

# Growth and Plant Hormones

**Growth:** All living organisms begin in the same form: as a single cell. That cell will divide and the resulting cells will continue dividing and differentiate into cells with various roles to carry out within the organism. This is life and plants are no different. Plant growth can be determinate or indeterminate, meaning some plants will have a cycle of growth then a cessation of growth, breakdown of tissues and then death (think of a radish plant or a tomato plant) while others (think of a giant cedar tree) will grow and remain active for hundreds of years. A tomato plant is fairly predictable and is said to have determinate growth, while the cedar tree has indeterminate growing potential. Development refers to the growth and differentiation of cells into tissues, organs and organ systems. This again all begins with a single cell.

**Plant Growth Regulators and Enzymes:** Genetic information directs the synthesis and development of enzymes which are critical in all metabolic process within the plant. Most enzymes are proteins in some form or another, are produced in very minute quantities and are produced on site—meaning they are not transported from one part of the organism to another. Genetic information also regulates the production of hormones, which will be addressed shortly. The major difference is that hormones are transported from one part of the plant to another as needed. Vitamins vital in the activation of enzymes and are produced in the cytoplasm and membranes of plant cells. Animals and humans utilize plants in order to provide some vitamin resources. In general, hormone and vitamin effects are similar and are difficult to distinguish in plants, and both are referred to in general as plant growth regulators.

**Plant Hormones:** The growth and development of a plant are influenced by genetic factors, external environmental factors, and chemical hormones inside the plant. Plants respond to many environmental factors such as light, gravity, water, inorganic nutrients, and temperature.

**Groups of Hormones:** Plant hormones are chemical messengers that affect a plant's ability to respond to its environment. Hormones are organic compounds that are effective at very low concentration; they are usually synthesized in one part of the plant and are transported to another location. They interact with specific target tissues to cause physiological responses, such as growth or fruit ripening. Each response is often the result of two or more hormones acting together.

Because hormones stimulate or inhibit plant growth, many botanists also refer to them as plant growth regulators. Many hormones can be synthesized in the laboratory, increasing the quantity of hormones available for commercial applications. Botanists recognize five major groups of hormones: auxins, gibberellins, ethylene, cytokinins, and abscisic acid.

**Auxins:** Auxins are hormones involved in plant-cell elongation, apical dominance, and rooting. A well known natural auxin is indoleacetic acid, or IAA which is produced in the apical meristem of the shoot. Developing seeds produce IAA, which stimulates the development of a fleshy fruit. For example, the removal of seeds from a strawberry prevents the fruit from