



St. Augustine Orchid Society

www.staugorchidsociety.org

Plant Hormones and Apical Dominance

by Sue Bottom, sbottom15@gmail.com

Plant hormones are naturally produced substances created in small amounts in one part of the plant that affect the growth of plant tissue in a different part of the plant. Auxin, the first plant hormone to be discovered, is present throughout the plant with the highest concentrations found in the actively growing parts, the shoot and root tips, young leaves, pollen and seed pods. Auxin produced in the growing tips of plants is transferred downward encouraging root formation, while cytokinins, another plant hormone that is produced in the roots, are transferred upward encouraging the formation of stems and leaves.

Apical Dominance. The auxin produced in the growing point of the plant, sometimes called the shoot apical meristem moves downward suppressing lateral bud formation. This phenomenon, called apical dominance, causes the main, central stem of a plant to grow more strongly than the side stems. When you pinch the top of an annual to encourage it to have a bushier shape, you remove the part of the plant that produces auxin that inhibits lateral branching, and then cytokinins become more dominant promoting the differentiation of tissue into side growth. Our orchids also exhibit apical dominance although differently depending on whether they are monopodial or sympodial orchids.

Monopodial Orchids. Apical dominance in monopodial orchids is very straightforward. Monopodial orchids, like vandas and phalaenopsis, grow upward, sprouting new leaves from the apex of the plant and sprouting roots and inflorescences from the axillary buds adjacent to the leaves. If the top of a vanda gets damaged, the apical tip and source of auxin is compromised. Without the suppressing effect of auxin, lateral buds are encouraged to sprout keikis from the leaf axils (axillary buds). Vanda growers sometimes let their too tall plants flop over on their sides, using the same principle to encourage the formation of keikis.

If you find yourself in the unfortunate situation of having a phal suffering from crown rot, your plant may still live to bloom another day. The crown rot destroys the apical tip of the plant. The cessation of auxin production means that lateral bud growth is no longer being suppressed, which will encourage the formation of a keiki from the base of the plant. Do not repot or disturb the roots during the several month period while you are waiting for the new plantlet to form. Simply remove the rotting tissue, disinfect with some hydrogen peroxide, water sparingly and wait. When the new plant is large enough to be self-sustaining, you can cut it away from the mother plant.



You may have seen a phal with an apical spike, in which the flower spike emerges from the central crown of a phalaenopsis rather than from an axillary bud adjacent to the leaves. This inflorescence consumes the apical tip of the plant so it can no longer grow more leaves or flower spikes from the plant apex. You will have to wait for a basal keiki to form for this plant to continue growing and flowering for you.

1. The normal spike emerges from between the leaves and the apical or terminal spike from the central crown of the phalaenopsis.



St. Augustine Orchid Society

www.staugorchidsociety.org

Plant Hormones and Apical Dominance

by Sue Bottom, sbottom15@gmail.com

Sympodial Orchids. Sympodial orchids have a lateral growth pattern so they do not have a top and bottom like a monopodial orchid. In cattleyas, a new shoot arises from the apical renewal bud or eye on the basal, rhizomatous part. The new growth enlarges into a swollen stem, the pseudobulb, as it matures with an apical mainly leafy part. The apical tip of the pseudobulb is consumed when it forms the flower buds. Once the apical tip terminates through either through flowering or becoming damaged, auxin production ceases and lateral growth is no longer suppressed. This stimulates the growth of a renewal bud in which the reserve lateral meristem takes over to form another pseudobulb, repeating the process. The result is that the rhizome, which may appear to be continuous is derived from multiple meristems, different from a monopodial plant whose stem derives from a single meristem. In the sympodial dendrobium, the apical tip of the cane is consumed when it forms the terminal leaf and the inflorescences arise from the leaf axils.

The older parts of plants can get a new lease on life as long as there are viable eyes. The back bulbs can be set in a tray or empty pot, misted daily and potted up once the renewal eye starts to swell. Better yet, if you know you are going to divide a plant, you can cut the rhizome several months prior to repotting to encourage the dormant eyes to sprout prior to disturbing the root system. When the time comes to repot, the new plant growth has already begun and it will reestablish more quickly.

Supplements. There are many different auxin bearing rooting hormone powders and liquids of varying strengths and formulations that can be used to encourage root growth. Many orchid growers use seaweed on their orchids on a routine basis, partly because it contains hormonal plant growth regulators. Using natural substances like seaweed or synthetic rooting hormones for a month or two on newly repotted plants or plants with compromised root systems is a common practice for returning plants to health.

Apical dominance is not a plan for world domination, it is an adaptation to encourage upward growth that will allow the plant to capture as much light as possible. In the event of damage, plants have a Plan B in which plant hormones trigger a growth response designed to ensure their continued existence. With healthy growing orchids, you should not need to supplement nature by supplying hormones from external sources. After you have stressed your plants in the repotting process or if your root system is ailing, a jolt of hormones, particularly the rooting hormones, can help stabilize them.

Citations and Additional Reading

Barkalow, Ray. 2014. Plant Growth Stimulants. *International Phalaenopsis Alliance*. 24(3) 24-25.

Brasch, James D., Plant Growth Regulators. *Orchids*. 69(3) 251-257.

Cline, M. G. 1994. The role of hormones in apical dominance. New approaches to an old problem in plant development. *Physiologia Plantarum*, 90: 230–237. doi:10.1111/j.1399-3054.1994.tb0

Rasmussen, H. N. 1986. The Vegetative Architecture of Orchids. *Lindleyana*, 1, 42-50.