25.2B: Charales

Algae in the order Charales live in fresh water and are often considered the closest-living relatives of embryophytes.

LEARNING OBJECTIVES

Identify the principle features of charophyte algae

KEY TAKEAWAYS

Key Points

• The structure of charophyte algae consists of a thallus, which is the main stem, and branches that arise from nodes which bear both male and female reproductive structures.

• Although charophyte algae do not exhibit alteration of generations, they share a number of adaptations to life on land with embryophytes, including the encasement of eggs in protective enclosures.

• As new DNA sequence analysis techniques develop, revisions may need to be made in our understanding of plant evolution, such as indications that green algae in the order of Zygnematales may be more-closely related to embryophytes than is Charales.

Key Terms

• Charales: green algae in the division Charophyta which are green plants believed to be the closest relatives of the green land plants

• sporopollenin: a combination of biopolymers observed in the tough outer layer of the spore and pollen wall
Charales

Green algae in the order Charales, and the coleochaetes, microscopic green algae that enclose their spores in sporopollenin, are considered the closest-living relatives of embryophytes. The Charales can be traced as far back as 420 million years. They live in a range of fresh water habitats and vary in size from as small as a few millimeters to as large as a meter in length. A representative species of Charales is Chara, which is often called muskgrass or skunkweed because of its unpleasant smell.

Charophyte algae: A representative charophyte alga, Chara, is a noxious weed in Florida, where it clogs waterways.

In Charales, large cells form the thallus: the main stem of the alga. Branches arising from the nodes are made of smaller cells. Male and female reproductive structures are found on the nodes; the sperm have flagella. Unlike land plants, Charales do not undergo alternation of generations in their lifecycle. Like embryophytes, Charales exhibit a number of traits that are significant in their adaptation to land life. They produce the compounds lignin and sporopollenin. They form plasmodesmata, which are microscopic channels that connect the cytoplasm of adjacent cells. The egg and, later, the zygote, form in a protected chamber on the parent plant.

New information from recent, extensive DNA sequence analysis of green algae indicates that the Zygnematales are more closely-related to the embryophytes than the Charales. The Zygnematales include the familiar genus Spirogyra. As techniques in DNA analysis improve and new information on comparative genomics arises, the phylogenetic connections between species will probably continue to change. Clearly, plant biologists have yet to solve the mystery of the origin of land plants.

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