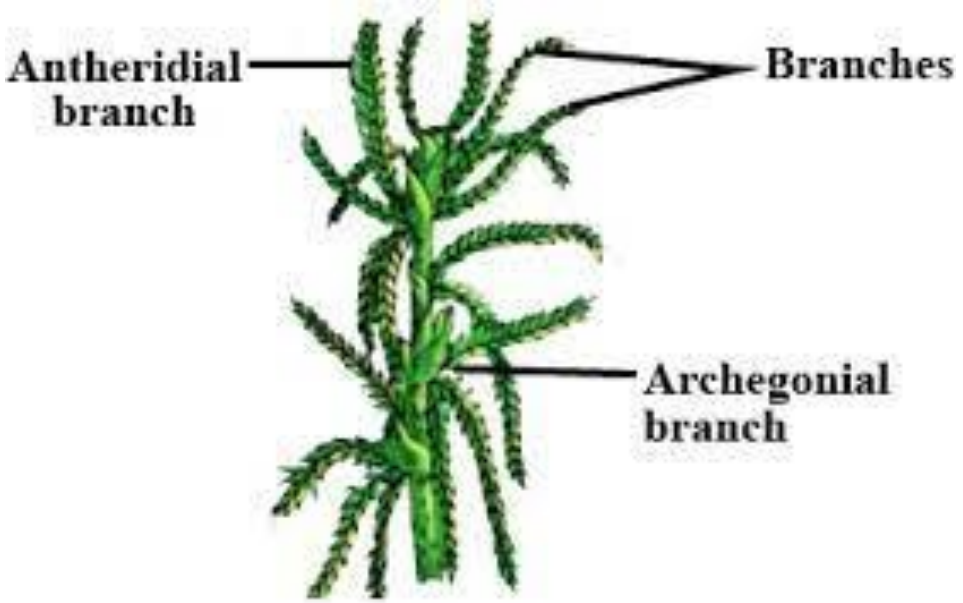
SPHAGNUM



- **Systematic position**
- Division –Bryophyta
- Class-Bryopsida (Musci)
- Sub-class- Sphagnidae
- Order-Sphagnales
- Family-Sphagnaceae
- Genus-Sphagnum

- Family Sphagnaceae contains **one genus, *Sphagnum*.**

INTRODUCTION

- Sphagnum is popularly known as **bog moss, peat moss** or **turf moss** because of its ecological importance in the development of peat or bog.
- Sphagnum is represented by about **336 species** which are cosmopolitan in distribution.
- **In India**, it is represented by about **20** species in Himalayas.
- Important species are *S. nemoreum, S. squarossum, S. tenellum, S. molluscum*.
- *S. obesum, S. cuspidatum* are submerged species.

Sphagnum is called peat moss because it grows in acidic marshes (bog) and helps in peat formation. The Sphagnum that has been decayed and dried is known as the peat or peat moss. As most of the dead material in peat bog comes from the Sphagnum that grew on top of that bog, Therefore, sphagnum can also be called peat moss.

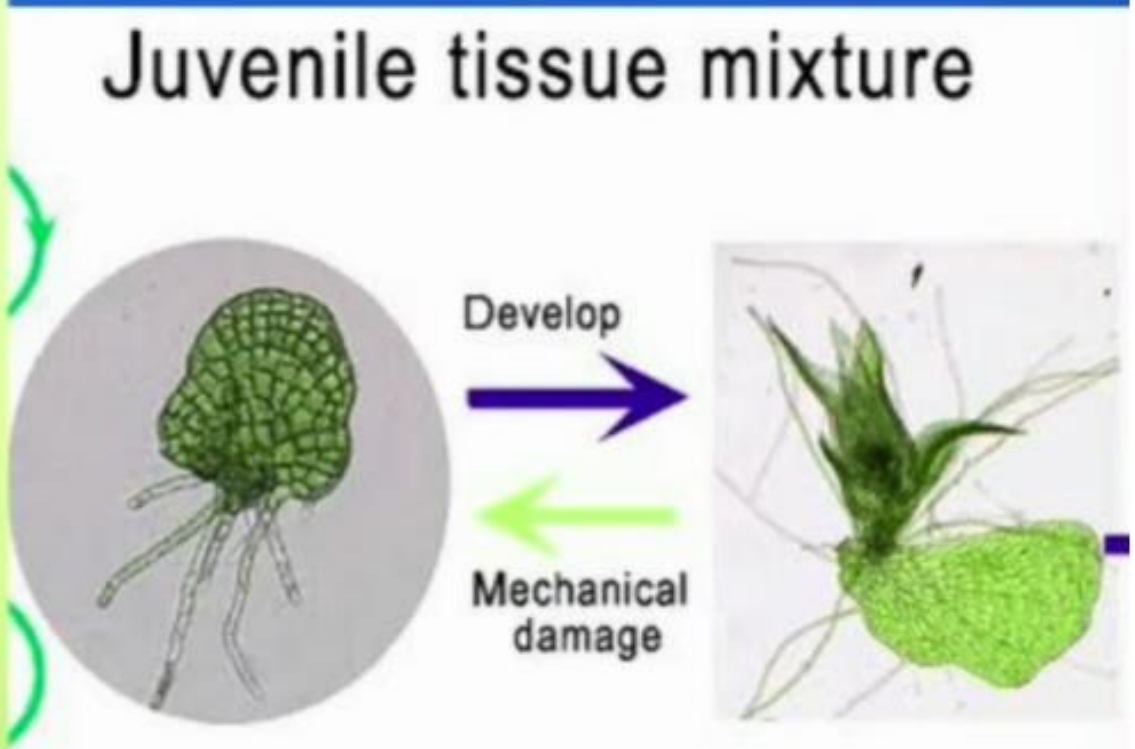
HABIT AND HABITAT

- Aquatic or semiaquatic and grow in dense masses or cushions in swamps, ponds and lake margins, moist heaths and wet hill sides.
- They grow along the bank of lakes and gradually encroach more and more of the water as creeping bogs and in course of time they completely cover up the lake transforming it into a bog.
- Hence Sphagnum is known as **bog moss**.

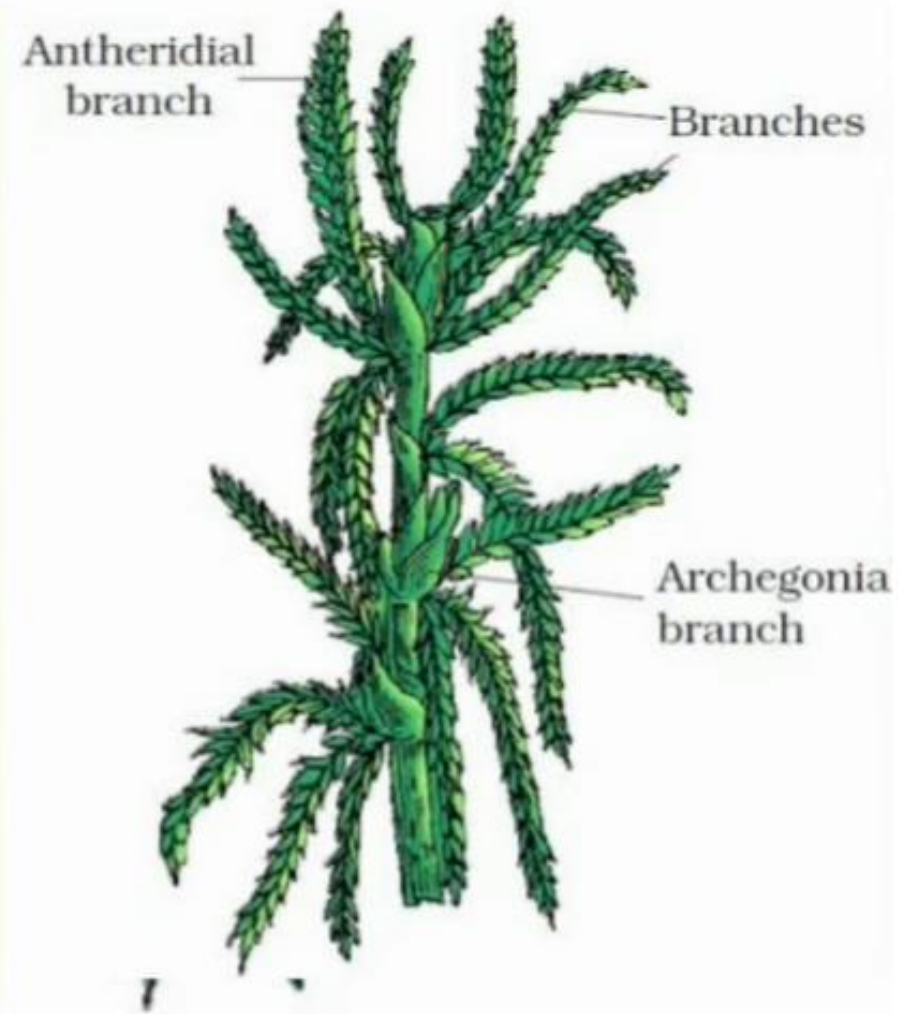
Gametophyte External Features

Plant body is gametophyte and consists of two stages:

- **Juvenile protonema stage** and **leafy gametophore.**
- Juvenile stage is formed by the germination of the spores.
- It is irregularly lobed thallus one cell in thickness.
- It is attached to the substratum by multicellular rhizoids with oblique septa.



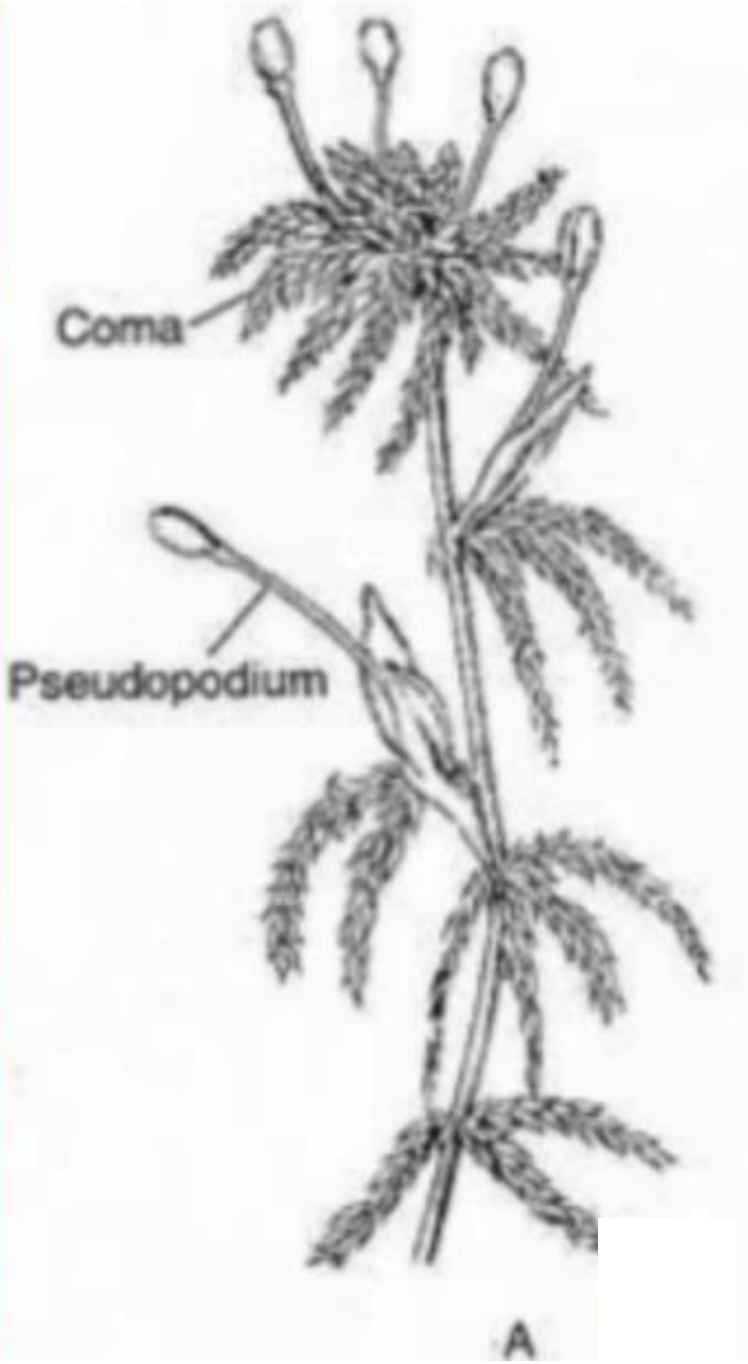
- From the protonema arise the erect leafy gametophyte called the **gametophore**.
- Very young gametophytes bear multicellular **rhizoids with oblique septa**.
- Mature gametophytes, however, do not bear rhizoids.
- Mature **Gametophore** can be differentiated into upright branched **axis** or **stem** and **leaves**.



Sphagnum gametophyte

Main Axis and Branches:

- The main axis is soft and weak at young stage, but becomes erect and stout at maturity.
- It is 12 inches or more in length with a diameter up to 1.2 mm.
- It is much longer in aquatic species, but is relatively short in terrestrial form.
- At the apex of the main stem, many small branches of limited growth are densely crowded forming a compact head called **coma**.



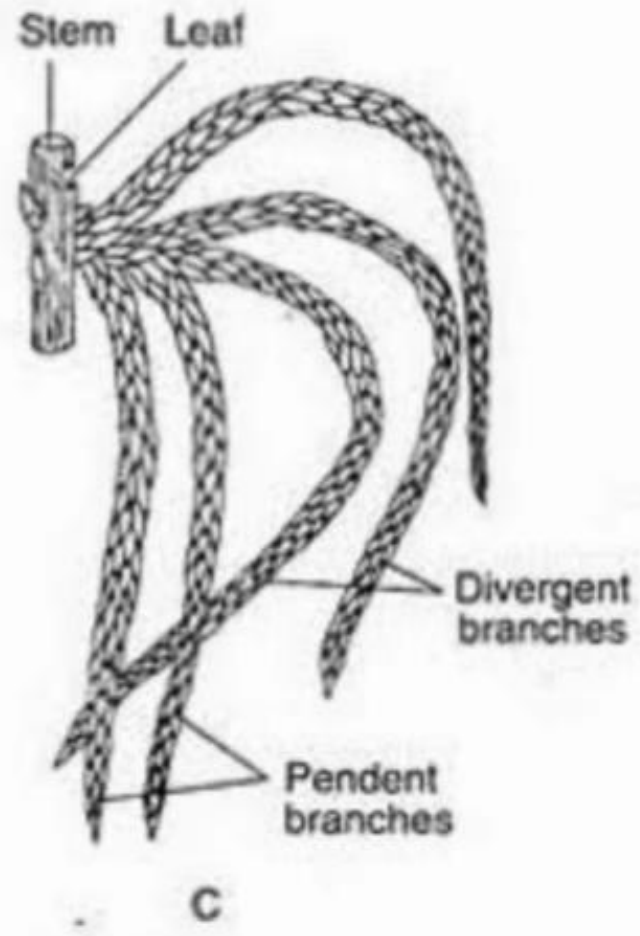
- These branches are of **two types.**

(a) Divergent or Excurrent branches:

- These branches grow out laterally from the stem and extend outward in a horizontal position.

(b) Pendent or Drooping or Flagelliforms branches or decurrent branches:

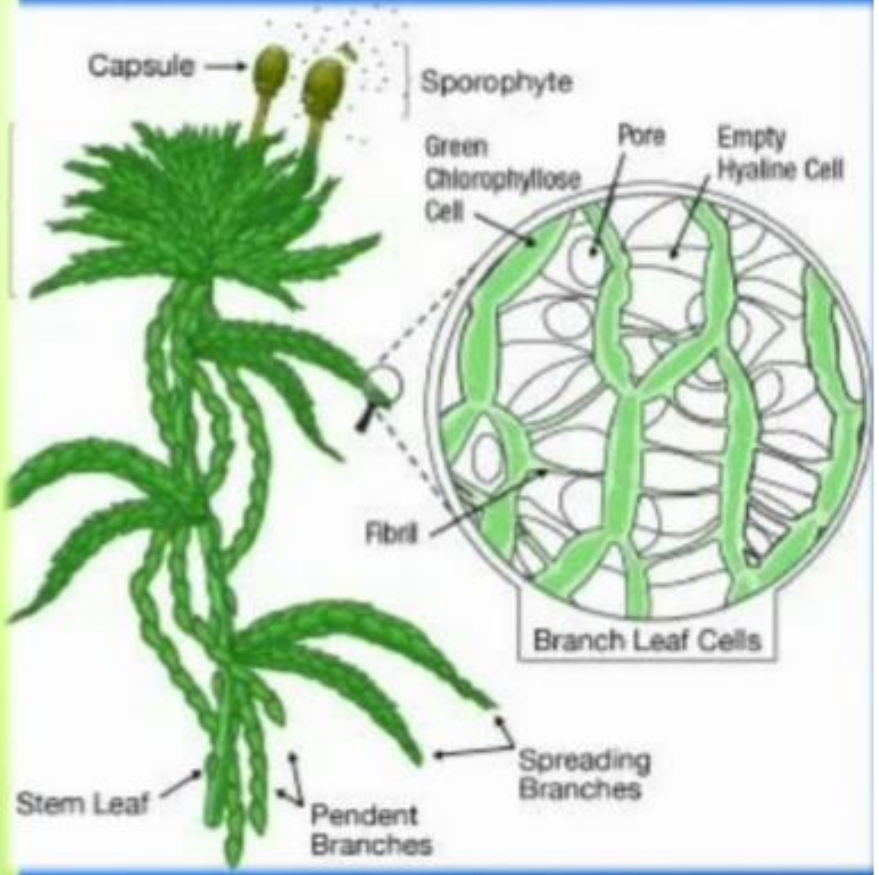
- These branches grow out laterally from the stem; droop or hang or run very close to the stem. These pendent or de-current branches act as water conductors.
- The submerged species (*S. obesum, S. cuspidatum*) have all the branches similar in form and structure.



LEAF

- Borne on the main stem as well as branches.
- On the stem they are little apart while on the branches they are smaller and overlapping.
- Leaves are arranged in a spiral manner with a phyllotaxy of 2/5 i.e., sixth leaf will come above the first leaf.
- They are thin, small, fleshy, oblong with a broad base. The margin is entire with acute apex. Mid rib is lacking.
- In surface view the leaf shows meshes composed of 2 different types of cells:

- Small living **photosynthetic cells** or assimilatory cells containing chlorophyll and large, **hyaline rhomboidal cells**.
- The chlorophyllose cells are triangular or biconvex with many discoid chloroplasts.
- The hyaline cells are large polygonal and become colourless by loosing their protoplasts.
- Their walls are provided with pores and become spirally thickened .
- The hyaline cells have a remarkable capacity of absorption and retention of water (hence called **capillary cells**)



INTERNAL STRUCTURE

Axis or Stem:

3 distinct zones:

(i) Cortex or hyalodermis:

(ii) Middle hadrome or Prosenchymatous

(iii) Central cylinder or Medulla:

(i) Cortex or hyalodermis: outermost region, cells are small and compact.

- In young axis, and in lateral branches the cortex is only one cell thick.
- In *S. subsecundum* it is single layered throughout its life but in majority of species it is composed of many layers.
- In *S. recurvum, S. obtusum*, it is composed of two to three layers of **hyaline cells**.

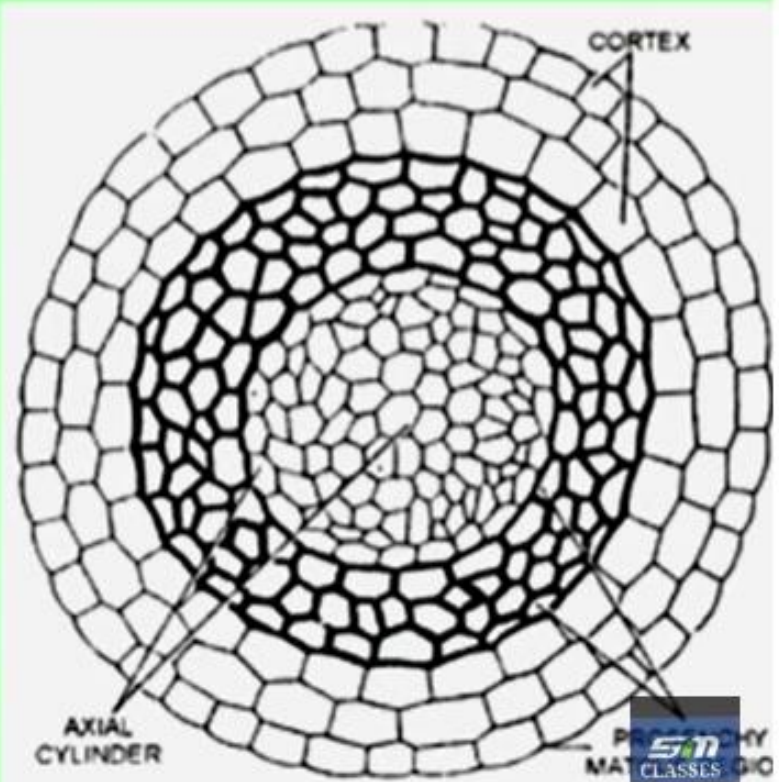
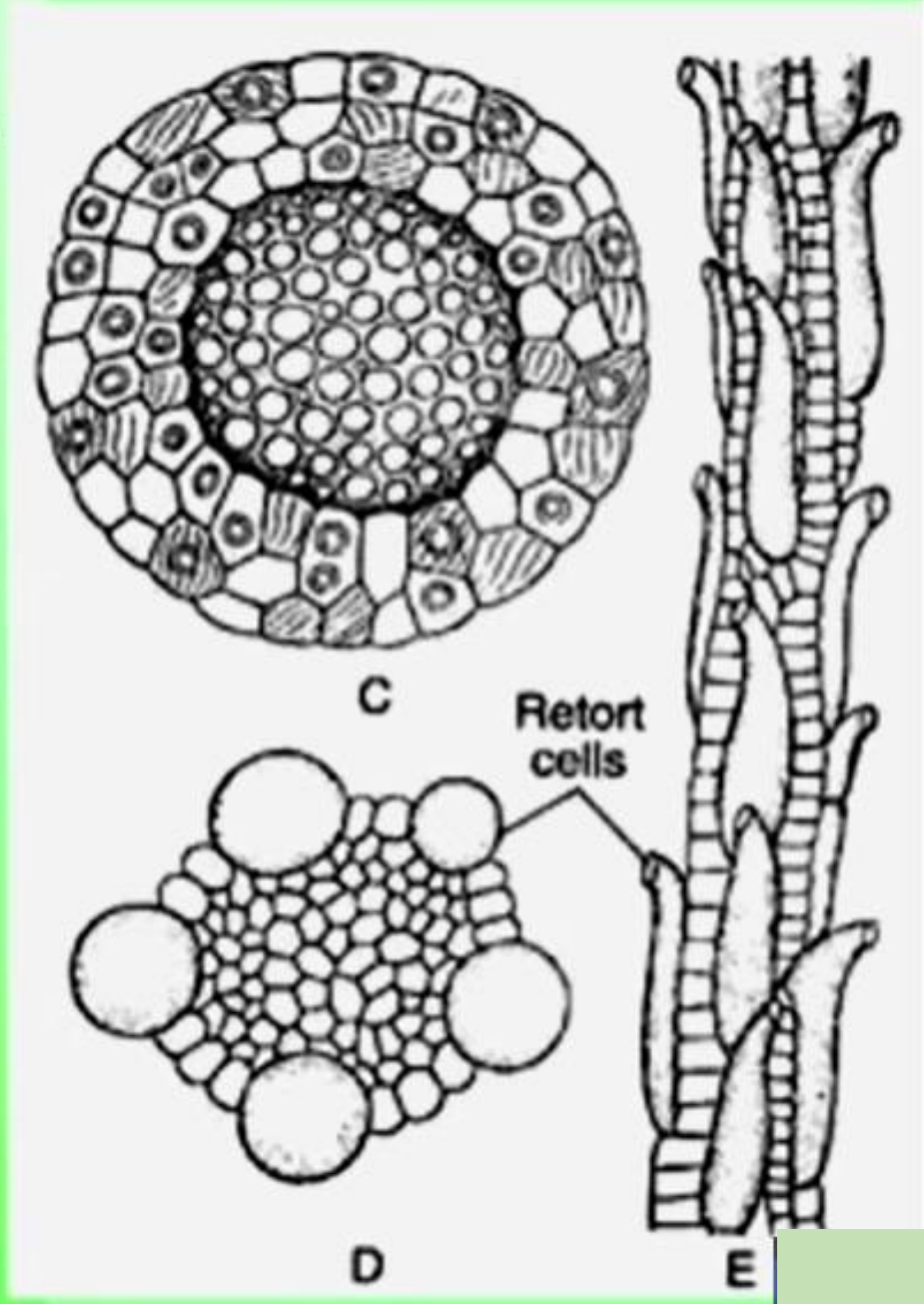


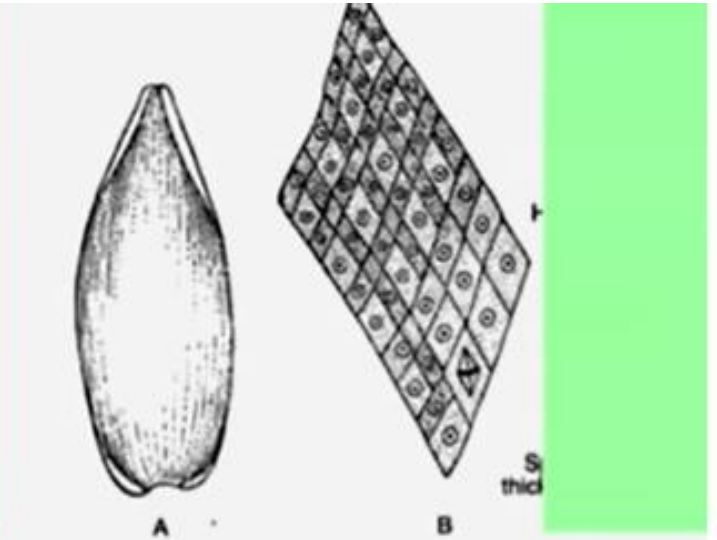
Fig. 5. *Sphagnum*. T.S. old axis.

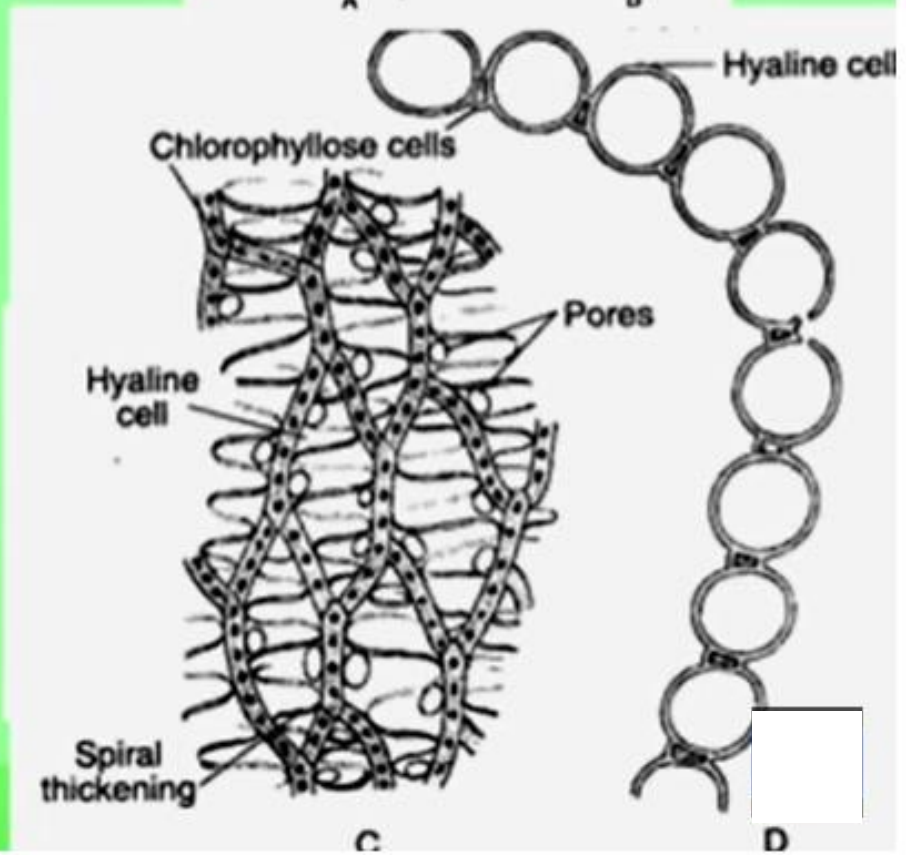
- On the basis of **nature of hyaline cell** Sphagnum has often been divided into **2 sub-genera.**
- In the sub-genus Sphagnum or **Inophloea**, cortical hyaline cells are fibrose and porose,
- In the sub-genus **Lithoploea** they are without pores or spiral thickening.
- The mature cortical cell is devoid of protoplasm.
- In some species (*S. tenellum, S. molluscum*), some outer cortical cells enlarge peculiarly and become bottle or retort-shaped hence called **retort cells.**



Leaf-Internal structure

- one cell in thickness. A young leaf is comprised of square or rectangular cells of uniform size.
- Mature leaf is characterised by 2 types of cells arranged in an alternate sequence to form a regular reticulate pattern.
- **The hyaline cells** : large polygonal, lack protoplasts, walls are provided with pores and spirally thickened. They have capacity of absorption and retention of water (called capillary cells).
- **The chlorophyllose cells:** small triangular or biconvex living cells with many discoid chloroplasts and have photosynthetic ability.





VEGETATIVE REPRODUCTION

SEXUAL REPRODUCTION

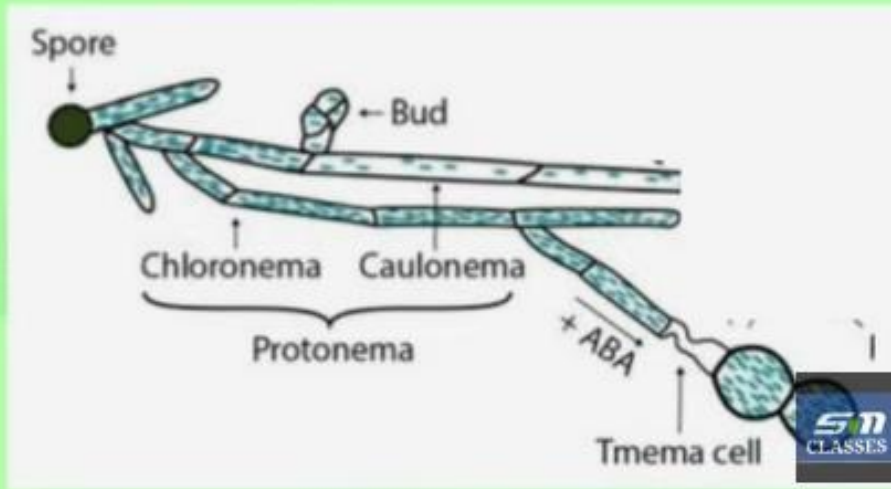
VEGETATIVE REPRODUCTION

1. Innovation:

- Special vegetative branches are known as innovations.
- Occasionally one of the branches in the axillary cluster become robust and grows upwards.
- This branch shows all the characteristics of main axis and known as innovation.
- Each innovation develop into a new plant when detatch from the parent plant.

2. Multiplication of Protonemal Branches:

- Any marginal cell of primary protonema become meristematic and forms a green cellular filament.
- In apical portion flat, thallus-like green secondary protonema is formed.
- Its marginal cells form the leafy gametophore.



3. Regeneration:

- During dessication, the growth of the Sphagnum is checked because the physiological activities are suspended, but the cytoplasm shows a high degree of resistance to dessication.
- When water is available these activities and normal growth of the plant are resumed.
- Such plants are known as **Pallacuophytes (Buch, 1947).**

II. Sexual Reproduction:

Sphagnum may be monoecious or dioecious, but the antheridia and archegonia are always borne on the special separate antheridial and archegonial branches of the same plant. These branches are much smaller than the vegetative branches (Fig. 6.38B & 6.39B). In monoecious plants, the antheridial branches develop first.

(a) Antheridial Branch:

The antheridial branches (Fig. 6.38B) first appear near the apex of the main shoot but eventually carried downwards due to the growth of the apical region. These branches are usually shorter but stouter than the vegetative branches. They are spindle-shaped and densely covered with yellow, red or dark green leaves generally smaller than the foliage leaves (Fig. 6.42A).

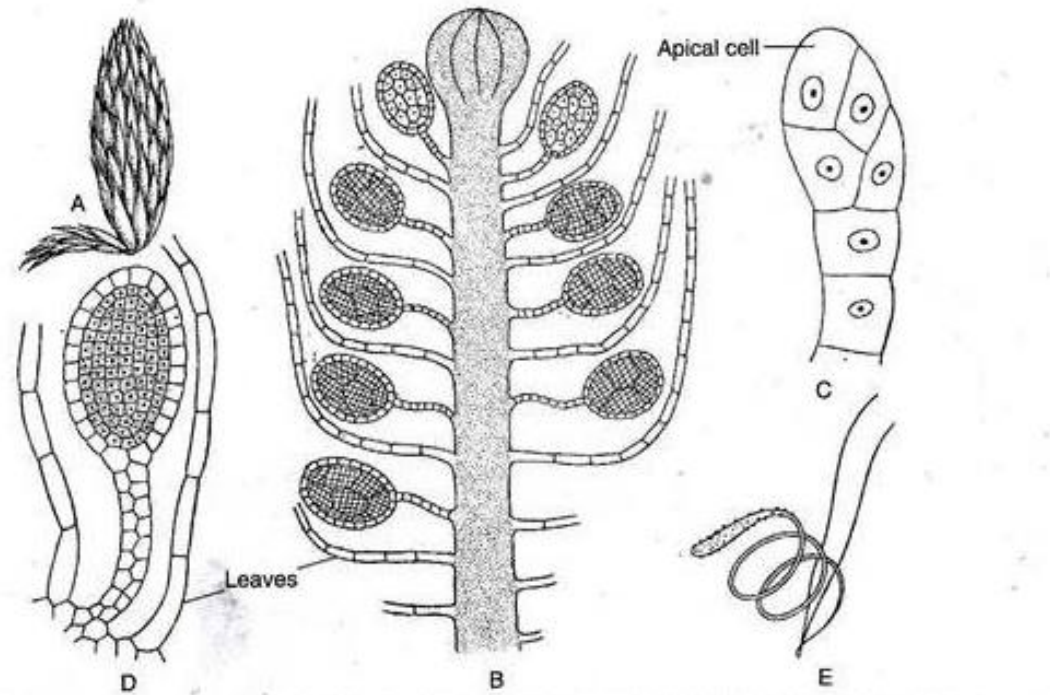


Fig. 6.42 : *Sphagnum nemoreum* : A. Antheridial branch, B. L.S. of A showing leaves and antheridia, C. Filamental stage in the development of an antheridium, D. A mature antheridium with two leaves, E. An antherozoid

(b) Archegonial Branches:

Archegonia are borne at the apices of the archegonial branches which develop at the apex, or laterally. The archegonial branches are very short and more or less ovoid in shape (Fig. 6.38B and 6.39B). The leaves on these branches are larger than those present on the foliage leaves. The upper leaves of these branches constitute the perichaetium enclosing the archegonia and thus protect archegonia from injury.

The Sporophyte:

Development of the Sporophyte:

The diploid zygote is the first cell of the sporophytic generation. Among the few archegonia only one is developed to form embryo in an archegonial branch.

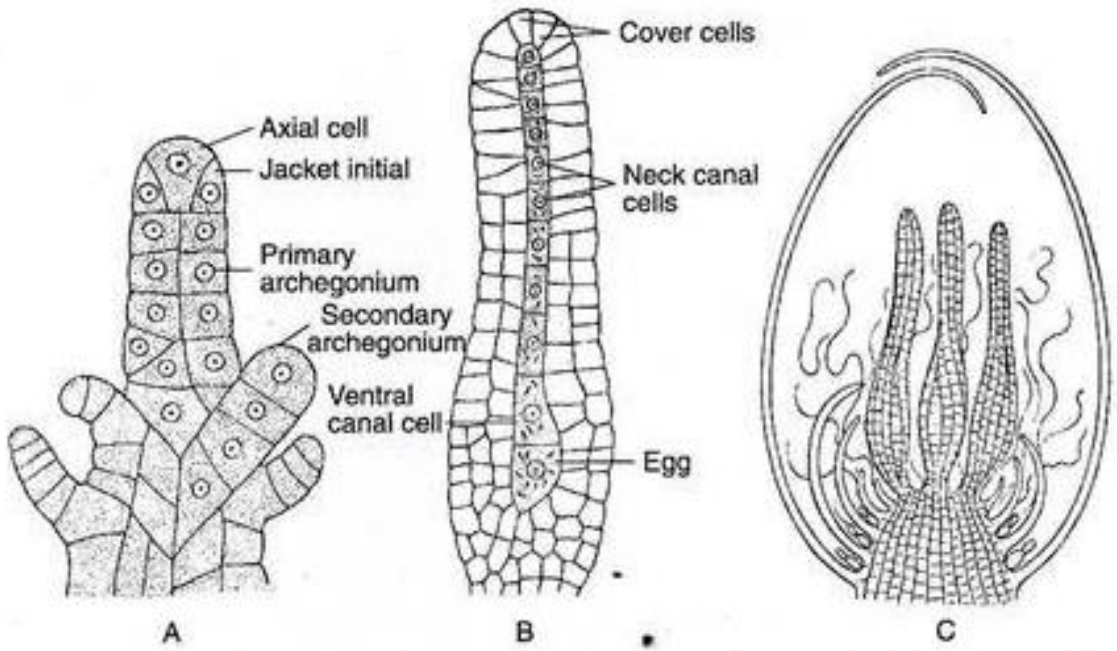


Fig. 6.43 : *Sphagnum* : A. Development of the apical primary archegonium and lateral secondary archegonia, B. A mature archegonium, C. Three archegonia on the tip of an archegonial branch (L.S. after Schimper)

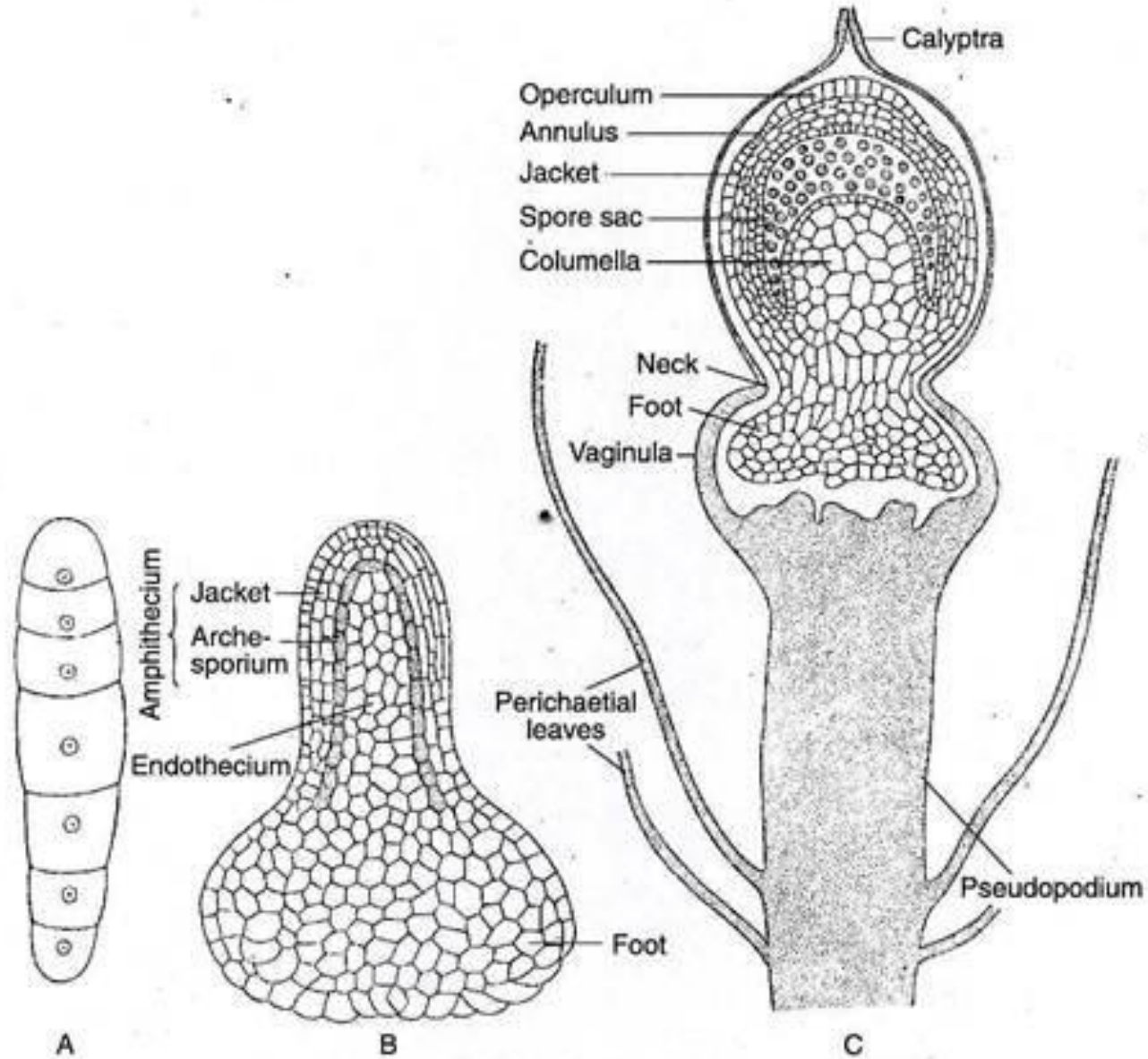


Fig. 6.44 : Stages of development of the *Sphagnum* sporophyte : A. Early filamentous sporophyte, B. Later stage showing differentiation of foot, amphithecium and endothecium, C. Mature sporophyte on pseudopodium in L.S.

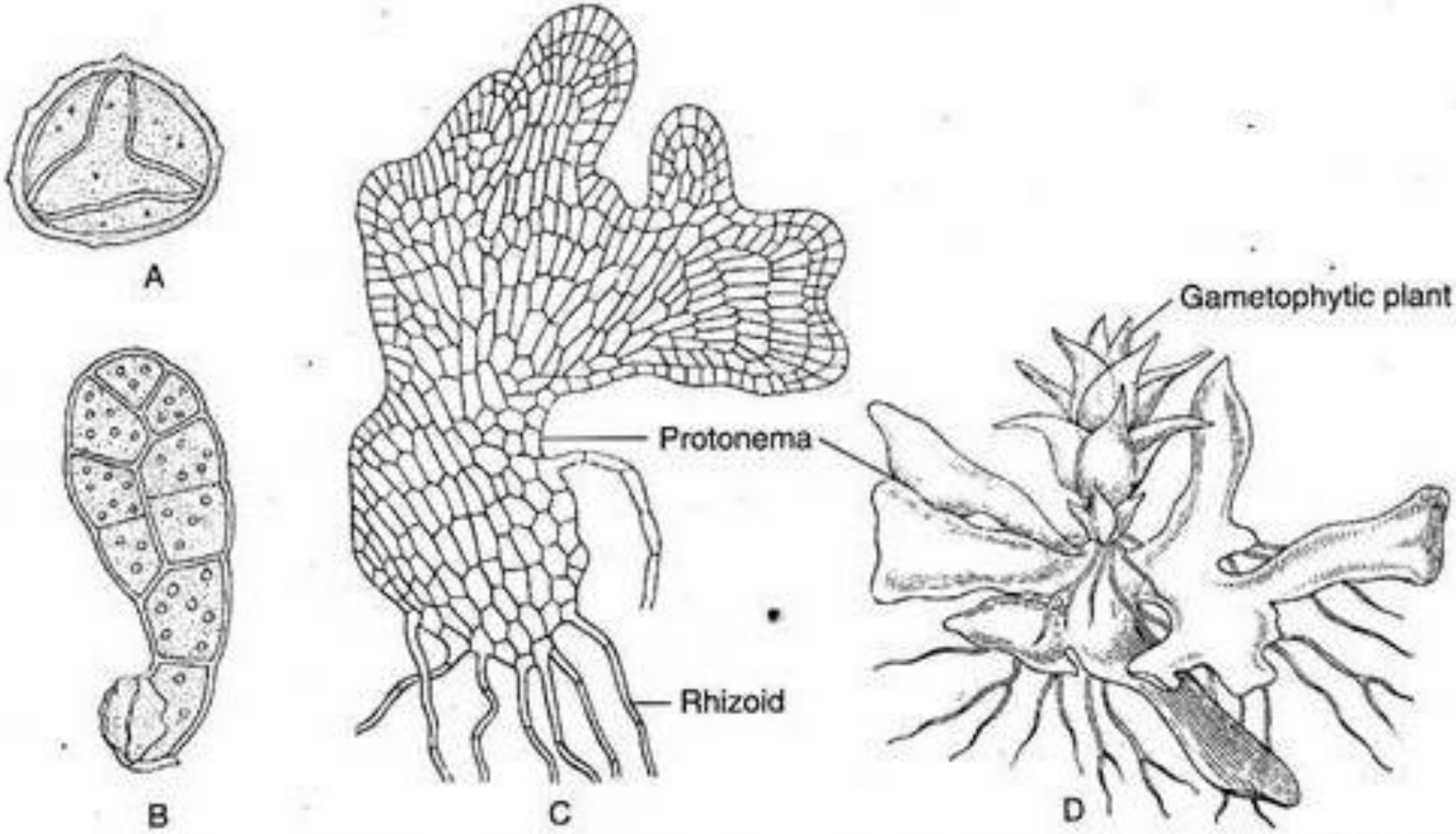


Fig. 6.45 : *Sphagnum palustre* : A. Spore, B. Germination of spore, C. The thalloid, lobed protonema, D. Development of a gametophyte plant on a lobed protonema of *S. nemoreum* (after Schimper)

The economic importances of sphagnum are:

1. It has the **great capacity for retaining moisture** like that of sponge so it is used as **packing materials** for the **transshipment** of living plants.
2. It maintains **high soil acidity** of certain plants so it improves the **retaining capacity of dry soil.**
3. It is said to possess half **the heating power of good coal** and twice the **heat of wood**. So it is used as **domestic fuel after drying** it.
4. It is instead of cotton for filling the **absorbent bandages** in **surgical dressing** in the hospitals.
5. It is also used as a material for **increasing** the **water retaining property** of certain poor **types of soils.**
6. The **flowers are packed** in peat mosses to keep them fresh for a **long period.**
7. It has **great power of regeneration**.
8. The **decomposed moss** is called as the **peat moss** and it is used in **gardens.**
9. It can **cause fungal infections**.

THANK YOU