

Morphology, Anatomy and Reproduction of *Riccia*

- INDRESH KUMAR PANDEY

Hepaticopsida-General characters

- Class Hepaticopsida includes the thallose liverworts and leafy liverworts
- Plants are dorsiventrally flattened, thalloid or differentiated into axis and leaves
- Leaves, if present are without mid-rib and are arranged into two or three rows on the axis
- Sex organs develop from the superficial cells situated on the dorsal side of thallus except in few cases where the sex organs are terminal
- Sporophytes are simple or may be differentiated into foot and capsule, or foot, seta and capsule
- Stomata are not present on the capsule wall
- The dehiscence mechanism of capsule is indefinite and irregular
- The class is further divided into the following orders:
 - I. Marchantiales
 - II. Monocleales
 - III. Sphaerocarpaceales
 - IV. Metzgeriales
 - V. Jungermanniales
 - VI. Calobryales

Riccia

Class – Hepaticopsida

Order- Marchantiales

Family-Ricciaceae

OCCURRENCE AND HABITAT

- Named after a politician P. F. Ricci
- Total 200 sp.(30 in India, occurring in plains and foot hills)
- Commonly found in India *R. cruciata*, *R. glauca*, *R. discolor*, *R. reticulata*, *R. gangetica*, *R. melanospora* and *R. crystallina*
- All species are terrestrial growing on moist damp soils except *R. fluitans* and *Ricciocarpus natans* (*Riccia natans*), which are aquatic



Ricciocarpos natans

GAMETOPHYTE PHASE

External Morphology

- Dorsiventrally differentiated, prostrate, fleshy thallus showing dichotomous branching to form rosettes
- Each branch of the thallus is either wedge-shaped or linear
- The dorsal surface of the green, fleshy thallus is generally thick in the centre and gradually becomes thinner towards the margin
- Middle portion has a median groove or furrow on the dorsal surface running through the entire length of the thallus and is termed the midrib
- At the distal end of the dorsal groove, lies an apical notch or a depression which protects the growing point

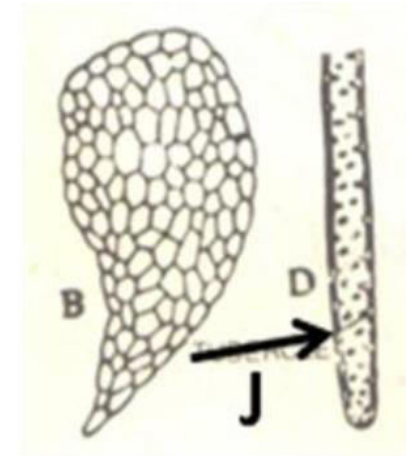
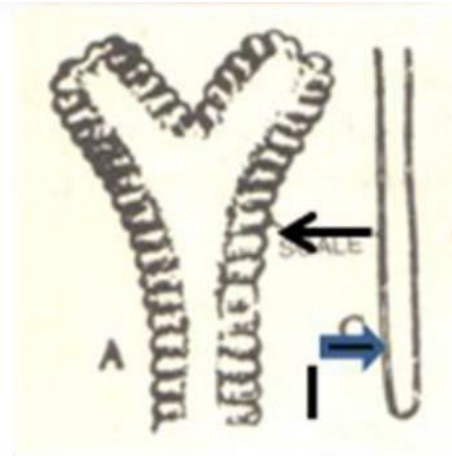


RHIZOIDS

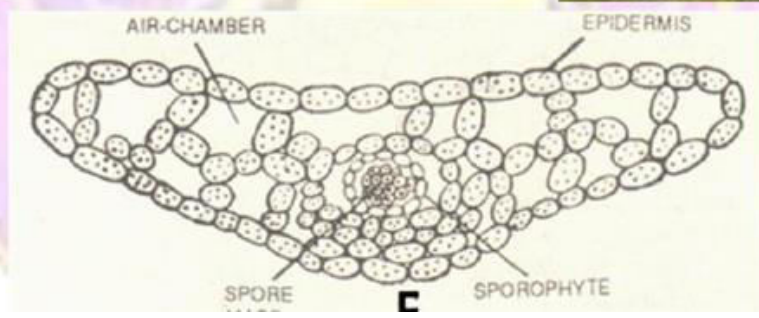
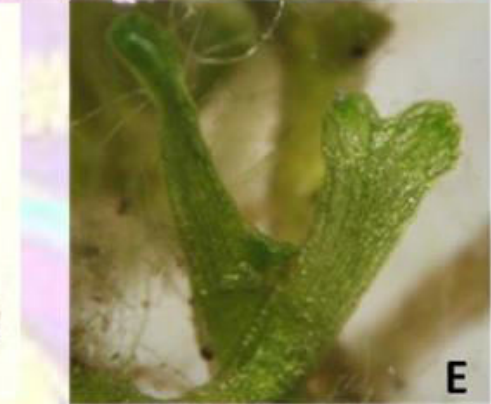
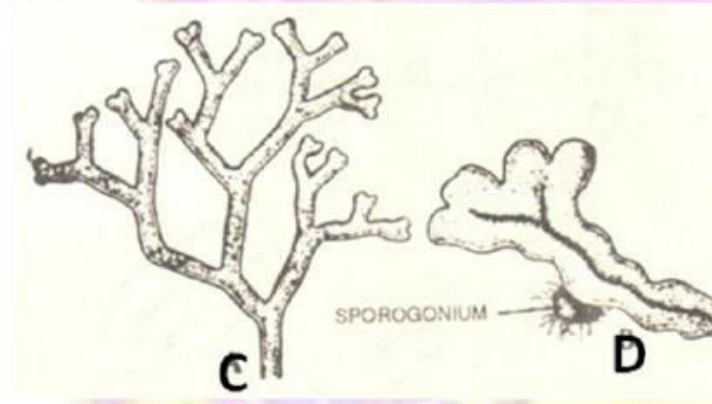
- The ventral surface of the thallus shows numerous, unicellular rhizoids that not only help in attaching the thallus to the substratum but also help in the uptake of water and minerals
- Rhizoids are of two types: smooth-walled and tuberculate. Smooth-walled rhizoids are, smooth-walled, simple and slightly wider. Tuberculate rhizoids are thinner and have peg-like projections in the lumen.

SCALES

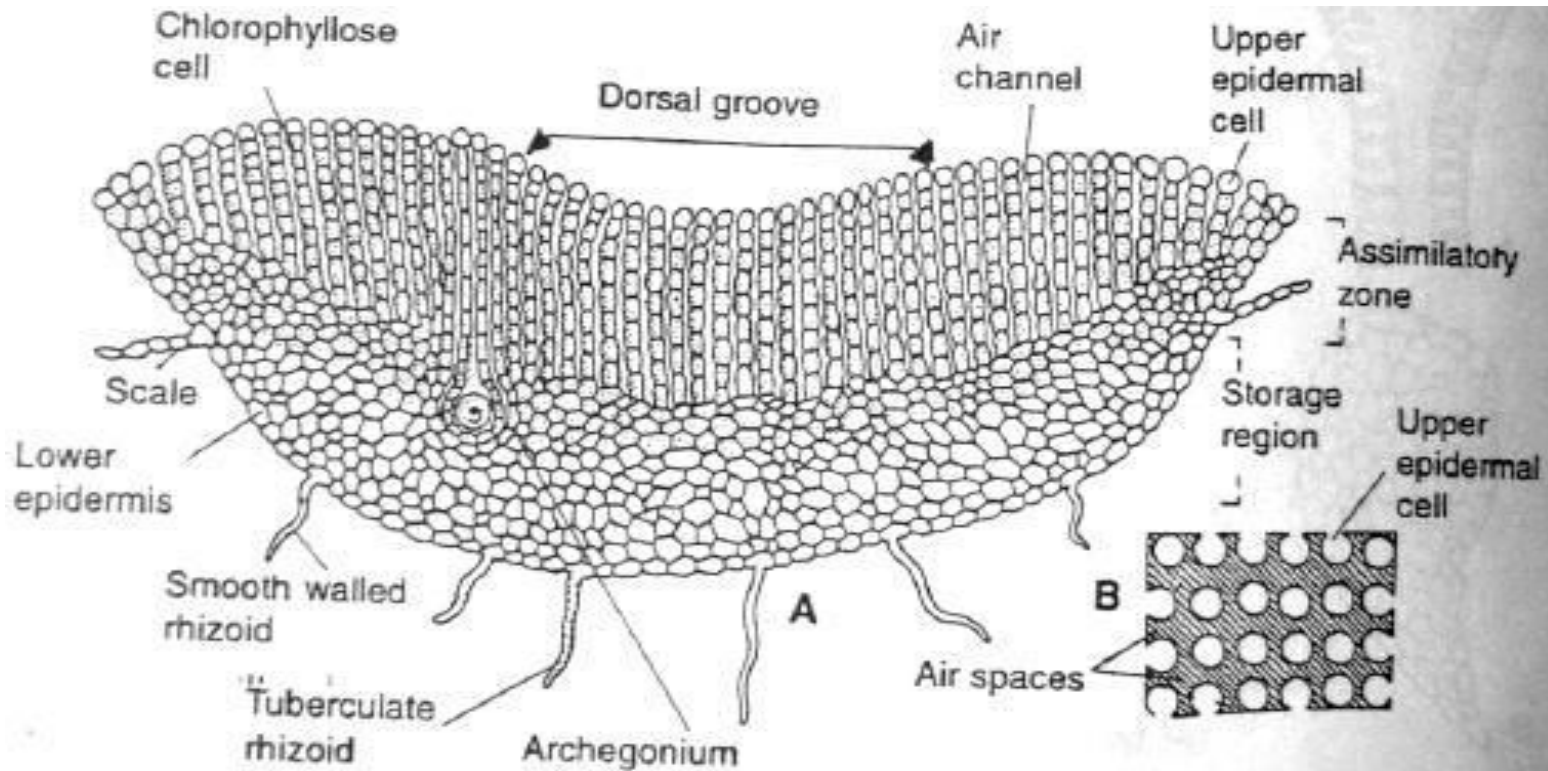
- Ventral surface also bears violet, membranous scales which are multicellular, one-cell thick and increase the surface area for absorption
- They are ephemeral in hygrophilous species but persistent in xerophytic species; and even absent in some species like *R. crystallina*
- They generally overlap each other in the apical portion of the thallus but are arranged in two rows



The plant body of *R. fluitans* is long, narrow, flattened, ribbon-like and exhibits repeated dichotomies (Fig. A-E), lacks scales and rhizoids (Fig. E) and do not undergo fruiting (Fig. D) till the water level lowers and they come in contact with mud at the bottom.



Internal Structure



REPRODUCTION

Vegetative Reproduction-

- 1. Fragmentation**
- 2. Adventitious branches**
- 3. Persistent apices**
- 4. Tubers**
- 5. Cell division at the apices of rhizoids**

Sexual Reproduction

- Most of the *species are monoecious (i.e. male and female sex organs occur on the same thallus)*

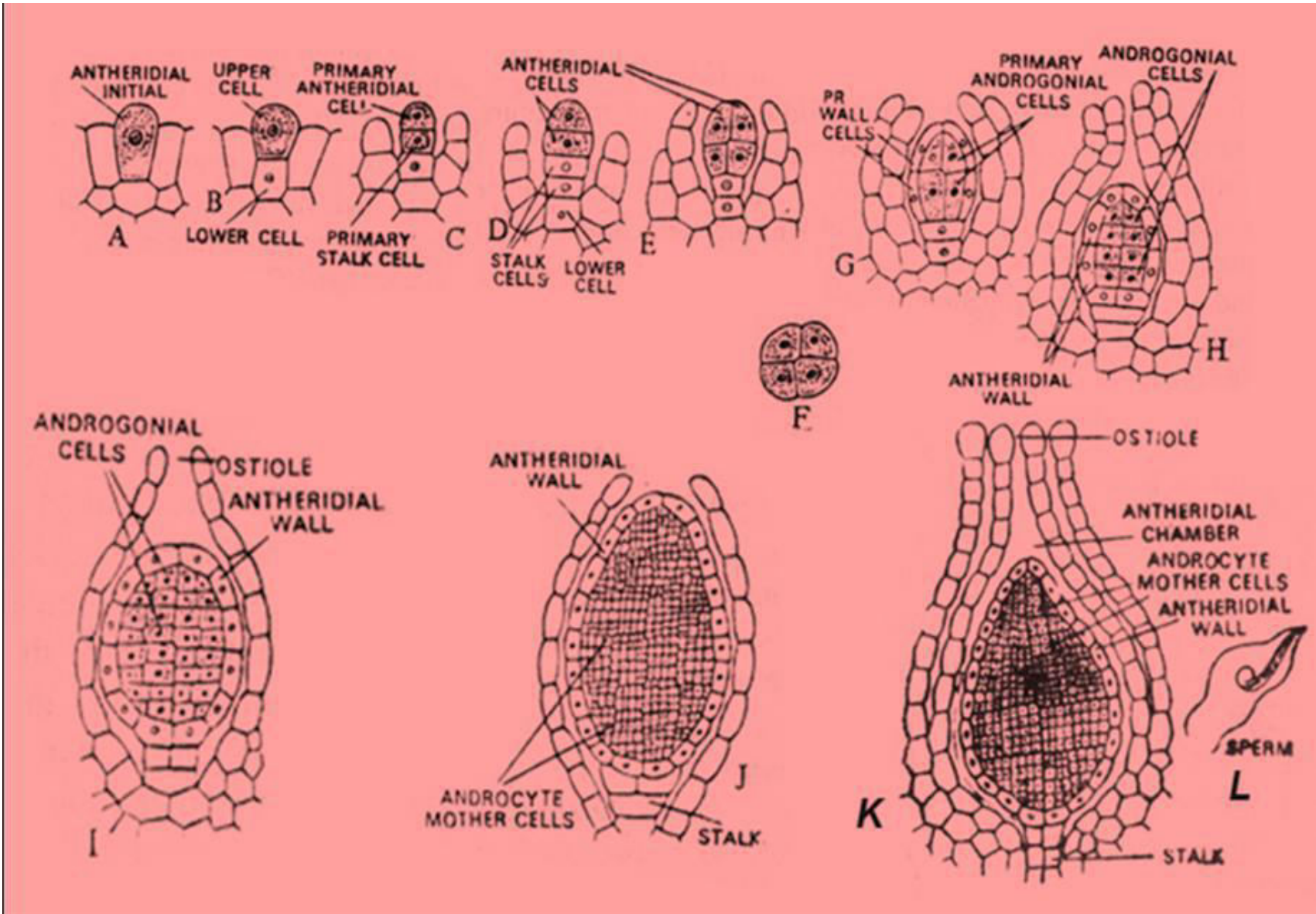
Exc.- R. discolor (dioecious)

- Sex organs lie in the longitudinal groove on the dorsal surface
- Develop superficially from the epidermal cells of the thallus in an acropetal succession (youngest near the growing tip of the thallus)
- Temperature and number of hours of light influence the gamete formation. *Riccia is a short day plant and sex organs are produced in November-December.*

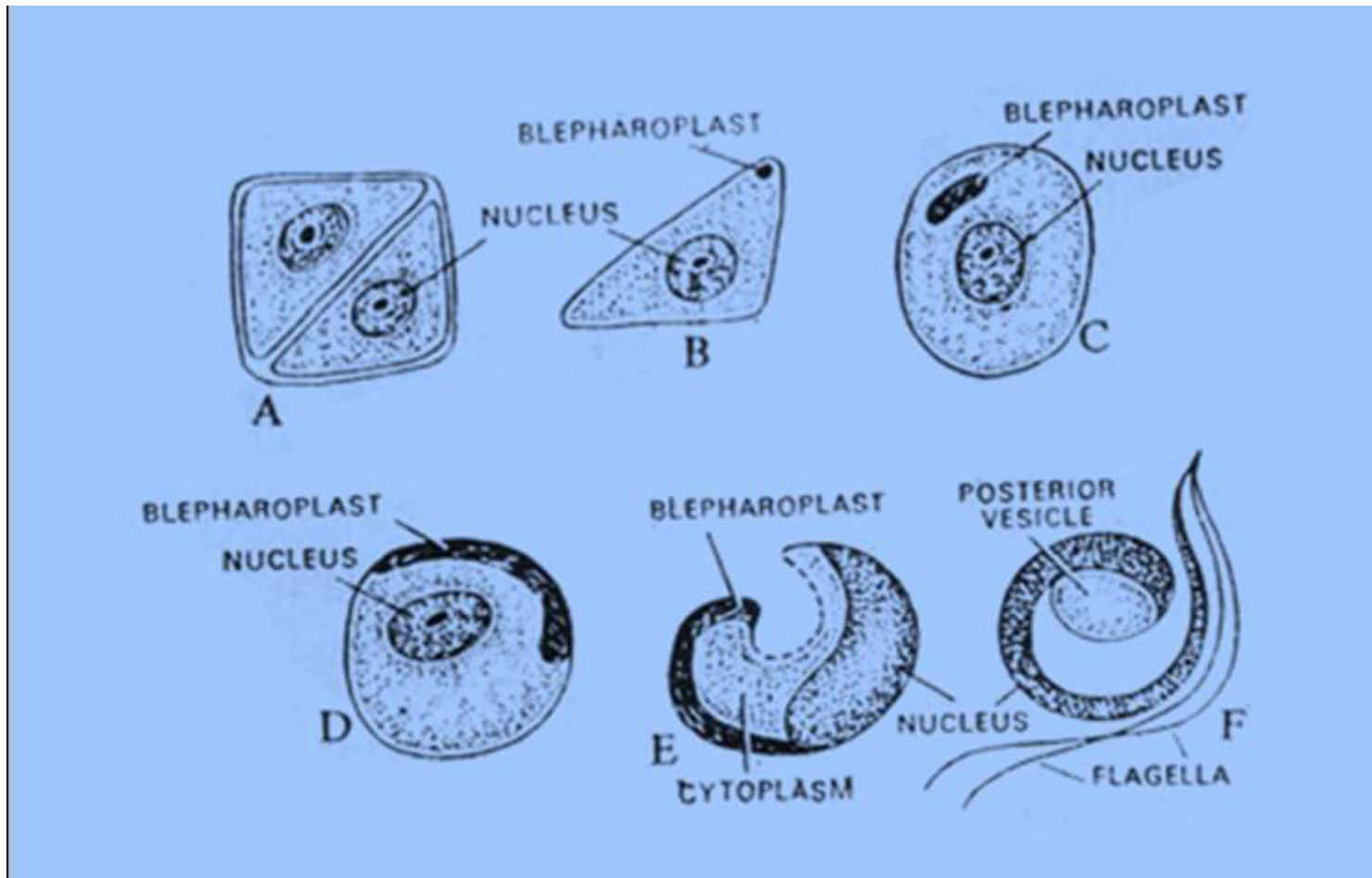
Structure and development of Antheridium

Structure:

Mature antheridium is pear-shaped or ovoid body with a short multicellular stalk, present in the antheridial chamber. Each antheridial chamber opens at the upper surface by a small pore called the ostiole



Antheridial development



Antherozoid/sperm development

Structure and development of Archegonium

Structure:

A mature archegonium is a flask shaped structure attached to the thallus with the help of a multicellular stalk. The lower portion of the flask is known as venter which elongates upwards into a slender neck. The neck is surrounded by a single-layered sterile jacket which consists of 6-9 tiers of elongated cells. At the mouth of the neck are located four large cover or lid cells. The venter has a single layered wall and encloses a large, basal egg cell and a small, upper ventral canal cell. Just like antheridium, archegonium also gets surrounded by vegetative cells of the thallus forming the archegonial chamber. Only the cover cells of the archegonial neck can be seen protruding from the surface of the dorsal groove

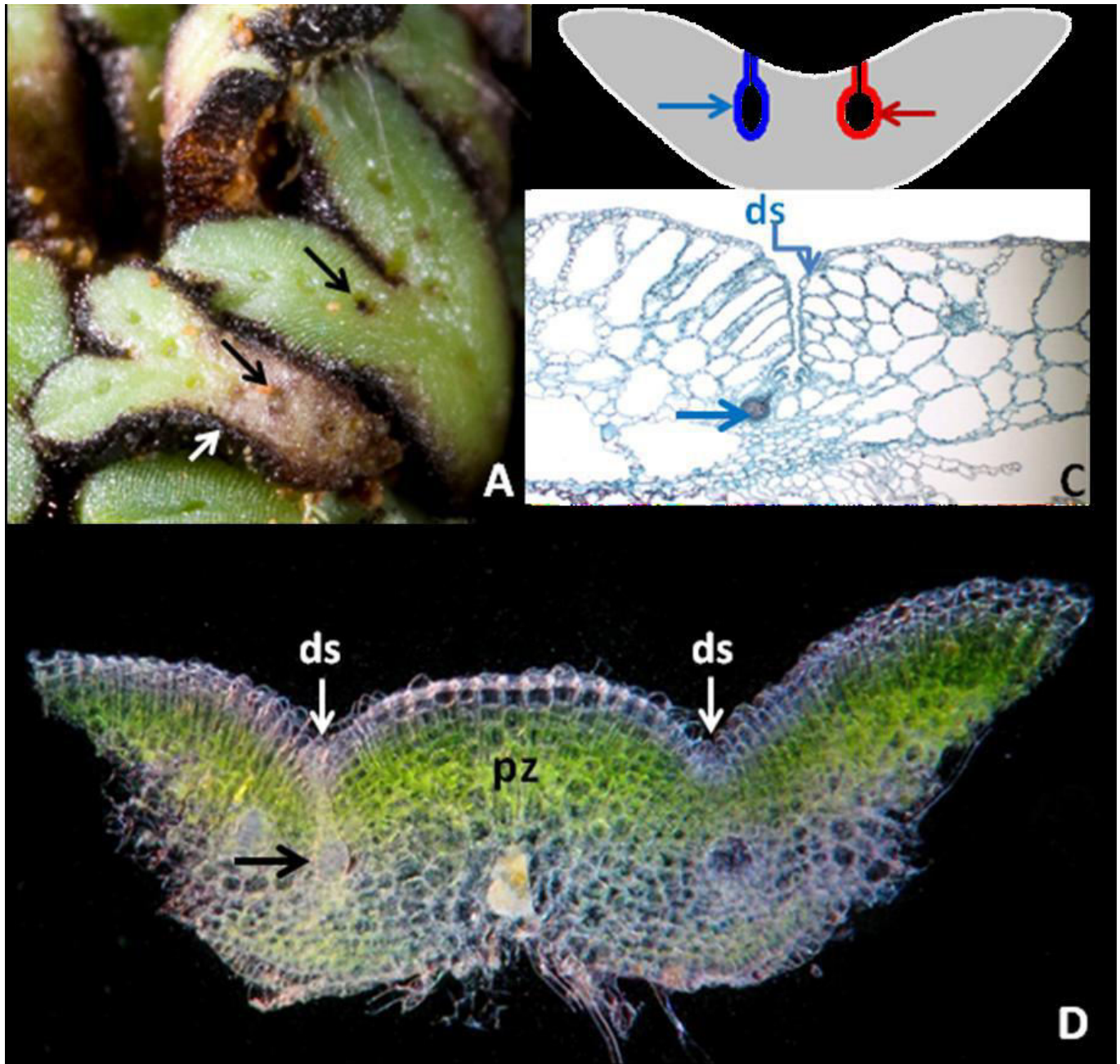
Archegonium

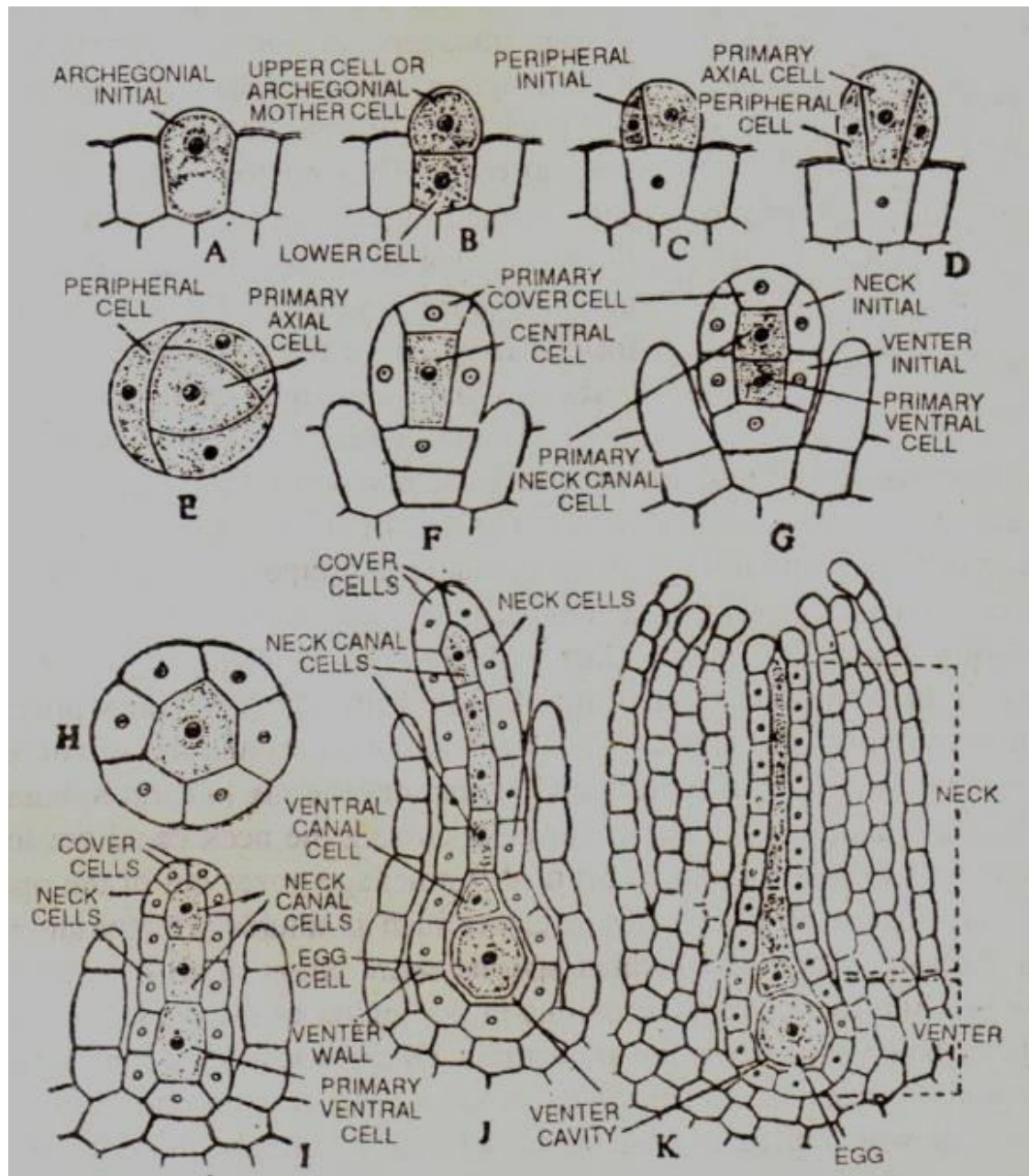
A. Thallus showing protruding tips (arrows) of archegonial necks.

B. Diagrammatic sketch of V.S. thallus showing embedded positions of antheridium (red arrow) and archegonium (blue arrow).

C. Part of the dorsal surface of the V.S. thallus showing dorsal groove (ds) and an archegonium (blue arrow).

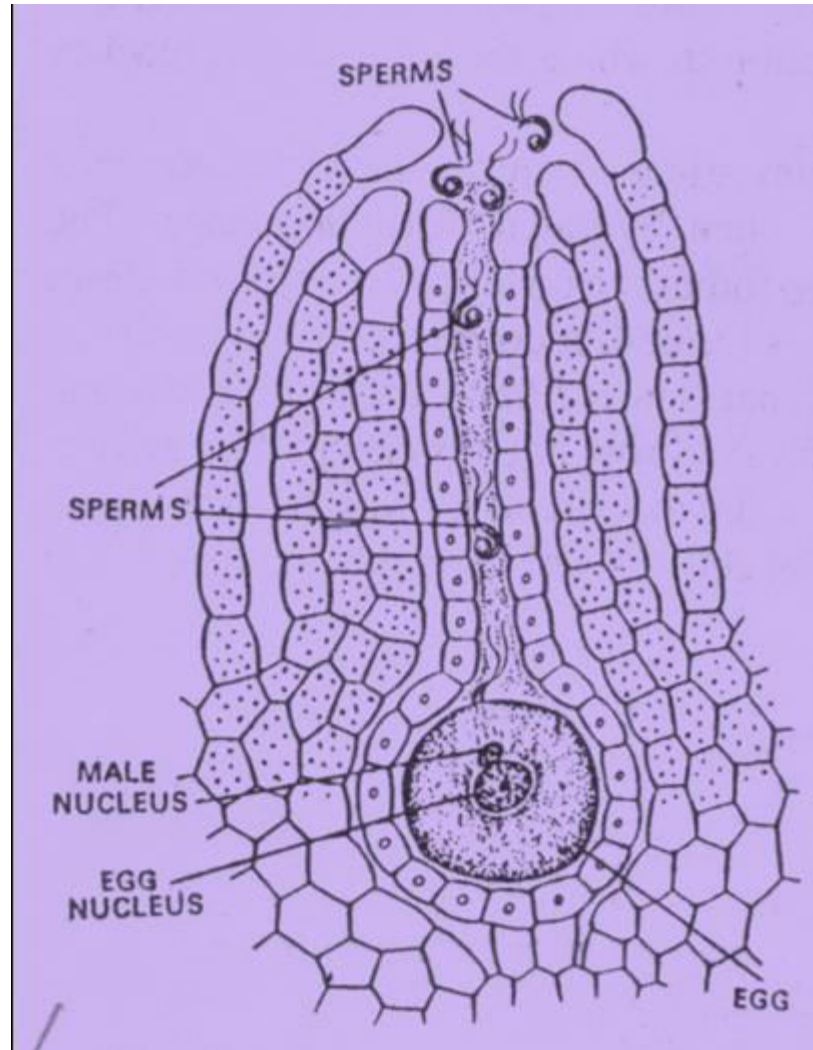
D. V.S. thallus with two dorsal grooves (ds) and an archegonium (black arrow).



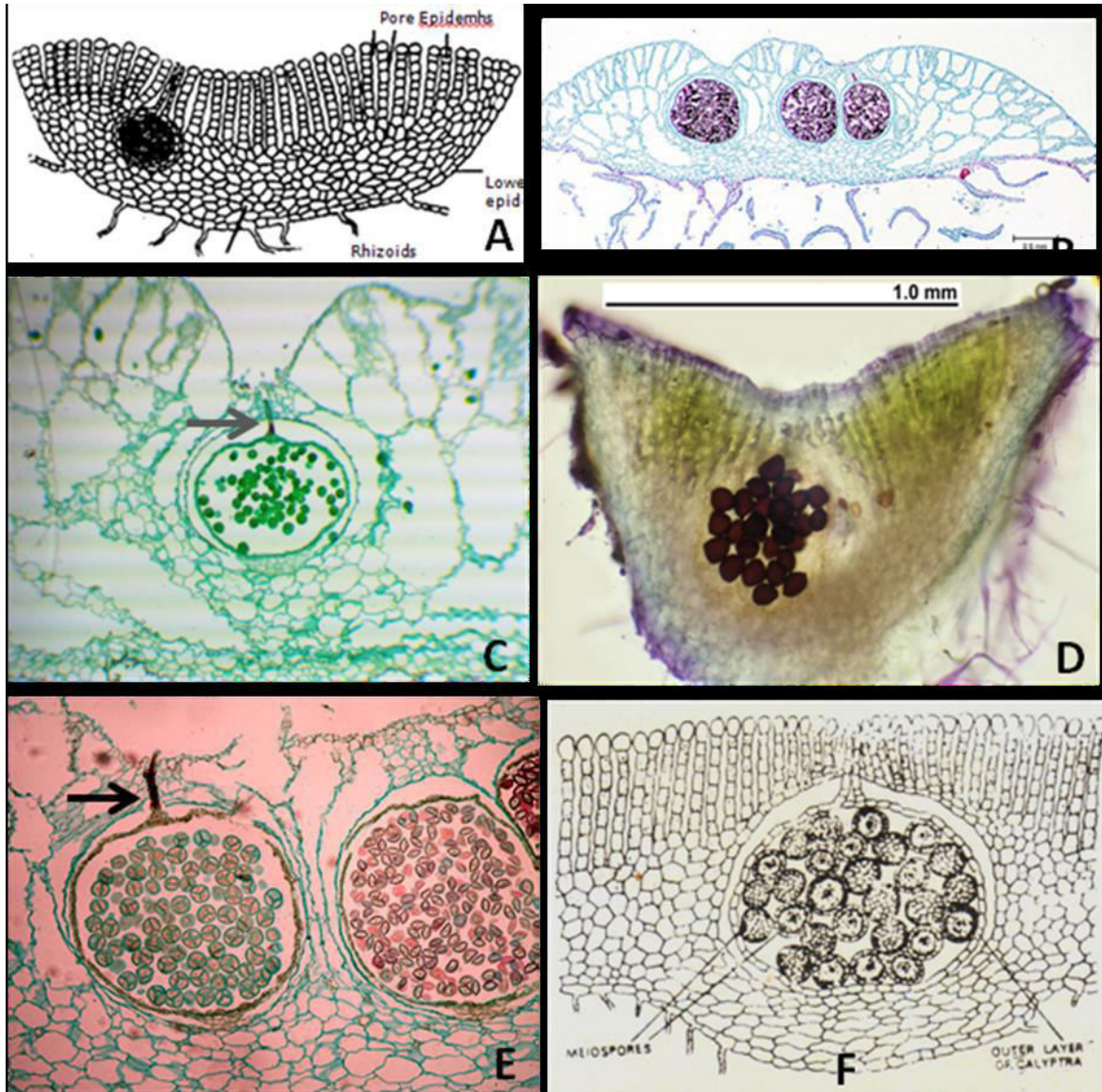


Stages in the development of an archegonium

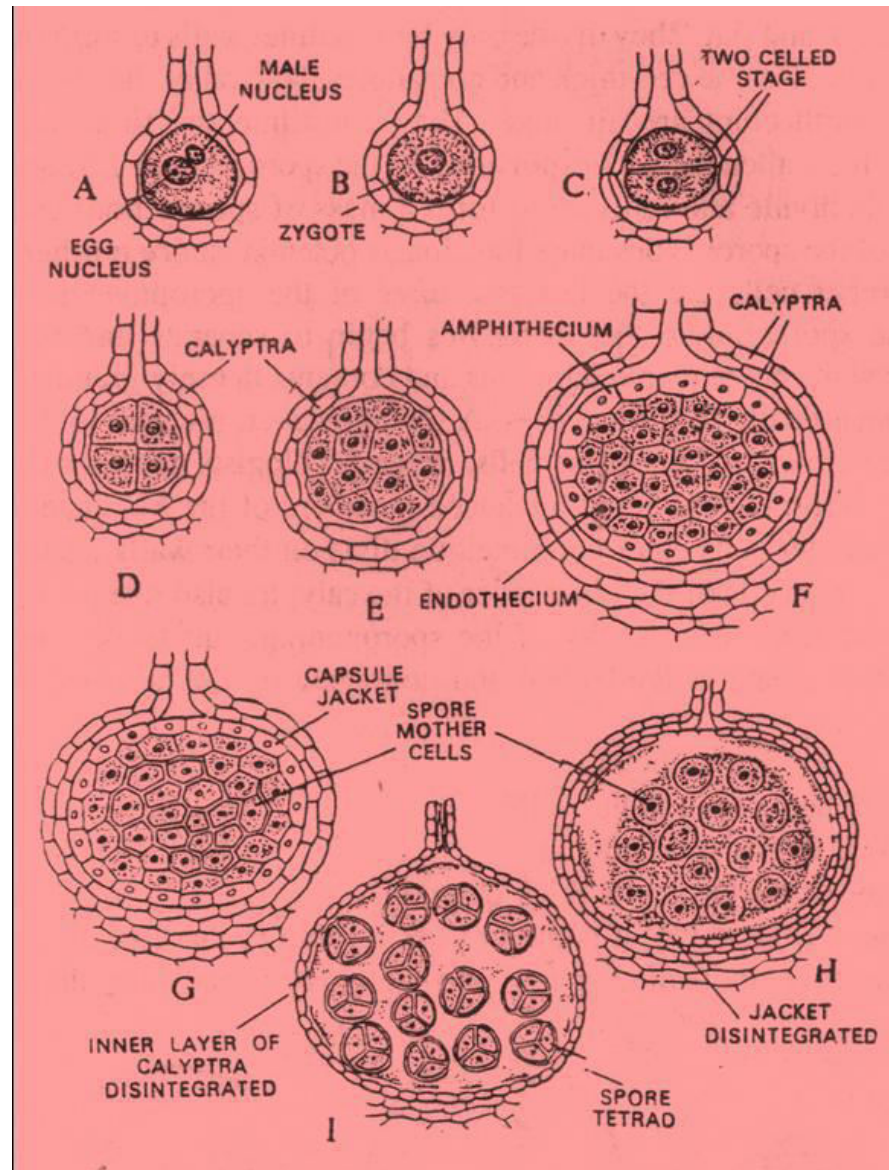
Fertilization



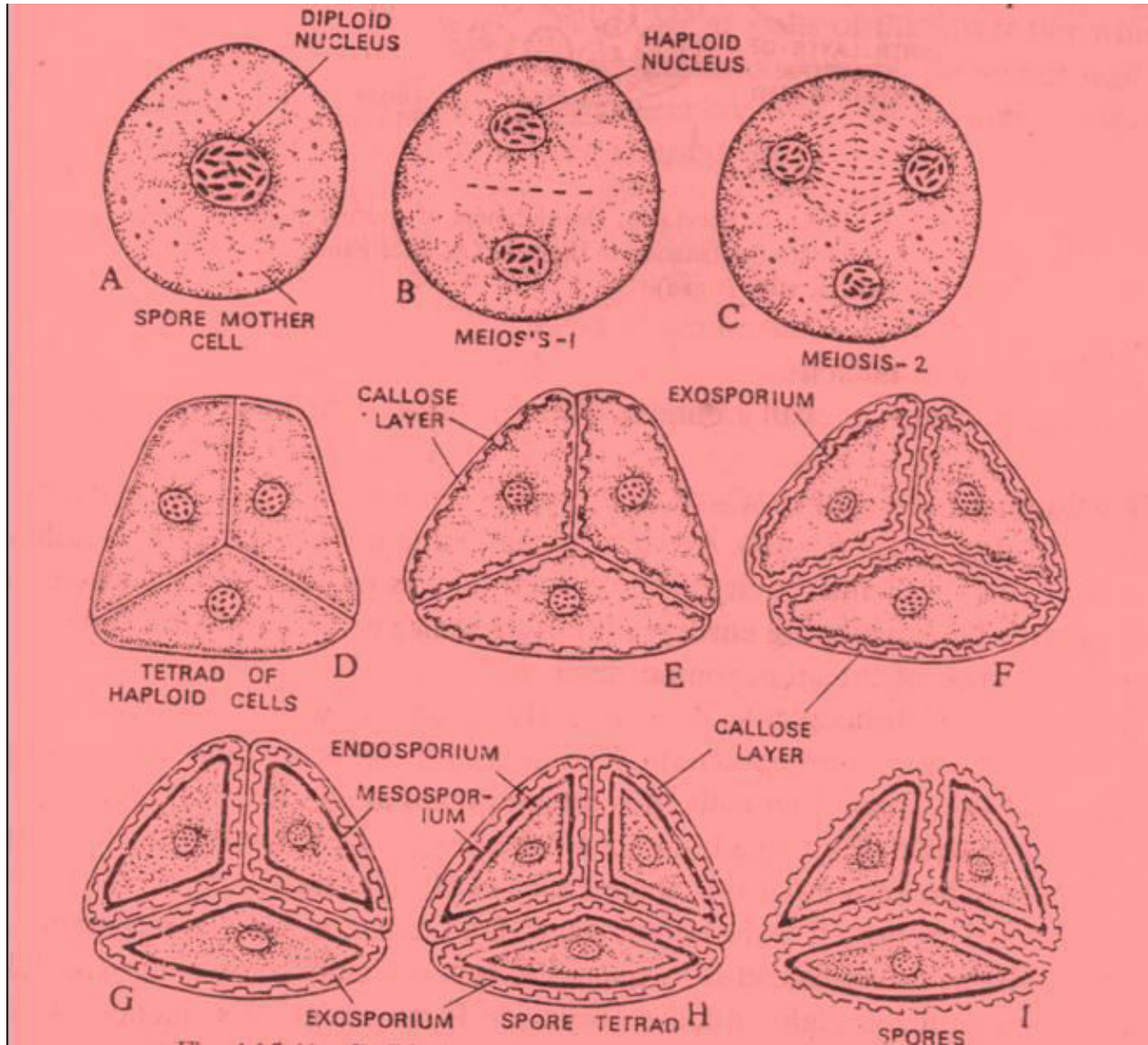
Sporophytic Phase



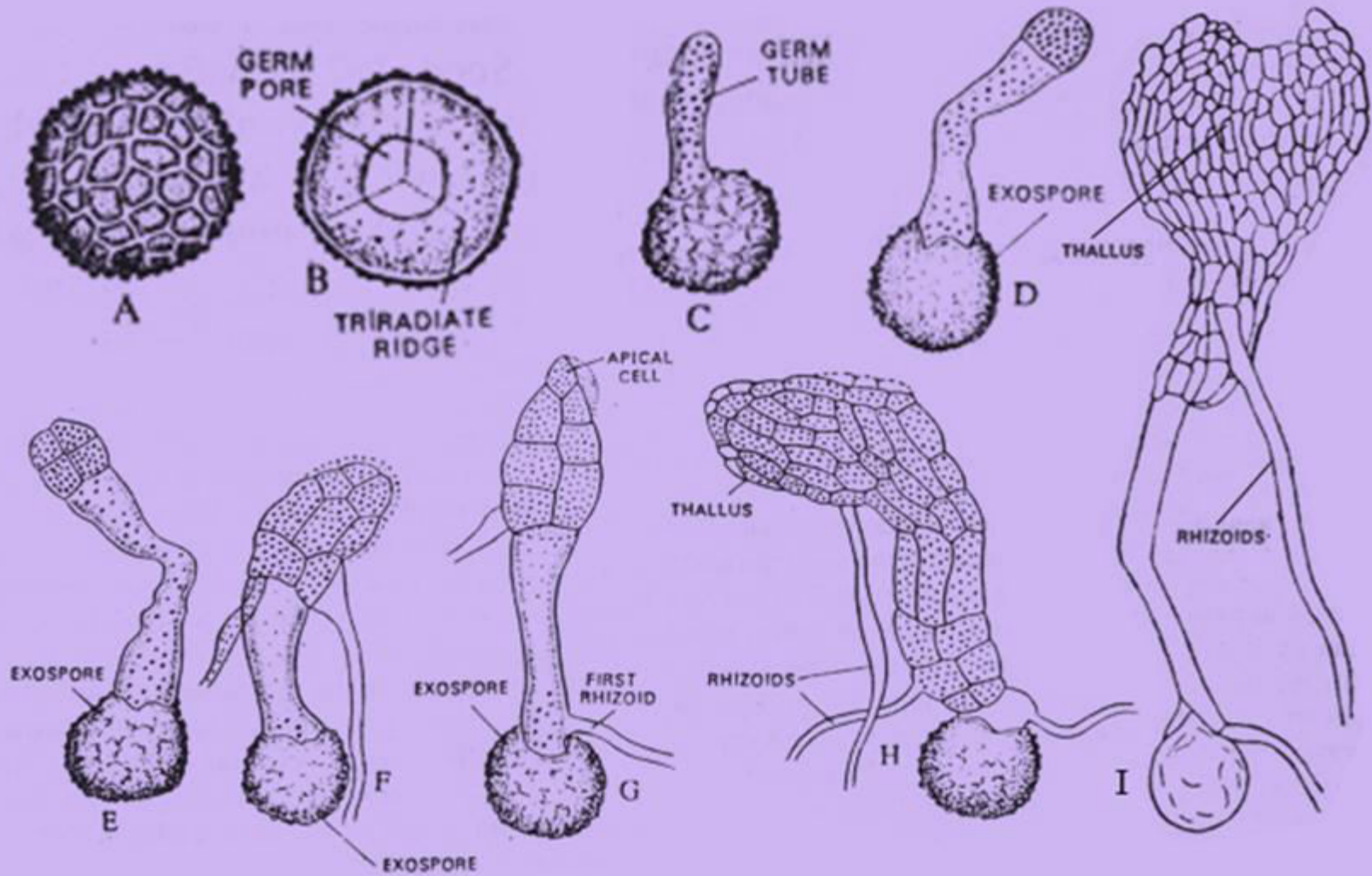
Various stages in the development of Sporophyte



Stages in the spore formation

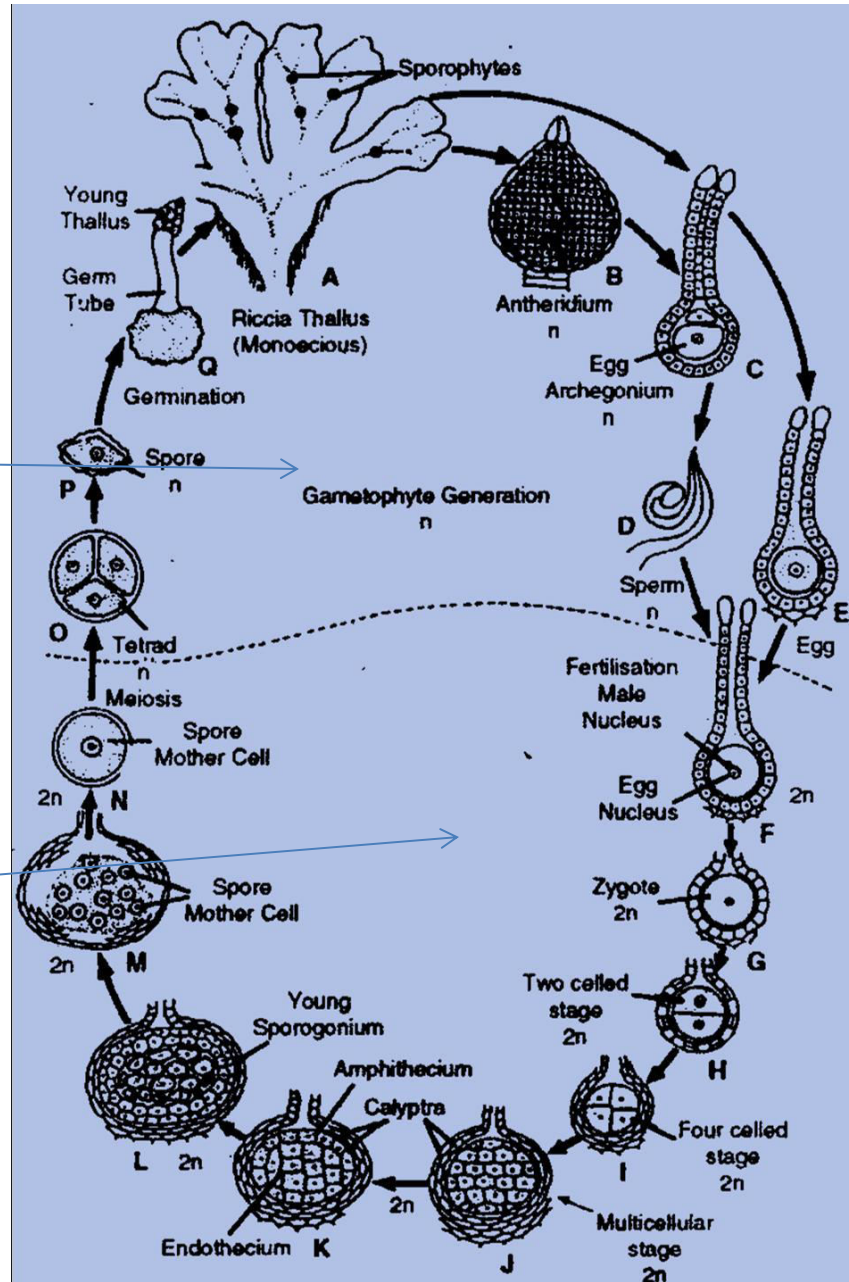


Stages in spore germination



Haploid

Diploid



Life cycle of *Riccia*