25.1D: Sporophytes and Gametophytes in Seedless Plants

Sporophytes (2n) undergo meiosis to produce spores that develop into gametophytes (1n) which undergo mitosis.

Learning Objectives

• Describe the role of the sporophyte and gametophyte in plant reproduction

Key Points

• The diploid stage of a plant (2n), the sporophyte, bears a sporangium, an organ that produces spores during meiosis.
• Homosporous plants produce one type of spore which develops into a gametophyte (1n) with both male and female organs.
• Heterosporous plants produce separate male and female gametophytes, which produce sperm and eggs, respectively.
• In seedless plants, male gametangia (antheridium) release sperm, which can then swim to and fertilize an egg at the female gametangia (archegonia); this mode of reproduction is replaced by pollen production in seed plants.

Key Terms

• **gametophyte**: a plant (or the haploid phase in its life cycle) that produces gametes by mitosis in order to produce a zygote
• **gametangium**: an organ or cell in which gametes are produced that is found in many multicellular protists, algae, fungi, and the gametophytes of plants
- **sporopollenin**: a combination of biopolymers observed in the tough outer layer of the spore and pollen wall
- **syngamy**: the fusion of two gametes to form a zygote
- **sporophyte**: a plant (or the diploid phase in its life cycle) that produces spores by meiosis in order to produce gametophytes

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### Sporangia in Seedless Plants

The sporophyte of seedless plants is diploid and results from syngamy (fusion) of two gametes. The sporophyte bears the sporangia (singular, sporangium): organs that first appeared in the land plants. The term “sporangia” literally means “spore in a vessel”: it is a reproductive sac that contains spores. Inside the multicellular sporangia, the diploid sporocytes, or mother cells, produce haploid spores by meiosis, where the 2n chromosome number is reduced to 1n (note that many plant sporophytes are polyploid: for example, durum wheat is tetraploid, bread wheat is hexaploid, and some ferns are 1000-ploid). The spores are later released by the sporangia and disperse in the environment.

![Figure 1: Sporangia](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/25%3A_S...)
two morphologically different types of spores. The male spores are called microspores, because of their smaller size, and develop into the male gametophyte; the comparatively larger megaspores develop into the female gametophyte. Heterospory is observed in a few seedless vascular plants and in all seed plants.

Figure \(\PageIndex{1}\): **Lifecycle of heterosporous plants**: Heterosporous plants produce two morphologically different types of spores: microspores, which develop into the male gametophyte, and megaspores, which develop into the female gametophyte.

When the haploid spore germinates in a hospitable environment, it generates a multicellular gametophyte by mitosis. The gametophyte supports the zygote formed from the fusion of gametes and the resulting young sporophyte (vegetative form). The cycle then begins anew.

The spores of seedless plants are surrounded by thick cell walls containing a tough polymer known as sporopollenin. This complex substance is characterized by long chains of organic molecules related to fatty acids and carotenoids; hence the yellow color of most pollen. Sporopollenin is unusually resistant to chemical and biological degradation. In seed plants, which use pollen to transfer the male sperm to the female egg, the toughness of sporopollenin explains the existence of well-preserved pollen fossils. Sporopollenin was once thought to be an innovation of land plants; however, the green algae, Coleochaetes, also forms spores that contain sporopollenin.

### Gametangia in Seedless Plants

Gametangia (singular, gametangium) are organs observed on multicellular haploid gametophytes. In the gametangia, precursor cells give rise to gametes by mitosis. The male gametangium (antheridium) releases sperm. Many seedless plants produce sperm equipped with flagella that enable them to swim in a moist environment to the archegonia: the female gametangium. The embryo develops inside the archegonium as the sporophyte. Gametangia are prominent in seedless plants, but are replaced by pollen grains in seed-producing plants.