

# **BIO414 (CRYPTOGAMIC BOTANY II)**

**WEEK 12**

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# **SYSTEMATICS OF MARCHANTIOPHYTA**

## Class: Haplomitriopsida

In the class Haplomitriopsida the plants are acrocarpous and the gametophyte is leafy.

Generally the stems are able to secrete copious amounts of mucilage, which is discharged from the epidermal cells.

The gametangia are typically situated in the axils of the leaves or lobules.

It is worth noting however that the archegonia and antheridia are normally not differentiated from the surrounding tissue of the gametophyte.

The sporophytes, which are relatively large, generally open along four lines of dehiscence.

## Subclass: Haplomitriidae

The species in the subclass Haplomitriidae have leaves that are 3-ranked on the stem.

A closer look will reveal the presence of two rows of lateral leaves and one row of underleaves, the latter being reduced.

Oil bodies, which are small, can be found within the leaf cells of these species.

Although the plants within this subclass lack rhizoids they have an extensive rhizomatous network.

Species in Haplomitriidae can either be dioecious or monoicous and the female reproductive structures may be either acrogynous or anacrogynous. Although the perianth is lacking, the female protective tissue surrounding the developing sporangium may be a shoot-calyptra or a true calyptra.

## Class Jungermannopsida

Class Jungermannopsida includes leafy and simple thalloid liverworts. There is a lack of shared characteristics between these two groups.

The leaves of leafy liverworts may be entire or lobed with various forms of insertion. The thalloid liverworts may be branched.

Oil bodies may or may not be present.

When present, oil bodies are typically found in both gametophytic and sporophytic regions of the liverwort. There are multiple oil bodies per cell.

## Class Marchantiopsida

The species in the class Marchantiopsida are characterized as being complex thalloid liverworts.

They have a global distribution and are commonly found growing on moist earth or mud. A few species can also be observed growing in water.

The gametophore of the species in this class is always thallose. The thallus, which is generally several cell thick, typically exhibits dichotomous branching.

The differentiated tissues of the thallus is why species in this class are termed the “complex thalloid liverworts”, and in turn, it distinguishes them from the simple thalloid liverworts seen in the class Jungermanniopsida.

The internal differentiation of the thallus can be made apparent due to the presence of several distinct tissues. The upper surface (dorsal) of the thallus is composed of an epidermis that is unistratose. The cells forming the epidermis contain no or very little chlorophyll. Furthermore, the epidermis of most genera in this class has pores, which can either be simple or complex, that serve as an opening to the photosynthetic tissue in the air chambers beneath.

The outline and distribution of the air chambers can be seen when looking at the reticulated pattern on the dorsal side of the thallus. Unlike stomata seen in higher plants, simple pores of these thalloid liverworts cannot open and close. However, some species have complex pores, in which the pores are surrounded by cells, giving the pore a barrel-like appearance.

The cells at the bottom of the barrel-like pore can remain turgid when in a moist environment, thereby keeping the pore open. When dry, these cells can collapse, and thus can greatly narrow the opening of the pore.

As previously mentioned, these air chambers house the photosynthetic tissue. The chloroplasts are typically located in the cells that make up the walls of these chambers or in uniseriate filaments found growing on the bottom of the air chamber. Below the chlorophyllous layer is where one can see a layer of storage cells, predominantly parenchymous cells. Some cells within this layer will contain a single large brownish complex oil body, while other cells may be filled with mucilage. Not only is the parenchymous tissue used for storage, but it can also be used to house fungi in order to



A ventral epidermis is present on the underside of the thallus, from which can emerge colorless rhizoids and scales. The rhizoids present can either be pegged or smooth. Pegged rhizoids are thought to be involved in water transport, whereas the smooth rhizoids aid in fixing the thallus to the substrate and are often considered a gateway for endophytic fungi.

The ventral unistratose scales are typically arranged in one or two rows and are thought to function in water retention and conduction.

The gametophyte of the species in this class can either be monoicous or dioicous. The antheridia can be found in chambers that open to the upper surface of the thallus. In some genera, the antheridia are present on a specialized structure that extends from the gametophyte called the antheridiophore, as seen in this picture.

The antheridia are located at the top of the disk and the sperm is dispersed via rain drops.

The archegonia can be found embedded in the thallus, as in *Ricciocarpos*, or elevated on umbrella-like called archegoniophores, as in *Marchantia*.

The location of the archegonia differs from that of the antheridia, such that they are typically found on the margin of the archegoniophore.

Furthermore, as the archegonia mature, the upper portion of the archegoniophore grows more than the lower portion and as a result, the archegonia are transferred to the lower surface.

However, it is important to keep in mind that the morphology of the male and female reproductive structures can vary considerably in this class.

For example, the antheridiophore of some aquatic species is highly reduced. Instead of being elevated, the antheridia are embedded in the thallus, and the sperm are dispersed by water movement.

However, the locomotive and biflagellate sperm is a distinctive trait that all species in this class share.

Asexual reproduction can be achieved by various ways depending on the species. In *Marchantia*, gemmae develop inside a cup-like structure on the surface of the thallus. Bifurcation, which is the splitting of the main thallus in two, is another means of asexual reproduction. This process is followed by the decay of the older posterior regions of the thallus, thus allowing the species to colonize

## Subclass: Marchantiidae

The plants of this subclass are usually thalloid and rarely leafy. The thallus, which is typically differentiated on the dorsal and ventral surface, will usually have air chambers and pores present.

Scales on the ventral surface of the gametophyte can generally be observed in several species.

Antheridia are present in chambers in various places depending on the species.

Some perigonial chambers can be found scattered on the dorsal surface of the thallus, while others can be clustered together on the main thallus or on a specialized raised receptacle (antheridiophore).

The location of the archegonia can also vary depending on the species.

While some are found on the dorsal surface of the thallus, others can be raised on a stalked receptacle termed the archegoniophore.

Even when the sporophyte reaches maturity the seta is typically short, and may be lacking in some species.

The sporangial wall is typically unistratose and the sporophyte generally dehisces by longitudinal valves or slits.

## **REFERENCES**

Url1. <https://blogs.ubc.ca/biology>“Introduction to Bryophytes”