Topic: Development and Structure of Marchantia Sporophyte
B.Sc. Botany (Hons.) I
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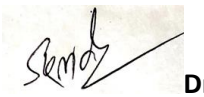
Development and Structure of Marchantia Sporophyte

The fertilized egg enlarges in size until it fills up the whole venter and secretes a wall and becomes zygote or oospore which initiates the sporophytic generation. The stimulus of fertilization causes development of the venter wall to 2-3 layered calyptra which envelopes the growing sporangium. A ring of cells at the base of calyptra also develops to form a second one layered covering round the growing sporangium and is called the perigynium or the pseudoperianth. Thus the sporangium develops within three gametophytic coverings- calyptra, perigynium and perichaetium.

Development of sporangium:

The zygote cell inside the venter divides first by transverse walls at right angles to the first and forms a quadrant stage. The two upper cells of the quadrant bare epibasal cells which form the cap and upper part of seta, while the two lower cells of quadrant are hypobasal cells and form the lower part of seta and foot. The four celled embryo is further divided by vertical walls at right angles to the first and thus the embryo becomes eight celled known as octant stage. After this octant stage the embryo begins to elongate. The further divisions are neither similar nor at the same rate. The cells of the hypobasal region divide to form a sort of paranchymatous tissue. The lower cells of the paranchymatous tissue form abulbous mass of cells functions as anchoring and absorbing organ of sporophyte known as foot.



The cells of the seta region are in vertical rows and isodiametric in the beginning but later on they elongate rapidly, as a result, the seta becomes elongated.

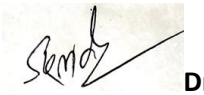
In the capsular region the young sporogonium divides periclinally to form outer amphithecium and inner endothecium. The amphithecium forms the jacket layer of capsule and the endothecium forms the archesporium. The cells of archesporium divide repeatedly to form a mass of sporogenous tissue. About half of the sporogenous tissue divides many times and form vertical rows of cubical spore mother cells. Each spore mother cell divides meiotically to form four haploid spores. The remaining sporogenous cells become sterile and form long slender cells tapering at both ends. These spindle shaped long slender spirally thickened cells are known as elaters. The elaters are hygroscopic and help in losing the spore mass and their dispersal.

The Mature sporogonium:

The mature sporogonium is somewhat elongated structure differentiated into foot, seta and capsule. The foot is bulbous, anchoring and absorbing organ. The seta is short, thick and functions as the stalk of the capsule. The capsule is oval or elliptical structure attached with seta. It is surrounded by a single layer of jacket except at the base where it is more than one layer in thickness. Inside the jacket there are spores and elaters. The elaters are long, narrow and spindle shaped cells pointed at both the ends and hygroscopic. The spores are small in size, spherical or rounded, encircled by two layered wall- the exosporium and the endosporium. Inside the endosporium there is granular cytoplasm with a single haploid nucleus.

Germination of spore and formation of young gametophyte:

The spores after liberation shed on the soil and germinate immediately under favourable conditions. After germination the irregular small thallus is formed this gradually increases in size and ultimately forms the full-fledged thallus of *Marchantia.*



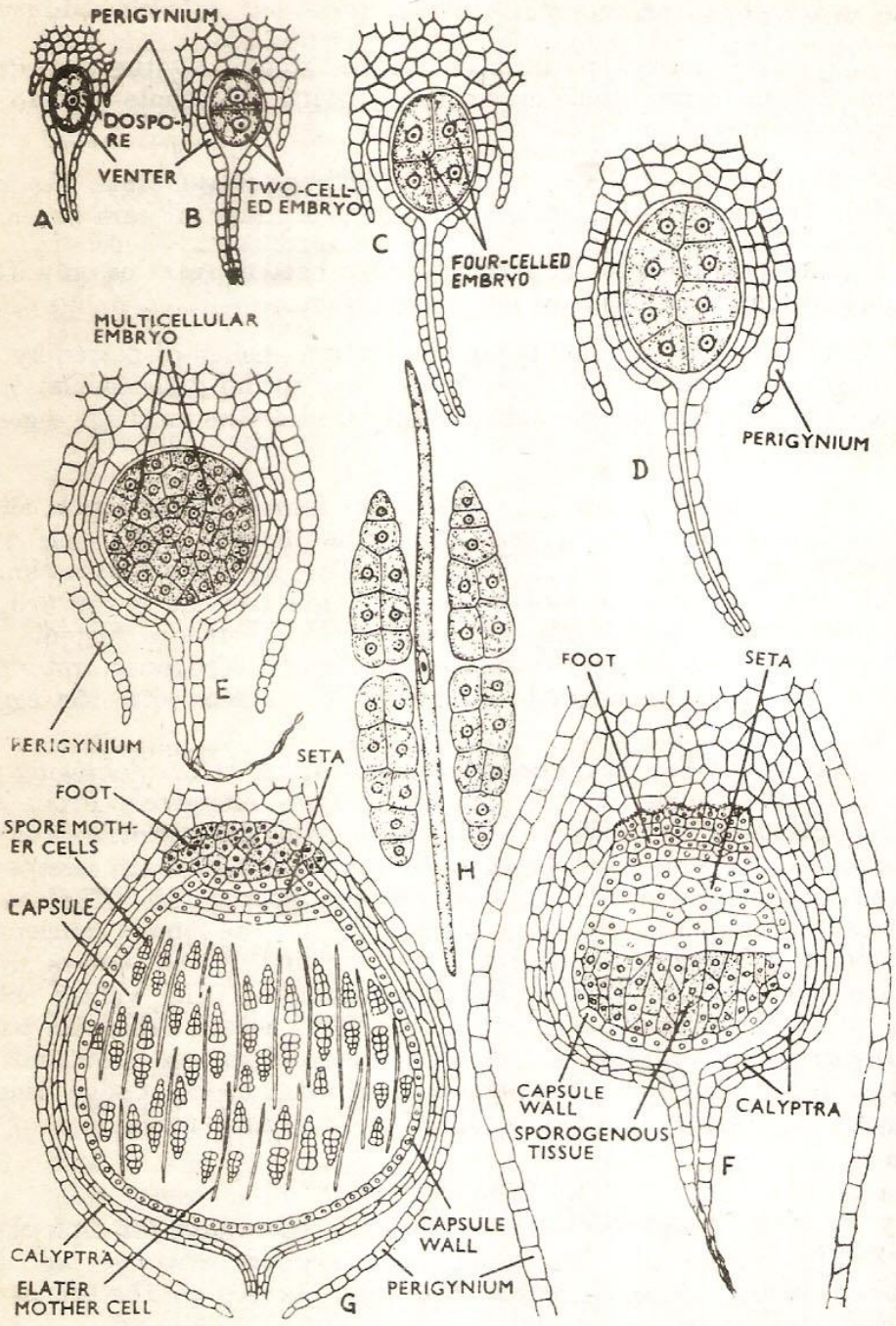


Fig. (A—D). **Marchantia.** Stages in the development of sporophyte. A, zygote located in the venter ; B—E, early stages in the development of embryo ; F, young sporophyte showing differentiation into foot seta and capsule ; G, later stage with the capsule containing groups of spore mother cells alternating with elater mother cells ; H, groups of spore mother cells with a young elater mother cell in between.

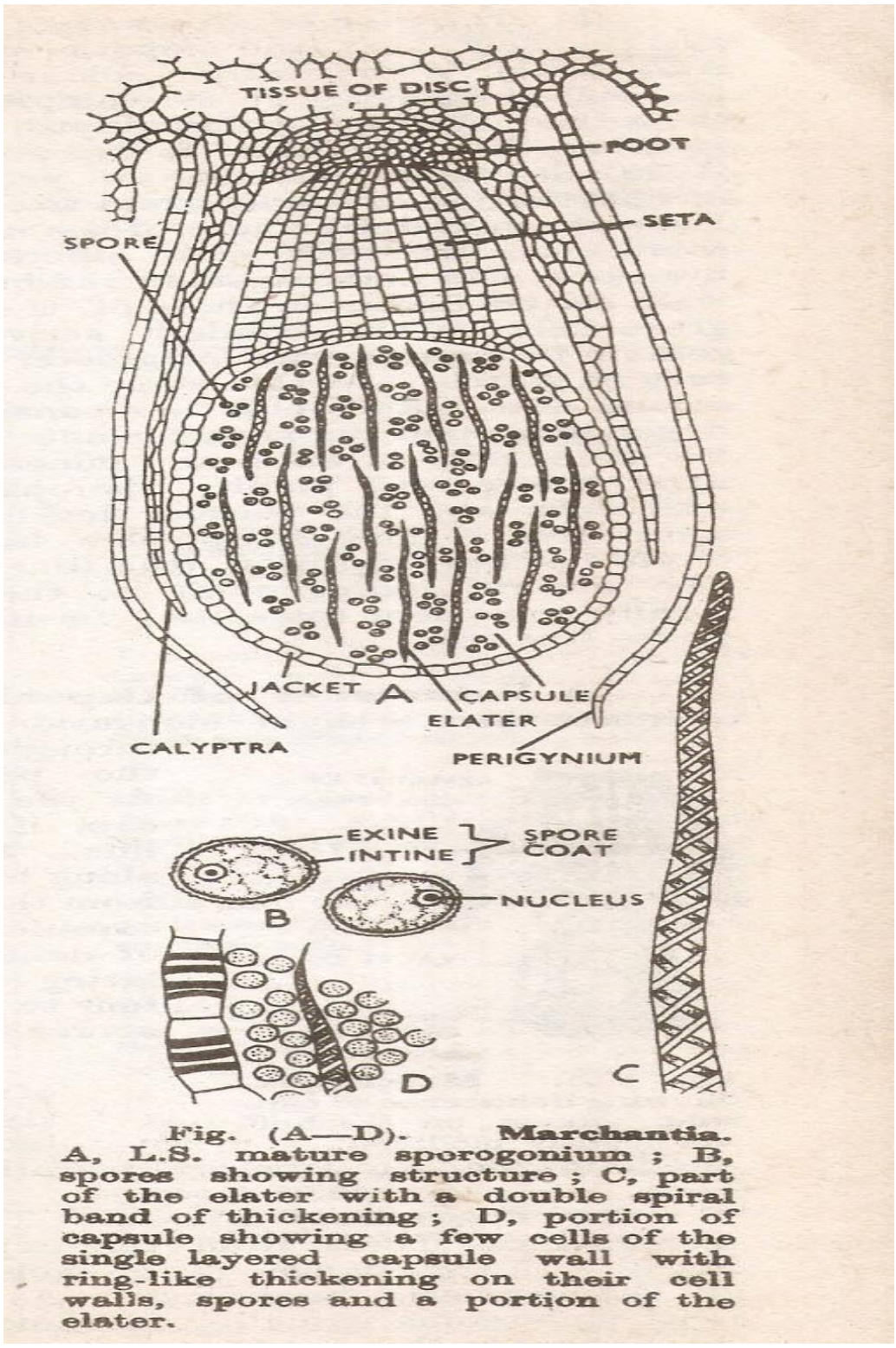


Fig. (A—D). **Marchantia.** A, L.S. mature sporogonium ; B, spores showing structure ; C, part of the elater with a double spiral band of thickening ; D, portion of capsule showing a few cells of the single layered capsule wall with ring-like thickening on their cell walls, spores and a portion of the elater.

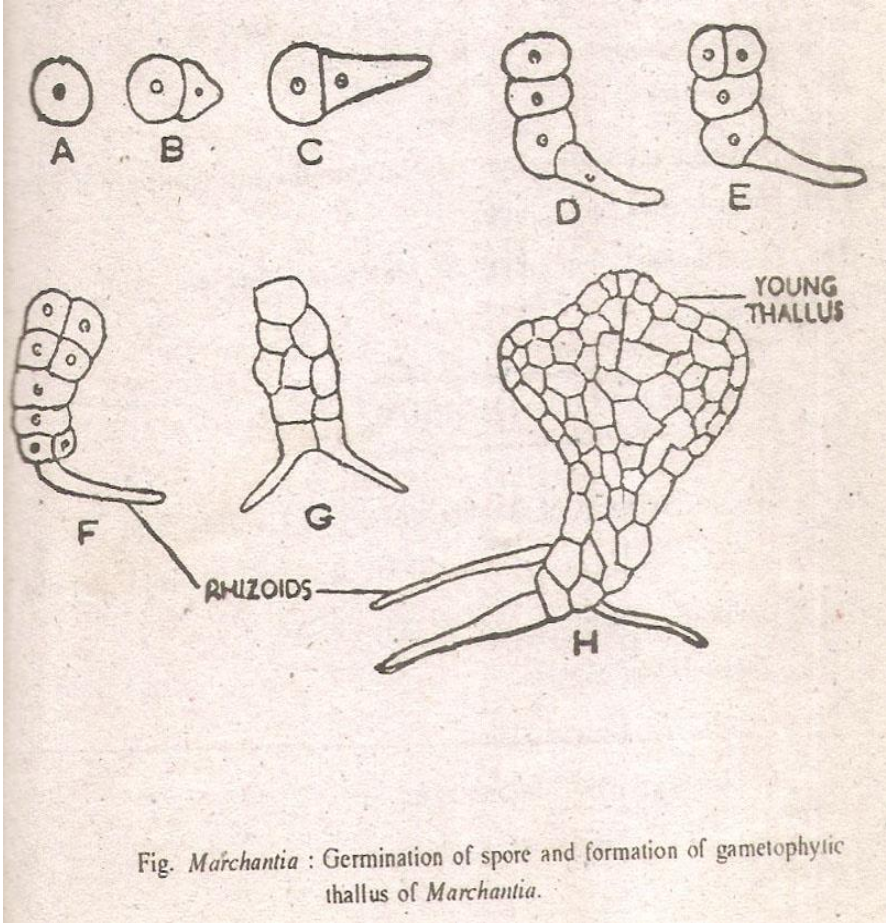


Fig. *Marchantia* : Germination of spore and formation of gametophytic thallus of *Marchantia*.