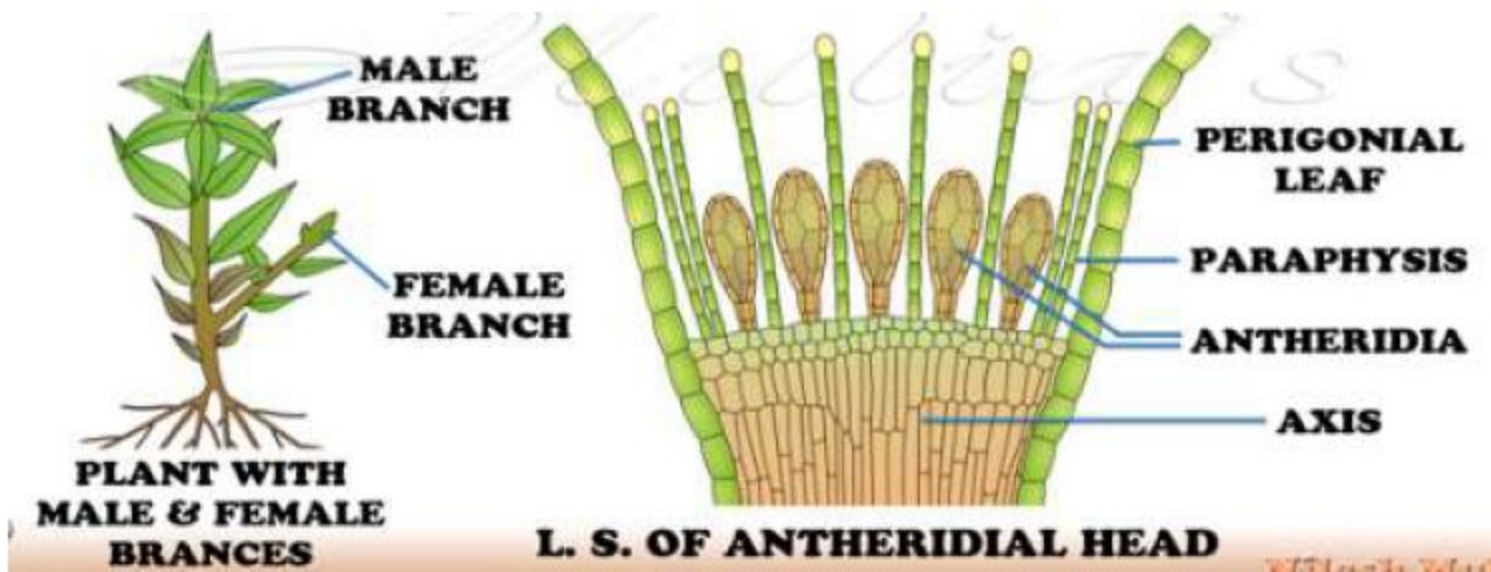


5. AOSPORY

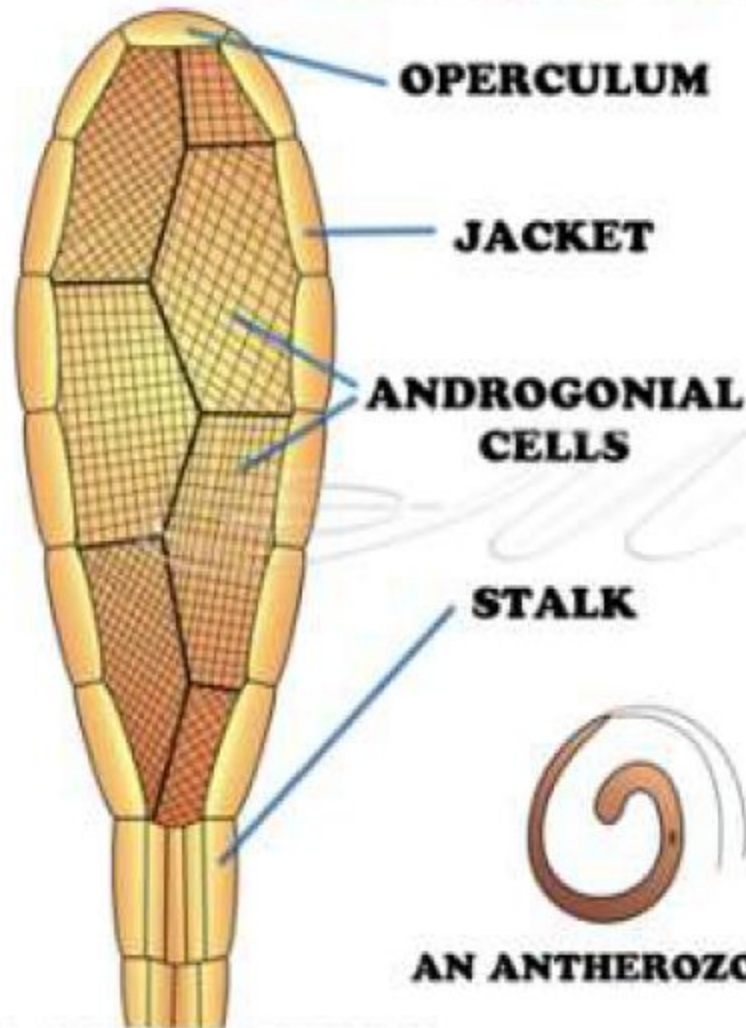


Sexual Reproduction

- ✓ Funaria is monoecious, autoicous, protandrous.
- ✓ Sex organs are developed in groups at the apex of stem (Male branch) and branch (Female branch).
- ✓ The male sex organs are called as **Antheridia** and female are **Archegonia**.
- ✓ The lateral female branch eventually grows taller than the male branch.



AN ANTHERIDIUM



OPERCULUM

JACKET

ANDROGONIAL
CELLS

STALK

AN ANTHEROZOID

• The mature antheridium of *Funaria* may be 0.25 mm in length.

• It has an elongate, club-shaped, orange-coloured body raised on a short, multicellular stalk.

• The body has a jacket layer of polyhedral, flattened cells.

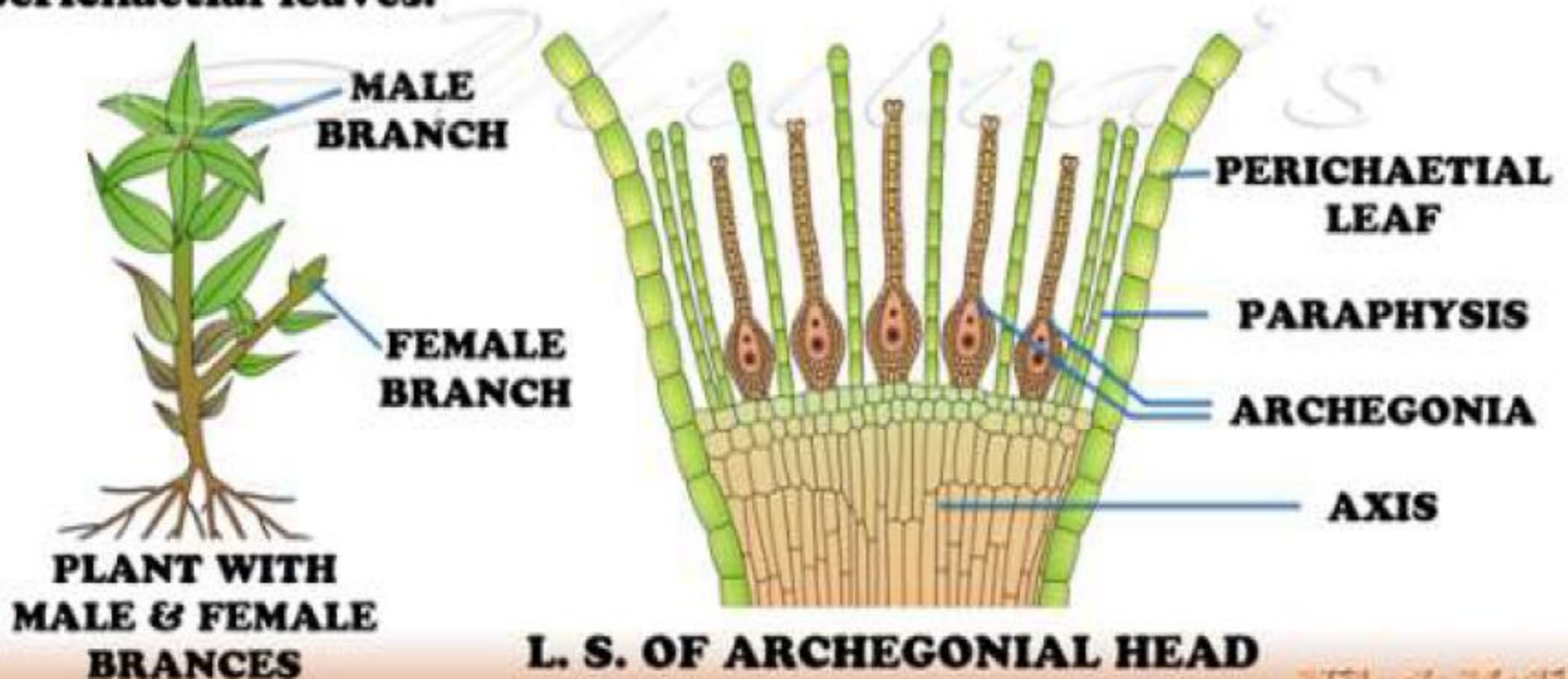
• With an antheridial wall is a dense mass of small cells. They are known as the androcytes.

• Each androcyte produces a single, biflagellate sperm.

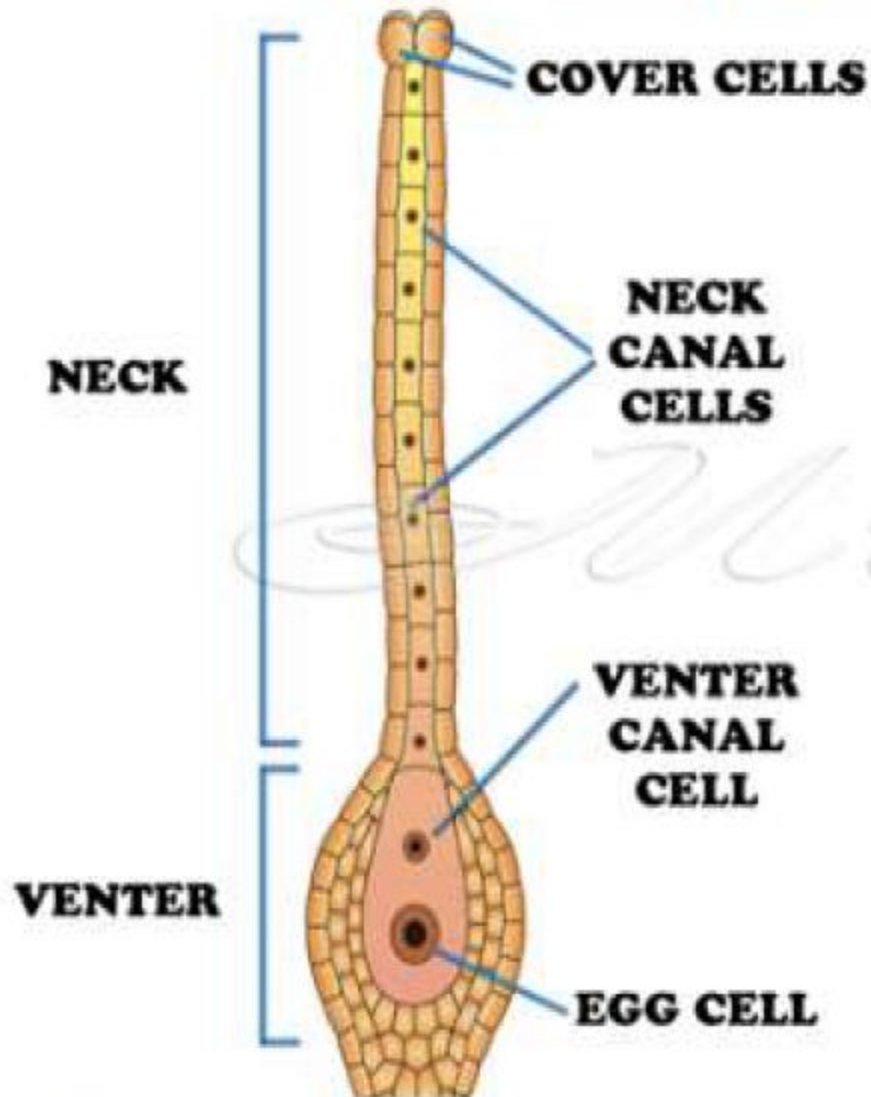
AN ANTHERIDIUM

FEMALE BRANCH

- The archegonial branch springs from the base of the male shoot.
- The archegonia are aggregated into a terminal cluster, stand erect and project from the surface of the female receptacle.
- The leaves surrounding the archegonial cluster are called perichaetial leaves.



AN ARCHEGONIUM



- The archegonia are typically flask-shaped, each consisting of the two usual parts, the venter and the neck.

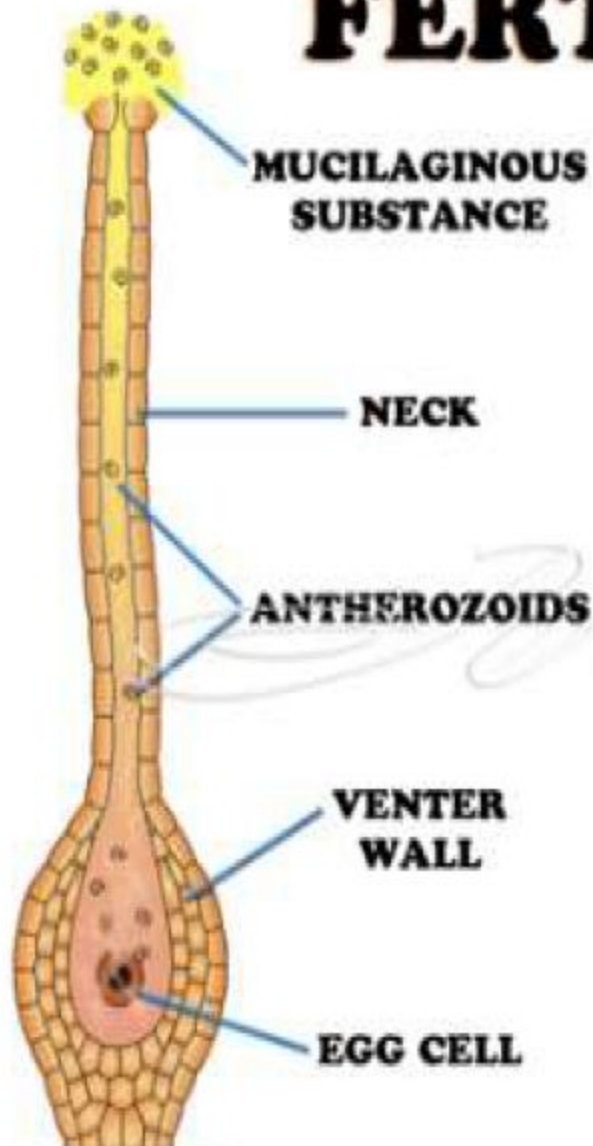
- The archegonium is borne on a distinct, multicellular stalk which is long and massive.

- The venter consists of a double layer of sterile cells. In it lie the egg cell below and the ventral canal cell above it.

- The long, tubular slightly twisted neck consists of six rows of neck cells.

AN ARCHEGONIUM

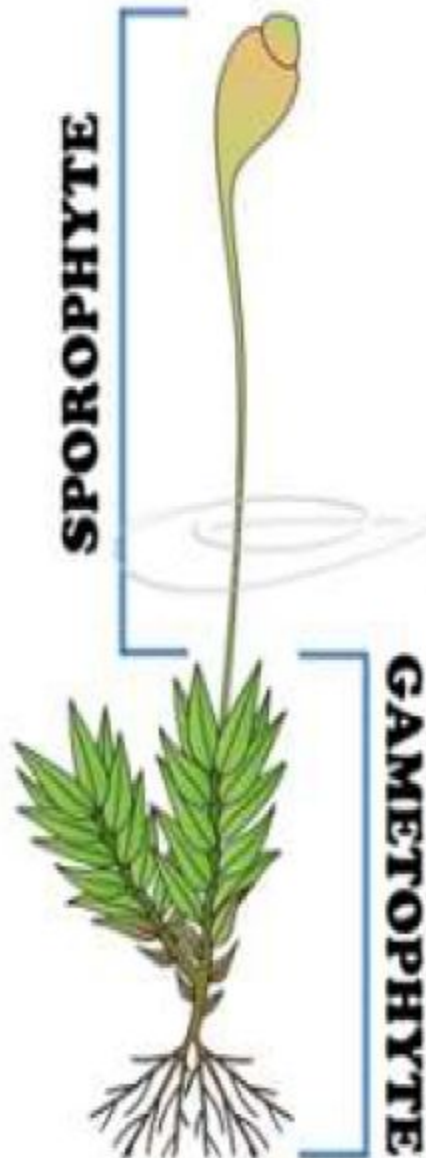
FERTILIZATION



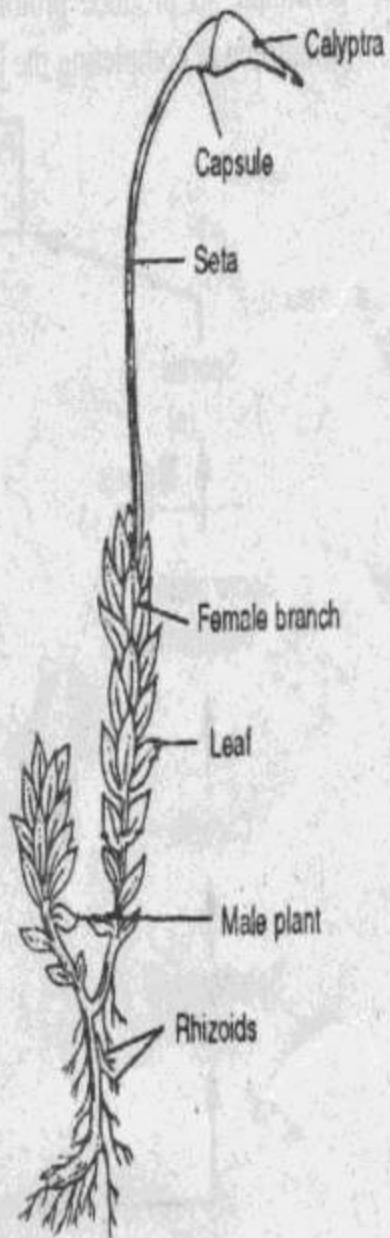
**MATURE
ARCHEGONIUM**

- Rain or dew water, usually accumulated in antheridial and archegonial clusters, helps in fertilization.
- The transfer of antherozoids from the antheridial head to the archegonial head is brought about by rain drops.
- Entry of antherozoids into the archegonium is due to chemotactic influence of the mucilaginous substances present in the neck.

SPOROPHYTIC PHASE



- ❁ **The diploid zygote formed by the fusion of the antherozoid with the egg is the first cell of the sporophytic generation.**
- ❁ **The zygote soon secretes a wall around itself and increase in size before dividing.**
- ❁ **The mature sporophyte of Funaria is differentiated into foot, seta and capsule.**



MATURE SPOROPHYTE

FOOT

Small, dagger-shaped conical structure embedded in the archegonial branch.

SETA

Long, slender, more or less twisted and stalk like structure which supports the capsule.

CAPSULE

Slightly oblique, erect green when young, but becomes bright orange and curved at maturity.

APOPHYSIS

THECA PROPER

APICAL REGION

CAPSULE

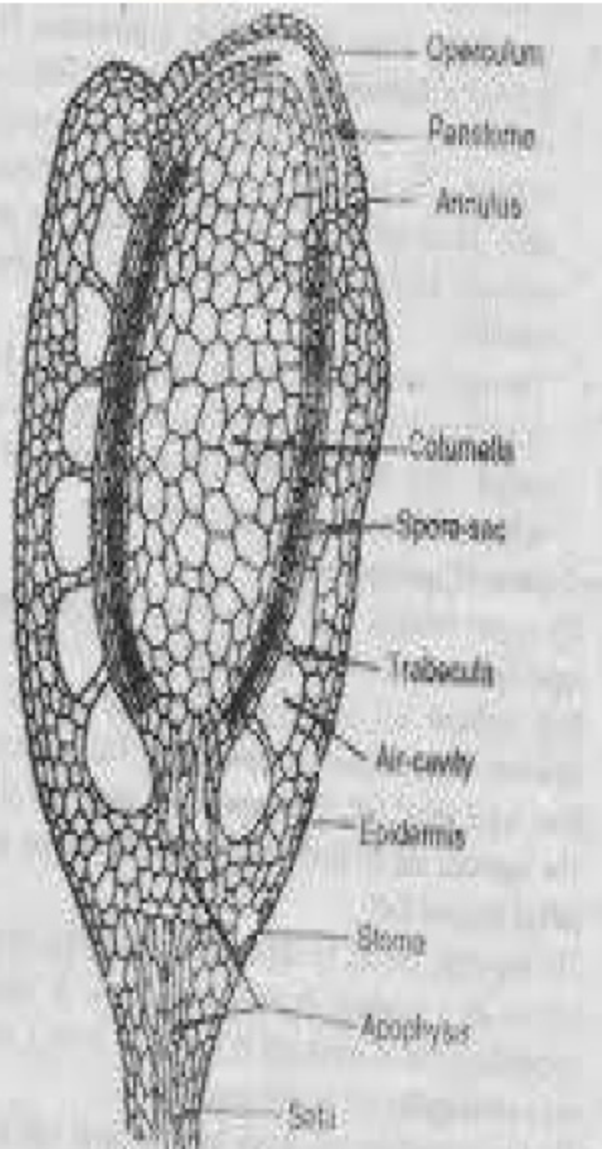
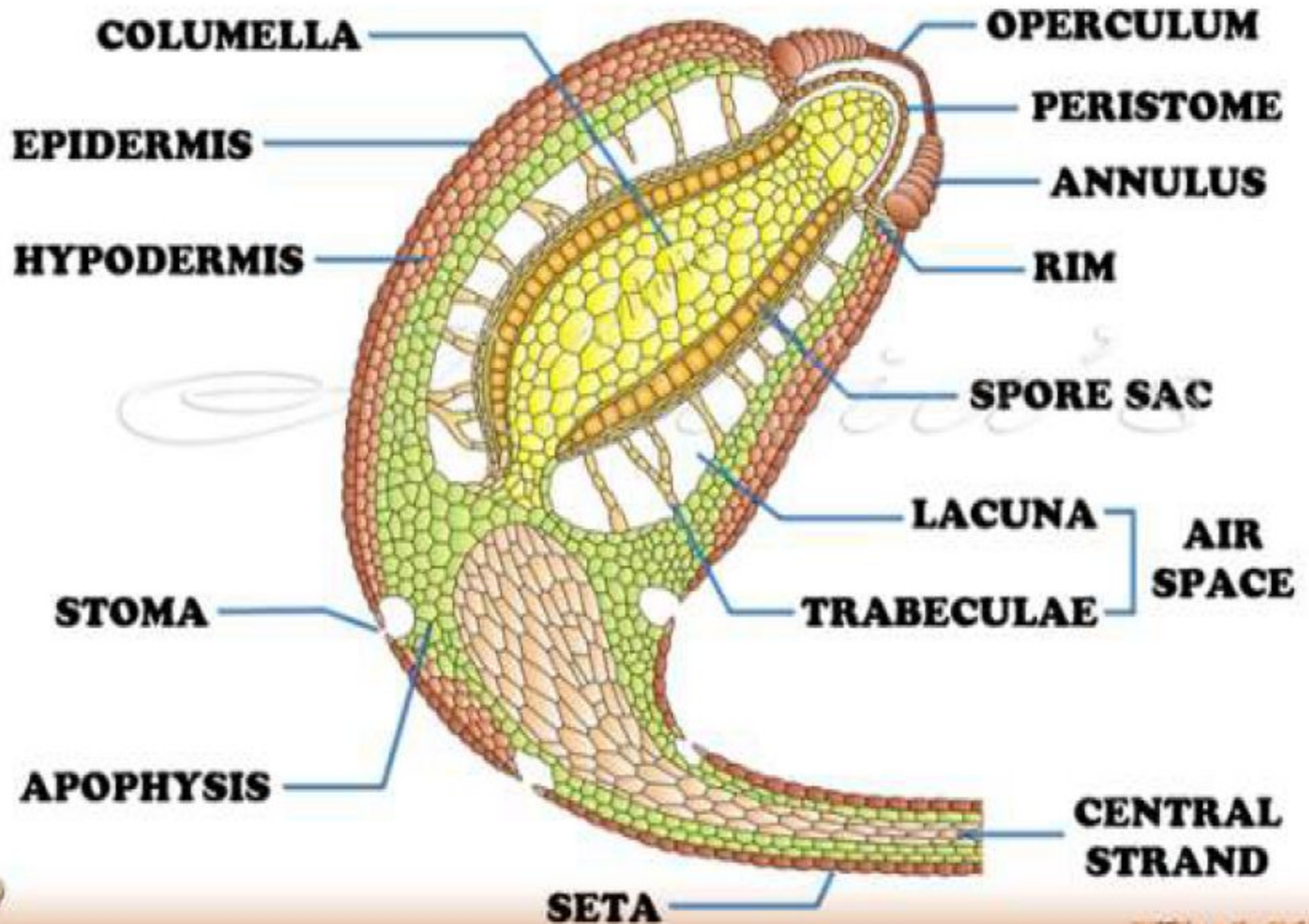


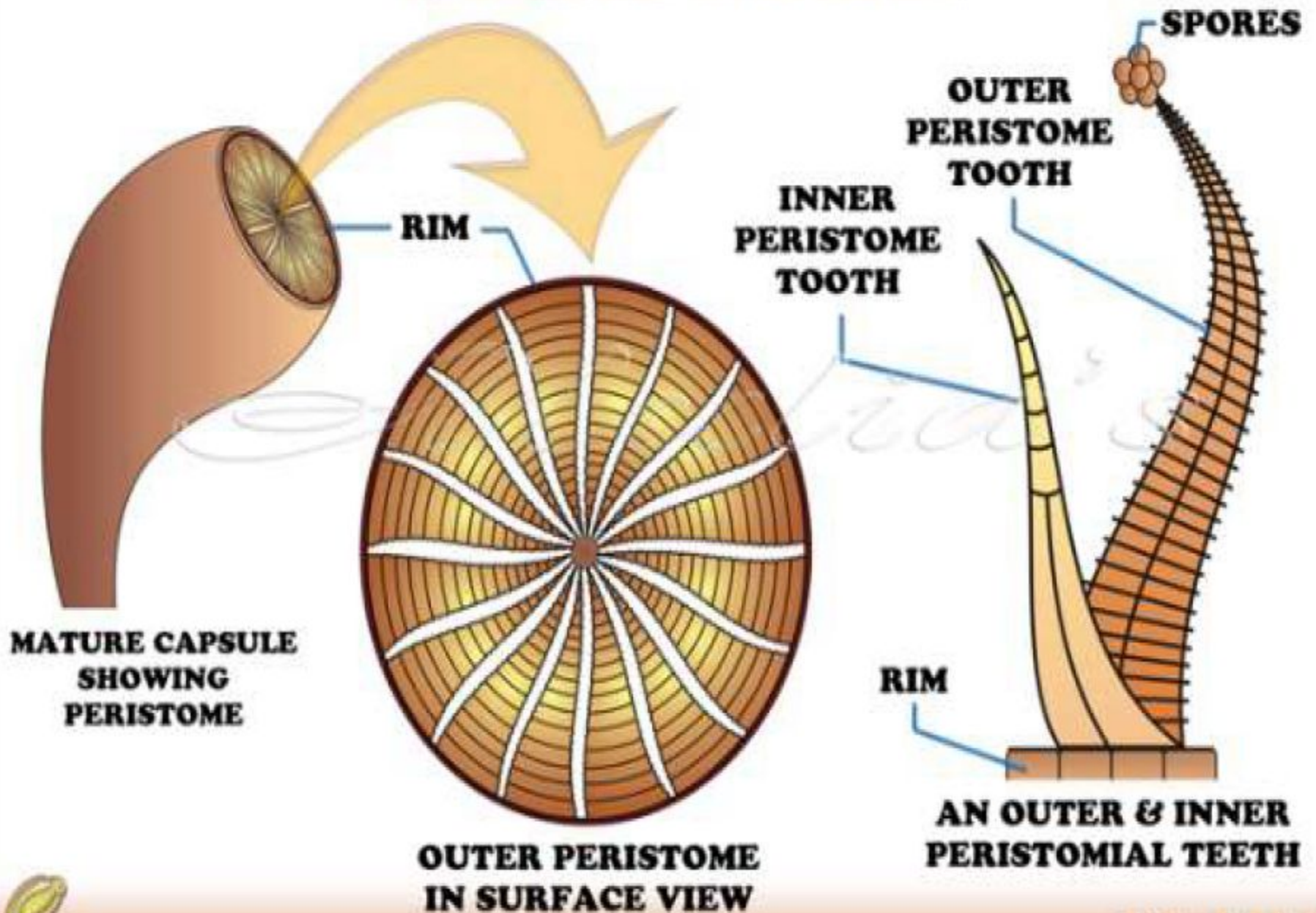
Fig: Section of Sporogonium



L. S. OF CAPSULE



PERISTOME



SPORE DISPERSAL

- ❖ As the sporophyte matures, the water supply of the capsule is cut off.
- ❖ As a result, all tissues of the capsule, except spores, dry up.
- ❖ The thin walled cells of the annulus break and the operculum is thrown away.
- ❖ The outer peristomial teeth are hygroscopic and in dry atmosphere they bend outwards with jerky movements, but the inner peristomial teeth remain in their position.
- ❖ Due to outward movements of the outer peristomial teeth, slits between the inner thin walled peristomial teeth become wider and spores escape through these slits gradually.



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Thank You
so much!