Summary

25–1 Hormones and Plant Growth

Plant growth is not precisely determined. However, plant growth still follows general growth patterns that differ among species. Plant growth never stops. New cells are always being made in meristems. Meristems are found at the tips of stems and roots. New cells later develop into specialized tissues.

Plants grow in response to environmental factors like light, moisture, gravity, and temperature. Certain plant chemicals also control plant growth. These chemicals are called hormones. A hormone is a substance that is produced in one part of an organism and affects another part of the same organism. The part of the organism affected by a hormone is the target cell or target tissue. Different kinds of target cells can respond to the same hormone. A single hormone may affect two different tissues in different ways.

One important group of plant hormones is auxins. Auxins have different effects on different tissues. Auxins make stems grow toward light and away from the pull of gravity. The tendency of a plant to grow toward light is called phototropism. Gravitropism is the response of a plant to the pull of gravity. Auxins make roots grow away from light and toward the pull of gravity. Auxins also control plant branching by keeping the buds on the sides of the stem from growing.

Growing roots and developing fruits and seeds make hormones called cytokinins. Cytokinins stimulate cell division and make dormant seeds sprout. Their effects are often opposite to the effects of auxins.

In the 1920s, Japanese scientists identified a substance produced by a fungus that stimulated plant growth. They named this substance gibberellin. Later, scientists learned that plants also produce gibberellins. Gibberellins cause dramatic increases in size and rapid growth.

Ethylene is another plant hormone. Plants release ethylene in response to auxins. Ethylene stimulates fruits to ripen.

25–2 Plant Responses

Plants respond to changes in their environment. They respond to gravity, light, and touch. These responses are called tropisms. Gravitropism is the response of a plant to gravity. Phototropism is the response of a plant to light. A plant's response to touch is called thigmotropism.

Some plants have a rapid response to touch that does not involve growth. This kind of response is caused by changes in the osmotic pressure of some cells. These pressure changes cause leaves to fold up or snap shut. This response enables a Venus' flytrap to trap an insect.

Many plants respond to periods of light and darkness. This is called photoperiodism. It is caused by changes in the length of periods of light and darkness. These changes affect plant pigments called phytochromes, causing plants to flower. Some plants, known as short-day plants, flower when days are short. Others, known as long-day plants, flower when the days are long.

Some plants lose their leaves and become dormant during the winter. Auxins and other hormones work together to control this. Changes in the length of light and dark periods cause a change in the chemistry of phytochrome. This change in phytochrome causes auxin production to drop. The production of ethylene increases. The leaves stop making chlorophyll. Other pigments in the leaves become visible as the green coloring disappears. The cells that join a leaf to the stem become weak, and an abscission layer forms. The abscission layer seals the leaf off from the rest of the plant.

The leaves fall from the tree. Thick, waxy bud scales form. They cover the buds at the ends of the branches. The bud scales protect the buds from winter cold.

25–3 Plant Adaptations

Flowering plants live in many different environments. Through natural selection, plants have evolved different adaptations to live successfully in each environment.

Aquatic plants often live in mud that does not contain much oxygen. To get enough oxygen, many aquatic plants have air-filled spaces in their tissues. Oxygen diffuses through these spaces from the leaves to the roots.

Some plants can grow in salt water or in very salty air near the ocean. Many salt-tolerant plants have special cells that pump salt out of the plant tissues and onto the leaf surface. There, the rain washes off the salt.

Plants that live in the desert are called xerophytes. These plants must tolerate high daytime heat, sandy soil, strong winds, and little rain. These plants often have extensive roots, reduced leaves, and thick stems that can store water. Seeds of many desert plants can remain dormant for years. These seeds will germinate only when enough moisture guarantees them a chance to survive.

Some plants grow in soil with little nutrients. Carnivorous plants and parasites have adapted to living in environments with poor soil. Carnivorous plants trap and digest insects to get nitrogen. Parasites get water and nutrients directly from a host plant. Like all parasites, these plants harm their host plants.

Epiphytes are plants that are not rooted in soil. They grow directly on the bodies of other plants. Epiphytes are not parasites. They gather their own moisture, generally from rainfall. They also make their own food. Most epiphytes live in rain forests.

Many plants produce chemicals that are poisonous to the animals that eat them. These chemical defenses protect plants from potential predators.