Summary

24–1 Reproduction With Cones and Flowers

Seed plants are completely adapted to life on land. They do not need water for reproduction. Cones, flowers, and seeds let seed plants reproduce without water.

In the seed plant life cycle, the spore-producing generation (sporophyte) alternates with the gamete-producing generation (gametophyte). In seed plants, the familiar form of the plant is the sporophyte. The gametophyte of seed plants is hidden within the cones and flowers. Cones and flowers are two different methods of reproduction.

Pine trees and other gymnosperms use cones for reproduction. Pollen cones produce the male gametophyte, which are called pollen grains. Seed cones produce the female gametophyte in ovules. A few large egg cells form within the ovules. When a pollen grain lands near an ovule, it grows a pollen tube into the ovule. A sperm from the pollen tube fertilizes the egg in the ovule. A zygote forms and grows into an embryo. The embryo becomes enclosed in a seed.

Angiosperms, or flowering plants, reproduce with flowers. Flowers are organs that are made up of four kinds of leaves: sepals, petals, stamens, and carpels. Sepals make up the outermost circle of floral parts and are often green. They protect the flower bud. Colorful petals form the next circle. Petals attract insects and other pollinators to the flower. Sepals and petals are sterile leaves.

The inner circles of a flower are fertile leaves. Stamens form the first inner circle. Each stamen has a long filament that supports an anther. The anther produces male gametophytes. One or more carpels form the innermost circle. Carpels, also called pistils, produce female gametophytes. Each carpel has a broad base called the ovary. The carpel's stalk is called the style. At the top of the style is the stigma. The stigma has a sticky surface where pollen grains land. Angiosperms may have stamens and carpels within the same flower or in separate flowers on the same plant.

Reproduction in flowering plants takes place inside the flower. Inside the anthers, each cell undergoes meiosis to produce four haploid spore cells. Each of these cells becomes a pollen grain. Inside the ovaries are the ovules, where the female gametophyte develops. A single cell goes through meiosis to produce four haploid cells. One of these cells goes through mitosis, producing the embryo sac. This is the female gametophyte. Within the embryo sac is the egg cell.

During pollination, pollen is transferred from the anther to the stigma. Most gymnosperms are wind pollinated. Animals pollinate most angiosperms. Animal-pollinated flowers have many adaptations to attract the animals. Animals have evolved body shapes that let them reach nectar deep within the flowers. Animal pollination is more efficient than wind pollination.

When a pollen grain lands on a stigma, it grows a pollen tube to the ovary. Two sperm nuclei enter the embryo sac. Two distinct fertilizations take place in the embryo sac. First, one sperm nucleus fuses with the egg to form a diploid zygote. The zygote will grow into the plant embryo. Then, the other sperm nucleus fuses with two other nuclei in the embryo sac to form the endosperm. The endosperm provides food for the embryo. This is known as double fertilization.

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24–2 Seed Development and Germination

Seeds helped to make angiosperms successful on land. Seeds nourish and protect embryos. As angiosperm seeds mature, the ovary walls thicken to form a fruit. The fruit encloses the seed. Some fruits are fleshy like grapes. Others are tough like pea pods.

Fleshy fruits often attract animals. When animals eat the fruit, they also eat the seeds. The animals disperse the seeds in their feces, often in areas far from the parent plant. Seeds that are spread by wind and water are usually lightweight. They easily float in the air or on water.

Many seeds enter a period of dormancy. They are alive, but not growing. Dormancy gives time for seeds to spread to new areas or wait for better growing conditions. The right temperature and moisture can cause seeds to germinate, ending dormancy.

Germination is the stage of early growth of the plant embryo. When seeds germinate, they absorb water. This makes a seed swell and crack open. The young root emerges through the crack and begins to grow. In most monocots, a shoot emerges, protected by a sheath. The cotyledon stays underground. In some dicots, the cotyledons emerge above the ground. They protect the stem and the first leaves. In other dicots, the cotyledons stay underground to provide food for the seedling.

24–3 Plant Propagation and Agriculture

The production of seeds and fruits is sexual reproduction. Many plants also reproduce asexually by vegetative reproduction. This enables a single plant to produce many offspring that are genetically identical.

Plants reproduce asexually in many different ways. Some plants send out long, horizontal stems that produce roots or new shoots. Other plants produce tiny plants, called plantlets, on their leaves or stems. These plantlets detach and grow into new plants. Some plants can even produce new plants when a leaf drops to the ground and grows roots.

Plant growers often use vegetative reproduction to make exact copies of a useful or pretty plant. One method is to make a cutting of a stem that has meristematic tissue. The stem is partially buried in soil and treated with a special rooting mixture.

Grafting and budding are other methods used by plant growers. New plants are grown on plants that have a strong root system. A scion is a piece cut from the parent plant. It is attached to the plant with strong roots, called the stock. In grafting, stems are used as scions. In budding, buds are used as scions.

Agriculture, or the cultivation of plants, is the foundation of human society. Farmers in North America produce enough food to feed millions of people around the world. Most people of the world depend on a few crop plants—wheat, rice, and corn. Most food from crop plants is taken from the seeds.

Over time, farmers have increased the amount of crops they can harvest in an acre of land. Selective breeding of crop plants and improved farming techniques have made crop production more efficient.

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