9.7: Nonvascular Plants

Do all plants have roots?

The massive moss covering these branches seems to be dominating its habitat. And maybe it is. Mosses, being nonvascular plants, don't need roots to grow, so they can easily cover moist areas. Mosses commonly grow close together in clumps or mats in damp or shady locations. You may even have mats of moss growing in your backyard.

Nonvascular Plants

Nonvascular plants are bryophytes. Despite the dominance of vascular plants today, more than 17,000 species of bryophytes still survive. They include liverworts, hornworts, and mosses.
Characteristics of Nonvascular Plants

Most bryophytes are small. They not only lack vascular tissues; they also lack true leaves, seeds, and flowers. Instead of roots, they have hair-like rhizoids to anchor them to the ground and to absorb water and minerals (see Figure below). Bryophytes occupy niches in moist habitats, but, as they lack vascular tissue, they are not very efficient at absorbing water.

The rhizoids of a bryophyte may be so fine that they are just one cell thick.

Bryophytes also depend on moisture to reproduce. Sperm produced by a male gametophyte must swim through a layer of rainwater or dew to reach an egg produced by a female gametophyte. The tiny, diploid sporophyte generation then undergoes meiosis to produce haploid spores. The spores may also need moisture to disperse.

Evolution of Nonvascular Plants

Nonvascular plants were the first plants to evolve. Compared to other plants, their small size and lack of specialized structures, such as vascular tissue, stems, leaves, or flowers, explains why these plants evolved first. The first nonvascular plants to evolve were the liverworts. The hornworts evolved somewhat later, and mosses apparently evolved last. Of all the bryophytes, mosses are most similar to vascular plants. Presumably, they share the most recent common ancestor with vascular plants.

Diversity of Nonvascular Plants

The three types of modern nonvascular plants are pictured in Figure below.

- Liverworts are tiny nonvascular plants that have leaf-like, lobed, or ribbon-like photosynthetic tissues rather than leaves. Their rhizoids are very fine, they lack stems, and they are generally less than 10 centimeters (4 inches) tall. They often grow in colonies that carpet the ground.
- Hornworts are minute nonvascular plants, similar in size to liverworts. They also have very fine rhizoids and lack stems. Their sporophytes are long and pointed, like tiny horns. They rise several centimeters above the gametophytes of the plant.
• Mosses are larger nonvascular plants that have coarser, multicellular rhizoids that are more like roots. They also have tiny, photosynthetic structures similar to leaves that encircle a central stem-like structure. Mosses grow in dense clumps, which help them retain moisture.

Liverworts, hornworts, and mosses are modern bryophytes. Liverworts are named for the liver-shaped leaves of some species. Hornworts are named for their horn-like sporophytes.

Summary

• Nonvascular plants are called bryophytes.
• Nonvascular plants include liverworts, hornworts, and mosses. They lack roots, stems, and leaves.
• Nonvascular plants are low-growing, reproduce with spores, and need a moist habitat.

Review

1. Describe nonvascular plants.
2. What is a rhizoid?
3. Why were nonvascular plants the first plants to evolve?