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Plant growth all about hormones

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Now that spring has arrived, we see buds bursting, seeds germinating, new stems growing upwards, and flowers opening. What all of these have in common is the influence of plant hormones.

Plant hormones are classified into five major groups: auxins, cytokinins, gibberellins, ethylene and abscisic acid.

Auxins are associated with cell elongation, and control varied aspects of plant growth. The word "auxin" comes from the Greek "to increase."

Plants growing on a window sill need to be rotated to keep them symmetrical because they grow towards the light, a phenomenon called phototropism. The growing tip of the plant (the apical meristem) produces auxin, which causes elongation of stem cells on the side away from the light. The stem on that side then grows more than the other side, and thus bends toward the light.

When you pinch off stem tips to make a plant bushier, you're removing the inhibitory "apical dominance" caused by auxins in the stem tips. This allows the side buds lower down on the stem to grow and send out new shoots. Auxin also functions in root formation; it's the major ingredient in commercial rooting powders.

Additionally, auxin is at work in geotropism (gravitropism), which causes roots to grow down towards gravity (positive geotropism), and stems to grow upwards away from gravity (negative geotropism).

Cytokinins function in cell division and can work with auxins in

Garden Tales

plant growth.

Gibberellins were first discovered when rice seedlings developed "foolish seedling disease" in Japan about 80 years ago. The cause was found to be a fungus (*Gibberella* sp.) which produced a hormone that affected the growth of the rice plants. After this, gibberellins were found to be produced by probably all plants, and influence such things as seed germination and flowering.

Gibberellins can cause of bolting in plants. A good example of this is when your lettuce plants suddenly elongate and produce flowering stalks, as summer approaches and days get longer. Plant flowering is categorized into three types: short-day plants, long-day plants and day-neutral plants; a phenomenon called photoperiodism.

So, in spring and fall, short-day plants flower; such as strawberries in the spring, and chrysanthemums in the fall. This also explains why some spring-flowering plants, like forsythia, violets and dandelions, sometimes produce a few flowers again in the fall, when day-length is short again. In the summer, long-day plants flower, like rudbeckia and spinach.

Other plants, such as tomato, petunia and impatiens, are day-neutral. Actually, what's important is the length of the night, not the day; so in short-day plants what really counts is the associated long night. The way a plant detects the length of darkness is through another chemical, phytochrome.



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"Short-day" plants like the native common blue violet (*Viola sororia*) flower now because of the influence of plant hormones.

Ethylene is the only plant hormone that is a gas, and one of its functions is fruit ripening. Many people know that if you want an unripe fruit like a green tomato or banana to ripen quickly, you put it in a bag with a ripe fruit. The ethylene produced by the ripe fruit will speed up the ripening of the unripe fruit.

This is not always a good thing, as in the expression "one bad apple will spoil the bunch." Ethylene also functions in leaf and flower aging (senescence).

Abscisic acid can act as an inhibitory hormone, and may be involved in dormancy of seeds and buds.

Right now in Delaware, the de-

licious early days of spring are unfolding. Red maples, bloodroot, and skunk cabbage are flowering in our woodlands, and ornamentals are surprising us with their blossoms; all brought to us by the actions of plant hormones.

Editor's note: On the campus of Delaware State University, the Claude E. Phillips Herbarium is Delaware's center for research, education, and outreach about plant identifications, locations, and uses. Call 857-6452 (Dr. Susan Yost, Herbarium Educator) to arrange a tour of the herbarium, or for more information about this article.