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Capsule of Funaria and Its Importance

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ABSTRACT: Funaria is a genus of approximately 210 species of moss. Funaria hygrometrica is the most common species. Funaria hygrometrica is called “cord moss” because of the twisted seta which is very hygroscopic and untwists when moist. The name is derived from the Latin word “funis”, meaning "a rope". In funaria root like structures called rhizoids are present.[2]

Capsules are abundant with the moss surviving as spore when conditions are not suitable.

Moss plant Funaria grows in dense patches or cushions in moist shady and cool places on rocks,walls or crevices 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 are multicellular colorless branched rhizoids with oblique septa.

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.

KEYWORDS- Funaria, moss, capsule, spores, sporophytic, hygroscopic

I.INTRODUCTION

Funaria hygrometrica

Funaria capsule:

The capsule is the sporophyte's last stage.
The capsule develops in the seta's apical region.
The calyptra protects the capsule.
The capsule is divided into three sections: apophasis, operculum, and theca.
Apophasis is the sterile base of the cell.
This area contains stomata and a thin-walled epidermis.
The area of the neck that connects with the seta is composed of spongy parenchyma.

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The chlorenchyma cells, which can undertake photosynthesis, are situated within the center area.
The top dome-shaped portion with the most layers of cells is known as the operculum.
The outer layer is known as the epidermis.
There is constriction as well as a diaphragm.
The operculum and theca cells are separated by a rim.
In the region around the diaphragm, there is a peristome, which contains teeth grouped in the shape of a ring.
The cuticle is what makes up the teeth.
There are parenchyma cells, which have thin walls and are located inside the teeth.
Theca is the spore consisting area found between an apophasis and its operculum.
The epidermis has a simple layer of cells with stomata, whereas the hypodermis has many layers of cells.
Spongy parenchyma cells contain chlorophyll and may undertake photosynthesis.[1,2,3]
Food is received from these cells, as well as water and other nutrients from the gametophyte, making the sporophyte interdependent on the gametophyte.
There are air pockets that contain green cells known as trabecular cells.
There are spore sacs, which are cavity-like structures with outside and interior walls.
The columella is just the core portion that contains parenchyma cells that aid in water and nutrient transfer.

In Moss (Funaria), the dispersal of spores is facilitated by hygroscopic pouring movements of peristomial teeth (lengthening and shortening of peristomial teeth). The inner peristome acts as a sieve allowing only few spores to escape at a time. When the mature capsule begins to dry up the thin walled cells of the annulus break and the operculum is thrown away. Dropping off the operculum is assisted by the outward hygroscopic movement of the underlying peristomial teeth. Due to this movement, slits between the inner thin walled peristomial teeth become wider and spores escape gradually through these slits. In a wet atmosphere, the wet peristomial teeth bend inwards and thus closing the slits and prevent the escape of spores.[4,5,6] The seta of the mature sporophyte also exhibits hygroscopic movements. In dry weather, by loosing water, it twists and bents, thus helping in dispersal of spores.

II.DISCUSSION

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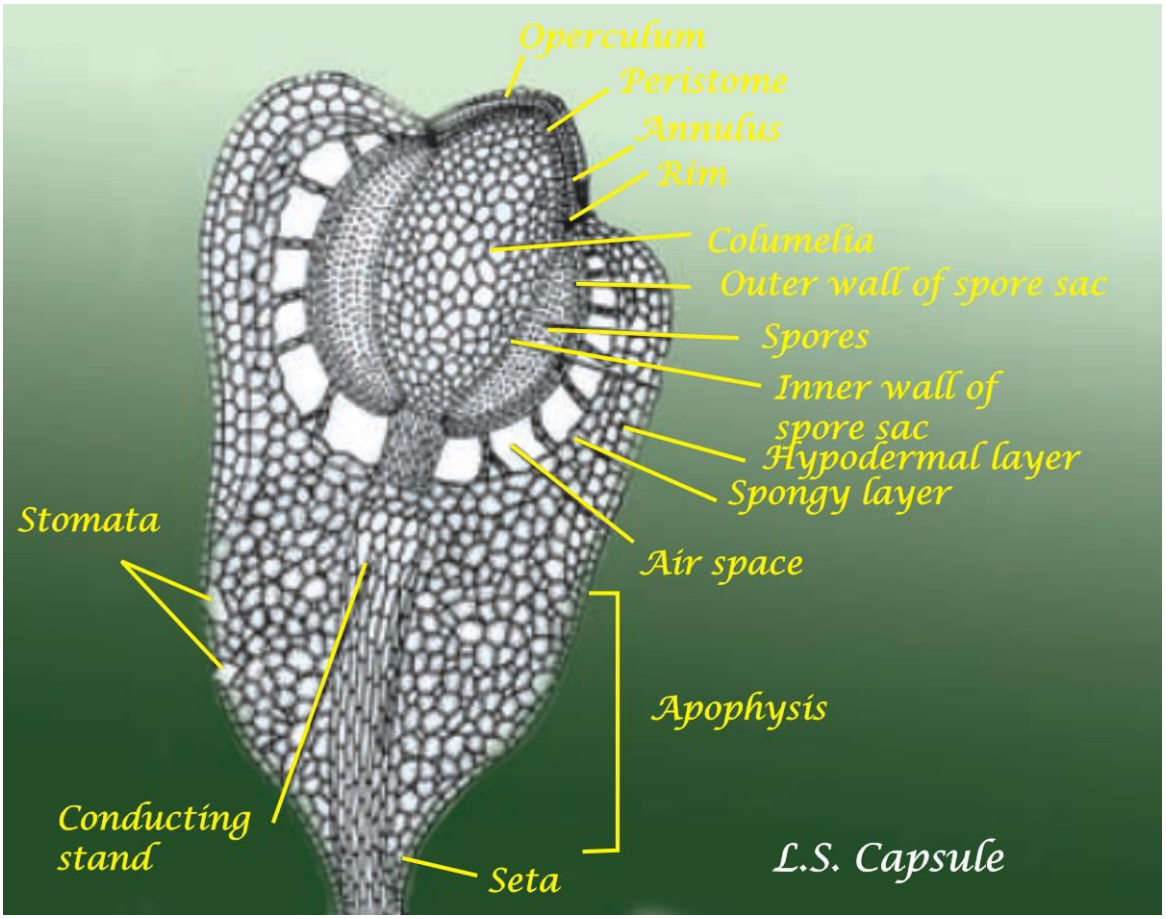
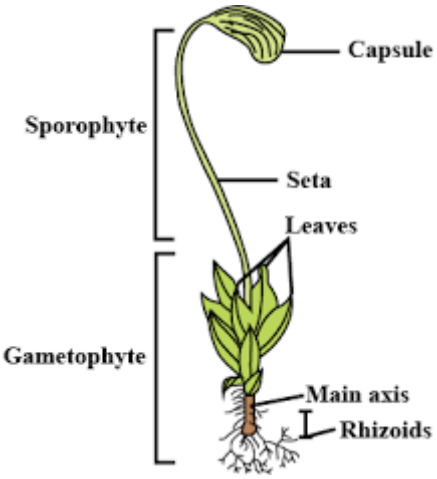


In moss (Funaria), the dispersal of spores is faciliated by hygroscopia pouring movement of peristomial teeth (lengthening and shortening of peristomial teeth). The inner peristome act as a sieve allowing only few spores to escape at a time.[7,8,9]



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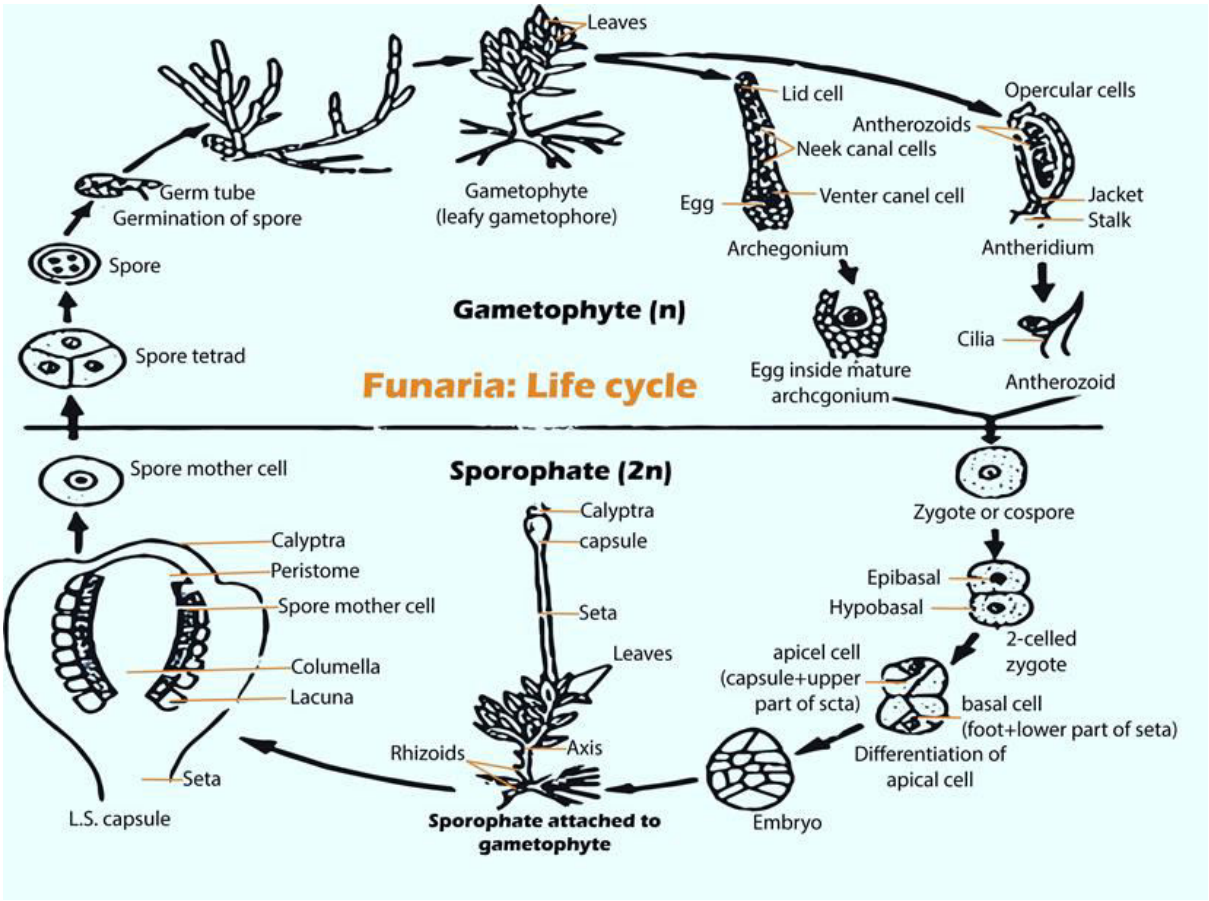
III.RESULTS



Funaria is a stegocarpous moss (dehisce along a pre-determined line) Dehiscence of the capsule is achieved by 'breaking off' of annulus. As the capsule matures it becomes inverted due to epinasty. The thin walled cells of the annulus break away, the operculum is thrown off and the peristome teeth are exposed. The outer peristomial teeth (exostome) are hygroscopic. The inner peristomial teeth (endostome) do not show any hygroscopic movements but act as a sieve allowing only a few spores to disperse at a time.[10,11,12] The lengthening and shortening of the outer peristomial teeth help in the dispersal of spores. In high humidity the exostome absorb water, increase in length and curve inwards. In dry weather, the exostome teeth lose water, bend outwards with jerky movements. It allows the dispersal of spores from the capsule in instalments. At maturity the seta also shows jerky movements. Twisting and swinging of seta in dry weather further aids in the dispersal of spores.[13,14,15]

IV.CONCLUSION

Spore is the first cell of the gametophytic phase. Each spore is spherical 12-20 µ in diameter and surrounded by two wall layers .The outer wall is thick, smooth, brown and known as exosporium, while the inner wall is thin, hyaline and called endosporium. Spore wall encloses single nucleus, chloroplasts and many oil globules. Under favourable conditions (sufficient moisture) spores germinate. Exosporium ruptures and endosporium comes out in the form of one or two germ tubes . Each germ tube is multicellular, green with oblique septa. The germ tube grows in length, divides by septa to form green algal filament like structure called primary protonema[16,17,18]

Primary Protonema: It is the juvenile (young) stage of the gametophyte formed by the germination of spore. It forms two different types of branches. Most of the branches grow horizontally on the moist surface of the soil and are known as chloronemal branches (positive phototrophic, thick and rich in chloroplast) while some branches grow down in the soil and are called rhizoidal branches (non-green, thin and possess oblique, septa) These branches can develop

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chlorophyll if expose to light. Rhizoidal branches function as anchoring and absorbing organs while chloronemal branches develop minute green buds behind the cross walls which develop into leafy gametophores.[19,20,21] From one primary protonema many moss plants develop, so the moss is gregarious in habit. Primary protonema is short lived. According to Sirnoval (1947) development of protonema under laboratory conditions can be differentiated into two stages— chloronemal stage and caulonemal stage.[26] Chloronemal stage is characterised by irregular branching, right angle colourless cross walls, and many evenly distributed discoid chloroplast. It is positive phototropic but never produce buds. Nearly after 20 days chloronemal stage matures into caulonemal stage. This stage is characterised by regular branching brown cell walls, oblique cross walls and fewer chloroplasts. It is negative phototropic and produce buds which later develop into leafy gametophores. Rhizoids arise from the base of a bud[22,23,24,25]

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