

Topic: General Account of Marchantia
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Group: A
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General Account of Marchantia

Systematic position

Class- Hepaticopsida

Order- Marchantiales

Family- Marchantia

Genus- *Marchantia*

Occurrence and Habitat

Marchantia, with about 65 species, is a genus cosmopolitan. *M. polymorpha* is the commonest and one of the most widely distributed species. About 11 species have reported from India growing mainly in the western Himalayas. The Indian species are *M.indica*, *M.nephhhalensis*, *M.palmata* and *M.palaeacea*. The species of *Marchantia* are almost terrestrial and grow mostly in hilly places. They also grow in marsh and shady places near the banks of streams, spring, swamps and ravines. The species like to grow in damp, burnt soil very well.

Morphology

- i. The plant body of *Marchantia* is of gametophyte which is called a thallus. The mature thallus may attain the length of 1-10cm. it is a dark green in color and possess the prominent midrib. The midrib is marked by the shallow groove in the dorsal surface and shows the rosette type. Along the midrib, special cup like structures called gemma cups is present.
- ii. The ventral surface of the thallus bears two or more rows of violet; multicellular plate like scales on the either side of the midrib. Scales are of two types: Ligulate and appendiculate. The ligulate scales are small and have no appendages. Scales gives the protection to the growing point.



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- iii. The ventral surface of the thallus also bears numerous rhizoids. They are pale brown, unicellular and branched. The rhizoid are of two types; smooth walled and tuberculated walled rhizoid. In the smooth walled rhizoid contain the smooth wall in the inner wall and in tuberculated rhizoids the inner wall possesses the peg like structure. They help in plant fixation and absorption of water and minerals.
- iv. In the reproductive stages thalli bears small upright, stalked structure called antheridiophores and archegoniophores. This bears male sex organ and female sex organ respectively.

Internal structure of the thallus

- i. A V.s. of the thallus shows the two distinct regions, the upper photosynthetic and storage region.
- ii. The upper epidermis is single layered of thin walled cells. It is interrupted by several air pores.
- iii. Air pores are barrel shaped consisting of 4-5 superimposed cells having both an upper and lower opening.
- iv. The air pores are helps to exchange the gaseous during the respiration and photosynthesis the photosynthesis region consist of large number of air chambers surrounded by the single celled thick 4-8 cells high septa.
- v. The storage region consists of compactly arranged thin walled parenchymatous cells. Some cells may have single oil body or filled by the mucilage.

Vegetative reproduction

The most common method of vegetative propagation is the progressive death and decay of older parts at the posterior end reaching a dichotomy, the two surviving branches continuing growth as two separate plants. There may also be propagation by the development of adventitious branches from ventral surface of the gametophyte. These branches after separation from parent plant develop onto new individuals. Another specialized method of propagation is by special asexual reproductive bodies of gemmae present in cupules or gemmae cups on the dorsal surface of the thallus.

Sexual reproduction

The sexual reproduction of the *Marchantia* is oogamous type. *Marchantia* plants are dioecious , i.e. male and female sex organ develop in separate thalli. The male sex organ is the



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antheridia and female sex organ are called archegonia. The sex organ of *Marchantia* is borne on special erect and stalked branches called the gametophores.

The gametophore bearing the antheridia is called antheriophore or stalk of male receptacle whereas the gametophore bearing archegonia is called archegoniophore or stalk of female receptacle.

Antheridiophore

Antheridiophore has an erect stalk which is about 2-3 cm in length. The top of antheridiophore is a flattened, slightly convex; eight lobed pellate discs each lobe of the disc has a growing point at its tip and this represent the apex of branch. On each lobe of the pellate disc, 10-12 antheridia develop in acropetal succession is the oldest being near the center and the youngest towards the tips of lobe. The ventral surface of stalk of antheridiosphore bears the scale and the rhizoids along the two grooves. The internal structure of antheridiospore is similar to that of the thallus. The antheridial chamber open outside by the pores called ostioles.

Structure of Mature Antheridium

The mature antheridium is club shape structure and consists of a short multicellular and rounded or ovoid antheridium proper. The antheridium proper has a single jacket. The jacket layer encloses the single androcytes. The androcytes gets metamorphosed into motile biflagellated antherozoids or male gametes.

Dehiscence of the Antheridium

The mature antheridium dehiscence in the presence of water. When the water enters into the antheridial chamber through the outside, the antheridium become swell up. Some of the terminal cells the wall on coming in contact with water disintegrated. Thus the antheridium rapture and the mass of the antherozoid emerge out. The antherozoids are sets free from the mass and swim in water. Each antherozoid is long slightly coiled rod shaped st. with two flagella attach to the anterior end. The antherozoids swims in water present in the grooves of receptacles with the help of flagella.

Archegoniospore

The archegoniospore consists of slender stalk and female receptacle. The stalks of mature archegoniosphore are comparatively longer and stouter then the antheridiosphore. The stalk is about 5-7cm in long and each surmounted by the lobe disc called the female receptacle. The disc is eight lobed with nine umbrellas like rays dropping down.



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All the archegonia are covered by the two-lipped membrane known as perichaetium or involucre. A cup shaped outgrowth that surround the archegonium called perigynium, give the protection to the archegonium.

Structure of the Mature Archegonium

The mature archegonium is flask shaped structure developed on short stalk. It has swollen venter and long neck. The neck consists of the six vertical rows of jacket cells. The apical parts of neck consist of four covered cells or lid cells. A single layer of jackets surrounds the venter. The venter has one egg and one venter canal cell. The fully mature, the neck canal cell and venter canal cell disorganize and to form the mucilage mass. Which absorb the moisture and swells. The swelling exerts the pressure on lid cells so that they separate apart and the passage down to the egg is developed.

Fertilization

It takes place in presence of water. The mucilage with the malic acids starts oozing through the mouth and that attract the antherozoids. The movement of the antherozoid in response of chemical is called chemotaxis. During the fertilization the antherozoids moving into water with female receptacle. Then a number of antherozoids enter the archegonium, but only one of them fuses with the egg to form the diploid zygote. The zygote developed the wall around itself and called the oospore. The fertilized egg or oospores represent the first stage of sporophytic generation.

Sporophyte

After the fertilization the archegonial cells shrivels. The wall of venter gives the 1-4 layered investment called calyptra which is of the gametophytic origin. In addition, perigynium also grows rapidly and covers the calyptra. The third covering called the involucre or perichetium is already present around the archegonia of each lobe. Thus the mature sporophyte is enveloped by three distinct protective covering; the calyptra, the perigynium, the perichaetium. These three covering layer protect young sporogonium from desiccation. The mature sporogonium of marchantia is completely parasite on gametophyte because of the lack of chloroplast; ventral position and the covering layer avoid the light penetration.

It is differentiated into foot, seta and capsule-



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- i. **Foot:** it is made up of parenchymatous cells, which are situated towards the base of archegonium. It helps in absorption of food material from the gametophyte for developing sporophyte.
- ii. **Seta:** the seta is short stalked, junction of connecting link between the foot and the capsule. It helps in the dispersal of spores.
- iii. **Capsule:** it is situated towards the neck of archegonium. It has single jacket layer of cell.

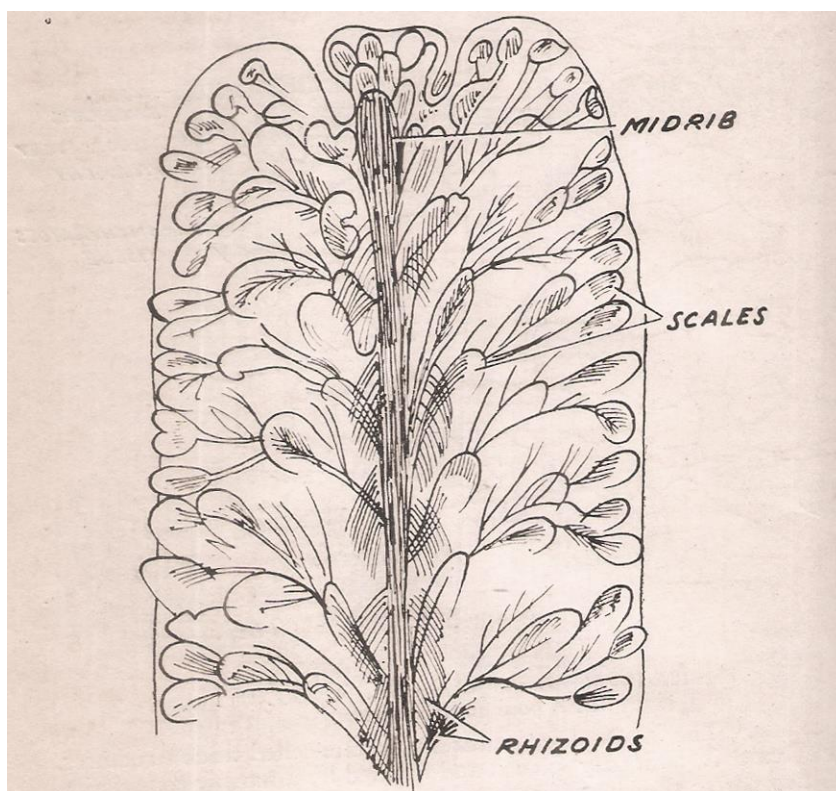
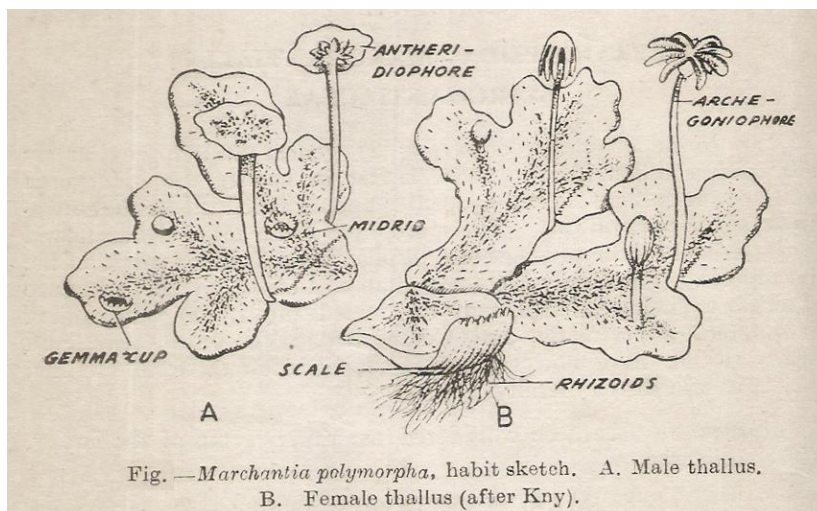
Spores and Germination of Spores

When the spores fall on the suitable condition they germinated. They swell by the absorption of water. The exine ruptures and intine produce the small germ tube. The filament like structure divided and redivided to form a multicellular structure and finally gets changed into dichotomously branched thallus of *Marchantia*.

Alternation of Generation

The life cycle of *Marchantia* shows the distinct alternation of generation. The lifecycle is completed only when the plant passes through the both the stages. The dominant phase is haploid gametophytic phase. The gametophyte reproduces sexually by male and female gametes and the result in the formation of sporophyte. The sporophyte reproduces asexually by the formation of spores. These spores give rise to the gametophyte. The *Marchantia* plant is a gametophyte which develops from haploid spore. The plant body consists of dorsoventrally differentiated thallus. The antheridia produce the female gametes or egg. The antherozoids swim in the water and reach to the egg of an archegonium. Out of them only one fuses with egg together to form a diploid zygote. The diploid zygote represent of first stage of sporophytic generation. The diploid zygote develops into complicating and elaborated structure the sporogonium or sporophyte. The sporogenous cell inside the sporophyte divided by meiosis to form a tetrad of haploid. This method of spore formation involving the meiosis is an asexual reproduction. The spores gametophytic stage. Each spore germinates and forms a haploid gametophytic thallus of *Marchantia*. This two generation regularly alternate to each other. This is known as alternation of generation.





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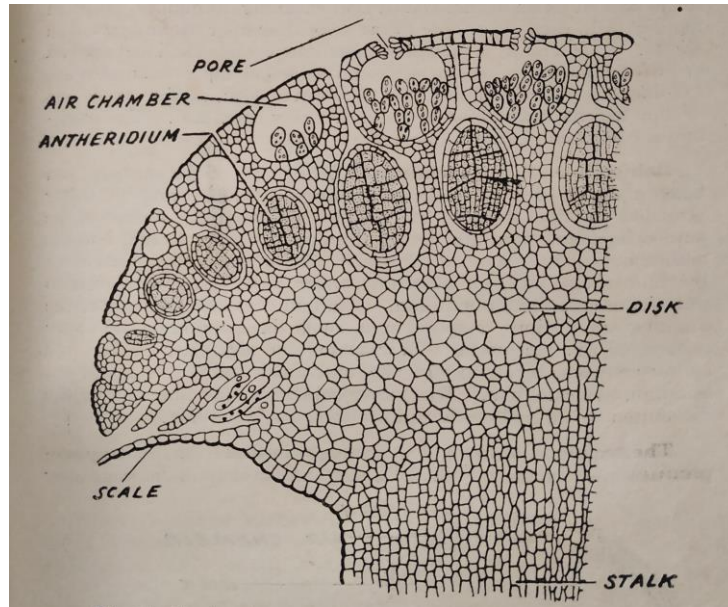


Fig. *Marchantia* L.S. of antheridiophore

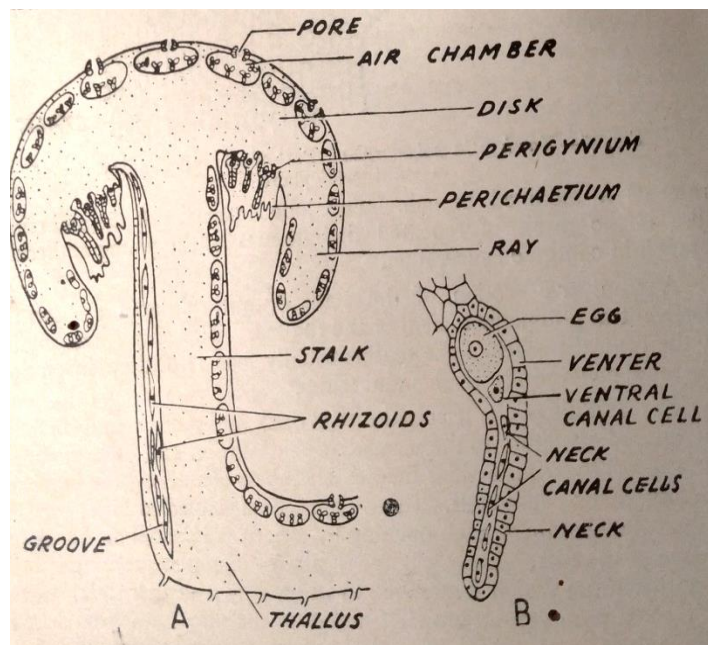


Fig. *Marchantia* A. V.S archegoniophore, B. magnified vies of mature archegonium

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